Updated Edition for the Australian Curriculum

Over 100 Units of Work

Fifteen Topic Tests and four Exams

Mathematics Revision & Exam Workbook

YEAR 9

Get the Results You Want!

AS Kalra
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© Pascal Press ISBN 978 1 74125 271 2 Excel Essential Skills Mathematics Revision & Exam Workbook Year 9
Introduction

There are two workbooks in this series for the Year 9 Australian Curriculum Mathematics course:
• Excel Essential Skills Year 9 Mathematics Revision & Exam Workbook (this book) and
• Excel Essential Skills Year 9 Mathematics Extension Revision & Exam Workbook.

This book should be completed before the Extension book. It is the core book, written specifically for the Year 9 Australian Curriculum Mathematics course and the fifth in a series of eight Revision & Exam Workbooks for Years 7 to 10. Each book in the series has been specifically designed to help students revise their work so that they can prepare for success in their tests during the school year and in their half-yearly and yearly exams.

The emphasis in this book is for students to master and consolidate the core skills and concepts of the course through extensive practice. This will ensure that students have a solid foundation on which to build towards both the Mathematics and Advanced Mathematics courses in senior years.

The following features will help students achieve this goal:

➲ This book is a workbook. Students write in the book, ensuring that they have all their questions and working in the same place. This is invaluable when revising for exams—no lost notes or missing pages!
➲ Each page is a self-contained, carefully graded unit of work; this means students can plan their revision effectively by completing set pages of work for each section.
➲ Every topic from the Year 9 Mathematics syllabus is covered in this book, so if students have a particular area of weakness they can concentrate on that topic.
➲ A Topic Test is provided at the end of each chapter. These tests are designed to help students test their knowledge of each syllabus topic. Practising tests similar to those they will sit at school will build students’ confidence and help them perform well in their actual tests.
➲ Four Exam Papers have been included to test students on the complete Year 9 Mathematics course, helping students prepare for their half-yearly and yearly exams.
➲ A marking scheme is included in both the Topic Tests and Exam Papers to give students an idea of their progress.
➲ A Topic Test and Exam Paper Feedback Chart, found on the inside back cover, enables students to record their scores in all tests and exams.
➲ Answers to all questions are provided at the back of the book.
➲ There is a page reference to the Excel Mathematics Study Guide Years 9–10 in the top right-hand corner of all pages, excluding the tests. If students need help with a specific section, they will find relevant explanations and worked examples on these pages of the study guide.

A note from the author

Mathematics is best learned if you have pen and paper with you and do every question in writing. Do not just read through the book—work through it and answer the questions, writing down all working. If this approach is coupled with a menu of motivation, realistic goal-setting and a positive attitude, it will lead to better marks in the examinations.

My best wishes are with you; I believe this book will help you achieve the best possible results.
Good luck in your studies!

AS Kalra, MA, MEd, BSc, BEd
**UNIT 1: Equivalent ratios**

**Question 1** Express the following ratios in simplest form.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>3:6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>5:5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>18:6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>4:12</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>e</td>
<td>15:3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>f</td>
<td>8:2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>2:12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>2:10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>64:8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>16:4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>9:27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l</td>
<td>12:48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>3:24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>22:14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o</td>
<td>7:49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>121:11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q</td>
<td>5:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>25:75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>36:72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>8:84</td>
<td></td>
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</tbody>
</table>

**Question 2** Express as a ratio in its simplest form.

<p>| | | | | |</p>
<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>10:20:30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>1\frac{1}{2}:1\frac{1}{4}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>2\frac{1}{2}:2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>1\frac{3}{4}:1\frac{3}{4}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>1\frac{1}{2}:1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>2:2\frac{1}{5}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>1\frac{5}{7}:1\frac{5}{7}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>3\frac{7}{11}:7\frac{7}{11}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>0.2:0.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>1.5:2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>1:1\frac{1}{4}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l</td>
<td>1.2:2.4</td>
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</table>

**Question 3** Simplify the following ratios.

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<tbody>
<tr>
<td>a</td>
<td>$4:$12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>30 cents:$6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>10 hours:1 day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>400 g:1 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>50 cents:90 cents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>3 days:3 weeks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>12 cm:1 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>20 sec:1 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>2 kg:800 g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>400 mL:1 L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k</td>
<td>3 km:600 m</td>
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<td>l</td>
<td>8 cm:60 mm</td>
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<td></td>
</tr>
<tr>
<td>m</td>
<td>60 cm:1\frac{1}{2} m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>500 g:3 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o</td>
<td>30 min:2 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>1 h:40 min</td>
<td></td>
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</table>
UNIT 2: Using ratios

QUESTION 1

a Divide $36 in the ratio of 4 : 5.

b Divide $40 in the ratio of 3 : 2.

c $200 is divided in the ratio 6 : 4. What is the smaller part?

d $45 is divided in the ratio 5 : 4. What is the larger part?

QUESTION 2

a The ratio of boys to girls is 2 : 3. If there are 12 boys, how many girls are there?

b Two girls aged 12 years and 15 years divide $72 in the ratio of their ages. How much does each girl receive?

c Find the ratio of the areas of two squares whose sides are 3 cm and 5 cm, respectively.

d A piece of rope is cut into three lengths in the ratio 2 : 3 : 5. If the smallest length is 6 m, find the length of the original rope.

QUESTION 3

a A rectangle has length 16 cm and breadth 8 cm. What is the ratio of its length to its perimeter?

b In a class of 30 students, the ratio of passes to failures in a test was 5 : 1. Find the number of students who passed.

c Two brothers are to share an inheritance of half a million dollars in the ratio 12 : 13. How much is the smaller share?

d The ratio of adults to children on a train trip is 3 : 2. If the train carries 800 passengers, find the number of adults and children on the train.
Rates and proportion

UNIT 3: Rates (1)

QUESTIONS

1. Complete the following sentences.
   a 320 km in 5 hours is a rate of ______ per hour.
   b 48 books bought for $360 is at the rate of ______ per book.
   c If 900 litres of water flows through a tap in 2 hours, it is a rate of ______ per minute.
   d Richard works for 10 hours and is paid $145. His rate of pay is ______ per hour.

2. Complete the equivalent rates.
   a 90 km/h = ______ km/min
   b 10 L/h = ______ L/day
   c 8 m/min = ______ m/h
   d $3/min = ______$/h
   e 20 mL/min = ______ mL/h
   f 30°/min = ______°/second

3. Michael drives 180 km in 3 hours. Find his average speed. _____________________________
   b Change 120 km into km/min. _____________________________
   c Change 180 km/h into m/s. _____________________________
   d John delivered 540 bottles of milk every morning between 5:00 am and 9:00 am. Find his hourly rate of delivery. _____________________________
   e A car travels at the speed of 25 m/s. How many kilometres does it travel in 1 hour? _____________________________

4. A car travels 600 km on a journey and covers this distance in 6 hours and 15 minutes. Calculate the average speed per hour. _____________________________
   b A tree grows to a height of 32.4 metres over a period of 8 \( \frac{1}{2} \) years. What is the average annual growth rate in metres per year? _____________________________
   c The distance between two towns is 90 km. A bus driver averages 30 km/h in heavy traffic in one direction and 45 km/h on the return trip. Calculate the total time taken and the average speed for the total journey. _____________________________
UNIT 4: Rates (2)

QUESTION 1  Complete the following sentences.

a  1430 km in 13 hours is a rate of _____________ per hour.

b  Monique works for 28 hours and is paid $268.80. Her rate of pay is _____________ per hour.

c  Claudette earns $621.25 for a 35-hour week.
   Her hourly rate of pay is _____________ dollars.

d  9.8 kg of meat costs $91.14, which equals _____________ per kilo.

e  If 3600 litres of water flows through a tap in 12 hours, it flows at a rate of
   _____________ per minute.

QUESTION 2

a  Simone drives 490 km in five hours.
   Find her average speed.
   _____________

b  A car travels at the speed of 31 m/s.
   How many kilometres does it travel in two hours?
   _____________

c  A car uses petrol at the rate of 8.25 L/100 km.
   How many litres would be used to travel 2460 km?
   _____________

QUESTION 3

a  Around schools, speed is limited to 40 km/h.
   A driver is distracted for 5 seconds.
   What distance does he cover in this time travelling at this speed?
   _____________

b  A tap drips at the rate of 3 mL/min.
   How much water is wasted in a day?
   _____________

c  A factory produces 560 bottles each minute.
   How long does it take to produce 1 000 000 bottles?
   _____________
UNIT 5: Conversion of rates

**QUESTION 1** Complete the equivalent rates.

a. $80 \text{ mL/min} = \hspace{1cm} \text{mL/h}$

b. $1000 \text{ mm/s} = \hspace{1cm} \text{cm/s}$

c. $24.5 \text{ t/day} = \hspace{1cm} \text{kg/h}$

d. $60 \text{ m/min} = \hspace{1cm} \text{m/h}$

e. $275 \text{ L/min} = \hspace{1cm} \text{kL/min}$

f. $100 \text{ L/h} = \hspace{1cm} \text{L/day}$

g. $120 \text{ km/h} = \hspace{1cm} \text{km/min}$

h. $27^\circ/\text{min} = \hspace{1cm} \text{^\circ/s}$

i. $54 \text{ ha/day} = \hspace{1cm} \text{m^2/day}$

j. $2.35 \text{ m/s} = \hspace{1cm} \text{cm/min}$

**QUESTION 2** A speed of 58 metres per second is how many:

a. metres per minute?

b. metres per hour?

c. kilometres per hour?

d. kilometres per day?

**QUESTION 3** A car is travelling at 110 km/h.
How many metres does it travel in one minute?

**QUESTION 4** A flow rate of 45 mL per second is how many:

a. mL per minute?

b. mL per hour?

c. L per hour?

d. kL per hour?

**QUESTION 5** Change:

a. $96 \text{ km/h} \text{ to m/s}$

b. $30 \text{ m/s} \text{ to km/h}$

c. $120 \text{ km/h} \text{ to m/s}$

d. $72 \text{ km/h} \text{ to m/min}$.
UNIT 6: Conversion graphs

This graph is used to convert litres to gallons.

**Question 1** Use the graph to change these measurements in litres to measurements in gallons.

- a 200 L
- b 400 L
- c 160 L
- d 260 L
- e 350 L
- f 50 L

**Question 2** Use the graph to change these measurements in gallons to measurements in litres.

- a 10 gallons
- b 90 gallons
- c 55 gallons
- d 66 gallons
- e 78 gallons
- f 102 gallons

**Question 3**

a Use the graph to answer these questions. 50 gallons is about how many litres? ________________

b A tank holds 5000 gallons of water. About how many litres does the tank hold? ________________

c Another tank holds 36200 litres of water. What is that capacity in gallons? ________________

**Question 4** The graph at right shows the water level in an industrial washing machine as it goes through part of its cycle.

a When is the level of water decreasing? ________________

b When is the water level constant? ________________

c How can you easily tell that the water level is increasing at a slower rate between 15 and 30 minutes than in the first ten minutes? ________________
UNIT 7: Direct variation (1)

**Question 1**

Given that $C = 38t$

(a) find $C$ when $t = 7$

(b) find $t$ when $C = 722$

**Question 2**

Given that $M = kP$, and that $k = \frac{2}{3}$, find $M$ when:

(a) $P = 36$

(b) $P = 129$

(c) $P = 53.1$

**Question 3**

Given that $y = kx$, and that $y = 171$ when $x = 3$, find:

(a) the value of $k$

(b) $y$ when $x = 11$

(c) $y$ when $x = 24$

**Question 4**

Given that $n = kq$, and that $n = 14$ when $q = 4$, find:

(a) the value of $k$

(b) $n$ when $q = 18$

(c) $q$ when $n = 161$

**Question 5**

Given that $C = kd$ and that $C = 44.8$ when $d = 16$, find:

(a) $C$ when $d = 34$

(b) $C$ when $d = 60$

(c) $d$ when $C = 201.6$
Rates and proportion

UNIT 8: Direct variation (2)

**Question 1** Given $P = kY$:

a first find $k$ if $P = 72$ when $Y = 3$

b then find $Y$ when $P = 288$

---

**Question 2** $C$ varies directly with $D$. If $C = 24.6$ when $D = 3$, then:

a find the relationship between $C$ and $D$

b find $C$ when $D = 5$

---

**Question 3** A car travels 360 km in 4 hours. How far will it travel in 12 hours if it continues travelling at the same rate?

---

**Question 4** $Y$ varies directly with $X$. When $X = 16$, $Y = 28$. Find the value of $Y$ when $X = 82$

---

**Question 5** The cost, $C$, to run a machine is directly proportional to the time, $t$ hours, for which it runs, so $C = kt$. The cost to run the machine for 15 hours is $630$.

a Find the cost to run the machine for 40 hours.

b During one week the cost to run the machine was $2310$. How many hours did the machine run that week?
Chapter 1: Rates and proportion

TOPIC TEST

Part A

Time allowed: 15 minutes

Total marks: 15

1. What is the ratio of 90 m to 30 cm in simplest form?
   - A 3 : 1
   - B 30 : 1
   - C 300 : 1
   - D 3000 : 1

2. Which equation, given that \( k \) is a constant, shows that \( y \) varies directly with \( x \)?
   - A \( y = x + k \)
   - B \( y = kx \)
   - C \( y = \frac{k}{x} \)
   - D \( xy = k \)

3. At an average speed of 75 km/h, how long will it take to travel 30 km?
   - A 15 min
   - B 24 min
   - C 30 min
   - D 40 min

4. Tyler is paid $1206.90 for working \( 37\frac{1}{4} \) hours. What is he paid per hour?
   - A $32.40
   - B $32.19
   - C $32.49
   - D $30.48

5. Given that \( F = ma \), and \( F = 588 \) when \( m = 60 \), what is the value of \( F \) when \( m = 80 \)?
   - A 441
   - B 608
   - C 686
   - D 784

6. Of 1000 people, 125 are children. What is the ratio of children to adults?
   - A 1 : 7
   - B 1 : 8
   - C 7 : 1
   - D 8 : 1

7. Change 120 km/h into m/min
   - A 2 m/min
   - B 7.2 m/min
   - C 2000 m/min
   - D 7200 m/min

8. A car travels 680 km in \( 8\frac{1}{2} \) hours. Calculate the average speed.
   - A 60 km/h
   - B 80 km/h
   - C 90 km/h
   - D 100 km/h

9. 15 litres per hour equals how many litres per day?
   - A 180 L/day
   - B 220 L/day
   - C 360 L/day
   - D none of these

10. In a school of 966 students, girls and boys are in the ratio 4 : 3. How many girls are there?
    - A 138
    - B 414
    - C 552
    - D none of these

11. If $36000 is divided in the ratio 4 : 5, what is the smaller share?
    - A $20000
    - B $16000
    - C $4000
    - D $8000

12. Convert a speed of 30 m/s into km/h
    - A 1.8 km/h
    - B 18 km/h
    - C 108 km/h
    - D 118 km/h

13. The angles of a triangle are in the ratio 2 : 3 : 5. Find the largest angle.
    - A 36°
    - B 54°
    - C 90°
    - D 144°

14. The ratio of 10.5 kg to 168 kg is
    - A 1 : 8
    - B 8 : 1
    - C 1 : 16
    - D 16 : 1

15. An amount is divided in the ratio 3 : 5. If the smaller part is $30, the original amount was?
    - A $50
    - B $80
    - C $18
    - D $48

Total marks achieved for Part A

Mark: 15
## Rates and proportion

### TOPIC TEST

**PART B**

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> a. Simplify the ratio 320 g : 4 kg</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b. There are 60 girls at a party. If the ratio of boys to girls is 5 : 6, how many boys are at the party?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c. $880 is divided in the ratio 7 : 4. Find the larger part.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d. A car travels at an average speed of 85 km/h, how long will it take to cover 595 km?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e. If Michael earns $462.50 for 25 hours how much will he earn for 60 hours?</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

| 2** | a. Light travels at a speed of $3 \times 10^8$ m/s How many kilometres does it travel in 2 hours? |            | 1     |
| b. Change 160 km/h into m/s. |            | 1     |
| c. Three business partners share their annual profit in the ratio 2 : 3 : 4. Find how much does each receive if the profit is $162000 |            | 1     |
| d. A rectangle has length 30 cm and breadth 20 cm. What is the ratio of its length to its perimeter? |            | 1     |
| e. Find the ratio of the areas of two squares whose sides are 7 cm and 9 cm respectively. |            | 1     |
| f. Change 40 m/s to km/h. |            | 1     |
| g. 252 litres of water flows through a filter in $10\frac{1}{2}$ minutes. What is the volume flow rate in litres per minute? |            | 1     |

| 3** | When $d = 17, h = 204$. Given $h = kd$ |            |       |
| a. find the value of $k$ |            | 1     |
| b. find $h$ when $d = 7$ |            | 1     |
| c. find $d$ when $h = 252$ |            | 1     |

**Total marks achieved for PART B**

15
CHAPTER 2

UNIT 1: Algebraic expressions

**Question 1** Write algebraic expressions for the following.

a) Add 5 to \(x\) = 

b) The sum of \(x\) and \(y\) = 

c) \(a\) times \(b\) = 

d) The difference between \(p\) and \(q\) = 

e) The square root of \(m\) = 

f) The product of seven and \(x\) = 

g) The square of \(d\) = 

h) The number \(x\) divided by \(n\) = 

i) Five times the sum of \(x\) and 3 = 

j) Square root of the product of \(x\) and \(y\) = 

k) Four times, the number plus nine = 

l) Half the number, minus six = 

m) Seven times the square of a number = 

**Question 2** Write algebraic expressions for the following.

a) The cost of \(p\) pens at \(d\) each = 

b) The distance travelled by a person at \(k\) km/h in \(h\) hours = 

c) If \(e\) is an even number, the next even number after \(e\) = 

d) If \(e\) is an even number, the next odd number after \(e\) = 

e) In a right-angled triangle, one of the acute angles is \(a^\circ\). The size of the other angle = 

**Question 3** Write the following algebraic expressions:

a) Double \(m\) and divide the result by 7: 

b) Multiply \(x\) and 5\(y\) and to this result add 9: 

c) Add 3 to \(p\) and multiply the result by 5: 

d) \(m\) is divided by \(n\) and \(p\) is added to the result: 

**Question 4** Write algebraic expressions for the perimeter of each of the following.

a) 

b) 

c) 

**Question 5** Write algebraic expressions for the area of each of the following.

a) 

b) 

c)
**UNIT 2: Substitution**

**QUESTION 1** Find the values of the following expressions if \(x = 2\), \(y = 3\) and \(z = 4\)

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x + y)</td>
<td>(2 + 3 = 5)</td>
</tr>
<tr>
<td>(y + z)</td>
<td>(3 + 4 = 7)</td>
</tr>
<tr>
<td>(x + z)</td>
<td>(2 + 4 = 6)</td>
</tr>
<tr>
<td>(x + y + z)</td>
<td>(2 + 3 + 4 = 9)</td>
</tr>
<tr>
<td>(x + y - z)</td>
<td>(2 + 3 - 4 = 1)</td>
</tr>
<tr>
<td>(x - y + z)</td>
<td>(2 - 3 + 4 = 3)</td>
</tr>
<tr>
<td>(2x + 3y)</td>
<td>(2(2) + 3(3) = 4 + 9 = 13)</td>
</tr>
<tr>
<td>(3y + 4z)</td>
<td>(3(3) + 4(4) = 9 + 16 = 25)</td>
</tr>
<tr>
<td>(x + 2y + 3z)</td>
<td>(2 + 2(3) + 3(4) = 2 + 6 + 12 = 20)</td>
</tr>
<tr>
<td>(x^2 + y^2)</td>
<td>(2^2 + 3^2 = 4 + 9 = 13)</td>
</tr>
<tr>
<td>(y^2 + z^2 - x^2)</td>
<td>(3^2 + 4^2 - 2^2 = 9 + 16 - 4 = 17)</td>
</tr>
<tr>
<td>(xy + yz)</td>
<td>(2(3) + 3(4) = 6 + 12 = 18)</td>
</tr>
<tr>
<td>(x + 3 + \frac{y}{3})</td>
<td>(2 + 3 + \frac{3}{3} = 2 + 3 + 1 = 6)</td>
</tr>
</tbody>
</table>

**QUESTION 2** Evaluate the following expressions if \(a = 3\), \(b = -2\) and \(c = 6\)

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a + b + c)</td>
<td>(3 + (-2) + 6 = 7)</td>
</tr>
<tr>
<td>(ab + c)</td>
<td>(3(-2) + 6 = -6 + 6 = 0)</td>
</tr>
<tr>
<td>(ab ÷ c)</td>
<td>(3(-2) ÷ 6 = -6 ÷ 6 = -1)</td>
</tr>
<tr>
<td>(a^2 + b^2)</td>
<td>(3^2 + (-2)^2 = 9 + 4 = 13)</td>
</tr>
<tr>
<td>((a + b + c)^2)</td>
<td>((3 + (-2) + 6)^2 = 7^2 = 49)</td>
</tr>
<tr>
<td>(a - b - c)</td>
<td>(3 - (-2) - 6 = 3 + 2 - 6 = -1)</td>
</tr>
<tr>
<td>(a + 2b + c)</td>
<td>(3 + 2(-2) + 6 = 3 - 4 + 6 = 5)</td>
</tr>
<tr>
<td>(\frac{a + b + c}{3})</td>
<td>(\frac{3 + (-2) + 6}{3} = \frac{7}{3})</td>
</tr>
<tr>
<td>(\frac{1}{a} + \frac{1}{c})</td>
<td>(\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2})</td>
</tr>
<tr>
<td>(\frac{a}{b} + \frac{b}{a})</td>
<td>(\frac{3}{-2} + \frac{-2}{3} = \frac{-9 + 4}{6} = \frac{-5}{6})</td>
</tr>
</tbody>
</table>

**QUESTION 3** If \(a = \frac{1}{4}\), \(b = \frac{1}{5}\) find the exact value of the following.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a + b)</td>
<td>(\frac{1}{4} + \frac{1}{5} = \frac{5}{20} + \frac{4}{20} = \frac{9}{20})</td>
</tr>
<tr>
<td>(a - b)</td>
<td>(\frac{1}{4} - \frac{1}{5} = \frac{5}{20} - \frac{4}{20} = \frac{1}{20})</td>
</tr>
<tr>
<td>(\frac{a + b}{a - b})</td>
<td>(\frac{\frac{1}{4} + \frac{1}{5}}{\frac{1}{4} - \frac{1}{5}} = \frac{\frac{9}{20}}{\frac{1}{20}} = 9)</td>
</tr>
<tr>
<td>(\frac{a - b}{a + b})</td>
<td>(\frac{\frac{1}{4} - \frac{1}{5}}{\frac{1}{4} + \frac{1}{5}} = \frac{\frac{1}{20}}{\frac{9}{20}} = \frac{1}{9})</td>
</tr>
</tbody>
</table>

**QUESTION 4** Find the value of \(2 \times \sqrt[3]{\frac{L}{g}}\) when \(l = 1.9\) and \(g = 9.8\) 

Give your answer correct to three decimal places.

**QUESTION 5** Evaluate \(p(p + q)\) correct to three decimal places when \(p = 2.4\) and \(q = 8.13\)
UNIT 3: Addition and subtraction of pronumerals

**Question 1** Simplify the following expressions by collecting like terms.

- **a** \(3x + 7x = \) 
- **b** \(6x - 4x = \) 
- **c** \(8a + 9a = \) 
- **d** \(12x - 11x = \) 
- **e** \(5m + 12m = \) 
- **f** \(7a - a = \) 
- **g** \(8n + 15n = \) 
- **h** \(5mn + 13nm = \) 
- **i** \(6p + 9p = \) 
- **j** \(8xy + 15xy = \) 
- **k** \(11a - 3a = \) 
- **l** \(7x^2 + 9x^2 = \)

**Question 2** Simplify the following.

- **a** \(8a + 7a + 3a = \) 
- **b** \(8xy + 7xy - 9xy - xy = \) 
- **c** \(9x - 3x - 2x = \) 
- **d** \(9k + 5k + 3k - k = \) 
- **e** \(5xy + 2xy - xy = \) 
- **f** \(10a + 3a + 2a - 5a = \) 
- **g** \(9x^2 + 7x^2 - 5x^2 - x^2 = \) 
- **h** \(14p + 6p - 9p = \) 
- **i** \(5x - 3x + 7x - 8x = \) 
- **j** \(9ab - 6ab - 3ab - ab = \) 
- **k** \(9m + 6m - 7m + m = \) 
- **l** \(18y - 7y - 3y - y = \)

**Question 3** Simplify by collecting like terms.

- **a** \(7a - 3b + 8a - 5b = \) 
- **b** \(12a + 9b - 2a = \) 
- **c** \(8a^2 + 7 - 6b + 7a^2 - 2b = \) 
- **d** \(9c - 7c - 3c + 2d = \) 
- **e** \(6y + 7x - 3y + 2x = \) 
- **f** \(8x^2 - x^2 - 4x^2 = \) 
- **g** \(10m + 3n + 10n + 2n = \) 
- **h** \(18mn - 6mn + 2mn = \) 
- **i** \(8y + 3y - 2x + 7x = \) 
- **j** \(8x + 6y - 3y - 3x = \) 
- **k** \(14 - 3x - 2x = \) 
- **l** \(8t + 19 - 3t - 7 = \)

**Question 4** Simplify the following.

- **a** \(9a + 7 - 4a = \) 
- **b** \(3x^2 + 9x^2 - 2x^2 - x^2 = \) 
- **c** \(6m + 9mn - 2m - 3mn = \) 
- **d** \(8x - 3x + 7x - 2x = \) 
- **e** \(10x + 4y - 3x - 3y = \) 
- **f** \(18y - 3y + 4y = \) 
- **g** \(8a^2 - a^2 - 2a^2 = \) 
- **h** \(3m - 4m + 9m = \) 
- **i** \(5y + 9x - 3x - 2x = \) 
- **j** \(9k + 5k + 3k + 2k = \) 
- **k** \(3y + 2y - 2x + 6x = \) 
- **l** \(18a - 17a - a - 3a = \) 
- **m** \(18 - 4x - 2x = \) 
- **n** \(11p + 6p - 8p = \) 
- **o** \(14m + 5n + 8n + 6m = \) 
- **p** \(9ab + 3ab - 2ab - ab = \)
UNIT 4: Multiplication of pronumerals

**Question 1** Find the products of the following.

a \( 8 \times 5a = \) ____________________________

b \( 6mn \times 3m \times 2n = \) ____________________________

c \( 4m \times 3n = \) ____________________________

d \( -3a \times -5b = \) ____________________________

e \( (-3x) \times 5 = \) ____________________________

f \( 8mn \times 6mn = \) ____________________________

g \( 8a \times -3a = \) ____________________________

h \( 9ab \times 6 = \) ____________________________

i \( 9a \times b \times a = \) ____________________________

j \( 5a \times 7b = \) ____________________________

k \( -3a \times -3b = \) ____________________________

l \( ab \times a^2b = \) ____________________________

**Question 2** Find the products of the following.

a \( (-9m) \times (-3) = \) ____________________________

b \( 6a^2b \times ab = \) ____________________________

c \( -7x \times -x = \) ____________________________

d \( 5x \times 2x \times 4 = \) ____________________________

e \( 4a \times 5am = \) ____________________________

f \( 2a \times 3a \times 4a = \) ____________________________

g \( (-3p) \times 5 \times (-5p) = \) ____________________________

h \( 3a \times 4b \times 5a = \) ____________________________

i \( (-8m) \times (-6mn) = \) ____________________________

j \( x \times (-y) \times 3 = \) ____________________________

k \( 4a \times 6am \times (-a) = \) ____________________________

l \( (-4) \times (-2p) \times 6 = \) ____________________________

**Question 3** Simplify the following.

a \( 9 \times -5y = \) ____________________________

b \( -6 \times -7a = \) ____________________________

c \( -3a \times -7 = \) ____________________________

d \( 11a \times -4b = \) ____________________________

e \( 8x^2 \times -x = \) ____________________________

f \( -6a \times 8ab = \) ____________________________

g \( -6a \times -3ab = \) ____________________________

h \( 10k \times -2k \times 4 = \) ____________________________

i \( -4y \times -2 \times 6x = \) ____________________________

j \( -5x \times 20y \times 3 \times -2x = \) ____________________________

k \( 3 \times -p \times q \times 2 = \) ____________________________

l \( 8x \times y \times -3 \times -x = \) ____________________________

**Question 4** Find the following products.

a \( 8mn \times \frac{1}{4}m = \) ____________________________

b \( -18ab \times \frac{1}{2}ab = \) ____________________________

c \( \frac{2a}{3} \times a = \) ____________________________

d \( 7t \times \frac{2}{5} = \) ____________________________

e \( \frac{x}{4} \times 8 = \) ____________________________

f \( 6 \times \frac{2n}{7} = \) ____________________________

g \( \frac{1}{8}a \times 16b \times -a = \) ____________________________

h \( 7p \times 8q \times \frac{1}{3}p = \) ____________________________

i \( m \times \frac{3n}{2} = \) ____________________________

j \( \frac{8c}{3} \times 4c = \) ____________________________
UNIT 5: Division of pronumerals

**QUESTION 1**  Divide the following.

a  \[ 12a \div 3 = \]  

b  \[ 20xy \div xy = \]  

c  \[ 8a^2b \div 4a^2 = \]  

d  \[ abc \div bc = \]  

e  \[ 16a \div -8 = \]  

f  \[ 6m \div 3m = \]  

g  \[ -64a \div -8a = \]  

h  \[ 18m \div 3m = \]  

i  \[ 60ab \div 30ab = \]  

j  \[ 36a \div 4a = \]  

k  \[ 9x \div -9 = \]  

l  \[ -10ab \div 5a = \]  

m  \[ 9x \div 9x = \]  

n  \[ 8x^2 \div 4 = \]  

o  \[ -42mn \div -7m = \]  

p  \[ 18a \div -a = \]  

q  \[ -36abc \div 9ab = \]  

r  \[ 16a^2b \div 8ab = \]  

**QUESTION 2**  Simplify:

a  \[ \frac{4x^2}{8x} = \]  

b  \[ \frac{12ab}{6b} = \]  

c  \[ \frac{15pq}{10p} = \]  

d  \[ \frac{45a}{9b} = \]  

e  \[ \frac{2a}{4b} = \]  

f  \[ \frac{5}{25a} = \]  

g  \[ \frac{8x^2}{2x} = \]  

h  \[ \frac{90m}{-9m} = \]  

i  \[ \frac{xy}{xz} = \]  

j  \[ \frac{24a^2b}{6ab} = \]  

k  \[ \frac{12e^3}{3e^2} = \]  

l  \[ \frac{9n^3}{3n} = \]  

m  \[ \frac{7x}{14x^2} = \]  

n  \[ \frac{12}{24n} = \]  

**QUESTION 3**  Simplify the following.

a  \[ 9x \times 8 \div 6x = \]  

b  \[ (8a)^2 \div 16a = \]  

c  \[ 18xyz \div 9xy \div z = \]  

d  \[ 9x \times 4y \div 6xy = \]  

e  \[ 16mn \times 4m \div 8n = \]  

f  \[ 48ab \div 8b \div 3a = \]  

UNIT 6: Algebraic expressions with grouping symbols

**Question 1** Expand the following.

- **a** \(3(x + 2) = \) 
- **b** \(2(a + 5) = \) 
- **c** \(5(y + 4) = \) 
- **d** \(8(x - 1) = \) 
- **e** \(7(m - 2) = \) 
- **f** \(9(x - 5) = \) 
- **g** \(3(2a + 3) = \) 
- **h** \(4(5a + 3) = \) 
- **i** \(7(8a + 7) = \) 
- **j** \(-2(5a - 7) = \) 
- **k** \(-3(6m - 9) = \) 
- **l** \(8(2a - 6) = \) 
- **m** \(-x(x + 9) = \) 
- **n** \(-y(y - 3) = \) 
- **o** \(-m(2m + 9) = \)

**Question 2** Expand and simplify the following.

- **a** \(4(a + 5) + 2a + 7 = \) 
- **b** \(2(x - 3) + 3x - 5 = \) 
- **c** \(5(m - 1) + 2m - 1 = \) 
- **d** \(9a + 6 + 2(3a + 5) = \) 
- **e** \(4y - 1 - 3(y + 2) = \) 
- **f** \(8x + 3(2x - 3) + 7 = \) 
- **g** \(7x + 5 + 2(x - 3) = \) 
- **h** \(3x - (x + 7) + 5x = \) 
- **i** \(15 - 3(x - 5) + 3x = \) 
- **j** \(5(6a - 3) - 15a + 6 = \) 
- **k** \(6a + 8 - 3(3a - 1) = \) 
- **l** \(9x + 10 - 3(x - 5) = \)

**Question 3** Expand and simplify the following.

- **a** \(5(x + 2) + 3(x - 1) = \) 
- **b** \(3(y + 3) + 2(y + 2) = \) 
- **c** \(8(x - 1) - 2(x - 3) = \) 
- **d** \(6(a - 3) - 2(a - 1) = \) 
- **e** \(7(m + 3) - 3(m - 2) = \) 
- **f** \(9(y - 7) + 6(y - 2) = \) 
- **g** \(x(x + 3) + 5(x + 1) = \) 
- **h** \(p(p - 2) - 3(p - 1) = \) 
- **i** \(a(a + b) + b(a - b) = \) 
- **j** \(4(2x + 7) + 3(2x - 1) = \) 
- **k** \(3(5x + 4) - 2(3x - 5) = \) 
- **l** \(x(x + 5) + x(x - 2) = \)
QUESTION 1  Given that \( A = \frac{1}{2}bh \), find \( A \) if:

a  \( b = 12, h = 4 \)  

b  \( b = 10, h = 7 \)  

c  \( b = 19, h = 5 \)  

---

QUESTION 2  Given that \( A = \frac{1}{2}bh(a + b) \), find \( A \) if:

a  \( h = 8, a = 3, b = 5 \)  

b  \( h = 6, a = 7, b = 9 \)  

c  \( h = 9, a = 5, b = 7 \)  

---

QUESTION 3  Given that \( P = 2L + 2B \), find \( P \) if:

a  \( L = 11, B = 9 \)  

b  \( L = 7, B = 5 \)  

c  \( L = 14, B = 10 \)  

---

QUESTION 4  Given that \( r = 14 \) and using \( \pi = \frac{22}{7} \), find:

a  \( C \) if \( C = 2\pi r \)  

b  \( A \) if \( A = \pi r^2 \)  

c  \( V \) if \( V = \frac{4}{3}\pi r^3 \)  

---

QUESTION 5  If \( C = \frac{5}{9}(F - 32) \), find \( C \) when \( F = 212 \)  

---

QUESTION 6  If \( B = \frac{m}{r^2} \), find \( B \) when \( m = 81 \) and \( h = 1.8 \)  

---

QUESTION 7  If \( A = 20 \), find \( D \) when:

a  \( D = \frac{ka}{70} \) and \( k = 42 \)  

b  \( D = \frac{yA}{y + 12} \) and \( y = 8 \)  

---
## Algebra

### TOPIC TEST

#### PART A

**Instructions**
- This part consists of 12 multiple-choice questions.
- Fill in only ONE CIRCLE for each question.
- Each question is worth 1 mark.

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Question</th>
<th>Options</th>
<th>Correct Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(3x - (1 - x)) equals</td>
<td>A. (1 - 4x)</td>
<td>B. (3x - 1)</td>
<td>C. (2x + 1)</td>
</tr>
<tr>
<td>2</td>
<td>(-2(3b - a)) equals</td>
<td>A. (2a - 6b)</td>
<td>B. (2a + 6b)</td>
<td>C. (-2a - 6b)</td>
</tr>
<tr>
<td>3</td>
<td>(4(x + 2) + 3) equals</td>
<td>A. (4x + 5)</td>
<td>B. (4x + 9)</td>
<td>C. (4x + 11)</td>
</tr>
<tr>
<td>4</td>
<td>Simplify (3a - 3(a + 1))</td>
<td>A. (1)</td>
<td>B. (-1)</td>
<td>C. (3)</td>
</tr>
<tr>
<td>5</td>
<td>If (x = -1) then (-x^2) equals</td>
<td>A. (1)</td>
<td>B. (-1)</td>
<td>C. (2)</td>
</tr>
<tr>
<td>6</td>
<td>If (x) and (y) are both negative, which of these expressions is always positive?</td>
<td>A. (x + y)</td>
<td>B. (x - y)</td>
<td>C. (-xy)</td>
</tr>
<tr>
<td>7</td>
<td>Given (v = u + at) and (v = 11.6) when (u = 6.5) and (a = 3.7), the value of (t) to three significant figures is</td>
<td>A. (1.378)</td>
<td>B. (1.37)</td>
<td>C. (1.38)</td>
</tr>
<tr>
<td>8</td>
<td>(-9x + x - 3x) equals</td>
<td>A. (-11x)</td>
<td>B. (13x)</td>
<td>C. (11x)</td>
</tr>
<tr>
<td>9</td>
<td>Which of the following will produce an even number if (x = 3)?</td>
<td>A. (x^2)</td>
<td>B. (x^2 + 2)</td>
<td>C. (2x + 1)</td>
</tr>
<tr>
<td>10</td>
<td>(a(a - 3)) is the same as</td>
<td>A. (-2a)</td>
<td>B. (-3a^2)</td>
<td>C. (a^2 - 3)</td>
</tr>
<tr>
<td>11</td>
<td>(5x - 3y + 2x - 7y =)</td>
<td>A. (3x - 4y)</td>
<td>B. (3x - 10y)</td>
<td>C. (7x - 4y)</td>
</tr>
<tr>
<td>12</td>
<td>(\frac{6a}{12a^2b} =)</td>
<td>A. (2ab)</td>
<td>B. (\frac{b}{2})</td>
<td>C. (\frac{1}{2ab})</td>
</tr>
</tbody>
</table>

Total marks achieved for PART A: 12
## Chapter 2: Algebra

### TOPIC TEST

**PART B**

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 If I can fit ( k ) boxes into one carton, how many boxes will fit into ( x ) cartons?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2 If ( a = -2, b = 3 ), find ( a(a^3 - b^2) )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3 Simplify ( 6n - 3 - 5(n + 2) )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4 Simplify ( 25 - (3x^2 - 2) - 8x^2 )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5 Simplify ( 9x - 2x(3 - x) + 5x^2 )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>6 Expand and simplify ( -8(2x - 3) + x )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>7 Expand and simplify ( 7(a + 6) - 2(a - 3) )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8 Expand and simplify ( -3(x + 3) + 5x - 3 )</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Simplify the following.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 ( 35a^2 \times b + 7a^2 )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>10 ( 48t^3 + -16t^2 )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>11 ( -5a \times 2a \times -3a )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>12 ( 32x^2 \times y + 4x \div 8y )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>13 Expand ( -n(2m - n) )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>14 Expand and simplify ( 2(2x + a) - (x + 2a) )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>15 Expand and simplify ( 8(x - y) - 4(x + y) )</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART B**

15
UNIT 1: Index notation (1)

QUESTION 1  Write the following in expanded form.

a  \(2^3 = \) __________________

b  \(4^0 = \) __________________

c  \(7^3 = \) __________________

d  \(3^5 = \) __________________

e  \(5^4 = \) __________________

f  \(8^2 = \) __________________

g  \(6^4 = \) __________________

h  \(7^6 = \) __________________

i  \(9^3 = \) __________________

QUESTION 2  Write the following without indices (in expanded form).

a  \((1.5)^3 = \) __________________

b  \(3^2 a^3 = \) __________________

c  \(2^4 x^3 = \) __________________

d  \(x^3 y^4 = \) __________________

e  \(7^5 = \) __________________

f  \((\frac{2}{3})^4 = \) __________________

g  \(5^3 \times 8^4 = \) __________________

h  \((9)^5 = \) __________________

i  \((–5)^6 = \) __________________

j  \((–\frac{3}{2})^4 = \) __________________

QUESTION 3  Change the following to expanded form.

a  \(6^8 = \) __________________

b  \(a^5 = \) __________________

c  \(x^3 = \) __________________

d  \(p^4 q^3 = \) __________________

e  \(7a^3 b^5 = \) __________________

f  \(5ax^5 = \) __________________

g  \(x^2 y^2 z^4 = \) __________________

h  \(–m^2 n^4 = \) __________________

i  \(–3ab^2 c^2 = \) __________________

j  \(15a^3 b = \) __________________

QUESTION 4  Write the following in index form.

a  \(3 \times 3 \times 3 \times 3 = \) __________________

b  \(5 \times 5 \times 5 \times 5 \times 5 \times 5 = \) __________________

c  \(2 \times 2 \times 2 \times 2 \times 2 = \) __________________

d  \(9 \times 9 \times 9 = \) __________________

e  \(7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 = \) __________________

f  \(4 \times 4 \times 4 \times 4 \times 4 = \) __________________

\(–3 \times –3 \times –3 \times –3 \times –3 = \) __________________

h  \(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \) __________________

i  \(1.8 \times 1.8 \times 1.8 = \) __________________

j  \(3.5 \times 3.5 \times 3.5 \times 3.5 \times 3.5 = \) __________________

QUESTION 5  Write the following using index notation.

a  \(a \times a \times a \times a \times b \times b = \) __________________

b  \(m \times m \times m \times m \times n \times n \times n \times n = \) __________________

c  \(x \times x \times x \times y \times y \times y \times y \times y = \) __________________

d  \(p \times p \times p \times p \times q \times q = \) __________________

\(4 \times 4 \times 4 \times a \times a \times a = \) __________________

f  \(2 \times 2 \times 2 \times 2 \times 2 \times 2 \times n \times n \times n \times n = \) __________________

g  \(a \times a \times a \times b \times b \times b \times b \times b \times b = \) __________________

h  \(7 \times 7 \times 7 \times x \times x \times x \times x \times x = \) __________________

i  \(5 \times 5 \times 5 \times x \times x \times x = \) __________________

j  \(x \times x \times x \times y \times y \times y \times y \times y \times y = \) __________________

QUESTION 6  Evaluate the following.

a  \(2^5 = \) __________________

b  \(3^4 = \) __________________

\(7^3 = \) __________________

\(5^4 = \) __________________

\(6^3 = \) __________________

\(4^3 = \) __________________

\(8^3 = \) __________________

\(9^3 = \) __________________

\(i 2^7 = \) __________________
UNIT 2: Index notation (2)

**QUESTION 1**  Write each of the following in simplest index notation.

a  \( m \times m \times m = \)  

b  \( a \times a \times a \times a \times a \times a = \)  

c  \( l \times l \times l \times l = \)  

d  \( x \times x \times x \times x \times x \times x = \)  

e  \( p \times p = \)  

f  \( q \times q \times q \times q \times q \times q \times q \times q = \)

**QUESTION 2**  Write each of the following in expanded form.

a  \( b^2 = \)  

b  \( x^5 = \)  

c  \( a^4 = \)  

d  \( m^7 = \)  

e  \( e^3 = \)  

f  \( f^8 = \)

**QUESTION 3**  Find the value of each of the following when \( x = 2 \)

a  \( x^2 = \)  

b  \( x^5 = \)  

c  \( x^4 = \)  

d  \( x^3 = \)  

e  \( x^7 = \)  

f  \( 3x = \)

**QUESTION 4**  Write each of the following in simplest index notation.

a  \( 3 \times a \times a \times a = \)  

b  \( 4 \times y \times y \times 2 = \)  

c  \( x \times x \times 6 \times x \times x = \)  

d  \( p \times p \times 2 \times p \times p = \)  

e  \( h \times h \times 9 \times h = \)  

f  \( 3 \times m \times m \times 3 \times m \times m = \)

**QUESTION 5**  Expand each of the following.

a  \( 5x^2 = \)  

b  \( 8a^3 = \)  

c  \( 7y^4 = \)  

d  \( 6m^5 = \)  

e  \( 11x^3 = \)  

f  \( 9y^2 = \)

**QUESTION 6**  Find the value of each of the following when \( a = 2 \) and \( b = 3 \).

a  \( a^2 = \)  

b  \( a^3b = \)  

c  \( a^4 - ab = \)  

d  \( a^3 + b^2 = \)  

e  \( 4a^2 + 3b^2 = \)  

f  \( 9b^3 = \)  

g  \( b^2 - a^2 = \)  

h  \( 8a^2b = \)
# Indices

**UNIT 3: Index laws—multiplication with indices**

**QUESTION 1**  Simplify the following, writing your answers in index form.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$2^4 \times 2^8 = $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$9^7 \times 9^5 = $</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$8^3 \times 8^9 = $</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$5^9 \times 5^{10} = $</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 2**  Simplify the following, writing your answers in index form.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$3 \times 3^2 = $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$6^5 \times 6 = $</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$7^2 \times 7^2 = $</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$3^4 \times 3^2 = $</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 3**  Simplify the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$a^2 \times a^4 = $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$n^8 \times n^6 = $</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$y^9 \times y^5 = $</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$w^5 \times w^2 \times w^3 = $</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 4**  Simplify the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$5x^3 \times x^2 = $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$6m^8 \times 7m^2 = $</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$6p^3q^5 \times 3p^2q^3 = $</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$6t \times 4t^3 = $</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 5**  Simplify the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$5^3 \times 5^4 = $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$7^5 \times 7^y = $</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$b^5 \times b^9 = $</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$6^s \times 6^{a^2+y^9} = $</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 6**  Find the missing term in each of the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$x^9 \times $</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>$4p^3 \times $ = $12p^5</td>
<td>e</td>
</tr>
<tr>
<td>g</td>
<td>$4a^2 \times $ = $8a^9</td>
<td>h</td>
</tr>
<tr>
<td>j</td>
<td>$6k^2 \times $ = $30k^8</td>
<td>k</td>
</tr>
</tbody>
</table>
UNIT 4: Index laws—division with indices

**Question 1** Simplify the following, writing your answers in index form.

a. \(2^9 ÷ 2^5 = \) ____________  
b. \(5^8 ÷ 5^3 = \) ____________  
c. \(7^{16} ÷ 7^3 = \) ____________

d. \(4^{27} ÷ 4^4 = \) ____________  
e. \(8^{19} ÷ 8^6 = \) ____________  
f. \(3^{10} ÷ 3^5 = \) ____________

g. \(6^{29} ÷ 6^6 = \) ____________  
h. \(9^{21} ÷ 9^6 = \) ____________  
i. \(12^{15} ÷ 12^4 = \) ____________

j. \(7^{10} ÷ 7^3 = \) ____________  
k. \(4^{18} ÷ 4^{12} = \) ____________  
l. \(3^{14} ÷ 3^5 = \) ____________

**Question 2** Simplify the following, writing your answers as basic numerals.

a. \(2^8 ÷ 2^3 = \) ____________  
b. \(3^9 ÷ 3^4 = \) ____________  
c. \(10^7 ÷ 10^3 = \) ____________

d. \(15^{18} ÷ 15^{16} = \) ____________  
e. \(5^{12} ÷ 5^8 = \) ____________  
f. \(2^9 ÷ 2^2 = \) ____________

g. \(6^{21} ÷ 6^{17} = \) ____________  
h. \(7^5 ÷ 7^2 = \) ____________  
i. \(8^9 ÷ 8^6 = \) ____________

j. \(9^{15} ÷ 9^{12} = \) ____________  
k. \(3^{18} ÷ 3^{13} = \) ____________  
l. \(6^8 ÷ 6^4 = \) ____________

**Question 3** Simplify the following, writing your answers in index form.

a. \(\frac{2^{15}}{2^8} = \) ____________  
b. \(\frac{3^{10}}{3^5} = \) ____________  
c. \(\frac{5^9}{5^5} = \) ____________

d. \(\frac{7^{12}}{7^5} = \) ____________  
e. \(\frac{8^{20}}{8^7} = \) ____________  
f. \(\frac{10^{12}}{10^7} = \) ____________

g. \(\frac{15^{15}}{15^{11}} = \) ____________  
h. \(\frac{3^{5}}{3^3} = \) ____________  
i. \(\frac{9^{32}}{9^9} = \) ____________

j. \(\frac{6^{47}}{6^{13}} = \) ____________  
k. \(\frac{12^{18}}{12^6} = \) ____________  
l. \(\frac{4^{16}}{4^{13}} = \) ____________

**Question 4** Simplify the following.

a. \(y^{10} ÷ y^2 = \) ____________  
b. \(a^{11} ÷ a^4 = \) ____________  
c. \(x^{21} ÷ x^{16} = \) ____________

d. \(p^{8} ÷ p^2 = \) ____________  
e. \(m^{12} ÷ m^3 = \) ____________  
f. \(n^9 ÷ n^3 = \) ____________

g. \(x^{15} ÷ x^7 = \) ____________  
h. \(q^{23} ÷ q^9 = \) ____________  
i. \(m^{18} ÷ m^6 = \) ____________

j. \(a^{21} ÷ a^{14} = \) ____________  
k. \(x^{22} ÷ x^{18} = \) ____________  
l. \(p^{54} ÷ p^{28} = \) ____________

**Question 5** Simplify the following.

a. \(3^5 ÷ 3^8 = \) ____________  
b. \(5^{10} ÷ 5^{3} = \) ____________  
c. \(8^{7y} ÷ 8^{6c} = \) ____________

d. \(9^x ÷ 9^3 = \) ____________  
e. \(12^{5a} ÷ 12^{2a} = \) ____________  
f. \(e^{8x} ÷ e^{7x} = \) ____________

g. \(y^{m} ÷ y^{3} = \) ____________  
h. \(x^{9m} ÷ x^{4m} = \) ____________  
i. \(a^{10b^8} ÷ a^b^3 = \) ____________

j. \(m^{10n^7} ÷ m^{8n^7} = \) ____________  
k. \(x^{5y^9} ÷ x^{3y^4} = \) ____________  
l. \(m^6n^6 ÷ m^4n^5 = \) ____________

**Question 6** Find the missing term in each of the following.

a. \(x^{9} ÷ x = x^{4}\)  

b. \(e^{14} ÷ e^8 = \) ____________  
c. \(y^{12} ÷ y = y\)

d. \(\frac{28m^6}{k} = 7m^2\)  

e. \(8a^9 ÷ 4a^6 = \) ____________  
f. \(36b^8 ÷ 9b^2 = \) ____________

g. \(20x^8 = \) ____________  

h. \(5a^2 = 3a^7\)  
i. \(\frac{48a^8b^{12}}{4a^6b^6} = \) ____________

j. \(32a^4b^4 ÷ 2a^3b^2 = \) ____________  
k. \(\frac{3x^3y^4}{15xy^6} = \) ____________  
l. \(\frac{48a^8b^{12}}{4a^6b^6} = \) ____________
UNIT 5: Index laws—powers of powers

**Question 1**  
Simplify the following, leaving your answers in the simplest index form.

a \((3^5)^5\) =  
b \((2^4)^2\) =  
c \((6^8)^8\) =  
d \((8^3)^3\) =  
e \((9^5)^4\) =  
f \((4^6)^9\) =  
g \((7^4)^6\) =  
h \((5^7)^8\) =  
i \((11^3)^5\) =  
j \((12^4)^6\) =  
k \((9^6)^7\) =  
l \((8^4)^9\) =  

**Question 2**  
Simplify the following, writing your answers as basic numerals.

a \((2^3)^2\) =  
b \((3^2)^3\) =  
c \((5^2)^2\) =  
d \((4^3)^1\) =  
e \((6^2)^2\) =  
f \((8^2)^2\) =  
g \((9^2)^1\) =  
h \((7^1)^3\) =  
i \((6^1)^3\) =  
j \((2^5)^2\) =  
k \((2^3)^3\) =  
l \((5^3)^3\) =  

**Question 3**  
Simplify the following, leaving your answers in index form.

a \((2^3)^8\) =  
b \((3^7)^3\) =  
c \((5^8)^6\) =  
d \((7^6)^7\) =  
e \((9^6)^5\) =  
f \((10^6)^3\) =  
g \((2^3)^5\) =  
h \((6^2)^2\) =  
i \((9^3)^2\) =  
j \((5^8)^2\) =  
k \((9^3)^3\) =  
l \((8^9)^2\) =  

**Question 4**  
Simplify the following.

a \((a^5)^3\) =  
b \((b^7)^5\) =  
c \((x^{10})^4\) =  
d \((y^{15})^8\) =  
e \((z^{15})^6\) =  
f \((m^{12})^7\) =  
g \((n^9)^2\) =  
h \((p^{10})^8\) =  
i \((q^{11})^6\) =  
j \((t^{10})^3\) =  
k \((y^9)^7\) =  
l \((x^{14})^9\) =  

**Question 5**  
Simplify the following.

a \((2p)^3\) =  
b \((2p^3)^3\) =  
c \((2t)^3\) =  
d \((3x^3)^3\) =  
e \((6y^2)^2\) =  
f \((10m^6)^3\) =  
g \((5n^8)^2\) =  
h \((a^2b^5)^4\) =  
i \((x^2y^2)^5\) =  

**Question 6**  
Complete the following.

a \((\_\_\_)^2 = 36a^4\)  
b \((\_\_\_)^3 = 8t^6\)  
c \((\_\_\_)^2 = 81x^6\)  
d \((\_\_\_)^2 = 64y^{14}\)  
e \((\_\_\_)^3 = 64a^3b^{15}\)  
f \((\_\_\_)^2 = 169x^6y^6\)  

**Question 7**  
Simplify the following.

a \((4^2)^y\) =  
b \((8^3)^y\) =  
c \((9^2)^m\) =  
d \((2^3)^{2a}\) =  
e \((3^5)^{3b}\) =  
f \((4^2)^{6m}\) =  

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UNIT 6: Index laws—the zero index

QUESTION 1  Simplify the following.

\begin{align*}
\text{a} & \quad (43)^0 = \quad & \text{b} & \quad 8 \times 3^0 = \quad & \text{c} & \quad x^0 y^0 = \\
\text{d} & \quad (85)^0 = \quad & \text{e} & \quad (xy)^0 = \quad & \text{f} & \quad 9y^0 = \\
\text{g} & \quad x^0 y^0 = \quad & \text{h} & \quad 3^4 y^0 = \quad & \text{i} & \quad (4)^0 = \\
\text{j} & \quad (6xy)^0 = \quad & \text{k} & \quad (9ab)^0 = \quad & \text{l} & \quad 15a^0 = \\
\end{align*}

QUESTION 2  Use your calculator to verify the following.

\begin{align*}
\text{a} & \quad 9^0 = 1 \quad & \text{b} & \quad 73^0 = 1 \quad & \text{c} & \quad \left(\frac{2}{3}\right)^0 = 1 \\
\text{d} & \quad (2.3)^0 = 1 \quad & \text{e} & \quad -(6)^0 = -1 \quad & \text{f} & \quad (6 \times 12)^0 = 1 \\
\text{g} & \quad -5 \times 7^0 = -5 \quad & \text{h} & \quad -5^0 - 3 - 5^0 = -3 \quad & \text{i} & \quad 8 \times 6^0 = 8 \\
\text{j} & \quad 21 \times (-5)^0 = 21 \quad & \text{k} & \quad 6 \times 4^0 \times (-9)^0 = 6 \quad & \text{l} & \quad 12 \div 4^0 = 12 \\
\end{align*}

QUESTION 3  Simplify the following.

\begin{align*}
\text{a} & \quad 5 \times 2^0 = \quad & \text{b} & \quad (8a)^2 = \quad & \text{c} & \quad 7^0 + 3m^0 = \\
\text{d} & \quad 5 \times (6a)^0 = \quad & \text{e} & \quad 9 \times 4x^0 = \quad & \text{f} & \quad (-15)^0 + 3 = \\
\text{g} & \quad (ab)^0 \times 7 = \quad & \text{h} & \quad 16^0 + 9^0 = \quad & \text{i} & \quad -9x^0 + 12 = \\
\text{j} & \quad (8 + 3)^0 = \quad & \text{k} & \quad (5a^2)^0 + (3b^2)^0 = \quad & \text{l} & \quad 9(y^0)^2 \times 3(x^7)^0 = \\
\end{align*}

QUESTION 4  Simplify the following.

\begin{align*}
\text{a} & \quad 5^6 + (5x)^0 = \quad & \text{b} & \quad \frac{10y^0}{(10y)^0} = \quad & \text{c} & \quad \frac{(6r)^0}{6r^0} = \\
\text{d} & \quad -8^0 - (-8)^0 = \quad & \text{e} & \quad 7(2a - 3b)^0 = \quad & \text{f} & \quad 12a^4b^0 = \\
\text{g} & \quad 28x^6y^4 = \quad & \text{h} & \quad 2ab^6c^0 = \quad & \text{i} & \quad (8a)^2 = \\
\text{j} & \quad \left(\frac{2}{3} \times 8\right)^0 = \quad & \text{k} & \quad (5xy)^0 = \quad & \text{l} & \quad 14 \times 7^0 = \\
\end{align*}

QUESTION 5  Simplify the following, leaving your answers in index form.

\begin{align*}
\text{a} & \quad 2^3 \times 2^0 = \quad & \text{b} & \quad 3^0 \times 3^3 = \quad & \text{c} & \quad 4^3 \times 4^0 = \\
\text{d} & \quad 10^9 \times 10^3 = \quad & \text{e} & \quad 8^3 \times 8^0 = \quad & \text{f} & \quad 5^6 \times 5^0 = \\
\text{g} & \quad 8^0 \times 8^7 = \quad & \text{h} & \quad 5^0 \times 5^0 = \quad & \text{i} & \quad 6^7 \times 6^0 = \\
\text{j} & \quad 3^5 \times 3^4 \times 3^0 = \quad & \text{k} & \quad 7^2 \times 7^0 \times 7^8 = \quad & \text{l} & \quad (-3)^0 \times -3^0 \times -3^0 = \\
\end{align*}

QUESTION 6  Simplify the following.

\begin{align*}
\text{a} & \quad (6y)^0 \times 6y^0 = \quad & \text{b} & \quad \frac{9a^2b^0}{3a^0b} = \quad & \text{c} & \quad \frac{(5x^3)^2 \times xy}{25x^3} = \\
\text{d} & \quad 3a^4 \times 2a^5 b \overline{(ab)^7} = \quad & \text{e} & \quad \frac{5a^2 \times (2a^3)^2}{20a^8} = \quad & \text{f} & \quad (6y)^0 + 6y^0 - y^1 = \\
\text{g} & \quad \frac{9x^2 \times (5x)^0}{3x^0} = \quad & \text{h} & \quad \frac{16m^8 n^0}{8mn^0} = \quad & \text{i} & \quad \frac{(4p)^3 \times 2pq}{32p^2} = \\
\text{j} & \quad 8y^0 \times (3y)^0 \div 4y^0 = \quad & \text{k} & \quad \frac{2a^2 \times 3a^3 b^2}{(2ab)^0} = \quad & \text{l} & \quad 5x^6 \times (5x)^0 = \\
\end{align*}
## UNIT 7: Index laws

### QUESTION 1
Simplify the following.

- **a** \(x^5 \times x^2 = \) __________
- **b** \(n^9 \times n^6 = \) __________
- **c** \(q^3 \times q^7 = \) __________
- **d** \(a^7 \times a^3 = \) __________
- **e** \(9p^7 \times p^6 = \) __________
- **f** \(x^8 \times x^3 \times x^2 = \) __________
- **g** \(5x^4 \times 4x^3 = \) __________
- **h** \(a^2b \times a^3 = \) __________
- **i** \(10p^7 \times 10p^5 = \) __________
- **j** \(3x^4 \times 4x^3 = \) __________
- **k** \(9a^2 \times 6a^4 = \) __________
- **l** \(x^3 \times x^5 \times x^2 = \) __________
- **m** \(x^7 \times x^9 = \) __________
- **n** \(q^3 \times q^7 = \) __________
- **o** \(5a^7b \times 2a \times 3b = \) __________

### QUESTION 2
Simplify the following.

- **a** \(a^9 \div a^5 = \) __________
- **b** \(x^7 \div x^3 = \) __________
- **c** \(y^{12} \div y^{10} = \) __________
- **d** \(6x^7 \div x^5 = \) __________
- **e** \(18a^6 \div 9a^4 = \) __________
- **f** \(36m^7 \div 9m^6 = \) __________
- **g** \(15n^{10} \div 5n^6 = \) __________
- **h** \(9a^9 \div 9a^7 = \) __________
- **i** \(48a^4 \div 16a^4 = \) __________
- **j** \(a^{13} \div a^9 = \) __________
- **k** \(k^{12} \div k^5 = \) __________
- **l** \(p^7q^4 \div p^4q = \) __________
- **m** \(12a^{10} \div 6a^8 = \) __________
- **n** \(24m^7 \div 12m^3 = \) __________
- **o** \(m^5n^3 \div m^5 = \) __________
- **p** \(p^6q^8 \div p^4q^3 = \) __________
- **q** \(a^{10}n^7 \div a^8 = \) __________
- **r** \(12a^8b^4 \div 6a^5b^3 = \) __________

### QUESTION 3
Simplify the following.

- **a** \((x^2)^3 = \) __________
- **b** \((y^3)^5 = \) __________
- **c** \((a^2)^4 = \) __________
- **d** \((m^3)^3 = \) __________
- **e** \((k^5)^2 = \) __________
- **f** \((x^5)^7 = \) __________
- **g** \((2x^3)^3 = \) __________
- **h** \((3y^2)^3 = \) __________
- **i** \((5m^2)^4 = \) __________
- **j** \((2x^3)^3 = \) __________
- **k** \((7p^2)^3 = \) __________
- **l** \((a^2b)^3 = \) __________
- **m** \((ab)^6 = \) __________
- **n** \((x^3y^2)^3 = \) __________
- **o** \((m^6n^3)^2 = \) __________
- **p** \((3x^2y^3)^2 = \) __________
- **q** \((8xy^2)^3 = \) __________
- **r** \((10a^2b)^2 = \) __________

### QUESTION 4
Use the index laws to simplify the following.

- **a** \(x^6 \times x^1 = \) __________
- **b** \(y^9 \div y^3 = \) __________
- **c** \((m^5)^3 = \) __________
- **d** \(a^2b^2 \times a^3b^3 = \) __________
- **e** \((5m^3)^3 = \) __________
- **f** \(9p^2 \div 4p^7 = \) __________
- **g** \((x^2)^3 \times x^5 = \) __________
- **h** \((a^3) \div a^9 = \) __________
- **i** \(5a^4b \div 6ab^2 = \) __________
- **j** \(5a^4 \div 3a^2 = \) __________
- **k** \((6m^2) \times (2m)^3 = \) __________
- **l** \(9ab \times a \times b = \) __________
- **m** \(8p^5 \div 4p^3 \times 6p = \) __________
- **n** \(a^2b \times a^2 \times b^2 = \) __________
- **o** \(x^9 \times x^7 \div x^{10} = \) __________
- **p** \((2ab)^3 = \) __________
- **q** \(a^9 \div (2a)^0 = \) __________
- **r** \(9x^0 = \) __________
<table>
<thead>
<tr>
<th></th>
<th>Indices</th>
<th>PART A</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$a^2 \times a^3$ equals</td>
<td>$A$ 2$a^5$</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>$24x^8 \div 8x^4$ equals</td>
<td>$A$ 3$x^4$</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>$3a^2 \times 5a^4$ equals</td>
<td>$A$ 15$a^6$</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>$m^2b \div m^2b^2$ equals</td>
<td>$A$ $m^2$</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>$p^4 \times (p^{10} \div p^2)$ equals</td>
<td>$A$ $p^{20}$</td>
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<tr>
<td>6</td>
<td>$5^3 \times 5^4$ equals</td>
<td>$A$ 5$^{12}$</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>$2(x^6)^2$ equals</td>
<td>$A$ 2$x^6$</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>$6(y^3 \div y)^0$ equals</td>
<td>$A$ 6$y^3$</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>$(3y^3)^2$ equals</td>
<td>$A$ 6$y^5$</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>$(7a^2)^0$ equals</td>
<td>$A$ 7$a^2$</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>$8t^4 \times (–3t^2)$ equals</td>
<td>$A$ 5$t^6$</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>$a^4 \times a^4$ equals</td>
<td>$A$ $a^8$</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>$(m^{10} \div m^2)^2$ equals</td>
<td>$A$ $m^{25}$</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>$3^0 + 3x^0$ equals</td>
<td>$A$ 1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>$(6a^8b^8)^2$ equals</td>
<td>$A$ 6$a^8$b^{16}</td>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART A 15
# Indices

## TOPIC TEST

### PART B

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Simplify the following.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>a</strong> $(3a^2)^3 =$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>b</strong> $32a^7b^2 ÷ 8a^6 =$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>c</strong> $(x^2y)^5 =$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>d</strong> $4^6 + (7t)^0 + (9t^3)^0 =$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>e</strong> $y^{20} ÷ (y^4)^2 =$</td>
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<td>1</td>
</tr>
</tbody>
</table>

| 2 Simplify the following. | | |
| **a** $3^9 × 3^5 =$ | | 1 |
| **b** $28n^8 ÷ 4n^4 =$ | | 1 |
| **c** $\frac{a^b c^2}{a^3 b^3} =$ | | 1 |
| **d** $\frac{ab^3}{(ab)^3} =$ | | 1 |
| **e** $(8mn^2)^2 ÷ 32mn^3 =$ | | 1 |

| 3 Simplify the following, writing your answers in the simplest index form. | | |
| **a** $2^5 × 2^4 × 2^9 =$ | | 1 |
| **b** $7^6 ÷ 7 =$ | | 1 |
| **c** $6^5 × 8r^1 ÷ 4r^3 =$ | | 1 |
| **d** $8(a^3)^0 + (8a)^0 + 8^0 =$ | | 1 |
| **e** $2^3 × 4^2 =$ | | 1 |

**Total marks achieved for PART B**

15
Chapter 4: Pythagoras' theorem

UNIT 1: Hypotenuse of a right-angled triangle

**QUESTION 1** Name the hypotenuse of each right-angled triangle.

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<thead>
<tr>
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<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
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<tr>
<td>d</td>
<td>e</td>
<td>f</td>
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</tbody>
</table>

**QUESTION 2** Name the hypotenuse of the triangle named below the diagram.

<p>| | | |</p>
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<td>a</td>
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<td>c</td>
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<td>d</td>
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**QUESTION 3** Complete the following statements.

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<td>d</td>
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</tbody>
</table>

a. _______ is the length of the side opposite to angle D.
b. _______ is the length of the side opposite to angle E.
c. _______ is the length of the side opposite to angle F.
d. _______ is the length of the hypotenuse of \( \triangle DEF \).
e. _______ is the area of the square on the side opposite to \( \angle D \).
f. _______ is the area of the square on the side opposite to \( \angle F \).
UNIT 2: Naming the sides of a right-angled triangle

For each of the following triangles, complete the table below and verify that the square on the hypotenuse is equal to the sum of the squares on the other two sides.

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</thead>
<tbody>
<tr>
<td>$a$</td>
<td>$b$</td>
<td>$c$</td>
<td>$a^2$</td>
<td>$b^2$</td>
<td>$c^2$</td>
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<td>9</td>
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</tbody>
</table>
UNIT 3: Selecting the correct Pythagorean rule

In the following right-angled triangles, circle the correct statement.

1. \( a^2 = b^2 + c^2 \)
   - \( b^2 = a^2 + c^2 \)
   - \( c^2 = a^2 + b^2 \)

2. \( d^2 = e^2 + f^2 \)
   - \( e^2 = d^2 + f^2 \)
   - \( f^2 = d^2 + e^2 \)

3. \( g^2 = h^2 + i^2 \)
   - \( h^2 = g^2 + i^2 \)
   - \( i^2 = g^2 + h^2 \)

4. \( j^2 = k^2 + l^2 \)
   - \( k^2 = j^2 + l^2 \)
   - \( l^2 = j^2 + k^2 \)

5. \( m^2 = n^2 + o^2 \)
   - \( n^2 = m^2 + o^2 \)
   - \( o^2 = m^2 + n^2 \)

6. \( p^2 = q^2 + r^2 \)
   - \( q^2 = p^2 + r^2 \)
   - \( r^2 = p^2 + q^2 \)

7. \( s^2 = t^2 + u^2 \)
   - \( t^2 = s^2 + u^2 \)
   - \( u^2 = s^2 + t^2 \)

8. \( x^2 = y^2 + z^2 \)
   - \( y^2 = x^2 + z^2 \)
   - \( z^2 = x^2 + y^2 \)

9. \( u^2 = v^2 + w^2 \)
   - \( v^2 = u^2 + w^2 \)
   - \( w^2 = u^2 + v^2 \)

10. \( b^2 = c^2 + d^2 \)
    - \( c^2 = b^2 + d^2 \)
    - \( d^2 = b^2 + c^2 \)

11. \( e^2 = f^2 + g^2 \)
    - \( f^2 = e^2 + g^2 \)
    - \( g^2 = e^2 + f^2 \)

12. \( h^2 = i^2 + j^2 \)
    - \( i^2 = h^2 + j^2 \)
    - \( j^2 = i^2 + h^2 \)
Pythagoras’ theorem

UNIT 4: Squares, square roots and
Pythagorean triads

**Question 1** Use your calculator to find the following squares.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>15² =</td>
</tr>
<tr>
<td>b</td>
<td>13² =</td>
</tr>
<tr>
<td>c</td>
<td>40² =</td>
</tr>
<tr>
<td>d</td>
<td>28² =</td>
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<tr>
<td>e</td>
<td>5² =</td>
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<tr>
<td>f</td>
<td>69² =</td>
</tr>
<tr>
<td>g</td>
<td>10² =</td>
</tr>
<tr>
<td>h</td>
<td>17² =</td>
</tr>
<tr>
<td>i</td>
<td>81² =</td>
</tr>
<tr>
<td>j</td>
<td>8² =</td>
</tr>
<tr>
<td>k</td>
<td>41² =</td>
</tr>
<tr>
<td>l</td>
<td>99² =</td>
</tr>
</tbody>
</table>

**Question 2** Use the square root key to find \( n \), given that \( n > 0 \).

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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<tbody>
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<td>( n² = 169 )</td>
</tr>
<tr>
<td>b</td>
<td>( n² = 841 )</td>
</tr>
<tr>
<td>c</td>
<td>( n² = 576 )</td>
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<td>d</td>
<td>( n² = 4761 )</td>
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<td>f</td>
<td>( n² = 1444 )</td>
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<td>g</td>
<td>( n² = 144 )</td>
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<td>h</td>
<td>( n² = 441 )</td>
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<td>i</td>
<td>( n² = 1600 )</td>
</tr>
<tr>
<td>j</td>
<td>( n² = 2809 )</td>
</tr>
<tr>
<td>k</td>
<td>( n² = 784 )</td>
</tr>
<tr>
<td>l</td>
<td>( n² = 5625 )</td>
</tr>
</tbody>
</table>

**Question 3** Which of the following are Pythagorean triads?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>{2, 4, 6}</td>
</tr>
<tr>
<td>b</td>
<td>{9, 12, 15}</td>
</tr>
<tr>
<td>c</td>
<td>{9, 40, 41}</td>
</tr>
<tr>
<td>d</td>
<td>{4, 6, 10}</td>
</tr>
<tr>
<td>e</td>
<td>{3, 4, 5}</td>
</tr>
<tr>
<td>f</td>
<td>{8, 13, 17}</td>
</tr>
<tr>
<td>g</td>
<td>{8, 10, 12}</td>
</tr>
<tr>
<td>h</td>
<td>{19, 40, 41}</td>
</tr>
<tr>
<td>i</td>
<td>{6, 8, 10}</td>
</tr>
<tr>
<td>j</td>
<td>{5, 12, 13}</td>
</tr>
<tr>
<td>k</td>
<td>{15, 36, 39}</td>
</tr>
<tr>
<td>l</td>
<td>{8, 15, 17}</td>
</tr>
</tbody>
</table>

**Question 4** Prove that the following triangles are right-angled triangles.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td></td>
</tr>
</tbody>
</table>
Pythagoras’ theorem

UNIT 5: Finding the length of the hypotenuse

**Question 1** Find the length of the hypotenuse in each of the following. (All measurements are in centimetres.)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td><img src="image-a.png" alt="Diagram" /></td>
</tr>
<tr>
<td>b</td>
<td><img src="image-b.png" alt="Diagram" /></td>
</tr>
<tr>
<td>c</td>
<td><img src="image-c.png" alt="Diagram" /></td>
</tr>
<tr>
<td>d</td>
<td><img src="image-d.png" alt="Diagram" /></td>
</tr>
<tr>
<td>e</td>
<td><img src="image-e.png" alt="Diagram" /></td>
</tr>
<tr>
<td>f</td>
<td><img src="image-f.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**Question 2** Find the length of the hypotenuse correct to one decimal place. (All measurements are in centimetres.)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td><img src="image-a.png" alt="Diagram" /></td>
</tr>
<tr>
<td>b</td>
<td><img src="image-b.png" alt="Diagram" /></td>
</tr>
<tr>
<td>c</td>
<td><img src="image-c.png" alt="Diagram" /></td>
</tr>
<tr>
<td>d</td>
<td><img src="image-d.png" alt="Diagram" /></td>
</tr>
<tr>
<td>e</td>
<td><img src="image-e.png" alt="Diagram" /></td>
</tr>
<tr>
<td>f</td>
<td><img src="image-f.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Pythagoras’ theorem

UNIT 6: Finding the length of one of the other sides

**Question 1** In the following triangles find the length of the unknown sides. (All measurements are in centimetres.)

a

\[
\begin{align*}
12 & \quad 13 \\
& \quad x
\end{align*}
\]

b

\[
\begin{align*}
& \quad x \\
20 & \quad 12
\end{align*}
\]

c

\[
\begin{align*}
15 & \quad 17 \\
x &
\end{align*}
\]

d

\[
\begin{align*}
& x \\
6 & \quad 10
\end{align*}
\]

e

\[
\begin{align*}
41 & \quad 40 \\
x &
\end{align*}
\]

f

\[
\begin{align*}
& \quad x \\
7 & \quad 25
\end{align*}
\]

**Question 2** Find the length of the unknown side correct to one decimal place. (All measurements are in centimetres.)

a

\[
\begin{align*}
& x \\
15.3 & \quad 8.9
\end{align*}
\]

b

\[
\begin{align*}
& x \\
6 & \quad 14
\end{align*}
\]

c

\[
\begin{align*}
5 & \quad 14.2 \\
x &
\end{align*}
\]

d

\[
\begin{align*}
& x \\
9 & \quad 17
\end{align*}
\]

e

\[
\begin{align*}
4.5 & \quad 12.3 \\
x &
\end{align*}
\]

f

\[
\begin{align*}
& x \\
15 & \quad 7
\end{align*}
\]
Pythagoras’ theorem

UNIT 7: Mixed questions

**QUESTION 1** In the following triangles find the length of the unknown sides.

<table>
<thead>
<tr>
<th>sin</th>
<th>cos</th>
<th>tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>0.7</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>0.9</td>
<td>0.4</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Question 1**

a. 

b. 

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>24</td>
<td>25</td>
</tr>
</tbody>
</table>

**Question 2** Find the length of the unknown side correct to one decimal place. (All measurements are in centimetres.)

<table>
<thead>
<tr>
<th>sin</th>
<th>cos</th>
<th>tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>0.7</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>0.9</td>
<td>0.4</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Question 2**

<table>
<thead>
<tr>
<th>cm</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>66</td>
</tr>
<tr>
<td>67</td>
<td>68</td>
</tr>
<tr>
<td>69</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>102</td>
</tr>
<tr>
<td>103</td>
<td>104</td>
</tr>
<tr>
<td>105</td>
<td>106</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
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</tr>
<tr>
<td>142</td>
<td>143</td>
</tr>
<tr>
<td>144</td>
<td>145</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>cm</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>55</td>
<td>56</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>3.2</td>
<td>3.3</td>
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</table>

<table>
<thead>
<tr>
<th>cm</th>
<th>cm</th>
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</thead>
<tbody>
<tr>
<td>19.5</td>
<td>20.0</td>
</tr>
<tr>
<td>20.5</td>
<td>21.0</td>
</tr>
<tr>
<td>21.5</td>
<td>22.0</td>
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</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.6</td>
<td>22.1</td>
</tr>
<tr>
<td>22.6</td>
<td>23.1</td>
</tr>
<tr>
<td>23.6</td>
<td>24.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>52</td>
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<tr>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>55</td>
<td>56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>cm</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>141</td>
</tr>
<tr>
<td>142</td>
<td>143</td>
</tr>
<tr>
<td>144</td>
<td>145</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>m</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>3.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>cm</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.5</td>
<td>20.0</td>
</tr>
<tr>
<td>20.5</td>
<td>21.0</td>
</tr>
<tr>
<td>21.5</td>
<td>22.0</td>
</tr>
</tbody>
</table>
UNIT 8: Miscellaneous questions on Pythagoras’ theorem

QUESTION 1  In each of the following, find the length of the unknown side, correct to one decimal place. (All measurements are in centimetres.)

a

\[ \begin{array}{c}
12 \\
5 \\
x \\
\end{array} \]

b

\[ \begin{array}{c}
17 \\
8 \\
11 \\
\end{array} \]

c

\[ \begin{array}{c}
16 \\
x \\
20 \\
\end{array} \]

d

\[ \begin{array}{c}
x \\
3 \\
y \\
2 \\
\end{array} \]

e

\[ \begin{array}{c}
12 \\
x \\
20 \\
\end{array} \]

f

\[ \begin{array}{c}
24 \\
x \\
30 \\
\end{array} \]

QUESTION 2  Find the length of the unknown side correct to two decimal places. (All measurements are in centimetres.)

a

\[ \begin{array}{c}
5 \\
6 \\
x \\
14 \\
\end{array} \]

b

\[ \begin{array}{c}
x \\
3 \\
12 \\
\end{array} \]

c

\[ \begin{array}{c}
7 \\
x \\
4 \\
\end{array} \]

d

\[ \begin{array}{c}
6 \\
x \\
10 \\
\end{array} \]

e

\[ \begin{array}{c}
5 \\
x \\
24 \\
\end{array} \]

f

\[ \begin{array}{c}
x \\
15 \\
21 \\
\end{array} \]
**Pythagoras’ theorem**

**UNIT 9: Problem solving and Pythagoras’ theorem**

**Question 1** Find the length of the diagonal of:

a. a square of side length 5 cm

[Diagram of a square with side length 5 cm]

b. a rectangle of length 35 cm and width 12 cm

[Diagram of a rectangle with length 35 cm and width 12 cm]

**Question 2** What is the altitude of an equilateral triangle whose sides are each 16 cm long? Give your answer correct to two decimal places.

[Diagram of an equilateral triangle with side length 16 cm]

**Question 3** A 15 metre ladder rests against a wall and its foot is 4 metres away from the base of the wall. How high does it reach up the wall? Give your answer correct to two decimal places.

**Question 4** The hypotenuse of a right-angled triangle is 30 cm. If one of the short sides is 18 cm, find the length of the other side.

**Question 5** In a right-angled triangle, the longest side is 39 cm and the shortest side is 15 cm. Find the length of the third side.

**Question 6** Find the perimeter of this triangle.

[Diagram of a triangle with sides 28.8 m, 17.5 m]
## Pythagoras’ theorem

### PART A

**TOPIC TEST**

**Instructions**
- This part consists of 12 multiple-choice questions.
- Fill in only ONE CIRCLE for each question.
- Each question is worth 1 mark.

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th>Question</th>
<th>Choices</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A triangle is said to satisfy the rule $c^2 = a^2 + b^2$ for which special triangle?</td>
<td>A: acute-angled</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>B: right-angled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: obtuse-angled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: none of these</td>
<td></td>
</tr>
</tbody>
</table>

| 2. The longest side of a right-angled triangle is called the | A: shortest side | 1 |
| | B: middle side | |
| | C: hypotenuse | |
| | D: none of these | |

| 3. Given that $c^2 = a^2 + b^2$ and $a = 8$, $b = 15$, find the value of $c$ ($c > 0$)? | A: 17 | 1 |
| | B: 23 | |
| | C: 289 | |
| | D: 529 | |

| 4. Pythagoras’ theorem can be applied to | A: acute-angled triangles | 1 |
| | B: obtuse-angled triangles | |
| | C: right-angled triangles | |
| | D: any triangle | |

| 5. The hypotenuse of a right-angled triangle is 17 cm. If one side is 15 cm, the third side is | A: 14 cm | 1 |
| | B: 12 cm | |
| | C: 10 cm | |
| | D: 8 cm | |

| 6. If the two sides of a right-angled triangle are 2.4 m and 1 m then the hypotenuse is | A: 2.4 m | 1 |
| | B: 2.6 m | |
| | C: 3.4 m | |
| | D: 3.8 m | |

| 7. The Pythagorean result for a triangle $ABC$ right-angled at $C$ is | A: $a^2 = b^2 + c^2$ | 1 |
| | B: $b^2 = a^2 + c^2$ | |
| | C: $c^2 = a^2 + b^2$ | |
| | D: none of these | |

| 8. The hypotenuse of a right-angled triangle is opposite to the | A: acute angle | 1 |
| | B: right angle | |
| | C: obtuse angle | |
| | D: none of these | |

| 9. If two shorter sides of a right-angled triangle are 7 m and 8 m, then the hypotenuse is | A: $\sqrt{65}$ | 1 |
| | B: $\sqrt{85}$ | |
| | C: $\sqrt{113}$ | |
| | D: $\sqrt{193}$ | |

| 10. In a triangle $ABC$ right-angled at $C$, the hypotenuse is named as | A: $a$ | 1 |
| | B: $b$ | |
| | C: $c$ | |
| | D: none of these | |

| 11. If the two sides of a right-angled triangle are 6 cm and 8 cm, then the hypotenuse is | A: 10 cm | 1 |
| | B: 9.4 cm | |
| | C: 12 cm | |
| | D: 14 cm | |

| 12. If $n^2 = 2304$ then $n$ ($n > 0$) equals | A: 38 | 1 |
| | B: 42 | |
| | C: 48 | |
| | D: 52 | |

**Total marks achieved for PART A** 12
Pythagoras’ theorem

TOPIC TEST

Instructions
• This part consists of 15 questions.
• Each question is worth 1 mark.
• Write only the answer in the answer column.
• For any working use the question column.

Time allowed: 20 minutes

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 If ( n^2 = 3844 ) ( (n &gt; 0) ) find the value of ( n ).</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2 Is {6, 8, 10} a Pythagorean triad?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3 Is ( \triangle PQR ) right-angled?</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Find the length of the unknown side in the following triangles, correct to two decimal places (where necessary).

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ( \sqrt{22} ) m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5 ( x )</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>6 ( x ) 7.2 cm</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>7 ( x ) 12 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8 ( x ) 7 cm</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>9 ( x ) 1 m 2 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>10 ( x ) 3 m 13 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>11 ( x ) 8 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>12 ( x ) 5 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>13 ( x ) 8 cm</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>14 ( x ) 17 m</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>15 ( x ) 23 cm</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART B

15
UNIT 1: Simple interest (1)

**Question 1** Find the simple interest for each of the following situations.

- a $8000 at 10% p.a. for 3 years
- b $15000 at 9% p.a. for 6 years
- c $12500 at 7% p.a. for 5 years
- d $6000 at 12% p.a. for 6 months
- e $30600 at 8% p.a. for 3 months
- f $50000 at 10.5% p.a. for 3 years
- g $88000 for 7 years at 7.5% p.a.
- h $72000 for 8 years at 8.25% p.a.

**Question 2** Use the simple interest formula \( I = PRN \) to complete this table.

<table>
<thead>
<tr>
<th>Interest</th>
<th>Principal</th>
<th>Rate</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>a $6500</td>
<td>$6500</td>
<td>7.5%</td>
<td>10</td>
</tr>
<tr>
<td>b $3300</td>
<td>$8950</td>
<td>6.4%</td>
<td>8</td>
</tr>
<tr>
<td>c $2864</td>
<td>$12000</td>
<td>6.25%</td>
<td>6</td>
</tr>
<tr>
<td>d $5437.50</td>
<td>$4860</td>
<td>8.25%</td>
<td>15</td>
</tr>
<tr>
<td>e $6196.50</td>
<td>$6196.50</td>
<td>7.5%</td>
<td>10</td>
</tr>
</tbody>
</table>

**Question 3** $8000 is invested at 7% p.a. simple interest for 5 years. Find:

- a the total amount of interest earned
- b the total value of the investment at the end of 5 years.
**Financial mathematics**

**UNIT 2: Simple interest (2)**

**QUESTION 1** Find the simple interest for each of the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>$1500 at 8% p.a. for 1 year</td>
<td><strong>b</strong></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>$8000 at 9% p.a. for 10 years</td>
<td><strong>d</strong></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>$10,500 at 8(\frac{1}{2})% p.a. for 3 months</td>
<td><strong>f</strong></td>
</tr>
</tbody>
</table>

**QUESTION 2** Find the length of time for:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>$500 to be the interest on $1800 at 6% p.a.</td>
<td><strong>b</strong></td>
</tr>
</tbody>
</table>

**QUESTION 3** Find the rate percent per annum for:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>$1500 to be the interest on $5400 for 5 years</td>
<td><strong>b</strong></td>
</tr>
</tbody>
</table>

**QUESTION 4** Find the principal required for:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>the simple interest to be $900 on an amount invested for 2 years at 10% p.a.</td>
<td><strong>b</strong></td>
</tr>
</tbody>
</table>
Financial mathematics

UNIT 3: Applying the simple interest formula

**Question 1** Find the length of time for:

a $800 to be the simple interest earned on $2700 invested at 5% p.a.

b $1250 to be the simple interest earned on $4500 invested at 7% p.a.

**Question 2** Find the rate as per cent per annum for:

a $1800 to be the simple interest earned on $6900 invested for 4 years

b $3000 to be the simple interest earned on $10000 invested for 3 years.

**Question 3** Find the principal required for:

a The simple interest earned to be $800 on an amount invested for 3 years at 6% p.a.

b The simple interest earned to be $1220 on an amount invested for 2 years at 8% p.a.

**Question 4** Use the simple interest formula \( I = PRN \) to complete this table.

<table>
<thead>
<tr>
<th></th>
<th>Interest</th>
<th>Principal</th>
<th>Rate</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$8000</td>
<td>$8000</td>
<td>6.25%</td>
<td>6</td>
</tr>
<tr>
<td>b</td>
<td>$5224</td>
<td>$10000</td>
<td>10.5%</td>
<td>7</td>
</tr>
<tr>
<td>c</td>
<td>$12500</td>
<td>$20000</td>
<td>8.4%</td>
<td>8</td>
</tr>
<tr>
<td>d</td>
<td>$8900</td>
<td>$20000</td>
<td>9.75%</td>
<td>10</td>
</tr>
<tr>
<td>e</td>
<td>$12500</td>
<td>$28000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 5** Jill cannot decide which is the better investment for her $15 000.

a 3 years at 2.5% p.a.

b 18 months at 6% p.a.

c 50 weeks at 2% p.a. (52 weeks = 1 year)

d 2 years at 2% per quarter.

e Which of the above investments generates the greatest simple interest per annum?
Financial mathematics

UNIT 4: Hire purchase

QUESTION 1  A motor car advertised for $6990 is sold under the following terms: 40% deposit and the balance repaid over 5 years at $32 per week. (52 weeks = 1 year)

a  Calculate the deposit required.

b  Find the amount paid as interest.

QUESTION 2  Kate buys a boat listed at $8500 for 10% deposit and repayments over 2 years at 11% p.a. on the balance.

a  Calculate the total cost.

b  Find the monthly repayment.

QUESTION 3  Mariam decides to buy a stereo marked at $600. She pays 20% deposit and the balance over two years, with interest charged at 15% p.a. on the balance.

a  Find the deposit paid.

c  Calculate the interest paid.

d  Find the total amount of the instalments to be repaid.

e  What is the monthly repayment?

QUESTION 4  Jean buys a house for $190000, pays a deposit of $50000, and then pays off the balance at $850 per month for 25 years. Find:

a  the total cost of the home

b  the average yearly interest paid.
Financial mathematics

Unit 5: Problem solving and percentages

1. The price of a stereo is $1200. There is a discount of 30%. How much is the discount?

2. Out of 630 students, 80% can swim. How many of the students can swim?

3. Out of 120 students, 65% went to camp. How many students went to the camp?

4. Clare obtained 90 out of 120 marks in a mathematics test. What percentage was this?

5. Decrease $100 by 10% and then increase this result by 10%.

6. If 35% of a number is 70, find the number.

7. In a class of 30 students, 20% are absent. How many are present?

8. 42 out of 70 students play tennis. What percentage play tennis?

9. A blanket that cost a retailer $56.50 sells for $110. What percentage profit is made?

10. Michael bought a second-hand car for $8000 and spent $2300 repairing it. If he sold the car for $15 600, find his gain as a percentage of the total cost price (including cost of repairs).

11. What is the cost of a pair of shoes whose full price is marked at $299.50, if a discount of $15\frac{1}{4}\%$ is allowed?

12. A tiler makes a mixture for a bathroom floor with 5 blue tiles and 4 grey tiles to each white tile. Express the composition of the floor as percentages. Also find the number of blue tiles used in a floor of 1690 tiles.
### Financial Mathematics

#### TOPIC TEST  PART A

**Time allowed: 15 minutes**  
**Total marks: 15**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2000 invested for 2 years at 10% simple interest becomes</td>
<td>A</td>
<td>$400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>$2200</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>$800 invested for 3 years at 12% p.a. simple interest becomes</td>
<td>A</td>
<td>$545.18</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>$4000 invested for 5 years at 8% p.a. simple interest becomes</td>
<td>A</td>
<td>$5600</td>
<td>B</td>
</tr>
<tr>
<td>4</td>
<td>At what rate of simple interest will $3500 earn $910 in 4 years?</td>
<td>A</td>
<td>6.2%</td>
<td>B</td>
</tr>
<tr>
<td>5</td>
<td>Find the simple interest on $4500 at 7% p.a. for 5 years.</td>
<td>A</td>
<td>$6075</td>
<td>B</td>
</tr>
<tr>
<td>6</td>
<td>$500 invested for 3 years at 15% p.a. simple interest becomes</td>
<td>A</td>
<td>$225</td>
<td>B</td>
</tr>
<tr>
<td>7</td>
<td>$2000 invested for 4 years at 10% p.a. simple interest becomes</td>
<td>A</td>
<td>$800</td>
<td>B</td>
</tr>
<tr>
<td>8</td>
<td>Find the simple interest on $1200 at 12% p.a. for 5 years.</td>
<td>A</td>
<td>$720</td>
<td>B</td>
</tr>
<tr>
<td>9</td>
<td>A sum of $8500 amounted to $8925 after being invested for 6 months at simple interest. What was the interest rate earned?</td>
<td>A</td>
<td>8% p.a.</td>
<td>B</td>
</tr>
<tr>
<td>10</td>
<td>Calculate the simple interest earned on $10000 at 9% p.a. for 3 years.</td>
<td>A</td>
<td>$13086</td>
<td>B</td>
</tr>
<tr>
<td>11</td>
<td>$15000 is invested for 5 years at 10% p.a. simple interest becomes</td>
<td>A</td>
<td>$24579.25</td>
<td>B</td>
</tr>
<tr>
<td>12</td>
<td>A dealer sells an article for $45 and makes a profit of $5. Her percentage profit on the cost price is:</td>
<td>A</td>
<td>12.5%</td>
<td>B</td>
</tr>
<tr>
<td>13</td>
<td>A $155 shirt is discounted by 25%. The price of the shirt is now</td>
<td>A</td>
<td>$96.25</td>
<td>B</td>
</tr>
<tr>
<td>14</td>
<td>A debt of $36000 is to be paid in equal instalments of $750. How many instalments are needed?</td>
<td>A</td>
<td>36</td>
<td>B</td>
</tr>
<tr>
<td>15</td>
<td>$2500 invested for 5 years at 12% simple interest p.a. becomes</td>
<td>A</td>
<td>$1500</td>
<td>B</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**  

15
Financial mathematics

TOPIC TEST

PART B

Instructions
• This part consists of 15 questions.
• Each question is worth 1 mark.
• Write only the answer in the answer column.
• For any working use the question column.

Time allowed: 20 minutes
Total marks: 15

1 Use the simple interest formula $I = PRN$ to complete this table.

<table>
<thead>
<tr>
<th>Interest (a)</th>
<th>Principal</th>
<th>Rate</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6500$</td>
<td>$4000$</td>
<td>$2650$</td>
<td>$9000$</td>
</tr>
<tr>
<td>$6540$</td>
<td>$10000$</td>
<td>$8200$</td>
<td>$25000$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

2 James decides to buy a computer marked at $5000. He pays a 20% deposit and the balance over 2 years with interest charged at 18% p.a. on the balance.

a Find the deposit paid.

b Calculate the balance owing.

c Calculate the simple interest paid.

d Find the total amount to be repaid.

e What is the monthly repayment?

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

3 a Find the simple interest on $35000 at 8% p.a. for 3 years.

b Find the length of time for $1200 to be the simple interest on $4800 at 5% p.a.

c Find the simple interest on $24000 at 7% p.a. for 2 years.

d An amount of money earned $1728 simple interest when invested for 3 years at 8% p.a. Find the amount that was invested.

e Each year a property increases in value by $10\frac{1}{2}\%$. What is the value of a $600000$ property after 1 year.

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART B

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
</tr>
</tbody>
</table>
UNIT 1: Negative indices

QUESTION 1  Write as a fraction.
\[
\begin{align*}
  a & \quad 2^{-1} & b & \quad 3^{-1} & c & \quad 7^{-1} \\
  & & & & & \\
  d & \quad 11^{-1} & e & \quad 12^{-1} & f & \quad 23^{-1}
\end{align*}
\]

QUESTION 2  Write in index form.
\[
\begin{align*}
  a & \quad \frac{1}{5} & b & \quad \frac{1}{6} & c & \quad \frac{1}{10} \\
  & & & & & \\
  d & \quad \frac{1}{13} & e & \quad \frac{1}{17} & f & \quad \frac{1}{59}
\end{align*}
\]

QUESTION 3  Write with a positive index.
\[
\begin{align*}
  a & \quad 8^{-2} & b & \quad 3^{-3} & c & \quad 2^{-7} \\
  & & & & & \\
  d & \quad 10^{-6} & e & \quad 5^{-4} & f & \quad 6^{-5}
\end{align*}
\]

QUESTION 4  Write as a fraction without indices.
\[
\begin{align*}
  a & \quad 3^{-2} & b & \quad 2^{-3} & c & \quad 5^{-2} \\
  & & & & & \\
  d & \quad 6^{-4} & e & \quad 10^{-5} & f & \quad 2^{-8}
\end{align*}
\]

QUESTION 5  Write with a negative index.
\[
\begin{align*}
  a & \quad \frac{1}{3^4} & b & \quad \frac{1}{5^7} & c & \quad \frac{1}{2^9} \\
  & & & & & \\
  d & \quad \frac{1}{6^5} & e & \quad \frac{1}{7^2} & f & \quad \frac{1}{10^7}
\end{align*}
\]

QUESTION 6  Write in index form (with a prime base and negative index).
\[
\begin{align*}
  a & \quad \frac{1}{25} & b & \quad \frac{1}{8} & c & \quad \frac{1}{1000} \\
  & & & & & \\
  d & \quad \frac{1}{81} & e & \quad \frac{1}{49} & f & \quad \frac{1}{64}
\end{align*}
\]
## Scientific notation

### UNIT 2: Powers of 10

**Question 1** Write the value of the following.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>10^3</td>
<td>=</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>10^4</td>
<td>=</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>10^5</td>
<td>=</td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>10^8</td>
<td>=</td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>10^9</td>
<td>=</td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>10^10</td>
<td>=</td>
</tr>
</tbody>
</table>

**Question 2** Write the following as a power of 10.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>1 000 000</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>1 000 000 000</td>
<td></td>
</tr>
</tbody>
</table>

**Question 3** Write the following as a basic numeral.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>2 × 10^3</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>4 × 10^2</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>8 × 10^4</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>9 × 10^5</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>5 × 10^10</td>
<td></td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>9 × 10^9</td>
<td></td>
</tr>
</tbody>
</table>

**Question 4** Write the following as a fraction.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>10^-1</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>10^-3</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>10^-7</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>0.0005</td>
<td></td>
</tr>
</tbody>
</table>

**Question 5** Write the following in decimal form.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>10^-1</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>10^-2</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>10^-4</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>10^-3</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>10^-10</td>
<td></td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>10^-12</td>
<td></td>
</tr>
</tbody>
</table>

**Question 6** Write the following using powers of 10.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>30 000</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>400 000</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>20 000 000</td>
<td></td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>
Scientific notation

UNIT 3: Scientific notation (1)

**Question 1** Express the following in scientific notation.

a. \(350 = \)  \( \)  

b. \(2500 = \)  \( \)  

c. \(15000 = \)  \( \)  

d. \(386000 = \)  \( \)  

e. \(500000 = \)  \( \)  

f. \(856 = \)  \( \)  

g. \(9500 = \)  \( \)  

h. \(3687 = \)  \( \)  

i. \(864300 = \)  \( \)  

j. \(53630 = \)  \( \)  

k. \(9643 = \)  \( \)  

l. \(83000 = \)  \( \)  

**Question 2** Express the following in scientific notation.

a. \(0.007 = \)  \( \)  

b. \(0.00098 = \)  \( \)  

c. \(0.05 = \)  \( \)  

d. \(0.0009 = \)  \( \)  

e. \(0.528 = \)  \( \)  

f. \(0.000681 = \)  \( \)  

g. \(0.009 = \)  \( \)  

h. \(0.6 = \)  \( \)  

i. \(0.632 = \)  \( \)  

j. \(0.001 = \)  \( \)  

k. \(0.000007 = \)  \( \)  

l. \(0.000835 = \)  \( \)  

**Question 3** Write the basic numeral for the following.

a. \(3.7 \times 10^2 = \)  \( \)  

b. \(8.5 \times 10^4 = \)  \( \)  

c. \(4.95 \times 10^3 = \)  \( \)  

d. \(7.89 \times 10^2 = \)  \( \)  

e. \(2.57 \times 10^5 = \)  \( \)  

f. \(1.7 \times 10^4 = \)  \( \)  

g. \(3.08 \times 10^{-2} = \)  \( \)  

h. \(4.6 \times 10^{-3} = \)  \( \)  

i. \(9.7 \times 10^{-4} = \)  \( \)  

j. \(2.39 \times 10^{-2} = \)  \( \)  

**Question 4** Use your calculator to answer the following correct to 3 significant figures.

a. \((1.2 \times 10^3) \times (2.3 \times 10^3) = \)  \( \)  

b. \((2 \times 10^2) \times (2.5 \times 10^3) = \)  \( \)  

c. \(4.9 \times (1.8 \times 10^3) = \)  \( \)  

d. \((5.9 \times 10^3) \div (2.3 \times 10^3) = \)  \( \)  

e. \((8.5 \times 10^2) \times (6.3 \times 10^{-1}) = \)  \( \)  

f. \(8.1 \times 10^{-2} \times 6.3 \times 10^4 = \)  \( \)  

g. \((4.5 \times 10^5) \times (3.2 \times 10^3) = \)  \( \)  

h. \((5.6 \times 10^3) \div (2.8 \times 10^2) = \)  \( \)
Scientific notation

UNIT 4: Numbers greater than one

**Question 1** Express each number in scientific notation.

a. $32\,000 = 3.2 \times \underline{\hspace{1cm}}$

b. $64\,000\,000 = 6.4 \times \underline{\hspace{1cm}}$

c. $93\,000 = 9.3 \times \underline{\hspace{1cm}}$

d. $938\,000 = 9.38 \times \underline{\hspace{1cm}}$

e. $7\,500\,000 = 7.5 \times \underline{\hspace{1cm}}$

f. $63\,000 = 6.3 \times \underline{\hspace{1cm}}$

g. $6\,540\,000 = 6.54 \times \underline{\hspace{1cm}}$

h. $2\,530\,000 = \underline{\hspace{1cm}} \times 10^6$

i. $8\,900\,000 = 8.9 \times \underline{\hspace{1cm}}$

j. $4160 = \underline{\hspace{1cm}} \times 10^3$

k. $23\,700\,000 = \underline{\hspace{1cm}} \times 10^7$

l. $630\,000 = \underline{\hspace{1cm}} \times 10^5$

**Question 2** Express each number in scientific notation.

a. $4800 = \underline{\hspace{1cm}}$

b. $80\,000 = \underline{\hspace{1cm}}$

c. $658\,000 = \underline{\hspace{1cm}}$

d. $3250\,000 = \underline{\hspace{1cm}}$

e. $600\,000 = \underline{\hspace{1cm}}$

f. $539.8 = \underline{\hspace{1cm}}$

g. $563\,000 = \underline{\hspace{1cm}}$

h. $853\,000\,000\,000 = \underline{\hspace{1cm}}$

i. $4000\,000 = \underline{\hspace{1cm}}$

j. $640 = \underline{\hspace{1cm}}$

k. $7935 = \underline{\hspace{1cm}}$

l. $63\,000 = \underline{\hspace{1cm}}$

**Question 3** Write each number in scientific notation.

a. $893 = \underline{\hspace{1cm}}$

b. $300\,000 = \underline{\hspace{1cm}}$

c. $90\,000 = \underline{\hspace{1cm}}$

d. $480\,000 = \underline{\hspace{1cm}}$

e. $63\,700 = \underline{\hspace{1cm}}$

f. $5431\,000 = \underline{\hspace{1cm}}$

g. $500\,000\,000 = \underline{\hspace{1cm}}$

h. $48\,600\,000 = \underline{\hspace{1cm}}$

i. $39\,000\,000 = \underline{\hspace{1cm}}$

j. $500\,000\,000 = \underline{\hspace{1cm}}$

k. $43.49 = \underline{\hspace{1cm}}$

l. $7631.7 = \underline{\hspace{1cm}}$

**Question 4** Express each number in scientific notation.

a. $9.7 = \underline{\hspace{1cm}}$

b. $8.0 = \underline{\hspace{1cm}}$

c. $5.38 = \underline{\hspace{1cm}}$

d. $7.9 = \underline{\hspace{1cm}}$

e. $3 = \underline{\hspace{1cm}}$

f. $8.2 = \underline{\hspace{1cm}}$

g. $9.63 = \underline{\hspace{1cm}}$

h. $7.25 = \underline{\hspace{1cm}}$

i. $4.62 = \underline{\hspace{1cm}}$

j. $8.13 = \underline{\hspace{1cm}}$

k. $2.54 = \underline{\hspace{1cm}}$

l. $9.75 = \underline{\hspace{1cm}}$

**Question 5** Write the following as ordinary numerals.

a. $3.4 \times 10^4 = \underline{\hspace{1cm}}$

b. $9.25 \times 10^6 = \underline{\hspace{1cm}}$

c. $8.23 \times 10^6 = \underline{\hspace{1cm}}$

d. $8.15 \times 10^6 = \underline{\hspace{1cm}}$

e. $7.01 \times 10^7 = \underline{\hspace{1cm}}$

f. $5.4 \times 10^3 = \underline{\hspace{1cm}}$

g. $6.351 \times 10^4 = \underline{\hspace{1cm}}$

h. $4.03 \times 10^4 = \underline{\hspace{1cm}}$

i. $3.486 \times 10^4 = \underline{\hspace{1cm}}$

j. $5.381 \times 10^5 = \underline{\hspace{1cm}}$

k. $9.5 \times 10^4 = \underline{\hspace{1cm}}$

l. $7.29 \times 10^5 = \underline{\hspace{1cm}}$

**Question 6** Express the following in scientific notation.

a. five hundred $\underline{\hspace{1cm}}$

b. eight thousand $\underline{\hspace{1cm}}$

c. three million $\underline{\hspace{1cm}}$

d. fifteen thousand $\underline{\hspace{1cm}}$

e. half a million $\underline{\hspace{1cm}}$

f. one hundred thousand $\underline{\hspace{1cm}}$

g. $63 \times 10^7 = \underline{\hspace{1cm}}$

h. $963.4 = \underline{\hspace{1cm}}$

i. $631 \times 10^7 = \underline{\hspace{1cm}}$

j. $2^7 = \underline{\hspace{1cm}}$

k. $798\,000 = \underline{\hspace{1cm}}$

l. $536 \times 10^4 = \underline{\hspace{1cm}}
### Unit 5: Numbers less than one

#### Question 1
Express each number in scientific notation.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.0025</td>
<td>2.5 × 10^-3</td>
</tr>
<tr>
<td>b</td>
<td>0.007</td>
<td>7 × 10^-3</td>
</tr>
<tr>
<td>c</td>
<td>0.000018</td>
<td>1.8 × 10^-5</td>
</tr>
<tr>
<td>d</td>
<td>0.0083</td>
<td>8.3 × 10^-3</td>
</tr>
<tr>
<td>e</td>
<td>0.000072</td>
<td>7.2 × 10^-5</td>
</tr>
<tr>
<td>f</td>
<td>0.0039</td>
<td>3.9 × 10^-3</td>
</tr>
<tr>
<td>g</td>
<td>0.0057</td>
<td>5.7 × 10^-3</td>
</tr>
<tr>
<td>h</td>
<td>0.0048</td>
<td>4.8 × 10^-4</td>
</tr>
<tr>
<td>i</td>
<td>0.000071</td>
<td>7.1 × 10^-6</td>
</tr>
<tr>
<td>j</td>
<td>0.0436</td>
<td>4.36 × 10^-2</td>
</tr>
<tr>
<td>k</td>
<td>0.0000022</td>
<td>2.2 × 10^-6</td>
</tr>
<tr>
<td>l</td>
<td>0.00005</td>
<td>5 × 10^-5</td>
</tr>
</tbody>
</table>

#### Question 2
Express each number in scientific notation.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.43</td>
<td>4.3 × 10^-1</td>
</tr>
<tr>
<td>b</td>
<td>0.0089</td>
<td>8.9 × 10^-3</td>
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<tr>
<td>c</td>
<td>0.00065</td>
<td>6.5 × 10^-4</td>
</tr>
<tr>
<td>d</td>
<td>0.00041</td>
<td>4.1 × 10^-4</td>
</tr>
<tr>
<td>e</td>
<td>0.000549</td>
<td>5.49 × 10^-4</td>
</tr>
<tr>
<td>f</td>
<td>0.0073</td>
<td>7.3 × 10^-3</td>
</tr>
<tr>
<td>g</td>
<td>0.00925</td>
<td>9.25 × 10^-3</td>
</tr>
<tr>
<td>h</td>
<td>0.00329</td>
<td>3.29 × 10^-3</td>
</tr>
<tr>
<td>i</td>
<td>0.000007</td>
<td>7 × 10^-7</td>
</tr>
<tr>
<td>j</td>
<td>0.83</td>
<td>8.3 × 10^-1</td>
</tr>
<tr>
<td>k</td>
<td>0.00000548</td>
<td>5.48 × 10^-7</td>
</tr>
<tr>
<td>l</td>
<td>0.00716</td>
<td>7.16 × 10^-3</td>
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</tbody>
</table>

#### Question 3
Write each number in scientific notation.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.85</td>
<td>8.5 × 10^-1</td>
</tr>
<tr>
<td>b</td>
<td>0.0356</td>
<td>3.56 × 10^-2</td>
</tr>
<tr>
<td>c</td>
<td>0.0047</td>
<td>4.7 × 10^-3</td>
</tr>
<tr>
<td>d</td>
<td>0.000831</td>
<td>8.31 × 10^-4</td>
</tr>
<tr>
<td>e</td>
<td>0.000215</td>
<td>2.15 × 10^-4</td>
</tr>
<tr>
<td>f</td>
<td>0.00835</td>
<td>8.35 × 10^-4</td>
</tr>
<tr>
<td>g</td>
<td>0.00017</td>
<td>1.7 × 10^-4</td>
</tr>
<tr>
<td>h</td>
<td>0.00218</td>
<td>2.18 × 10^-4</td>
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<tr>
<td>i</td>
<td>0.000387</td>
<td>3.87 × 10^-5</td>
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<tr>
<td>j</td>
<td>0.000000534</td>
<td>5.34 × 10^-8</td>
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<tr>
<td>k</td>
<td>0.00123</td>
<td>1.23 × 10^-4</td>
</tr>
<tr>
<td>l</td>
<td>0.0005</td>
<td>5 × 10^-4</td>
</tr>
</tbody>
</table>

#### Question 4
Express each number in scientific notation.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.05</td>
<td>5 × 10^-2</td>
</tr>
<tr>
<td>b</td>
<td>0.008</td>
<td>8 × 10^-3</td>
</tr>
<tr>
<td>c</td>
<td>0.025</td>
<td>2.5 × 10^-2</td>
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<tr>
<td>d</td>
<td>0.000006</td>
<td>6 × 10^-7</td>
</tr>
<tr>
<td>e</td>
<td>0.000251</td>
<td>2.51 × 10^-5</td>
</tr>
<tr>
<td>f</td>
<td>0.06932</td>
<td>6.932 × 10^-2</td>
</tr>
<tr>
<td>g</td>
<td>0.000456</td>
<td>4.56 × 10^-4</td>
</tr>
<tr>
<td>h</td>
<td>0.0073</td>
<td>7.3 × 10^-3</td>
</tr>
<tr>
<td>i</td>
<td>0.358</td>
<td>3.58 × 10^{-1}</td>
</tr>
<tr>
<td>j</td>
<td>0.00063</td>
<td>6.3 × 10^-5</td>
</tr>
<tr>
<td>k</td>
<td>0.000084</td>
<td>8.4 × 10^-6</td>
</tr>
<tr>
<td>l</td>
<td>0.000792</td>
<td>7.92 × 10^{-5}</td>
</tr>
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</table>

#### Question 5
Write the following as ordinary numerals.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>5 × 10^{-3}</td>
<td>0.005</td>
</tr>
<tr>
<td>b</td>
<td>8 × 10^{-6}</td>
<td>0.000008</td>
</tr>
<tr>
<td>c</td>
<td>7.6 × 10^{-2}</td>
<td>0.76</td>
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<td>d</td>
<td>5.608 × 10^{-4}</td>
<td>0.0005608</td>
</tr>
<tr>
<td>e</td>
<td>5.03 × 10^{-2}</td>
<td>0.0503</td>
</tr>
<tr>
<td>f</td>
<td>8.3 × 10^{-3}</td>
<td>0.0083</td>
</tr>
<tr>
<td>g</td>
<td>8.59 × 10^{-4}</td>
<td>0.000859</td>
</tr>
<tr>
<td>h</td>
<td>5.9 × 10^{-3}</td>
<td>0.0059</td>
</tr>
<tr>
<td>i</td>
<td>3.33 × 10^{-3}</td>
<td>0.00333</td>
</tr>
<tr>
<td>j</td>
<td>5.08 × 10^{-3}</td>
<td>0.00508</td>
</tr>
<tr>
<td>k</td>
<td>9.8 × 10^{-2}</td>
<td>0.98</td>
</tr>
<tr>
<td>l</td>
<td>9.61 × 10^{-4}</td>
<td>0.000961</td>
</tr>
</tbody>
</table>

#### Question 6
Express the following in scientific notation.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>three tenths</td>
<td>0.3</td>
</tr>
<tr>
<td>b</td>
<td>one-hundredth</td>
<td>0.01</td>
</tr>
<tr>
<td>c</td>
<td>five-thousandths</td>
<td>0.0005</td>
</tr>
<tr>
<td>d</td>
<td>twelve-hundredths</td>
<td>0.012</td>
</tr>
<tr>
<td>e</td>
<td>three-millionths</td>
<td>0.000003</td>
</tr>
<tr>
<td>f</td>
<td>nine-tenths</td>
<td>0.9</td>
</tr>
<tr>
<td>g</td>
<td>five-hundredths</td>
<td>0.005</td>
</tr>
<tr>
<td>h</td>
<td>six-millionths</td>
<td>0.000006</td>
</tr>
<tr>
<td>i</td>
<td>seven-tenths</td>
<td>0.7</td>
</tr>
<tr>
<td>j</td>
<td>0.005</td>
<td>5 × 10^{-3}</td>
</tr>
<tr>
<td>k</td>
<td>0.023</td>
<td>2.3 × 10^{-2}</td>
</tr>
<tr>
<td>l</td>
<td>0.00008</td>
<td>8 × 10^{-6}</td>
</tr>
</tbody>
</table>
Scientific notation

UNIT 6: Scientific notation calculations

QUESTION 1  Simplify the following, giving your answers in scientific notation.

a  \((4 \times 10^5) \times (3.5 \times 10^4) = \)  

b  \((6.7 \times 10^9) \times (4.2 \times 10^2) = \)

c  \((8.32 \times 10^7) \times (5.2 \times 10^3) = \)

d  \((3.6 \times 10^6) \times (5.2 \times 10^2) = \)

e  \((4.9 \times 10^4) \times (5.8 \times 10^6) = \)

f  \((6.9 \times 10^5) \times (4.2 \times 10^8) = \)

QUESTION 2  Express your answers to the following in scientific notation.

a  \((8.4 \times 10^8) \div (2.1 \times 10^6) = \)

b  \((6.5 \times 10^{12}) \div (1.3 \times 10^7) = \)

c  \((9.6 \times 10^9) \div (1.6 \times 10^4) = \)

d  \((6.3 \times 10^{20}) \div (2.4 \times 10^{17}) = \)

e  \((9.6 \times 10^7) \div (4.8 \times 10^2) = \)

f  \((2.24 \times 10^{-8}) \div (3.2 \times 10^5) = \)

QUESTION 3  Simplify the following, giving your answers in scientific notation.

a  \((6.3 \times 10^8) \times (2.1 \times 10^5) = \)

b  \((3.24 \times 10^{12}) \div (2.4 \times 10^8) = \)

c  \((5.86 \times 10^9) \div (3.5 \times 10^4) = \)

d  \((6.4 \times 10^{-3})^2 = \)

e  \((9.3 \times 10^{13}) \div (3.1 \times 10^{-4}) = \)

f  \(9.8 \times 10^{-7} \div 1.4 \times 10^{-3} = \)

QUESTION 4  Simplify the following, expressing your answers in scientific notation correct to four significant figures.

a  \(58000 \times 632000 = \)

b  \(59000 \times 5 \times 31000 = \)

c  \(8.2 \times 9236000 = \)

d  \(70630 \times 250480 = \)

e  \((9.2 \times 10^{32}) + (1.6 \times 10^{30}) = \)

f  \(\sqrt[3]{6.15 \times 10^{12}} = \)

QUESTION 5  Express your answers to the following in scientific notation.

a  \((8 \times 10^3)^4 = \)

b  \((6 \times 10^{-3})^2 = \)

c  \((9.3 \times 10^9) \div (3.1 \times 10^{-4}) = \)

d  \((8 \times 10^9) \times (3 \times 10^3)^4 = \)

e  \((7.2 \times 10^4) \div (1.8 \times 10^{-3}) = \)

f  \((8.4 \times 10^7) \div (2.1 \times 10^{-6}) = \)

QUESTION 6  The following numbers are not in scientific notation. Convert them to scientific notation.

a  \(847.6 \times 10^4 = \)

b  \(0.000072 \times 10^5 = \)

c  \(85 \times 10^{-4} = \)

b  \(536.48 \times 10^{-2} = \)

e  \(1000 \times 10^{-5} = \)

f  \(0.635 \times 10^{-4} = \)
Chapter 6: Scientific notation

Unit 7: Comparing numbers in scientific notation

**Question 1** Choose the larger number from each pair.

| a | \(5 \times 10^7\) or \(7 \times 10^7\) | b | \(6.4 \times 10^5\) or \(2.5 \times 10^4\) |
| c | \(9.8 \times 10^6\) or \(3.2 \times 10^6\) | d | \(5 \times 10^{-2}\) or \(6 \times 10^{-5}\) |
| e | \(4.8 \times 10^{-3}\) or \(5.1 \times 10^{-4}\) | f | \(4.8 \times 10^{-3}\) or \(6.7 \times 10^2\) |

**Question 2** Select the smaller number from each pair.

| a | \(6.2 \times 10^8\) or \(9.3 \times 10^6\) | b | \(6.03 \times 10^0\) or \(6.03 \times 10^{-2}\) |
| c | \(8.9 \times 10^4\) or \(3.2 \times 10^8\) | d | \(5.9 \times 10^{-6}\) or \(3.1 \times 10^{-4}\) |
| e | \(8.35 \times 10^{-6}\) or \(8.6 \times 10^2\) | f | \(7.5 \times 10^{-5}\) or \(8.9 \times 10^3\) |

**Question 3** Write each group of numbers in ascending order (from smallest to largest).

| a | \(3.5 \times 10^6, 3.5 \times 10^{-8}, 3.5 \times 10^4\) | b | \(5 \times 10^{-7}, 5 \times 10^{-6}, 5 \times 10^{-2}\) |
| c | \(7 \times 10^{-3}, 7 \times 10^{-8}, 7 \times 10^{-5}\) | d | \(3.8 \times 10^6, 2.5 \times 10^4, 3.1 \times 10^6\) |
| e | \(3.8 \times 10^{-3}, 3.9 \times 10^{-3}, 5.4 \times 10^{-3}\) | f | \(3.8 \times 10^3, 4.9 \times 10^3, 3.5 \times 10^{-5}\) |

**Question 4** Write each group of numbers in descending order (from largest to smallest).

| a | \(8 \times 10^5, 8 \times 10^4, 8 \times 10^3\) | b | \(5.3 \times 10^4, 3.9 \times 10^5, 7.6 \times 10^3\) |
| c | \(2.1 \times 10^6, 1.5 \times 10^6, 3.2 \times 10^6\) | d | \(5 \times 10^3, 6 \times 10^3, 8 \times 10^3\) |
| e | \(7 \times 10^{-2}, 5 \times 10^{-2}, 4 \times 10^{-3}\) | f | \(9.1 \times 10^{-2}, 8.3 \times 10^{-3}, 5.6 \times 10^{-4}\) |

**Question 5** Write the following in the order indicated.

| a | \(7 \times 10^3, 7 \times 10^2, 7 \times 10^4\) (smallest to largest) | b | \(2.3 \times 10^9, 3.6 \times 10^4, 8.9 \times 10^2\) (largest to smallest) |
| c | \(8.6 \times 10^{-2}, 3.6 \times 10^{-1}, 2.4 \times 10^{-3}\) (smallest to largest) | d | \(6.8 \times 10^{-2}, 5.8 \times 10^{-1}, 4.3 \times 10^{-3}\) (largest to smallest) |
| e | \(9.5 \times 10^3, 8.6 \times 10^3, 7.8 \times 10^3\) (ascending order) | f | \(3.2 \times 10^{-6}, 4.7 \times 10^{-4}, 6.5 \times 10^{-5}\) (descending order) |

**Question 6** Select the largest number from each group.

| a | \(6.3 \times 10^5, 5.8 \times 10^{-3}, 3.7 \times 10^5\) | b | \(6.2 \times 10^8, 6.2 \times 10^8, 6.2 \times 10^4\) |
| c | \(8 \times 10^4, 8 \times 10^5, 8 \times 10^{-7}\) | d | \(1.3 \times 10^3, 1.3 \times 10^5, 1.3 \times 10^9\) |
| e | \(4.5 \times 10^{-6}, 4.5 \times 10^{-4}, 4.5 \times 10^{-2}\) | f | \(9.3 \times 10^9, 9.3 \times 10^7, 9.3 \times 10^5\) |
**UNIT 8: Significant figures**

**QUESTION 1** Round off each number to the number of significant figures indicated.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>38 653 to 3 significant figures</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>24 686 357 to 2 significant figures</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>387 006 432 to 1 significant figure</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>96 481 to 1 significant figure</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>3653.854 to 3 significant figures</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>857 300 to 2 significant figures</td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>0.005 6831 to 2 significant figures</td>
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<tr>
<td><strong>h</strong></td>
<td>5.238 765 41 to 3 significant figures</td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>0.000 358 132 to 2 significant figures</td>
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<tr>
<td><strong>j</strong></td>
<td>76.362 to 3 significant figures</td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>0.000 139 764 3 to 2 significant figures</td>
</tr>
<tr>
<td><strong>l</strong></td>
<td>0.007 543 6 to 1 significant figure</td>
</tr>
</tbody>
</table>

**QUESTION 2** Write each number correct to 3 significant figures.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>56 383 420</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>8 361 000 000</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>43 682</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>0.036 873 5</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>0.558 324</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>0.000 325 69</td>
</tr>
</tbody>
</table>

**QUESTION 3** Leon used a tape measure, marked in centimetres, to measure a piece of material. Leon finds the material to be 1.8775 m long. Do you think this is a reasonable finding? Briefly comment.

<p>| |</p>
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</table>

**QUESTION 4** Sean has a set of kitchen scales that measure up to 5 kg. The scales have a dial, each division of which is 20 g. To what accuracy can Sean use his scales? Briefly comment.

<p>| |</p>
<table>
<thead>
<tr>
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</table>
Scientific notation

Unit 9: Scientific notation (2)

**QUESTION 1** Write the following number in scientific notation.

a) 7000 =

b) 19000 =

c) 53000 =

d) 647000 =

e) 816000000 =

f) 580000000 =

g) 690 =

h) 873 =

i) 235000 =

j) 56000 =

k) 64900 =

l) 865000000 =

**QUESTION 2** Write the following in scientific notation.

a) 0.035 =

b) 0.0038 =

c) 0.06532 =

d) 0.000058 =

e) 0.0000043 =

f) 0.00075 =

g) 0.00059 =

h) 0.0067 =

i) 0.000094 =

j) 0.0356 =

k) 0.0098 =

l) 0.05361 =

**QUESTION 3** Express the following as ordinary numerals.

a) $4 \times 10^3 =$

b) $3.6 \times 10^4 =$

c) $7.29 \times 10^7 =$

d) $3.5 \times 10^5 =$

e) $4.75 \times 10^3 =$

f) $7.96 \times 10^5 =$

g) $7.4 \times 10^4 =$

h) $2.5 \times 10^6 =$

i) $5.13 \times 10^3 =$

j) $9.5 \times 10^3 =$

k) $5.83 \times 10^2 =$

l) $6.91 \times 10^5 =$

**QUESTION 4** Express the following as ordinary numerals.

a) $4.8 \times 10^{-2} =$

b) $3.05 \times 10^{-4} =$

c) $7.15 \times 10^{-5} =$

d) $5.4 \times 10^{-3} =$

e) $3.9 \times 10^{-2} =$

f) $5.12 \times 10^{-3} =$

g) $6.7 \times 10^{-6} =$

h) $5.5 \times 10^{-5} =$

i) $8 \times 10^{-4} =$

j) $7.69 \times 10^{-5} =$

k) $1.6 \times 10^{-3} =$

l) $5.3 \times 10^{-6} =$

**QUESTION 5** Write the answer to the following in scientific notation, correct to 3 significant figures.

a) $(2.5 \times 10^3) \times (1.5 \times 10^2) =$

b) $(5.4 \times 10^3) \times (4.8 \times 10^2) =$

c) $(5.1 \times 10^3) \times (2.3 \times 10^3) =$

d) $(8.1 \times 10^4) \div (2.7 \times 10^2) =$

e) $(6.4 \times 10^5) \div (1.6 \times 10^3) =$

f) $(8.5 \times 10^4) - (7.6 \times 10^2) =$

g) $(3.8 \times 10^3) \times (2.1 \times 10^4) =$

h) $(7.6 \times 10^3)^2 =$

**QUESTION 6** Evaluate to 1 decimal place, leaving your answer in scientific notation.

a) $6.835 \times 10^5 =$

b) $3.16 \times 10^2 =$

c) $5.68 \times 10^4 =$

d) $3.2 \times 10^2 =$

e) $8^9 =$

f) $0.0025 \div 625.7 =$
# TOPIC TEST

**TOPIC: Scientific notation**

**PART A**

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th>Total marks: 15</th>
<th>Marks</th>
</tr>
</thead>
</table>

## 1. Write the value of $10^5$

- **A**: $5 \times 10$
- **B**: 10000
- **C**: 100000
- **D**: none of these

## 2. Write 10,000,000 as a power of 10

- **A**: $10^7$
- **B**: $10^6$
- **C**: 105
- **D**: 104

## 3. Write $5 \times 10^3$ as a basic numeral.

- **A**: $5 \times 3 \times 10$
- **B**: $5 \times 100$
- **C**: $5 \times 1000$
- **D**: 5000

## 4. Write $10^{-3}$ as a fraction.

- **A**: $\frac{1}{30}$
- **B**: $\frac{1}{300}$
- **C**: $\frac{1}{1000}$
- **D**: 1000

## 5. Write $10^{-5}$ in decimal form.

- **A**: 0.001
- **B**: 0.0001
- **C**: 0.00001
- **D**: 0.000001

## 6. Write $6 \times 10^4$ as an ordinary numeral.

- **A**: $6 \times 4 \times 10$
- **B**: $6 \times 1000$
- **C**: $6 \times 10000$
- **D**: 60000

## 7. Write $\frac{1}{(10^3)^4}$ with a negative index.

- **A**: $10^{-3}$
- **B**: $10^{-4}$
- **C**: $10^{-7}$
- **D**: $10^{-12}$

## 8. Simplify $10^{12} \div 10^5 \div 10^3$

- **A**: $10^{20}$
- **B**: $10^{12}$
- **C**: $10^{10}$
- **D**: $10^{4}$

## 9. 4.05 x $10^{-6}$ equals

- **A**: 0.0000405
- **B**: 0.00000405
- **C**: 40500
- **D**: 405000

## 10. Which one of the following numbers is written in scientific notation?

- **A**: $8 \times 10000$
- **B**: 80000
- **C**: $8 \times 10^4$
- **D**: $8 \times 10^3$

## 11. $(3 \times 10^5) \div (6 \times 10^{-3})$ equals

- **A**: $5 \times 10^3$
- **B**: 50000
- **C**: $5 \times 10^7$
- **D**: $5 \times 10^8$

## 12. Express 8 million in scientific notation.

- **A**: $8 \times 10^4$
- **B**: $8 \times 10^5$
- **C**: $8 \times 10^6$
- **D**: $8 \times 10^7$

## 13. Express 0.0059 in standard notation.

- **A**: $59 \times 10^1$
- **B**: $59 \times 10^2$
- **C**: $5.9 \times 10^{-3}$
- **D**: $5.9 \times 10^4$

## 14. Write $7 \times 10^{-6}$ as ordinary numerals.

- **A**: 0.0007
- **B**: 0.00007
- **C**: 0.000007
- **D**: 0.0000007

## 15. Simplify $(6 \times 10^{-4})^2$ giving your answer in scientific notation.

- **A**: $6 \times 10^{-2}$
- **B**: $6 \times 10^{-8}$
- **C**: $3.6 \times 10^{-7}$
- **D**: $3.6 \times 10^{-8}$

---

**Total marks achieved for PART A**

---

56

**Excel ESSENTIAL SKILLS Year 9 Mathematics Revision & Exam Workbook**
### TOPIC TEST

**PART B**

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 a Write $7^{-1}$ as a fraction.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b Write $\frac{1}{3}$ in index form.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c $10^9 \times 10^7 \div 10^2$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d $10^{15} \div 10^9 \div 10^6$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e Write $2^{-4}$ as a fraction.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2 a Find the value of $x$ in $10^{18} \div 10^{12} = 10^x$.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b Express 17000 in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c Write 0.00005 in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d Express $596 \times 10^{-4}$ in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e Write $1.5 \times 10^3$ as a basic numeral.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3 a One astronomical unit is about 149 000 000 km. Write this in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b Write $4.3 \times 10^5$, $4.3 \times 10^4$, $4.3 \times 10^3$ in ascending order.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c Simplify $(6.8 \times 10^6) \times (2.8 \times 10^{-3})$ in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d Convert 0.000007 $\times 10^9$ to scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e Express the number of centimetres in 370 km in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART B**

15

---

Chapter 6: **Scientific notation**
UNIT 1: The distance between two points

**Question 1** Write down the distance between each pair of points.

- a  $A(3, 6)$ and $B(7, 6)$  
  $AB =$

- b  $C(5, 2)$ and $D(5, 7)$  
  $CD =$

- c  $E(-3, 5)$ and $F(-3, 0)$  
  $EF =$

- d  $G(5, 4)$ and $H(9, 4)$  
  $GH =$

- e  $I(7, 2)$ and $J(11, 2)$  
  $IJ =$

- f  $K(-1, 2)$ and $L(2, 2)$  
  $KL =$

- g  $M(1, 1)$ and $N(1, 8)$  
  $MN =$

- h  $O(4, 4)$ and $P(4, 9)$  
  $OP =$

**Question 2** Use Pythagoras’ theorem to find the distance $AB$ in each diagram. Leave your answers in surd (square root) form where necessary.

**Question 3** Use Pythagoras’ theorem to find the length of each interval. Leave your answers in surd form where necessary.

**Question 4** $ABCD$ is a rectangle. Find:

- a  the coordinates of the vertex $A$

- b  the length of the interval
  
  i  $AB$

  ii  $BC$

  iii  $CD$

  iv  $DA$

  v  $BD$

  vi  $AC$

- c  The perimeter of $ABCD$

- d  The area of $ABCD$
QUESTION 1  Use the distance formula \( d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \) to calculate the distance between the following pairs of points. Leave your answers in surd form where necessary.

a  A(1, 3) and B(5, 7) 

b  A(4, 2) and B(11, 1) 

c  C(−2, 3) and D(5, 2) 

d  E(5, 1) and F(8, 2) 

e  G(3, 9) and H(5, 12) 

f  I(3, 8) and J(2, 5) 

QUESTION 2  Calculate the distance between the following pairs of points correct to one decimal place.

a  A(5, 8) and B(−1, −2) 

b  C(4, 9) and D(9, 5) 

c  E(6, 7) and F(0, −2) 

d  G(3, 7) and H(9, 15) 

e  I(5, 6) and J(7, 10) 

f  K(1, 6) and L(2, 5) 

QUESTION 3  

a  What is the square of the distance between the points A(−3, 4) and B(1, 9)?

b  Find the perimeter of the triangle whose vertices are A(6, 0), B(9, 6) and C(1, 0).

QUESTION 4  The points A(−2, 3), B(5, 3), C(5, −1) and D(−2, −1) are the vertices of a rectangle. Find:

a  the length \( AB = \) 

b  the length \( BC = \) 

c  the length \( CD = \) 

d  the length \( DA = \) 

e  the exact length \( AC = \) 

f  the exact length \( BD = \)
Coordinate geometry

UNIT 3: The midpoint of an interval

QUESTION 1
a  What number is halfway between 6 and 10? _____________________________

b  What is the average of 6 and 10? _____________________________

c  Find \( \frac{6 + 10}{2} \) _____________________________

d  What number is halfway between –2 and 12? _____________________________

e  What is the average of –2 and 12? _____________________________

f  Find \( \frac{-2 + 12}{2} \) _____________________________

QUESTION 2  What number is halfway between the point A and the point B on each number line?

a  _____________________________

b  _____________________________

c  _____________________________

d  _____________________________

QUESTION 3  Find the number that is halfway between:

a  0 and 16 = _____________________________

d  3 and 15 = _____________________________

b  4 and 12 = _____________________________

e  1 and 13 = _____________________________

c  2 and 10 = _____________________________

f  –1 and 7 = _____________________________

g  –2 and 6 = _____________________________

h  –4 and 4 = _____________________________

i  2 and 18 = _____________________________

j  –5 and 15 = _____________________________

k  3 and 17 = _____________________________

l  1 and 19 = _____________________________

QUESTION 4  Consider the points \( P(4, 10) \) and \( Q(6, –2) \).

a  Use the \( x \)-coordinates of the points \( P \) and \( Q \) to find the number halfway between 4 and 6.

b  Use the \( y \)-coordinates of the points \( P \) and \( Q \) to find the number halfway between 10 and –2.

c  What are the coordinates of the point \( M \), which is halfway between \( P \) and \( Q \)?

QUESTION 5  If \( x_1 \) and \( x_2 \) are given, find the value of \( x \) when \( x = \frac{x_1 + x_2}{2} \)

a  \( x_1 = 3 \) and \( x_2 = 21 \) _____________________________

c  \( x_1 = 5 \) and \( x_2 = 13 \) _____________________________

e  \( x_1 = 1 \) and \( x_2 = 9 \) _____________________________

g  \( x_1 = –4 \) and \( x_2 = 8 \) _____________________________

i  \( x_1 = –5 \) and \( x_2 = 7 \) _____________________________

k  \( x_1 = –7 \) and \( x_2 = –1 \) _____________________________

b  \( x_1 = –2 \) and \( x_2 = 8 \) _____________________________

d  \( x_1 = 4 \) and \( x_2 = 10 \) _____________________________

f  \( x_1 = –6 \) and \( x_2 = 14 \) _____________________________

h  \( x_1 = –6 \) and \( x_2 = 10 \) _____________________________

j  \( x_1 = –2 \) and \( x_2 = 16 \) _____________________________

l  \( x_1 = –8 \) and \( x_2 = –2 \) _____________________________
Coordinate geometry

UNIT 4: The midpoint formula

**QUESTION 1** Use the midpoint formula \( \frac{x_1 + x_2}{2} \) and \( \frac{y_1 + y_2}{2} \) to find the midpoint of the interval joining each of the following sets of points.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>A(0, 6), B(0, 10)</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>A(2, 7), B(8, 9)</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>C(–2, –5), D(–7, 9)</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>E(4, 9), F(8, 3)</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>G(8, 8), H(6, 0)</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>I(0, 8), J(4, 4)</td>
</tr>
</tbody>
</table>

**QUESTION 2** Use the midpoint formula to find the midpoints of the intervals joining the following points:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>P(2, –5), Q(8, 5)</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>R(9, 3), S(7, 5)</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>A(5, 13), B(11, 11)</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>C(4, 5), D(6, 9)</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>E(–3, –6), F(1, 4)</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>G(–4, 6), H(8, –2)</td>
</tr>
</tbody>
</table>

**QUESTION 3** The points O(0, 0), A(1, 4), B(6, 4) and C(5, 0) are the vertices of a parallelogram.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>Find the coordinates of the midpoint of OB.</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>Find the coordinates of the midpoint of AC.</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>Are the midpoints of OB and AC the same?</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>What can you say about the diagonals of the parallelogram?</td>
</tr>
</tbody>
</table>

**QUESTION 4** Find the coordinates of the centre of the circle if the endpoints of a diameter are:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>A(–2, 9), B(9, 6)</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>C(6, 0), D(4, 2)</td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>E(3, 11), F(9, 9)</td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>G(5, 6), H(7, 10)</td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>I(–5, –8), J(–1, 2)</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>K(–5, 5), L(7, –3)</td>
</tr>
</tbody>
</table>

**QUESTION 5** The vertices of a triangle ABC are A(2, 13), B(14, 15) and C(–3, 5). Find the midpoint of each side.

**QUESTION 6** Prove that the midpoint of A(5, –8) and B(–5, 8) is the origin.
UNIT 5: Finding an end point

**Question 1** For each diagram, find the coordinates of \( A \), given that \( M \) is the midpoint of \( AB \).

(a) ![Diagram](image.png)

(b) ![Diagram](image.png)

**Question 2** The coordinates of the midpoint \( M \) of an interval and one of its end points \( A \), are given. Find the coordinates of the other end point \( B \).

(a) \( M(4, 7) \) and \( A(1, 6) \)

(b) \( M(5, 9) \) and \( A(1, 7) \)

(c) \( M(6, -3) \) and \( A(4, 1) \)

(d) \( M(0, 8) \) and \( A(4, 10) \)

(e) \( M(5, 9) \) and \( A(1, 7) \)

(f) \( M(4, 3) \) and \( A(0, 0) \)

(g) \( M(3, 9) \) and \( A(-1, 5) \)

(h) \( M(7, 9) \) and \( A(4, 5) \)

(i) \( M(2, 1) \) and \( A(5, -5) \)

(j) \( M(4, 9) \) and \( A(0, 2) \)

(k) \( M(8, 4) \) and \( A(5, 2) \)

(l) \( M(8, 0) \) and \( A(7, 3) \)

**Question 3** Given the coordinates of the centre \( C \) of a circle, and one end point \( B \) of a diameter, find the coordinates of the other end point \( A \) of the diameter.

(a) \( C(2, 4) \) and \( B(0, 1) \)

(b) \( C(3, 7) \) and \( B(2, 6) \)

(c) \( C(-1, 2) \) and \( B(-4, 4) \)

(d) \( C(-2, 5) \) and \( B(-6, 4) \)

(e) \( C(0, 0) \) and \( B(-4, -6) \)

(f) \( C(6, 9) \) and \( B(4, 6) \)

(g) \( C(-1, 8) \) and \( B(-4, 3) \)

(h) \( C(-3, 1) \) and \( B(-7, 0) \)

**Question 4**

(a) \((3, 6)\) is the midpoint of \( AB \) and \( A \) is the point \((0, 2)\). Find the coordinates of \( B \). 

(b) If the midpoint of \((a, b)\) and \((9, 9)\) is \((6, 2)\). What are the values of \(a\) and \(b\)?

(c) If the midpoint of \((5, p)\) and \((7, -4)\) is \((6, 3)\). What is the value of \(p\)?

(d) If the midpoint of \((x, 5)\) and \((9, y)\) is \((1, 6)\). What are the values of \(x\) and \(y\)?
UNIT 6: The gradient of a line

**QUESTION 1**  State whether the gradient of the line < is positive or negative.

- **a**
- **b**
- **c**
- **d**

**QUESTION 2**  Find the gradient of each line.

- **a**
- **b**
- **c**
- **d**
- **e**
- **f**
- **g**
- **h**
- **i**
UNIT 7: The gradient formula

**Question 1** Use the gradient formula \( m = \frac{y_2 - y_1}{x_2 - x_1} \) to find the gradient of the straight line passing through:

\[ \begin{align*}
\text{a} & \quad A(3, 5) \text{ and } B(7, -1) \\
\text{b} & \quad C(2, 5) \text{ and } D(-2, 1) \\
\text{c} & \quad E(0, 7) \text{ and } F(4, 3) \\
\text{d} & \quad G(1, -1) \text{ and } H(6, 4) \\
\text{e} & \quad I(1, 0) \text{ and } J(4, 9) \\
\text{f} & \quad K(0, 0) \text{ and } L(5, 8)
\end{align*} \]

**Question 2** Find the gradient of the line between:

\[ \begin{align*}
\text{a} & \quad A(-2, -3) \text{ and } B(3, 2) \\
\text{b} & \quad C(0, 5) \text{ and } D(5, 0) \\
\text{c} & \quad E(6, 0) \text{ and } F(1, -5) \\
\text{d} & \quad G(5, 5) \text{ and } H(2, -5) \\
\text{e} & \quad I(4, 3) \text{ and } J(1, 4) \\
\text{f} & \quad K(6, 8) \text{ and } L(1, -1)
\end{align*} \]

**Question 3** Show that \( A(0, -5), B(3, 1) \) and \( C(-2, -9) \) are collinear.

**Question 4** A line passes through the points \( A(1, 3) \) and \( B(x, 7) \) and its gradient is 1. Find the value of \( x \).

**Question 5** Show that the four points \( A(-2, -3), B(-5, 2), C(0, 4) \) and \( D(3, -1) \) are the vertices of a parallelogram.

**Question 6** Which of the following sets of points is collinear?

\[ \begin{align*}
\text{a} & \quad (3, 7), (0, 4) \text{ and } (8, 2) \\
\text{b} & \quad (0, 1), (-1, -1) \text{ and } (2, 5)
\end{align*} \]
UNIT 8: Gradient and y-intercept of the line \( y = mx + b \)

For each of the graphs drawn below, write:

a. the y-intercept  
b. the gradient  
c. whether the gradient is positive or negative  
d. whether the line is leaning to the right or to the left.

1. [Graph Image]
   a. 
   b. 
   c. 
   d. 

2. [Graph Image]
   a. 
   b. 
   c. 
   d. 

3. [Graph Image]
   a. 
   b. 
   c. 
   d. 

4. [Graph Image]
   a. 
   b. 
   c. 
   d. 

5. [Graph Image]
   a. 
   b. 
   c. 
   d. 

6. [Graph Image]
   a. 
   b. 
   c. 
   d. 

Chapter 7: Coordinate geometry
UNIT 9: More on gradient and y-intercept of the line \( y = mx + b \)

For each of the equations given below,

a. Complete a table of values.

b. Draw the graph of the line.

c. Write the gradient of the line.

d. State whether it is positive or negative.

e. Write the coefficient of \( x \).

f. State whether the line is leaning to the left or to the right.

g. Is it the same as the gradient?

h. Write the \( y \)-intercept.

i. Is it the same as the constant term of the equation?

**QUESTION 1**

\( y = x - 3 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( y = -2x + 3 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QUESTION 2**

\( y = -2x + 3 \)

\( y = 2x + 3 \)

\( y = -3x + 7 \)

**QUESTION 3**

For each of the lines given below write:

i. the gradient

ii. the \( y \)-intercept.

\( y = 8x - 5 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( y = 2x + 3 \)

<table>
<thead>
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<tr>
<td>( y )</td>
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</table>

\( y = -3x + 7 \)

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<tbody>
<tr>
<td>( y )</td>
<td></td>
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</tbody>
</table>
UNIT 10: Different forms of linear equations

QUESTION 1 Write each of the following equations in general form.

a \[3x + 5y = 9\]  
b \[2x - y = 7\]  
c \[y = 3x - 4\]  
d \[4x - 3y = 8\]  
e \[9x - y = 7\]  
f \[y = -2x - 6\]  
g \[9x - 5 = 7y\]  
h \[4x - 13y = -18\]  
i \[y = \frac{x}{5} + 2\]

QUESTION 2 Write each of the following equations in the gradient-intercept form.

a \[10 + y = 6x\]  
b \[4y = 8x + 32\]  
c \[3y = -2x + 1\]  
d \[6y - 3x = 12\]  
e \[y + 5x = 0\]  
f \[9x - 4y = 12\]  
g \[x + y = 2\]  
h \[3x - 2y = 7\]  
i \[4y = 3x - 8\]

QUESTION 3 Write down the gradient \((m)\) and the \(y\)-intercept \((b)\) for each of the following.

a \[y = 3x + 1\]  
b \[y = 9x - 5\]  
c \[y = -x - 3\]  
d \[y = -4x + 7\]  
e \[y = \frac{2}{3}x - 5\]  
f \[y = \frac{1}{4}x - 2\]

QUESTION 4 Write the equation of the line in the gradient-intercept form when the gradient \((m)\) and the \(y\)-intercept \((b)\) are given.

a \[m = 3, b = 2\]  
b \[m = 9, b = -3\]  
c \[m = -1, b = 7\]  
d \[m = \frac{3}{4}, b = 5\]  
e \[m = -\frac{2}{3}, b = 1\]  
f \[m = -7, b = 8\]

QUESTION 5 Write the equation in the form \(y = mx + b\) of the line that passes through the given point and has the given gradient.

a \[A(-3, 2), m = 4\]  
b \[A(4, -1), m = 2\]  
c \[A(1, 5), m = \frac{1}{2}\]  
d \[A(1, 8), m = \frac{2}{3}\]  
e \[A(2, 5), m = \frac{1}{3}\]  
f \[A(0, 8), m = -3\]
Coordinate geometry

UNIT 11: Determining whether or not a point lies on a line

**Question 1**

a. Show that the point (–2, 3) lies on the line \( y = x + 5 \)

b. Does the point (0, –3) lie on the line \( 3x – 2y = 6 \)?

c. Show that the line \( 2x – y + 3 = 0 \) passes through the points (0, 3), (2, 7) and (–4, –5)

**Question 2**

State whether the point given after each linear equation lies on that line:

a. \( 2x + y = 4 \) (1, 2)

b. \( 3x – y = 6 \) (0, –6)

c. \( y = 4x – 5 \) (–1, –9)

d. \( 3x – 4y = 12 \) (4, –2)

e. \( 2x + 5y = 10 \) (0, 2)

**Question 3**

Does the line pass through the origin (0, 0)?

a. \( 3x – 4y = 12 \)

b. \( 7x – 2y = 0 \)

c. \( 9x = 4y \)

d. \( 2x – 7y = 8 \)

e. \( y = –5x \)

**Question 4**

Find the missing coordinates to make each of the following points satisfy the equation \( y = 2x – 5 \)

a. (0, )

b. ( , –1)

c. (3, )

d. (–2, )

e. (1, )

**Question 5**

a. If the point (–3, –5) lies on the line \( px – y + 4 = 0 \) find the value of \( p \)

b. The straight line \( y = mx + 6 \) passes through the point (–3, 3). Find the value of \( m \)


**TOPIC TEST**

**PART A**

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Question</th>
<th>Options</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The gradient of the line that passes through the points (0, 5) and (2, 9) is</td>
<td>A 3  B -3  C 2  D 4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>The slope of the line $y = \frac{1}{3}x + 5$ is</td>
<td>A 5  B -5  C $\frac{1}{3}$  D $-\frac{1}{3}$</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>The gradient of the line $2x - 5y = 10$ is</td>
<td>A 2  B 5  C $\frac{2}{5}$  D $\frac{5}{2}$</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>The point (9, -1) lies on which of these lines?</td>
<td>A $3x + y - 6 = 0$  B $3x - y + 6 = 0$  C $x + 3y - 6 = 0$  D $x + 3y + 6 = 0$</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>The distance, in units, between the two points A(0, 2) and B(8, 8) is</td>
<td>A 6  B 8  C 10  D 12</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>The equation $2y - 3x = 6$ expressed in general form is</td>
<td>A $2y - 3x + 6 = 0$  B $2y - 3x - 6 = 0$  C $-3x + 2y - 6 = 0$  D $3x - 2y + 6 = 0$</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>The equation $6x - y = 7$ expressed in gradient-intercept form is</td>
<td>A $6x = y + 7$  B $y = 6x + 7$  C $y = 6x - 7$  D $y = -6x + 7$</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>The midpoint of the interval joining the points (1, -3) and (-3, 5) is</td>
<td>A (1, -1)  B (-1, 1)  C (1, 1)  D (-1, -1)</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>The gradient of the line represented by the equation $3x - 5y = 5$ is</td>
<td>A $\frac{3}{5}$  B $\frac{5}{3}$  C 3  D -5</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>The distance between the points (2, 8) and (-1, 3) is</td>
<td>A $\sqrt{26}$  B $\sqrt{122}$  C $\sqrt{34}$  D $\sqrt{130}$</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>The line $y = 5x$ passes through which of these points?</td>
<td>A (0, -1)  B (0, 0)  C (0, 1)  D (1, 0)</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Find the distance, in units, between the origin and the point (12, 5)</td>
<td>A $\sqrt{119}$  B 5  C 12  D 13</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Find the gradient of the line represented by the equation $2x + 2y - \frac{1}{2} = 0$.</td>
<td>A $-\frac{1}{2}$  B $\frac{1}{2}$  C -1  D 1</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Write $y = 3x - 4$ in general form.</td>
<td>A $y - 3x = -4$  B $y + 4 = 3x$  C $y - 3x + 4 = 0$  D $3x - y - 4 = 0$</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Write $4y - 3x = 12$ in gradient-intercept form.</td>
<td>A $y = \frac{3}{4}x - 3$  B $y = \frac{3}{4}x + 3$  C $y = -\frac{3}{4}x - 3$  D $y = -\frac{3}{4}x + 3$</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**

15
### Coordinate geometry

#### TOPIC TEST

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**  
**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For the points $A(-2, 6)$ and $B(3, 5)$ find:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. the distance $AB$ as a square root</td>
<td></td>
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<tr>
<td>b. the midpoint of $AB$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c. the gradient of $AB$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d. the equation of the line $AB$ is $x + 5y = 28$ in general form.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e. the equation of the line $AB$ in gradient-intercept form.</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

| 2. a. What is the distance from $(-2, 7)$ to $(-2, -3)$?                  |         | 1     |
| b. Find the square of the distance between the point $A(-3, 5)$ and $B(1, 9)$ |         | 1     |
| c. Find the exact distance between the origin and the point $(4, 8)$     |         | 1     |
| d. Find the midpoint of $(-5, 7)$ and $(5, -7)$                           |         | 1     |
| e. The coordinates of the midpoint of $AB$ are $(2, 2)$. If $A$ is the point $(-1, -3)$, what are the coordinates of $B$? |         | 1     |

| 3. a. Are the points $A(0, -4)$, $B(1, -2)$ and $C(-3, -10)$ collinear?  |         | 1     |
| b. If the end points of the diameter of a circle are $(-3, 4)$ and $(7, 6)$, what are the coordinates of the centre? |         | 1     |
| c. The midpoint of $P(2, 8)$ and $Q(a, b)$ is $M(4, -4)$. Find the coordinates of point $Q$. |         | 1     |
| d. Which of the points $(-2, -2)$ and $(2, 2)$ lies on the line $y = 5x - 8$? |         | 1     |
| e. Find the equation of the line that has gradient $\frac{2}{3}$ and y-intercept of 6. |         | 1     |

**Total marks achieved for PART B**  
15
**Chapter 8: Linear and non-linear relationships**

**UNIT 1: Tables of values**

**Question 1** Complete each table of values.

<table>
<thead>
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<th>y</th>
<th>x</th>
<th>y</th>
<th>x</th>
<th>y</th>
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<td>−3</td>
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**Question 2** Complete each of the following:

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<th>n</th>
<th>m</th>
<th>b</th>
<th>a</th>
<th>q</th>
<th>p</th>
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<tbody>
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<th>y</th>
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<td></td>
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<td>2</td>
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</table>
UNIT 2: Graphing points of intersection

**Question 1** Graph each pair of lines on the same number plane and find their point of intersection.

a  \( x = 2 ; \ y = 1 \)

Point of intersection: __________________________

b  \( x = 4 ; \ y = -3 \)

Point of intersection: __________________________

**Question 2** Graph each pair of lines on the same number plane and find their point of intersection.

a  \( y = 2x + 1 ; \ y = -2x + 1 \)

Point of intersection: ________________

b  \( y = 2x - 1 ; \ y = x - 2 \)

Point of intersection: ________________
Linear and non-linear relationships

UNIT 3: Meaning for gradient and y-intercept

QUESTION 1  Andrew receives a fixed amount of pocket money each week. In addition, if Andrew chooses to help his mother, she gives him an extra amount per hour for the time worked. The graph shows the amount of money Andrew might receive in pocket money each week.

a What is the intercept on the vertical axis?

b What does the intercept on the vertical axis represent?

c What is the gradient of this line?

d What does the gradient represent?

QUESTION 2  Melissa intends to ride a bicycle from Baxton to Clair to raise money for the local hospital. The graph shows her expected distance from Clair in kilometres over time (in hours).

a What is the intercept on the vertical axis?

b What information does this intercept tell us?

c What is the gradient of the line?

d What information does the gradient tell us?

e What is the equation of the line?
Linear and non-linear relationships

UNIT 4: General form of linear equations

**Question 1** Write each of the following linear equations in general form.

- **a** \(2x - 5y = 9\)
- **b** \(3x + 4y = 8\)
- **c** \(5x - 7 = 2y\)
- **d** \(8y - 3 = 4x\)
- **e** \(2x = 9 - y\)
- **f** \(y = 8x + 7\)
- **g** \(3y - 2x = 6\)
- **h** \(9y = 8x + 12\)
- **i** \(2y = \frac{x}{3} + 1\)

**Question 2** Each of the following equations is in general form. Change it to gradient-intercept form, then write down its gradient and y-intercept.

- **a** \(2x + 3y - 8 = 0\)
- **b** \(x + 5y - 7 = 0\)
- **c** \(3x - 2y - 3 = 0\)
- **d** \(x - y + 7 = 0\)
- **e** \(2x + y - 9 = 0\)
- **f** \(5x - 6y + 11 = 0\)
- **g** \(3x - 2y - 6 = 0\)
- **h** \(4x + 5y + 3 = 0\)
- **i** \(2x - y + 6 = 0\)

**Question 3** Write the equation of each line in gradient-intercept form and then change it to general form.

- **a** \(m = 4\), \(b = 3\)
- **b** \(m = 2\), \(b = -5\)
- **c** \(m = 3\), \(b = 7\)
- **d** \(m = \frac{1}{2}\), \(b = 4\)
- **e** \(m = \frac{2}{3}\), \(b = 6\)
- **f** \(m = \frac{5}{6}\), \(b = 3\)
UNIT 5: Using graphs to solve linear equations (1)

**QUESTION 1** The graph of $y = x + 2$ is shown opposite. Use the graph to write the $y$-value for each of the following $x$-values.

a i $x = 3$ ii $x = 1$ iii $x = -4$

   

b Use the graph to find the $x$-value for each of the following $y$-values.

   i $y = 6$ ii $y = -3$ iii $y = 0$

   

c In part b replace $y$ by $x + 2$ as $y = x + 2$ is the equation of the graph. Use the graph to solve each of the following linear equations.

   i $x + 2 = 6$ ii $x + 2 = -3$ iii $x + 2 = 0$


**QUESTION 2** The graph of $y = 2x - 1$ is drawn below. Use the graph to solve each of the following equations.

a $2x - 1 = 1$ b $2x - 1 = 3$

c $2x - 1 = -3$ d $2x - 1 = -5$

e $2x - 1 = 5$ f $2x - 1 = 0$

g $2x - 1 = 2$ h $2x - 1 = 4$

   i $2x - 1 = -2$
Linear and non-linear relationships

UNIT 6: Using graphs to solve linear equations (2)

**QUESTION 1**

a. Complete the table of values for the relation $y = 3x - 5$

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td></td>
<td></td>
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</tbody>
</table>

b. Draw the graph of $y = 3x - 5$

c. Use the graph to solve the following linear equations.

i. $3x - 5 = 1$  
ii. $3x - 5 = 7$

iii. $3x - 5 = -2$  
iv. $3x - 5 = -8$

**QUESTION 2**

a. Complete the table of values for the relation $y = -2x + 7$

<table>
<thead>
<tr>
<th>$x$</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

b. Draw the graph of $y = -2x + 7$

c. Use the graph to solve the following linear equations.

i. $-2x + 7 = 1$  
ii. $-2x + 7 = 3$

iii. $-2x + 7 = 5$  
iv. $-2x + 7 = -1$

v. $-2x + 7 = -3$
UNIT 7: Drawing quadratic relationships

**Question 1** Complete the table of values and then, on the same number plane, draw the graphs of the following:

\[ y = x^2 \]
\[ y = 3x^2 \]
\[ y = \frac{1}{3}x^2 \]

<table>
<thead>
<tr>
<th></th>
<th>(-3)</th>
<th>(-2)</th>
<th>(-1)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>(y = x^2)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td>(y = 3x^2)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>iii</td>
<td>(y = \frac{1}{3}x^2)</td>
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</tbody>
</table>

**Question 2** Complete the table of values and then, on the same number plane, draw the graphs of the following:

\[ y = x^2 \]
\[ y = x^2 + 3 \]
\[ y = x^2 - 3 \]

<table>
<thead>
<tr>
<th></th>
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<th>(-2)</th>
<th>(-1)</th>
<th>0</th>
<th>1</th>
<th>2</th>
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</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>(y = x^2)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td>(y = x^2 + 3)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii</td>
<td>(y = x^2 - 3)</td>
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</tbody>
</table>

**Question 3** Complete the table of values for \(y = x^2 + 1\) and sketch its graph.

<table>
<thead>
<tr>
<th></th>
<th>(-3)</th>
<th>(-2)</th>
<th>(-1)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y = x^2 + 1)</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

a. What is the equation of its axis of symmetry? ____________________________

b. What are the coordinates of its vertex? ____________________________

c. What is the minimum value for \(y = x^2 + 1\)? ____________________________

d. Find the x-intercepts: ____________________________

e. Find the y-intercept: ____________________________

**Question 4** Sketch the graphs of the following on the same number plane.

a. \(y = x^2\)

b. \(y = x^2 + 4\)

c. \(y = x^2 - 4\)

d. Explain how the graphs of \(y = x^2 + 4\) and \(y = x^2 - 4\) can be drawn using \(y = x^2\) ____________________________
Linear and non-linear relationships

UNIT 8: Further parabolas

**QUESTION 1** The equation of each parabola is of the form \( y = ax^2 + c \). Use the features of each graph to determine the values of \( a \) and \( c \) and hence write down the equation.

![Graphs of parabolas](image)

**a**  

**b**  

**c**  

**d**  

**e**  

**f**  

**g**  

**h**  

**QUESTION 2** A computer program was used to draw the graph of the height, \( h \) m, of a ball fired into the air after \( t \) seconds.

a How high is the ball after 4 seconds?

b How high is the ball after 2.8 seconds?

c How high is the ball after 14 seconds?

d What is the maximum height reached by the ball?

e After how many seconds does the ball reach the maximum height?

f When is the ball 30 m high?

and

g After how many seconds does the ball return to the ground?
Linear and non-linear relationships

UNIT 9: Exponential curves

QUESTION 1

a. Complete the table of values for \( y = 2^x \)

\[ \begin{array}{ccccccc}
   x  & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\
   y  &    &    &    & 1 & 2 & 4 & 8 \\
\end{array} \]

b. On the number plane provided, sketch the graph of \( y = 2^x \)

c. What happens to the \( y \)-value as \( x \) becomes very large?

__________________________

d. What happens to the \( y \)-value as \( x \) decreases in value?

__________________________

e. What is the value of \( y \) when \( x = 0 \)?

__________________________

QUESTION 2

a. Complete the table of values for \( y = 3^x \)

\[ \begin{array}{cccc}
   x  & -2 & -1 & 0 & 1 & 2 \\
   y  & 1  & 3  & 9 & 27 & 81 \\
\end{array} \]

b. On the number plane provided, sketch the graph of \( y = 3^x \)

c. Complete the table of values for \( y = 3^{-x} \)

\[ \begin{array}{cccc}
   x  & -2 & -1 & 0 & 1 & 2 \\
   y  & 4  & 4  & 1 & 1 & 0.33 \\
\end{array} \]

d. On the same number plane, sketch the graph of \( y = 3^{-x} \)

e. For what value of \( x \) does \( 3^x = 3^{-x} \)?

__________________________

QUESTION 3

Complete the tables of values and then on the same graph, sketch \( y = -2^x \) and \( y = -2^{-x} \)

\[ \begin{array}{ccccccc}
   x  & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\
   y = -2^x & 8 & 4 & 2 & 1 & 0.5 & 0.25 & 0.125 \\
   y = -2^{-x} & 8 & 4 & 2 & 1 & 0.5 & 0.25 & 0.125 \\
\end{array} \]

QUESTION 4

Complete the tables of values and then on the same graph, sketch \( y = 2^x \) and \( y = 2^x + 1 \) and \( y = 2^x - 1 \)

\[ \begin{array}{ccccccc}
   x  & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\
   y = 2^x & 8 & 4 & 2 & 1 & 0.5 & 0.25 & 0.125 \\
   y = 2^x + 1 & 9 & 5 & 3 & 2 & 1.5 & 1.25 & 1.13 \\
   y = 2^x - 1 & 7 & 3 & 1 & 0 & 0.5 & 0.25 & 0.125 \\
\end{array} \]
UNIT 10: Circles

QUESTION 1
a What are the coordinates of the centre of this circle? ________________
b What is the radius? ________________
c What is the equation of the circle? ________________
d The point \( P(4, 3) \) lies on the circle. Show that the coordinates of \( P \) satisfy the equation.

______________________________
______________________________

QUESTION 2
a Use Pythagoras’ theorem to find the distance from \((0, 0)\) to \((6, 8)\).
______________________________
b Write down the equation of the circle that has its centre at the origin and passes through \( P \).
______________________________

QUESTION 3 Write the equation for each circle.

a ________________
b ________________
c ________________
d ________________

QUESTION 4 For each equation of a circle write down the centre and the radius.

a \( x^2 + y^2 = 4 \)  
  ________________  ________________
b \( x^2 + y^2 = 49 \)  
  ________________  ________________
c \( x^2 + y^2 = 144 \)  
  ________________  ________________
d \( x^2 + y^2 = 6.25 \)  
  ________________  ________________

QUESTION 5 Sketch the graph of each of these.

a \( x^2 + y^2 = 64 \)  
  ________________
b \( x^2 + y^2 = 12.25 \)  
  ________________
c \( x^2 + y^2 = 121 \)  
  ________________
d \( x^2 + y^2 = 1 \)  
  ________________
# Chapter 8: Linear and non-linear relationships

## TOPIC TEST

### PART A

**Time allowed:** 15 minutes

**Total marks:** 12

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Correct Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The equation of the line $&lt; $ is</td>
<td>(\text{A} \ x = 2) (\text{B} \ x = -2) (\text{C} \ y = 2) (\text{D} \ y = -2)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Which graph best represents $y = x^2$?</td>
<td>(\text{A} \ y = 2^x) (\text{B} \ y = 2^{-x}) (\text{C} \ y = -2^x) (\text{D} \ y = -2^{-x})</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Which of the following could be the equation of the graph?</td>
<td>(\text{A} \ y = 0) (\text{B} \ x = 0) (\text{C} \ y = x) (\text{D} \ y + x = 0)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>The equation of a linear graph with $y$-intercept 5 and gradient 2 is</td>
<td>(\text{A} \ y = 2x + 5) (\text{B} \ y = 5x + 2) (\text{C} \ y = 2x - 5) (\text{D} \ y = -2x + 5)</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>The line $y = 2x - 2$ has</td>
<td>(\text{A} \ \text{gradient} -2 \ \text{y-intercept} 2) (\text{B} \ \text{gradient} 2 \ \text{y-intercept} -2) (\text{C} \ \text{gradient} -2 \ \text{y-intercept} -2) (\text{D} \ \text{gradient} 2 \ \text{y-intercept} 2)</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Which one of the following points lies on the line $3x - 4y = 12$?</td>
<td>(\text{A} \ (-3, 8)) (\text{B} \ (-3, -8)) (\text{C} \ (8, 3)) (\text{D} \ (8, -3))</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>For the equation $2x + y = 6$, find the $x$-intercept.</td>
<td>(\text{A} \ (0, 6)) (\text{B} \ (6, 0)) (\text{C} \ (0, 3)) (\text{D} \ (3, 0))</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>The coordinates of the point of intersection of the lines $x = 2$ and $y = -3$ are</td>
<td>(\text{A} \ (-3, 2)) (\text{B} \ (3, -2)) (\text{C} \ (-2, 3)) (\text{D} \ (2, -3))</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>The equation $y = 3 - x^2$ represents</td>
<td>(\text{A} \ \text{a straight line}) (\text{B} \ \text{a parabola}) (\text{C} \ \text{exponential curve}) (\text{D} \ \text{a circle})</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>The gradient of the line $y = 3 - x$ is</td>
<td>(\text{A} \ \text{horizontal}) (\text{B} \ \text{vertical}) (\text{C} \ \text{negative}) (\text{D} \ \text{positive})</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>The equation of the line is</td>
<td>(\text{A} \ x - 2y - 2 = 0) (\text{B} \ x - 2y + 2 = 0) (\text{C} \ 2x - y - 2 = 0) (\text{D} \ 2x - y + 2 = 0)</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**

12
Linear and non-linear relationships

TOPIC TEST

PART B

Instructions
• This part consists of 15 questions.
• Each question is worth 1 mark.
• Write only the answer in the answer column.
• For any working use the question column.

Time allowed: 20 minutes

Total marks: 15

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 a</strong> What are the coordinates of the centre of this circle?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b</strong> What is the radius?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>c</strong> What is the equation of the circle?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>d</strong> If the distance from O(0, 0) to P(7, 7) is (d) units, use Pythagoras’ theorem to find the value of (d^2).</td>
<td></td>
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<tr>
<td><strong>e</strong> Does point P lie inside, on or outside the circle?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>2 a</strong> Find the gradient of the line (\ell).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b</strong> What is its (y)-intercept?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>c</strong> Write the equation of the line (\ell).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>d</strong> Where does the line cut the (x)-axis?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>e</strong> For what value of (x) will (y = 8)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>3 a</strong> Complete the table of values for (y = x^2 - 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x)</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>(y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b</strong> Sketch the graph of (y = x^2 - 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>c</strong> What is the equation of its axis of symmetry?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>d</strong> What are the coordinates of its vertex?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>e</strong> What are the (x)-intercepts?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART B

| | |
| 15 | |
UNIT 1: One-step equations (addition and subtraction)

**Question 1** Solve the following equations.

a. \( x + 2 = 9 \)

b. \( a + 5 = 16 \)

c. \( n - 3 = 7 \)

d. \( y + 3 = 7 \)

e. \( n + 6 = 8 \)

f. \( k - 2 = 15 \)

g. \( a + 9 = 21 \)

h. \( t + 2 = 5 \)

i. \( x - 6 = 8 \)

j. \( m + 1 = 10 \)

k. \( p + 8 = 11 \)

l. \( y - 1 = 5 \)

**Question 2** Solve the following one-step equations.

a. \( a - 4 = 12 \)

b. \( x - 7 = 21 \)

c. \( m - 3 = 25 \)

d. \( n - 5 = 6 \)

e. \( a - 8 = 20 \)

f. \( 17 + a = 24 \)

g. \( y + 9 = 12 \)

h. \( t - 8 = -7 \)

i. \( y - 3 = -6 \)

j. \( x - 5 = 23 \)

k. \( 9 + p = 25 \)

l. \( m - 2 = -12 \)

**Question 3** Solve these equations.

a. \( a + 8 = 24 \)

b. \( x + 4 = 18 \)

c. \( b + 3 = 8 \)

d. \( k - 6 = 4 \)

e. \( n + 6 = 10 \)

f. \( a - 1 = 25 \)

\( m - 7 = 27 \)

h. \( t - 3 = 31 \)

i. \( y - 4 = 22 \)

j. \( x - 9 = 18 \)

k. \( a - 6 = 21 \)

l. \( 14 + x = 51 \)

**Question 4** Solve these equations.

a. \( 3 + x = 18 \)

b. \( n + 7 = 12 \)

\( m - 3 = 14 \)

\( y - 2 = 10 \)

e. \( x - 1 = 12 \)

f. \( y + 3 = 19 \)

g. \( m - 2 = 12 \)

h. \( t - 6 = 2 \)

i. \( a - \frac{11}{2} = \frac{1}{2} \)
UNIT 2: One-step equations (multiplication and division)

Question 1 Solve the following equations.

\[
\begin{align*}
a & \quad 3x = 9 \\
b & \quad 4y = 24 \\
c & \quad 5t = 15 \\
d & \quad \frac{m}{3} = 6 \\
e & \quad \frac{n}{2} = 8 \\
f & \quad \frac{a}{5} = 4 \\
g & \quad 4x = 20 \\
h & \quad \frac{y}{5} = 2 \\
i & \quad \frac{x}{4} = 3 \\
j & \quad \frac{x}{4} = 7 \\
k & \quad \frac{x}{2} = 11 \\
l & \quad \frac{t}{3} = -2
\end{align*}
\]

Question 2 Solve the following one-step equations.

\[
\begin{align*}
a & \quad 7a = 56 \\
b & \quad \frac{a}{9} = 2 \\
c & \quad \frac{x}{4} = 10 \\
d & \quad 9x = 72 \\
e & \quad 5m = 35 \\
f & \quad \frac{t}{2} = 7 \\
g & \quad \frac{x}{4} = 8 \\
h & \quad \frac{x}{7} = -3 \\
i & \quad 12x = 36 \\
j & \quad \frac{d}{3} = -3 \\
k & \quad 5x = 55 \\
l & \quad 3t = 15
\end{align*}
\]

Question 3 Solve these equations.

\[
\begin{align*}
a & \quad \frac{x}{6} = 1 \\
b & \quad \frac{y}{7} = -2 \\
c & \quad \frac{m}{8} = -1 \\
d & \quad 9m = -81 \\
e & \quad 6t = 24 \\
f & \quad 5n = 35 \\
g & \quad 8a = 88 \\
h & \quad \frac{p}{3} = 16 \\
i & \quad \frac{x}{2} = 7 \\
j & \quad \frac{n}{5} = -14 \\
k & \quad \frac{x}{4} = -6 \\
l & \quad \frac{y}{7} = -8
\end{align*}
\]

Question 4 Solve these equations.

\[
\begin{align*}
a & \quad \frac{x}{2} = 27 \\
b & \quad 2x = 10 \\
c & \quad 4x = -48 \\
d & \quad 6x = -12 \\
e & \quad 3y = -15 \\
f & \quad \frac{m}{3} = 9 \\
g & \quad \frac{x}{4} = 8 \\
h & \quad \frac{a}{7} = -9 \\
i & \quad 2x = 23 \\
j & \quad 3y = 15 \\
k & \quad 2x = 15 \\
l & \quad \frac{m}{3} = -11
\end{align*}
\]
UNIT 3: Two-step equations

**QUESTION 1** Solve the following two-step equations.

a. \(3x - 1 = 5\)

b. \(2x + 7 = 17\)

c. \(9y - 4 = 23\)

d. \(6a - 5 = 25\)

e. \(8a + 7 = 47\)

f. \(\frac{3m}{2} = 6\)

g. \(\frac{x - 3}{5} = 4\)

h. \(\frac{a}{2} - 4 = 6\)

i. \(3x - 2 = 19\)

**QUESTION 2** Solve the following equations.

a. \(3x + 8 = 32\)

b. \(8y - 3 = 21\)

c. \(7p - 8 = 13\)

d. \(\frac{a}{3} - 2 = 9\)

e. \(4a - 2.5 = 9.5\)

f. \(6a + 1\frac{1}{2} = 4\frac{1}{2}\)

g. \(5x - 5 = 30\)

h. \(\frac{x}{2} + 7 = 12\)

i. \(\frac{x - 3}{2} = 8\)

**QUESTION 3** Solve these equations.

a. \(2y + 5 = 35\)

b. \(7y - 3 = 4\)

c. \(8x - 6 = 26\)

d. \(5t - 2 = 8\)

e. \(m - 34 = 5\)

f. \(2x - 1 = 17\)

g. \(3y + 2 = 5\)

h. \(5y - 4 = 26\)

i. \(2x - 5 = 11\)

j. \(x - 34 = 6\)

k. \(2y + 8 = -2\)

l. \(4p - 6 = -10\)
UNIT 4: Equations with pronumerals on both sides

Question 1
Solve the following equations.

a) $5a - 9 = 3a + 11$

b) $9x + 5 = 7x - 9$

c) $2x + 3 = x - 7$

d) $6a - 13 = 9a - 15$

e) $8t + 11 = 7t - 4$

f) $11a + 3 = 9a + 1$

g) $4y + 10 = 7y - 2$

h) $6a + 9 = 2a - 7$

i) $6 - 5t = 9 - 2t$

Question 2
Solve these equations.

a) $4m - 11 = 7m - 13$

b) $4x + 6 = 5x - 9$

c) $6a + 13 = 27 + 3a$

d) $5x - 4 = x + 12$

e) $10a - 5 = 7a - 2$

f) $2x - 20 = 9x - 6$

g) $13x - 29 = 31 - 7x$

h) $5m - 3 = 4m + 12$

i) $x - 15 = 2x + 11$

Question 3
Solve these equations.

a) $7x + 15 = -3 - 2x$

b) $9a - 20 = 7a + 32$

c) $x - 13 = 2x - 12$

d) $7x - 28 = 4x - 10$

e) $3y + 1 = 2y - 4$

f) $9y - 6 = 7y + 10$

g) $3y + 8 = 2y + 9$

h) $5y - 7 = 4y + 8$

i) $12t - 12 = 13t + 33$

j) $4t + 7 = 7t + 7$

k) $32x + 18 = -20x - 10$

l) $5y + 2 = 3y - 8$

m) $8a - 9 = 5a + 21$

n) $x - 13 = 7x + 5$

o) $4x - 5 = 3x + 7$
UNIT 5: Equations with grouping symbols

Question 1  Solve the following equations.

\[ a \quad 2(x + 3) = 12 \]

\[ b \quad 3(y + 1) = 15 \]

\[ c \quad 7(m - 4) = 14 \]

\[ d \quad 4(x + 5) = 32 \]

\[ e \quad 8(2x - 1) = 64 \]

\[ f \quad 2(5x - 1) = 28 \]

\[ g \quad 6(x - 2) = 18 \]

\[ h \quad -2(3x - 1) = 20 \]

\[ i \quad -3(y + 1) = 15 \]

Question 2  Solve these equations.

\[ a \quad 2(4x - 3) = 30 \]

\[ b \quad 5(m - 4) = 35 \]

\[ c \quad 3(2t + 1) = 21 \]

\[ d \quad -3(p - 4) = 21 \]

\[ e \quad 5(2x + 3) = 25 \]

\[ f \quad 5(a + 4) = 4(a - 3) \]

\[ g \quad 6(2x - 1) = 5(x + 3) \]

\[ h \quad 4(a - 2) = 3(a + 2) \]

\[ i \quad 6(x - 8) = 5(x - 1) \]

Question 3  Solve these equations.

\[ a \quad 6(m + 3) + m + 12 = 0 \]

\[ b \quad 4(x - 3) = 3(x + 2) \]

\[ c \quad 5(4a + 1) = 2a + 3 \]

\[ d \quad 5(a + 3) = 4(7 + a) \]

\[ e \quad 8(m - 1) = 7(m - 3) \]

\[ f \quad 9(t + 2) = 7(t + 3) \]

\[ g \quad 5(a + 1) + 2a + 7 = 33 \]

\[ h \quad 5(n + 3) = 4(n - 1) \]

\[ i \quad 4(5a - 3) = 38 \]

\[ j \quad 7(x - 8) = -28 \]

\[ k \quad 8(y - 3) = 7(y + 1) \]

\[ l \quad 5(a + 4) = 4(a - 2) \]
# Equations

## TOPIC TEST

<table>
<thead>
<tr>
<th>Time allowed: 15 minutes</th>
<th>Total marks: 15</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> If $2x - 3 = 17$ then $x$ equals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 7</td>
<td>B 10</td>
<td>C 14</td>
</tr>
<tr>
<td><strong>2</strong> If $\frac{m}{3} - 2 = 4$ then $m$ equals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>B 6</td>
<td>C 14</td>
</tr>
<tr>
<td><strong>3</strong> If $5x - 3 = 60$, what is the value of $x$?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 12</td>
<td>B 57</td>
<td>C 63</td>
</tr>
<tr>
<td><strong>4</strong> If $4(3m - 5) = 6m - 14$ then $m$ equals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>B 1</td>
<td>C -2</td>
</tr>
<tr>
<td><strong>5</strong> Solve for $x$, $2x - 5 = 23$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 8</td>
<td>B 9</td>
<td>C 14</td>
</tr>
<tr>
<td><strong>6</strong> Solve $4(x - 2) - 3(x - 1) = 0$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A -5</td>
<td>B 5</td>
<td>C -11</td>
</tr>
<tr>
<td><strong>7</strong> Solve $5(x - 1) - 1 = 24$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 5</td>
<td>B 6</td>
<td>C 10</td>
</tr>
<tr>
<td><strong>8</strong> If $12x - 4 = 8$, then $x$ is equal to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A $\frac{1}{3}$</td>
<td>B $\frac{2}{3}$</td>
<td>C 1</td>
</tr>
<tr>
<td><strong>9</strong> Solve $\frac{x - 2}{5} = 4$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 6</td>
<td>B 20</td>
<td>C 22</td>
</tr>
<tr>
<td><strong>10</strong> When $2(a + 3) = 10$, the value of $a$ is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>B 5</td>
<td>C 7</td>
</tr>
<tr>
<td><strong>11</strong> Three more than twice the number equals the number plus 7. What is the number?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>B 4</td>
<td>C 5</td>
</tr>
<tr>
<td><strong>12</strong> Find the value of $x$ in the equation $3x - 75 = 0$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 3</td>
<td>B 5</td>
<td>C 25</td>
</tr>
<tr>
<td><strong>13</strong> Given that $P = 2L + 2B$, find $L$ when $P = 50$ and $B = 15$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 10</td>
<td>B 20</td>
<td>C 25</td>
</tr>
<tr>
<td><strong>14</strong> Find the solution of $\frac{x + 3}{2} = 8$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A $x = 16$</td>
<td>B $x = 13$</td>
<td>C $x = -16$</td>
</tr>
<tr>
<td><strong>15</strong> The solution of $x + 5 = 4$ is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A $x = 1$</td>
<td>B $x = 9$</td>
<td>C $x = -1$</td>
</tr>
</tbody>
</table>

Total marks achieved for PART A: 15
# Equations

## TOPIC TEST

### Instructions
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

<table>
<thead>
<tr>
<th>Time allowed: 20 minutes</th>
<th>Total marks: 15</th>
</tr>
</thead>
</table>

### Questions

<table>
<thead>
<tr>
<th>Marks</th>
<th>Answers</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>a ( x - 11 = 24 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>b ( x + 3 = 10 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>c ( \frac{y}{8} = -9 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>d ( \frac{m}{2} - 8 = 16 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>e ( 4x^2 - 12 = 0 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>f ( 3(x + 2) = 5 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>g ( 5p - 7 = 4p + 8 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>h ( \frac{8x - 5}{3} = -2 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>i ( \frac{4x}{9} = 5 + x )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>j ( 20 = \frac{3x - 7}{4} )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>k ( 5(3x - 2) = 3(2x - 10) )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>l ( 4m - 3(m + 2) = 9 )</td>
</tr>
</tbody>
</table>

### 2
15 more than 4 times a number equals the number plus 45. What is the number?

<table>
<thead>
<tr>
<th>Marks</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### 3
Given that \( S = \frac{n}{2}(a + l) \), find:

<table>
<thead>
<tr>
<th>Marks</th>
<th>Answers</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>a ( S ) when ( n = 20, a = 6 ) and ( l = 240 )</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>b ( n ) when ( S = 680, a = 5 ) and ( l = 75 )</td>
</tr>
</tbody>
</table>

---

Chapter 9: Equations

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Excel Essential Skills Mathematics Revision & Exam Workbook Year 9
UNIT 1: Naming the sides of a right-angled triangle

**Question 1** In each of the following triangles, state whether \( x \), \( y \) and \( z \) are the opposite side, adjacent side or hypotenuse, with reference to the angle marked.

(a) \( x \) \( y \) \( z \)

(b) \( x \) \( y \) \( z \)

(c) \( x \) \( y \) \( z \)

**Question 2** Name each side of the following triangles as opposite (opp), adjacent (adj) or hypotenuse (hyp), with reference to the angle marked.

(a) \( a \) \( b \) \( c \)

(b) \( f \) \( d \) \( e \)

(c) \( i \) \( h \)

(d) \( l \) \( j \) \( k \)

(e) \( o \) \( m \) \( n \)

(f) \( q \) \( r \)

**Question 3** Name the hypotenuse in each triangle.

(a) \( A \) \( B \) \( C \)

(b) \( D \) \( E \) \( R \)

(c) \( G \) \( H \)

(d) \( J \) \( L \) \( K \)

(e) \( M \) \( N \)

(f) \( P \) \( R \)
UNIT 2: The trigonometric ratios (1)

**QUESTION 1** Complete the following by writing the correct ratio.

a \( \frac{\text{\( \theta \)}}{\text{hypotenuse}} \) = \( \frac{\text{opposite}}{\text{hypotenuse}} \) 

b \( \frac{\text{\( \theta \)}}{\text{hypotenuse}} \) = \( \frac{\text{adjacent}}{\text{hypotenuse}} \) 

c \( \frac{\text{\( \theta \)}}{\text{adjacent}} \) = \( \frac{\text{opposite}}{\text{adjacent}} \)

**QUESTION 2** For each triangle write value of \( \sin A \) as a fraction. All lengths are in millimetres.

a \[ \begin{array}{c}
9 \\
41 \\
40
\end{array} \]

\[ \sin A = \]

b \[ \begin{array}{c}
12 \\
5 \\
13
\end{array} \]

\[ \sin A = \]

c \[ \begin{array}{c}
17 \\
8 \\
15
\end{array} \]

\[ \sin A = \]

**QUESTION 3** Find the value of \( \cos A \) in each triangle as a fraction. All lengths are in millimetres.

a \[ \begin{array}{c}
4 \\
5 \\
3
\end{array} \]

\[ \cos A = \]

b \[ \begin{array}{c}
17 \\
8 \\
15
\end{array} \]

\[ \cos A = \]

c \[ \begin{array}{c}
3 \\
\sqrt{58} \\
7
\end{array} \]

\[ \cos A = \]

**QUESTION 4** Find the value of \( \tan A \) in each triangle as a fraction. All lengths are in millimetres.

a \[ \begin{array}{c}
1 \\
\sqrt{10} \\
3
\end{array} \]

\[ \tan A = \]

b \[ \begin{array}{c}
2 \\
\sqrt{29} \\
5
\end{array} \]

\[ \tan A = \]

c \[ \begin{array}{c}
12 \\
5 \\
13
\end{array} \]

\[ \tan A = \]

**QUESTION 5** Write as fractions.

a \( \sin P = \)

b \( \cos Q = \)

c \( \tan Q = \)

d \( \cos P = \)

e \( \sin Q = \)

f \( \tan P = \)

**QUESTION 6** Complete:

a \( \tan 32^\circ = \)

b \( \sin 58^\circ = \)

c \( \cos 32^\circ = \)

d \( \cos 58^\circ = \)

e \( \tan 58^\circ = \)

f \( \sin 32^\circ = \)
UNIT 3: The trigonometric ratios (2)

**QUESTION 1** Name the angle of each triangle that has the given sine ratio.

**a**  
\[ \sin \theta = \frac{8}{17} \]
\[ \sin \theta = \frac{15}{17} \]

**b**  
\[ \sin \theta = \frac{30}{50} \]
\[ \sin \theta = \frac{40}{50} \]
\[ \sin \theta = \frac{5}{\sqrt{34}} \]
\[ \sin \theta = \frac{3}{\sqrt{34}} \]

**QUESTION 2** Name the angle of each triangle that has the given cosine ratio.

**a**  
\[ \cos \theta = \frac{4}{5} \]
\[ \cos \theta = \frac{3}{5} \]

**b**  
\[ \cos \theta = \frac{8}{17} \]
\[ \cos \theta = \frac{15}{17} \]
\[ \cos \theta = \frac{5}{13} \]
\[ \cos \theta = \frac{12}{13} \]

**QUESTION 3** Name the angle of each triangle that has the given tangent ratio.

**a**  
\[ \tan \theta = \frac{60}{11} \]
\[ \tan \theta = \frac{11}{60} \]

**b**  
\[ \tan \theta = \frac{30}{40} \]
\[ \tan \theta = \frac{40}{30} \]
\[ \tan \theta = \frac{25}{60} \]
\[ \tan \theta = \frac{60}{25} \]

**QUESTION 4** Write the correct trig ratio to complete these statements.

**a**  
\[ 37^\circ = \frac{x}{4} \]
\[ 51^\circ = \frac{x}{11} \]

**b**  
\[ 28^\circ = \frac{x}{7} \]
\[ 36^\circ = \frac{x}{19} \]

**c**  
\[ 70^\circ = \frac{x}{5} \]
\[ 61^\circ = \frac{x}{33} \]

**d**  
\[ 34^\circ = \frac{8}{x} \]

**e**  
\[ 36^\circ = \frac{6}{x} \]

**f**  
\[ 48^\circ = \frac{9}{x} \]
UNIT 4: Use of a calculator in trigonometry

**QUESTION 1** Find the value of the following correct to two decimal places.

a \( \sin 34° = \)  

b \( \tan 70° = \)  

c \( \cos 15° = \)  

d \( \cos 59° = \)  

e \( \cos 40° = \)  

f \( \sin 38° = \)  

g \( \tan 83° = \)  

h \( \sin 30° = \)  

i \( \tan 64° = \)  

**QUESTION 2** Find the value of the following correct to three decimal places.

a \( \frac{\sin 35°}{2} = \)  

b \( \frac{\cos 64°}{8} = \)  

c \( \frac{18.9}{\cos 35°} = \)  

d \( \frac{\cos 38°42'}{2.5} = \)  

e \( \frac{\sin 29°43'}{8.4} = \)  

f \( \frac{20.5}{\sin 53°27'} = \)  

g \( \frac{\tan 29°18'}{7.25} = \)  

h \( \frac{\tan 68°25'}{7.1} = \)  

i \( \frac{829}{\tan 28°15'} = \)  

**QUESTION 3** Find the value of the following correct to three significant figures.

a \( 3.9 \tan 23° = \)  

b \( \tan 56°8' = \)  

c \( \cos 35°29' = \)  

d \( 7 \sin 35° = \)  

e \( \sin 25°19' = \)  

f \( \sin 69°18' = \)  

g \( \cos 61°38' = \)  

h \( 8.4 \cos 65°23' = \)  

i \( \tan 23°46' = \)  

**QUESTION 4** \( A \) is an acute angle. Find its size to the nearest degree.

a \( \sin A = 0.6325 \)  

b \( \cos A = 0.3787 \)  

c \( \tan A = 2.538 \)  

d \( \cos A = 0.5783 \)  

e \( \tan A = 0.7938 \)  

f \( \sin A = 0.7613 \)  

g \( \tan A = 1.6928 \)  

h \( \sin A = 0.2831 \)  

i \( \cos A = 0.9852 \)  

**QUESTION 5** \( A \) is an acute angle. Find its size to the nearest degree.

a \( \sin A = 0.5 \)  

b \( \tan A = 0.5832 \)  

c \( \sin A = 0.7681 \)  

d \( \cos A = 0.3876 \)  

e \( \cos A = 0.5 \)  

f \( \tan A = 2.1075 \)  

**QUESTION 6** Find the size of the acute angle \( B \) to the nearest degree.

a \( \tan B = \frac{16}{23} \)  

b \( \cos B = \frac{5}{13} \)  

c \( \sin B = \frac{8.3}{14.5} \)  

d \( \sin B = \frac{1}{2} \)  

e \( \tan B = \frac{8}{9} \)  

f \( \cos B = \frac{11.3}{14.8} \)  

Chapter 10: Trigonometry
UNIT 5: Using trigonometric ratios to find sides

**Question 1** Use the sine ratio to find the value of $x$ to one decimal place.

a) \[
\frac{x}{8} = \sin 26^\circ
\]

b) \[
\frac{52}{x} = \sin c
\]

c) \[
\frac{x}{13.5} = \sin 19^\circ
\]

**Question 2** Use the cosine ratio to find the value of $x$ to one decimal place.

a) \[
\frac{19}{x} = \cos 32^\circ
\]

b) \[
\frac{83}{x} = \cos 71^\circ
\]

c) \[
\frac{x}{32.5} = \cos 40^\circ
\]

**Question 3** Use the tangent ratio to find the value of $x$ to one decimal place.

a) \[
\frac{x}{4} = \tan 68^\circ
\]

b) \[
\frac{21}{x} = \tan 15^\circ
\]

c) \[
\frac{\text{9.5 km}}{x} = \tan 53^\circ
\]

**Question 4** Find the value of $x$ to two decimal places.

a) \[
\frac{x}{17.2} = \tan 59^\circ
\]

b) \[
\frac{x}{23.25} = \tan 47^\circ
\]

c) \[
\frac{x}{17.6} = \tan 39^\circ
\]
UNIT 6: Finding an unknown side

QUESTION 1  Find the value of the unknown side correct to one decimal place.

\[ \begin{align*}
\text{a} & \quad x & \quad 8.9 & \quad 25^\circ \\
\text{b} & \quad a & \quad 6.35 & \quad 50^\circ \\
\text{c} & \quad p & \quad 32^\circ & \quad 6.2
\end{align*} \]

QUESTION 2  Find the value of the pronumeral in the following triangles correct to two decimal places.

\[ \begin{align*}
\text{a} & \quad n & \quad 29^\circ & \quad 15.6 \\
\text{b} & \quad m & \quad 20.8 & \quad 62^\circ \\
\text{c} & \quad p & \quad 5.9 & \quad 61^\circ
\end{align*} \]

QUESTION 3  Find the value of the pronumeral correct to two decimal places.

\[ \begin{align*}
\text{a} & \quad q & \quad 5.8 & \quad 30^\circ \\
\text{b} & \quad t & \quad 60^\circ & \quad 10.6 \\
\text{c} & \quad l & \quad 9.5 & \quad 52^\circ \\
\text{d} & \quad c & \quad 12.3 & \quad 63^\circ \\
\text{e} & \quad d & \quad 8.7 & \quad 70^\circ \\
\text{f} & \quad k & \quad 6.5 & \quad 57^\circ
\end{align*} \]
UNIT 7: Finding the hypotenuse

**Question 1** Find the length of the hypotenuse correct to one decimal place.

- **a**
  - $7 \text{ cm}$
  - $25^\circ$

- **b**
  - $10 \text{ cm}$
  - $40^\circ$

- **c**
  - $14 \text{ cm}$
  - $33^\circ$

- **d**
  - $18.3 \text{ cm}$
  - $25^\circ$

- **e**
  - $8.6 \text{ cm}$
  - $44^\circ$

- **f**
  - $15.8 \text{ cm}$
  - $58^\circ$

**Question 2** Find the length of the hypotenuse correct to two decimal places.

- **a**
  - $8 \text{ cm}$
  - $60^\circ$

- **b**
  - $12 \text{ cm}$
  - $58^\circ$

- **c**
  - $15 \text{ cm}$
  - $39^\circ$

**Question 3** Find the length of the hypotenuse correct to one decimal place.

- **a**
  - $28 \text{ cm}$
  - $63^\circ$

- **b**
  - $33 \text{ cm}$
  - $18^\circ$

- **c**
  - $15 \text{ cm}$
  - $38^\circ$

- **d**
  - $18.3 \text{ cm}$
  - $25^\circ$

- **e**
  - $8.6 \text{ cm}$
  - $44^\circ$

- **f**
  - $15.8 \text{ cm}$
  - $58^\circ$
UNIT 8: Mixed questions on finding sides

QUESTION 1  Which ratio (sin, cos or tan) would be the best to use to find the value of $x$ if the size of the marked angle was known?

a  

b  

c  

d  

QUESTION 2  Find the length of side $AB$ of each triangle correct to one decimal place.

a  

b  

c  

d  

e  

f  

QUESTION 3  Find the value of $x$ to two decimal places.

a  

b  

c  

Chapter 10: Trigonometry

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UNIT 9: Finding an unknown angle

**QUESTION 1**  Find the size of the angle marked with the pronumeral to the nearest degree.

a. [Diagram]

b. [Diagram]

c. [Diagram]

**QUESTION 2**  Find the size of the angle marked to the nearest degree.

a. [Diagram]

b. [Diagram]

c. [Diagram]

**QUESTION 3**  Find the size of the angle marked to the nearest degree.

a. [Diagram]

b. [Diagram]

c. [Diagram]

d. [Diagram]

e. [Diagram]

f. [Diagram]

**QUESTION 4**  Find the size of the marked angle. Give the answer to the nearest minute.

a. [Diagram]

b. [Diagram]

c. [Diagram]
UNIT 10: Problem solving

**Question 1**  A piece of wood 2.5 m long leans against a vertical wall, making an angle of 51° with the floor. How far up the wall, to the nearest centimetre, is the top of the wooden piece?

**Question 2**  Find the value of $x$.

**Question 3**  In $\triangle PQR$, $\angle R = 90^\circ$, $QR = 8.2$ cm and $PR = 6.7$ cm, find $\angle P$ to the nearest degree.

**Question 4**  In $\triangle PQR$, $\angle R = 90^\circ$, $\angle P = 48^\circ$ and $PQ = 8.6$ cm, find $PR$ correct to two decimal places.

**Question 5**  $ABCD$ is a rectangle with $AC = 24$ cm and $AD = 10$ cm. Find $\angle ACD$ correct to the nearest degree.

**Question 6**  In $\triangle ABC$, $\angle A = 90^\circ$, $\angle B = 58^\circ$ and $AB = 23$ m, find $BC$ correct to the nearest metre.
### Trigonometry

**TOPIC TEST**

**PART A**

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Use your calculator to find $\cos 48^\circ$ correct to two decimal places.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.74</td>
<td>B</td>
<td>1.11</td>
<td>C</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Evaluate $25 \tan 63^\circ$ correct to two decimal places.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>1.96</td>
<td>B</td>
<td>49.07</td>
<td>C</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Find the value of $\frac{\cos 32^\circ}{43.27}$ correct to two decimal places.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.01</td>
<td>B</td>
<td>0.02</td>
<td>C</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>If $\sin \theta = \frac{5}{9}$, calculate the size of angle $\theta$ to the nearest degree.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$33^\circ$</td>
<td>B</td>
<td>$34^\circ$</td>
<td>C</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>$\sin 56^\circ 45'$ is closest to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.8334</td>
<td>B</td>
<td>0.8363</td>
<td>C</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>If $\cos \theta = \frac{1}{2}$, find the size of angle $\theta$.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$30^\circ$</td>
<td>B</td>
<td>$45^\circ$</td>
<td>C</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>$28.65^\circ$ equals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$29^\circ 5'$</td>
<td>B</td>
<td>$28^\circ 39'$</td>
<td>C</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>If $\tan \theta = 0.468$ then, to the nearest minute, $\theta =$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$25^\circ 8'$</td>
<td>B</td>
<td>$25^\circ 7'$</td>
<td>C</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Find the size of angle $\theta$ to the nearest degree.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$40^\circ$</td>
<td>B</td>
<td>$41^\circ$</td>
<td>C</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>In a $\triangle ABC$, the angle $B$ is $90^\circ$, $AB$ is 8 m and $AC$ is 10 m. Find the size of angle $A$ correct to the nearest degree.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$36^\circ$</td>
<td>B</td>
<td>$37^\circ$</td>
<td>C</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>A road rises uniformly 30.6 m for every 600 m along the road. Find the angle of elevation of this road correct to the nearest degree.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$1^\circ$</td>
<td>B</td>
<td>$2^\circ$</td>
<td>C</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>Find the hypotenuse of this triangle in centimetres correct to 1 decimal place.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>9 cm</td>
<td>B</td>
<td>15.1 cm</td>
<td>C</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Use your calculator to find $7.9 \cos 63^\circ$ correct to three significant figures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>3.58</td>
<td>B</td>
<td>3.59</td>
<td>C</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>Evaluate $\frac{\sin 54^\circ}{28.65}$ correct to two decimal places.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.02</td>
<td>B</td>
<td>0.03</td>
<td>C</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Find the size of the acute angle $\theta$ to the nearest degree if $\tan \theta = \frac{12.5}{19.34}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$40^\circ$</td>
<td>B</td>
<td>$32^\circ$</td>
<td>C</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**

15
### TOPIC TEST PART B

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed:** 20 minutes  
**Total marks:** 15

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Find the value of each expression correct to two decimal places.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) ( \cos 72^\circ ) = [ \frac{8.93}{72.54} ]</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b) ( \tan 68^\circ ) = [ \frac{34.20}{56^\circ} ]</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b) Find acute angle A to the nearest degree.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>i) ( \sin A = 0.6835 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) ( \tan A = 1.4862 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Find the value of the pronumeral in each triangle correct to two decimal places.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3. The diagonal of a square is 12.5 cm long.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) What type of triangle is ( \triangle BCD )?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b) What is the size of ( \angle BDC )?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c) Find the length of ( BC ) to the nearest mm.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d) Find ( \sin \angle BDC ) to three decimal places.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e) Find ( \tan \angle ABD ).</td>
<td></td>
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</tr>
</tbody>
</table>

**Total marks achieved for PART B**

15
UNIT 1: Polygons

**QUESTION 1** Write the special name for the polygon with the following number of sides.

<table>
<thead>
<tr>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
<td>h</td>
</tr>
</tbody>
</table>

**QUESTION 2** State whether each of the following shapes is a polygon or not, and if it is, name it.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**QUESTION 3** State whether each of the following shapes is a polygon or not, and if it is, name it and state whether it is a regular or an irregular polygon.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QUESTION 4** Name each polygon and state whether it is a convex or a non-convex polygon.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT 2: The angle sum of a polygon

**Question 1** Divide each polygon into triangles by drawing all the diagonals from vertex A.

a

b

c

**Question 2** Complete the following table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of sides</th>
<th>Number of Δs formed</th>
<th>Angle sum of the interior angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heptagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decagon</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 3** Use the angle sum formula \( S = (n - 2) \times 180^\circ \) to find the sum of the interior angles of a polygon with:

a 12 sides  
b 18 sides  
c 24 sides.

**Question 4** Find the number of sides of a polygon whose interior angle sum is:

a 540°  
b 1080°  
c 1440°

**Question 5** Find the size of the unknown angle \( x \) in each polygon.

a  
b  
c
UNIT 3: Regular polygons

QUESTION 1 Calculate the size of each interior angle and each exterior angle in each polygon.

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&\text{interior angle} \quad &\text{interior angle} \quad &\text{interior angle} \\
&\text{exterior angle} \quad &\text{exterior angle} \quad &\text{exterior angle}
\end{align*}
\]

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&100^\circ \quad &120^\circ \quad &150^\circ \\
&80^\circ \quad &60^\circ \quad &30^\circ \\
&100^\circ \quad &120^\circ \quad &150^\circ \\
&80^\circ \quad &60^\circ \quad &30^\circ \\
\end{align*}
\]

QUESTION 2 Find the size of each interior angle of a regular polygon.

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&\text{10 sides} \quad &\text{15 sides} \quad &\text{20 sides}
\end{align*}
\]

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&100^\circ \quad &120^\circ \quad &150^\circ \\
&80^\circ \quad &60^\circ \quad &30^\circ \\
&100^\circ \quad &120^\circ \quad &150^\circ \\
&80^\circ \quad &60^\circ \quad &30^\circ \\
\end{align*}
\]

QUESTION 3 Find how many sides a regular polygon has if each interior angle is:

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&135^\circ \quad &144^\circ \quad &150^\circ
\end{align*}
\]

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&8 \quad &10 \quad &12 \\
&9 \quad &10 \quad &12 \\
&8 \quad &10 \quad &12 \\
&9 \quad &10 \quad &12 \\
\end{align*}
\]

QUESTION 4 Find the size of each interior angle of a regular polygon.

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&\text{hexagon} \quad &\text{nonagon} \quad &\text{dodecagon}
\end{align*}
\]

\[
\begin{align*}
&\text{a} \quad &\text{b} \quad &\text{c} \\
&120^\circ \quad &144^\circ \quad &150^\circ \\
&108^\circ \quad &140^\circ \quad &150^\circ \\
&120^\circ \quad &144^\circ \quad &150^\circ \\
&108^\circ \quad &140^\circ \quad &150^\circ \\
\end{align*}
\]

QUESTION 5 The sum of the interior angles of a regular polygon is 3600°.

\[
\begin{align*}
&\text{a} \quad &\text{b} \\
&\text{Find the number of sides the polygon has} \quad &\text{Find the size of each interior angle}
\end{align*}
\]

\[
\begin{align*}
&\text{a} \quad &\text{b} \\
&10 \quad &180^\circ \\
&12 \quad &150^\circ \\
&10 \quad &180^\circ \\
&12 \quad &150^\circ \\
\end{align*}
\]
UNIT 4: The exterior angle sum of a polygon

**Question 1** Find the value of $x$.

- **Diagram a**
  - $3x^\circ$ and $2x^\circ$

- **Diagram b**
  - $140^\circ$ and $75^\circ$

**Question 2** Find the size of each exterior angle of a regular

- **a** hexagon
- **b** octagon
- **c** decagon

**Question 3** If each exterior angle of a regular polygon is $72^\circ$, find:

- **a** the number of sides of the polygon
- **b** the size of each interior angle
- **c** the sum of the interior angles.

**Question 4** For a regular polygon of 24 sides, find the following:

- **a** the size of each exterior angle
- **b** the size of each interior angle
- **c** the sum of the interior angles.

**Question 5** For a regular hexagon below, find the following:

- **a** the size of each exterior angle
- **b** the size of each interior angle
- **c** the sum of the interior angles.
UNIT 5: Recognising congruent triangles

**Question 1**  By measuring, find all pairs of congruent triangles.


**Question 2**  In the following pairs of congruent triangles:

i. name all pairs of corresponding angles   
ii. name all pairs of corresponding sides

\[\text{Diagram of triangles a, b, c, d, e, f}\]

**Question 3**  In the following shapes, name different pairs of congruent triangles.

\[\text{Diagram of shapes a, b}\]
UNIT 6: Tests for congruent triangles

**Question 1** Complete the following statements.

a. The symbol for congruence is \( \equiv \).

b. Two triangles are congruent if three sides of one triangle are equal to ____________________________ of the other triangle.

c. Two triangles are congruent if two angles and a side of one triangle are equal to ____________________________ of the other triangle.

d. Two triangles are congruent if two sides and the included angle of one triangle are equal to ____________________________ of the other triangle.

e. Two right-angled triangles are congruent if the hypotenuse and one side of one triangle are equal to ____________________________ of the other triangle.

**Question 2** In each pair of triangles, write the congruency test that would be used to prove that the triangles are congruent.

a. [Diagram]

b. [Diagram]

c. [Diagram]

d. [Diagram]

**Question 3** In the diagram, \( O \) is the centre of the circle. \( OC \) is drawn perpendicular to \( AB \).

a. Name the common side in \( \triangle OAC \) and \( \triangle OBC \).

b. Name the pair of sides that are equal.

c. Are the triangles congruent?

d. If they are congruent, name the test you can use to prove it.
Geometry

TOPIC TEST

PART A

Time allowed: 15 minutes

Total marks: 15

1. The angle sum of a triangle is always equal to
   A 90°   B 180°   C 270°   D 360°

2. What name is given to a polygon with 7 sides?
   A hexagon   B heptagon   C nonagon   D noptagon

3. How many sides does a dodecagon have?
   A 9   B 10   C 11   D 12

4. Which is NOT a test for congruent triangles?
   A AAA   B AAS   C SAS   D SSS

5. What is the angle sum of an octagon?
   A 1080°   B 1260°   C 1350°   D 1440°

6. The angle sum of a quadrilateral is always equal to
   A 90°   B 180°   C 270°   D 360°

7. The number of sides in a quadrilateral is
   A 2   B 3   C 4   D 5

8. The exterior angles of a regular pentagon are each
   A 36°   B 54°   C 72°   D 108°

9. The minimum number of sides in a polygon is
   A 2   B 3   C 4   D 5

10. The sum of the exterior angles of any polygon is equal to
    A 90°   B 180°   C 270°   D 360°

11. If a triangle has all three sides equal, find the size of each angle.
    A 30°   B 45°   C 60°   D 90°

12. Referring to the diagram, what correctly completes this sentence:
    $\triangle ABC = \triangle \underline{_____}$
    A $\triangle DEC$   B $\triangle DCE$   C $\triangle ECD$   D $\triangle EDC$

13. If all the sides and angles of a polygon are equal, it is what type of polygon
    A open   B closed   C regular   D irregular

14. If all the interior angles of a polygon are less than 180°, the polygon is called
    A open   B closed   C convex   D concave

15. A three-sided regular polygon is what type of triangle?
    A right-angled   B scalene   C isosceles   D equilateral

Total marks achieved for PART A

15
# Geometry

## TOPIC TEST

### Instructions
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
</table>
| 1 In the quadrilateral $PS = PQ$ and $SR = QR$.  
   a Complete $\triangle PSR \equiv \triangle ________$  
   b Which test is used to show the triangles congruent? | | 1 |
| | | 1 |
| 2 Draw a regular hexagon $ABCDEF$ and from vertex $(A)$ draw all the diagonals.  
   a How many diagonals are drawn?  
   b How many triangles are formed?  
   c What is the sum of the interior angles of a hexagon?  
   d Find the size of each interior angle.  
   e Find the size of each exterior angle. | | 1 |
| | | | 1 |
| 3 For a regular polygon with 20 sides,  
   a are all the angles equal?  
   b what is the sum of the exterior angles of this polygon?  
   c find the size of each exterior angle.  
   d find the size of each interior angle.  
   e find the sum of the interior angles of the polygon. | | 1 |
| | | | | 1 |
| 4 $ABCDE$ is a regular pentagon.  
   a Which test is used to show $\triangle AED \equiv \triangle ABC$?  
   b What is the size of $\angle ADC$? | | 1 |
| | | 1 |
| 5 Find the value of $x$. | | 1 |

**Total marks achieved for PART B** 15
UNIT 1: The enlargement factor

**QUESTION 1**  In this diagram, $\triangle A'B'C'$ is similar to and an enlargement of $\triangle ABC$. By measuring find the following.

a i $\frac{A'B'}{AB} =$ ii $\frac{B'C'}{BC} =$ iii $\frac{A'C'}{AC} =$

b What is the enlargement factor? ______________

c Write the centre of enlargement. ______________

**QUESTION 2**  The following figure is reduced in size and is similar to quadrilateral $ABCD$.

a i $\frac{A'B'}{AB} =$ ii $\frac{B'C'}{BC} =$ iii $\frac{C'D'}{CD} =$ iv $\frac{D'A'}{DA} =$

b What is the scale factor of reduction? ______________

**QUESTION 3**  Draw the image of the following figure if the scale factor is

a 3

b $\frac{1}{2}$

**QUESTION 4**  Find the scale factor if the figure $ABCD$ has been enlarged to figure $A'B'C'D'$.
UNIT 2: Properties of similar figures

**QUESTION 1** In this diagram, square $PQRS$ has been enlarged to square $P'Q'R'S'$. Find the following.

\[
\begin{align*}
OP' &= \underline{\quad} , & OQ' &= \underline{\quad} , & OR' &= \underline{\quad} , & OS' &= \underline{\quad} \\
OP &= \underline{\quad} , & OQ &= \underline{\quad} , & OR &= \underline{\quad} , & OS &= \underline{\quad} \\
P'Q' &= \underline{\quad} , & QR &= \underline{\quad} , & RS &= \underline{\quad} , & SP &= \underline{\quad} \\
\end{align*}
\]

a Write the centre of enlargement. _______

b Write the enlargement factor. ____________

d In similar figures, the length of corresponding sides are in the same _____________.

c \[
d = \frac{PQ'}{PQ} = \frac{QR'}{QR} = \frac{RS'}{RS} = \frac{SP'}{SP} = \quad
\]

**QUESTION 2** Two quadrilaterals $ABCD$ and $EFGH$ are similar. (All measurements are in centimetres.)

\[
\begin{align*}
AB &= \quad , & BC &= \quad , & CD &= \quad , & DA &= \quad \\
E F &= \quad , & FG &= \quad , & GH &= \quad , & HE &= \quad \\
\end{align*}
\]

a List the pairs of corresponding sides.

b List the pairs of corresponding angles.

c Find the value of $x$.

**QUESTION 3** The following shapes are similar. (All lengths are in centimetres.)

\[
\begin{align*}
A &= \quad , & B &= \quad , & C &= \quad , & D &= \quad \\
A' &= \quad , & B' &= \quad , & C' &= \quad , & D' &= \quad \\
\end{align*}
\]

a List the corresponding equal angles

b List the ratio of the corresponding sides

c In similar figures, the length of corresponding sides are in the same _____________.

d In similar figures, the length of corresponding sides are in the same _____________.

**QUESTION 4** Complete the following.

a In similar figures, the corresponding angles are _____________.

b In similar figures, the length of corresponding sides are in the same _____________.

---

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UNIT 3: Similar shapes

**Question 1** For the following similar figures, list the pairs of corresponding sides.

a

\[
\begin{array}{cccc}
A & B & E & F \\
D & C & H & G \\
\end{array}
\]

b

\[
\begin{array}{cccc}
A & B & D & C \\
B & C & E & F \\
\end{array}
\]

c

\[
\begin{array}{cccc}
D & C & H & G \\
A & B & E & F \\
\end{array}
\]

**Question 2** For the following similar figures, write the proportion statements.

a

\[
\begin{array}{cccc}
A & B & E & F \\
D & C & H & G \\
\end{array}
\]

b

\[
\begin{array}{cccc}
A & B & D & C \\
B & C & E & F \\
\end{array}
\]

c

\[
\begin{array}{cccc}
D & C & H & G \\
A & B & E & F \\
\end{array}
\]

**Question 3** For the following similar figures, write the proportion statements and then find the value of the pronumerals.

a

\[
\begin{array}{cccc}
A & B & E & F \\
2 & 4 & 5 & 4 \\
\end{array}
\]

b

\[
\begin{array}{cccc}
A & B & C & D \\
9 & 12 & 5 & x \\
\end{array}
\]

c

\[
\begin{array}{cccc}
A & B & C & D \\
8 & 4 & 10 & 10 \\
\end{array}
\]
UNIT 4: Similar triangles (1)

**QUESTION 1**

a In $\triangle LMN$ and $\triangle OPQ$, write the matching angles.

$\angle L = \underline{\text{}}$, $\angle M = \underline{\text{}}$, $\angle N = \underline{\text{}}$

b Write the matching sides.

$LM: \underline{\text{}}$, $MN: \underline{\text{}}$, $LN: \underline{\text{}}$

**QUESTION 2**

In the following pair of triangles, write the ratio of the matching sides.

a $\frac{AB}{DE} =$

b $\frac{AC}{DF} =$

c $\frac{BC}{EF} =$

**QUESTION 3**

In the following two triangles, write the value of:

a $\frac{AB}{DE} =$

b $\frac{AC}{DF} =$

c $\angle BAC =$

d $\angle EDF =$

**QUESTION 4**

In the diagram given below, $PQ \parallel BC$

a List the matching angles.

b List the matching sides.

 c Find the value of $x$.

**QUESTION 5**

Complete the following statements. Two triangles are similar if:

a The corresponding angles are ____________________________.

b The corresponding sides are in the ____________________________ ratio.

c The hypotenuse and a second side of a right-angled triangle are proportional to the ___________ and another ___________________ of another ___________________ triangle.

d The ratios of two pairs of corresponding sides are __________________ to two sides of another triangle and the ___________________ angles are equal.
UNIT 5: Similar triangles (2)

For each of the following pairs of similar triangles:

a) complete the similarity statement by writing the vertices in the correct order
b) find the value of the pronumerals.

1. \( \triangle ABC \|\| \triangle ABE \|\| \triangle ADE \)

2. \( \triangle ABC \|\| \triangle ACB \|\| \triangle ABC \)

3. \( \triangle ABC \|\| \triangle LMN \|\| \triangle ABC \)

4. \( \triangle ABC \|\| \triangle ACB \|\| \triangle ABC \)

5. \( \triangle ABC \|\| \triangle ABC \|\| \triangle ABC \)

6. \( \triangle ABC \|\| \triangle ABC \|\| \triangle ABC \)

7. \( \triangle PQR \|\| \triangle LMN \|\| \triangle ABC \)

8. \( \triangle LMN \|\| \triangle LMN \|\| \triangle LMN \)

9. \( \triangle ABC \|\| \triangle ABC \|\| \triangle ABC \)
UNIT 6: Conditions for similar triangles

QUESTION 1  Write the similarity condition for each of the following and find the value of the pronumerals.

(a) \[ \frac{12}{10} = \frac{18}{m} \]
(b) \[ \frac{15}{6} = \frac{4}{y} \]
(c) \[ \frac{14}{x} = \frac{12}{y} \]
(d) \[ \frac{12}{9} = \frac{x}{18} \]
(e) \[ \frac{4}{x} = \frac{y}{7.5} \]
(f) \[ \frac{10}{x} = \frac{8}{20} \]

QUESTION 2  Find the value of the pronumerals in each pair of similar triangles.

(a) \[ \frac{10}{36} = \frac{32}{36} \]
(b) \[ \frac{18}{21} = \frac{10}{21} \]
(c) \[ \frac{12}{16} = \frac{y}{15} \]
UNIT 7: Tests for similar triangles

QUESTION 1  Complete the following sentences.

a  Two triangles are similar if two angles of one triangle are equal to ________________ of the other triangle.

b  Two triangles are similar if their corresponding sides are in the ________________.

c  Two triangles are similar if an angle of one triangle is equal to ________________ of the other and the lengths of the sides that form the angle are in the ________________.

d  Two triangles are similar if the ________________ and a second side of one right-angled triangle and the ________________ and a second side of another ________________ are in the same ratio.

e  The symbol for similarity is ________________.

QUESTION 2  In each pair of triangles given below, write the test for similarity that would be used to prove that the triangles are similar.

a  

b  


c  

d  


QUESTION 3  The triangles drawn here are similar triangles.

a  Write the similarity test that proves that they are similar. ________________

b  List the pairs of corresponding angles. ________________

c  List the pairs of corresponding sides. ________________
UNIT 8: Use of similar triangles to find the value of pronumerals

QUESTION 1  In each pair of triangles given below, use a test of similarity to find the value of the pronumeral.

a

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

b

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

c

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

d

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

e

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

f

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

QUESTION 2  Find the value of the pronumeral in each of the following.

a

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

c

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]

d

\[
\begin{align*}
\triangle & \sim \triangle \ \text{because they share an angle and have two corresponding sides proportional.}
\end{align*}
\]
### Similarity

#### TOPIC TEST

**Instructions**
- This part consists of 10 multiple-choice questions.
- Fill in only ONE CIRCLE for each question.
- Each question is worth 1 mark.

**Time allowed: 15 minutes**

<table>
<thead>
<tr>
<th>Marks</th>
<th>Total marks: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tbody>
<tr>
<td>1</td>
<td>Two triangles are similar if they have the</td>
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<td></td>
<td>A same shape B different shape C same area D different area</td>
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<td>2</td>
<td>The symbol for similar triangles is</td>
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<td></td>
<td>A ( \equiv ) B ( \equiv ) C ( = ) D none of these</td>
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<tr>
<td>3</td>
<td>If the corresponding angles of two triangles are equal then the triangles are definitely</td>
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<td></td>
<td>A congruent B similar C equilateral D isosceles</td>
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<tr>
<td>4</td>
<td>All similar triangles are</td>
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<td></td>
<td>A different B congruent C equilateral D equiangular</td>
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<tr>
<td>5</td>
<td>If two triangles are similar, the corresponding sides must be</td>
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<td>A equal B different C in the same ratio D none of these</td>
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<tr>
<td>6</td>
<td>A photo that was 8 cm long and 6 cm wide is enlarged so that it is now 96 cm wide. How long is it?</td>
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<td></td>
<td>A 72 cm B 98 cm C 120 cm D 128 cm</td>
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<tr>
<td>7</td>
<td>Two triangles must be similar if</td>
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<tr>
<td></td>
<td>A 2 angles of one are equal to 2 angles of the other B 2 sides of one are equal to 2 sides of the other C a side and angle of one are equal to a side and angle of the other D none of these</td>
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<tr>
<td>8</td>
<td>It is known that ( \triangle XYZ ) is similar to ( \triangle MLN ). Which side of ( \triangle MLN ) corresponds to ( XZ? )</td>
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<td></td>
<td>A ( LN ) B ( MN ) C ( LM ) D none of these</td>
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</table>

It is known that \( \triangle GFE \) is similar to \( \triangle PQR \).

<p>| | | | | | | | | | |</p>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>What is the size of ( \angle FGE )?</td>
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<tr>
<td></td>
<td>A 76° B 46° C 58° D not enough information</td>
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<tr>
<td>10</td>
<td>Side ( FG ) of ( \triangle GFE ) is 16.8 cm long. What is the enlargement factor?</td>
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<tr>
<td></td>
<td>A 2.1 B 2.4 C 2.7 D 2.8</td>
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</tr>
</tbody>
</table>

**Total marks achieved for PART A**

10
### Topic Test PART B

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

<table>
<thead>
<tr>
<th>Time allowed: 20 minutes</th>
<th>Total marks: 15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questions</strong></td>
<td><strong>Answers</strong></td>
</tr>
<tr>
<td>1. AB is parallel to ED. AD and BE intersect at C.</td>
<td></td>
</tr>
<tr>
<td>a. Which angle of ( \triangle CDE ) is equal to ( \angle ABC )?</td>
<td></td>
</tr>
<tr>
<td>b. Why are the triangles similar?</td>
<td></td>
</tr>
<tr>
<td>c. Complete ( \triangle ABC \parallel \triangle )</td>
<td></td>
</tr>
<tr>
<td>d. If ( AB = 34 \text{ cm} ) and ( ED = 85 \text{ cm} ), what is the enlargement factor?</td>
<td></td>
</tr>
<tr>
<td>2. A 1 m high stick casts a shadow 0.8 m long on level ground. At the same time a tree casts a shadow of 36 m.</td>
<td></td>
</tr>
<tr>
<td>a. Briefly explain why the triangles formed are similar.</td>
<td></td>
</tr>
<tr>
<td>b. How tall is the tree?</td>
<td></td>
</tr>
<tr>
<td>3. a. How many times larger is the smallest side of ( \triangle DEF ) than the smallest side of ( \triangle ABC )?</td>
<td></td>
</tr>
<tr>
<td>b. How many times larger is the largest side of ( \triangle DEF ) than the largest side of ( \triangle ABC )?</td>
<td></td>
</tr>
<tr>
<td>c. How many times larger is the remaining side of ( \triangle DEF ) than the remaining side of ( \triangle ABC )?</td>
<td></td>
</tr>
<tr>
<td>d. Briefly explain why the triangles are similar.</td>
<td></td>
</tr>
<tr>
<td>e. Which angle of ( \triangle DEF ) corresponds to ( \angle ABC )?</td>
<td></td>
</tr>
<tr>
<td>f. Complete ( \triangle DEF \parallel \triangle )</td>
<td></td>
</tr>
<tr>
<td>4. a. Find ( \frac{AB}{DE} ) in simplest form.</td>
<td></td>
</tr>
<tr>
<td>b. Find ( \frac{BC}{EC} ) in simplest form.</td>
<td></td>
</tr>
<tr>
<td>c. Which test shows that the triangles are similar?</td>
<td></td>
</tr>
</tbody>
</table>

**Total marks achieved for PART B** 15
UNIT 1: Areas of plane shapes

QUESTION 1  Find the area of the following shapes. All measurements are in centimetres.

a.  
\[ \frac{1}{2} \times 3.2 \times 9.8 \]

b.  
\[ 5.4 \times 10.5 \]

c.  
\[ 6.1 \times 6.1 \]

d.  
\[ \frac{1}{2} \times 5 \times 14 \]

e.  
\[ \frac{1}{2} \times 12.5 \times 16.8 \]

f.  
\[ \frac{1}{2} \times 5.2 \times 10 \]

g.  
\[ \frac{1}{2} \times 4 \times 9 \]

h.  
\[ \frac{1}{2} \times 8 \times 12 \]

i.  
\[ \pi \times 7^2 \]

QUESTION 2  Find the area of these composite shapes. All measurements are in centimetres.

a.  
\[ \frac{1}{2} \times 8 \times 12 + \frac{1}{2} \times 8 \times 8 \]

b.  
\[ \pi \times 8 \times 14 \]

c.  
\[ 8 \times 9 + 11 \times 12 \]
UNIT 2: Area of a sector

**Question 1** These six circles have the same radius. List the black sectors in ascending order of area.

A

B

C

D

E

F

**Question 2** Calculate the area of each shaded sector correct to two significant figures.

a

b

c

d

e

f

**Question 3** Find the area of each sector, leaving your answer in terms of \( \pi \).

a

b

c

**Question 4** Find the radius, correct to one decimal place, for each sector.

a

b

c

\[ A = 42 \text{ cm}^2 \]

\[ A = 75 \text{ cm}^2 \]

\[ A = 120 \text{ cm}^2 \]
UNIT 3: Composite and shaded areas

**QUESTION 1**  Find the area of each composite figure by dividing it into different shapes. All measurements are in cm and all angles are right angles.

a

\[ \text{Area of a} = \text{Area of } b + \text{Area of } c \]

\[ \text{Area of } b = \text{Area of } d + \text{Area of } e \]

\[ \text{Area of } c = \text{Area of } f + \text{Area of } g \]

**QUESTION 2**  Find the area of the following shaded shapes. All measurements are in centimetres.

a

\[ \text{Area of a} = \text{Area of } b + \text{Area of } c \]

\[ \text{Area of } d = \text{Area of } e + \text{Area of } f \]

**QUESTION 3**  Find the area of each shaded shape.

a

\[ \text{Area of a} = \text{Area of } b + \text{Area of } c \]

\[ \text{Area of } d = \text{Area of } e + \text{Area of } f \]

O is the centre of the circle with arc AB.
UNIT 4: Surface area of a right prism

QUESTION 1  Find the surface area of each cube.

a  

b  

QUESTION 2  Find the surface area of each rectangular prism.

a  

b  

QUESTION 3  Find the surface area of each triangular prism.

a  

b  

QUESTION 4  Find the surface area of each shape.

a  

b  

Chapter 13: Measurement, area, surface area and volume
**UNIT 5: Surface area of a right cylinder**

**QUESTION 1** For each cylinder, find the following correct to two decimal places.

i the area of a circular base ii the area of the curved surface

![Diagram](a) 20 cm 8 cm  

![Diagram](b) 36 cm 15 cm

**QUESTION 2** Find the curved surface area of each cylinder in terms of \( \pi \).

![Diagram](a) 3.8 cm 9.3 cm  

![Diagram](b) 32 cm 14 cm

**QUESTION 3** For each cylinder, find the following correct to three significant figures.

i the combined area of the two circular ends ii the area of the curved surface iii the total surface area

![Diagram](a) 4.8 cm 9.5 cm  

![Diagram](b) 6 m 10.8 cm

**QUESTION 4** Find the total surface area of the outside of a pipe 20 m long with an outer radius 0.75 m (a pipe does not have any ends). Give your answer correct to one decimal place.
UNIT 6: Surface area of a solid

**QUESTION 1** Find the surface area of the following rectangular prisms.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>9 cm</td>
<td>6 cm</td>
<td>5.2 cm</td>
</tr>
<tr>
<td>7 cm</td>
<td>4.5 cm</td>
<td>4.9 cm</td>
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</table>

**QUESTION 2** Find the surface area of the following triangular prisms.

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</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>8 cm</td>
<td>10 cm</td>
<td>5 cm</td>
</tr>
<tr>
<td>12 cm</td>
<td>20 cm</td>
<td>12 cm</td>
</tr>
<tr>
<td>10.8 cm</td>
<td>18 cm</td>
<td>14.6 cm</td>
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</table>

**QUESTION 3** Find the surface area of the following trapezoidal prisms.

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</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>10 m</td>
<td>3.6 m</td>
<td>15 m</td>
</tr>
<tr>
<td>14 m</td>
<td>8.5 m</td>
<td>8.5 m</td>
</tr>
<tr>
<td>8 m</td>
<td>12 m</td>
<td>8.5 m</td>
</tr>
<tr>
<td>2.5 m</td>
<td>12.1 m</td>
<td>21 m</td>
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</table>

**QUESTION 4** Find the surface area of the following solid cylinders.

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</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>5 cm</td>
<td>12 cm</td>
<td>14 cm</td>
</tr>
<tr>
<td>11 cm</td>
<td>6 cm</td>
<td>20.7 cm</td>
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</table>
UNIT 7: Applications of area and volume

**Question 1** Find the volume of each cube.

<table>
<thead>
<tr>
<th>Side</th>
<th>Side</th>
<th>Side</th>
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</thead>
<tbody>
<tr>
<td>3 cm</td>
<td>3 cm</td>
<td></td>
</tr>
<tr>
<td>5 cm</td>
<td>5 cm</td>
<td></td>
</tr>
<tr>
<td>8.4 cm</td>
<td>8.4 cm</td>
<td></td>
</tr>
</tbody>
</table>

**Question 2** Find the volume of each rectangular prism.

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 cm</td>
<td>5 cm</td>
<td>7 cm</td>
</tr>
<tr>
<td>8 cm</td>
<td>4 cm</td>
<td>6 cm</td>
</tr>
<tr>
<td>35 m</td>
<td>5 m</td>
<td>7 m</td>
</tr>
</tbody>
</table>

**Question 3** Find the volume of each prism, given the area of the shaded face.

<table>
<thead>
<tr>
<th>Area</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 cm²</td>
<td>14 cm</td>
</tr>
<tr>
<td>120 m²</td>
<td>35 m</td>
</tr>
</tbody>
</table>

**Question 4** For the triangular prism, find:

a) the area of the shaded face
b) the volume of the prism.

<table>
<thead>
<tr>
<th>Side</th>
<th>Side</th>
<th>Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m</td>
<td>4 m</td>
<td>7 m</td>
</tr>
</tbody>
</table>

$$A = 20 \text{ cm}^2$$

$$A = 120 \text{ m}^2$$
UNIT 8: Volume of a prism

**QUESTION 1** Find the volume of the following rectangular prisms correct to one decimal place.

- **a**
  - 5.8 cm
  - 5.8 cm
  - 5.8 cm

- **b**
  - 3.5 cm
  - 9.6 cm
  - 5.6 cm

- **c**
  - 3.7 cm
  - 15.6 cm
  - 3.7 cm

**QUESTION 2** Find the volume of the following triangular prisms correct to four significant figures.

- **a**
  - 10 cm
  - 30.5 cm

- **b**
  - 7.8 cm
  - 5.4 cm
  - 10.6 cm

- **c**
  - 12.6 cm
  - 28 cm

**QUESTION 3** Find the volume of the following trapezoidal prisms.

- **a**
  - 20.7 cm
  - 11.4 cm
  - 46.8 cm
  - 15.9 cm

- **b**
  - 9 m
  - 15 m
  - 1.6 m
  - 3.6 m
  - 15.1 m

- **c**
  - 18.6 cm
  - 6.2 cm
  - 25.7 cm
  - 12.5 cm

**QUESTION 4** Find the volume of the following solids.

- **a**
  - 5 m
  - 10 m
  - 16 m

- **b**
  - 14 m
  - 10 m
  - 16 m
  - 12 m

- **c**
  - 3 m
  - 12 m
  - 10 m
UNIT 9: Volume of a cylinder

**Question 1** Find the volume of the following cylinders correct to one decimal place.

- a. \( \pi \times 6^2 \times 10 = \)  \( \pi \times 36 \times 10 = \)
- b. \( \pi \times 8^2 \times 15 = \)  \( \pi \times 64 \times 15 = \)
- c. \( \pi \times 7^2 \times 12.5 = \)  \( \pi \times 49 \times 12.5 = \)

**Question 2** Find the volume of the following cylinders correct to three significant figures.

- a. \( \pi \times 8^2 \times 12 = \)  \( \pi \times 64 \times 12 = \)
- b. \( \pi \times 28^2 \times 10 = \)  \( \pi \times 784 \times 10 = \)
- c. \( \pi \times 6^2 \times 15.4 = \)  \( \pi \times 36 \times 15.4 = \)

**Question 3** Find the volume of the following correct to two decimal places.

- a. \( \pi \times 5.6^2 \times 3 = \)  \( \pi \times 31.36 \times 3 = \)
- b. \( \pi \times 14^2 \times 25 = \)  \( \pi \times 196 \times 25 = \)
- c. \( \pi \times 14.5^2 \times 10.8 = \)  \( \pi \times 210.25 \times 10.8 = \)

**Question 4** Find the volume of the following solids correct to one decimal place.

- a. \( \pi \times 17.6^2 \times 25 = \)  \( \pi \times 309.76 \times 25 = \)
- b. \( \pi \times 8.3^2 \times 7 = \)  \( \pi \times 69.089 \times 7 = \)
- c. \( \pi \times 9^2 \times 12 = \)  \( \pi \times 81 \times 12 = \)

(diameter of hole = 8 cm)

(diameter of hole = 7 cm)
UNIT 10: Very small and very large units of measurement

QUESTION 1
Complete the table using the powers from the list at the left.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Symbol</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>kilo</td>
<td>k</td>
</tr>
<tr>
<td>b</td>
<td>mega</td>
<td>M</td>
</tr>
<tr>
<td>c</td>
<td>giga</td>
<td>G</td>
</tr>
<tr>
<td>d</td>
<td>tera</td>
<td>T</td>
</tr>
<tr>
<td>e</td>
<td>peta</td>
<td>P</td>
</tr>
<tr>
<td>f</td>
<td>milli</td>
<td>m</td>
</tr>
<tr>
<td>g</td>
<td>micro</td>
<td>μ</td>
</tr>
<tr>
<td>h</td>
<td>nano</td>
<td>n</td>
</tr>
<tr>
<td>i</td>
<td>pico</td>
<td>p</td>
</tr>
<tr>
<td>j</td>
<td>femto</td>
<td>f</td>
</tr>
</tbody>
</table>

QUESTION 2

a A dam holds 853 850 megalitres of water. How many litres is this?

b An estimate of the age of the universe is $1.2 \times 10^{10}$ years. How many days is this? 1 year = $365\frac{1}{4}$ days

c One year is equal to $365\frac{1}{4}$ days. How many seconds is this?

d One astronomical unit is about $149 000 000$ km. How many centimetres is this?

e The Sun is approximately $1.5 \times 10^8$ km from Earth and light travels at approximately $3 \times 10^8$ m/s. How long does it take light from the sun to reach Earth?

f A micrometre is one-millionth of a metre. Write 7 micrometres as a decimal of a metre using scientific notation.
# Measurement, area, surface area and volume

## TOPIC TEST

**PART A**

**Instructions**
- This part consists of 10 multiple-choice questions.
- Fill in only ONE CIRCLE for each question.
- Each question is worth 1 mark.

<table>
<thead>
<tr>
<th>Time allowed: 12 minutes</th>
<th>Total marks: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Find the area of a square with side length 12 cm.</td>
<td>Marks</td>
</tr>
<tr>
<td>A 48 cm²</td>
<td>B 288 cm²</td>
</tr>
<tr>
<td><strong>2</strong> Calculate the volume of a cube with side length 5 cm.</td>
<td></td>
</tr>
<tr>
<td>A 30 cm³</td>
<td>B 125 cm³</td>
</tr>
<tr>
<td><strong>3</strong> A rectangular prism has sides of length 9 cm, 11 cm and 12 cm. Find its volume.</td>
<td></td>
</tr>
<tr>
<td>A 32 cm³</td>
<td>B 339 cm³</td>
</tr>
<tr>
<td><strong>4</strong> A cube has a volume of 4913 cm³. Find the length of each side of the cube.</td>
<td></td>
</tr>
<tr>
<td>A 70 cm</td>
<td>B 8.4 cm</td>
</tr>
<tr>
<td><strong>5</strong> Find the perimeter of a square of side 4.2 cm.</td>
<td></td>
</tr>
<tr>
<td>A 17.64 cm</td>
<td>B 74.1 cm</td>
</tr>
<tr>
<td><strong>6</strong> If the perimeter of a square is 36 cm, then the area of the square is</td>
<td></td>
</tr>
<tr>
<td>A 6 cm²</td>
<td>B 9 cm²</td>
</tr>
<tr>
<td><strong>7</strong> How many square centimetres are there in a square metre?</td>
<td></td>
</tr>
<tr>
<td>A 100</td>
<td>B 1000</td>
</tr>
<tr>
<td><strong>8</strong> How many nanoseconds in 1 second?</td>
<td></td>
</tr>
<tr>
<td>A 1 000 000</td>
<td>B 100 000 000</td>
</tr>
<tr>
<td><strong>9</strong> What is the area of a circle of radius 3.2 m? Answer to the nearest square metre.</td>
<td></td>
</tr>
<tr>
<td>A 101 m²</td>
<td>B 32 m²</td>
</tr>
<tr>
<td><strong>10</strong> The volume of a rectangular prism is 216 cm³. Find the total surface area of a cube having the same volume.</td>
<td></td>
</tr>
<tr>
<td>A 64 cm²</td>
<td>B 216 cm²</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**

10
### Topic Test Part B

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 A cylindrical tank has diameter 3 m and height 5 m. Give answers correct to one decimal place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a What is the area of the circular end of the tank?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b What is the area of the curved surface?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c What is the total surface area of the closed tank?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d What is the volume of the tank?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e Given that 1 m³ = 1000 L, how many kilolitres of water will the tank hold?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2 A swimming pool, 9 m long and 4 m wide, is to be surrounded by a concrete path 2 m wide.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a What is the area that will be concreted?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b If the concrete is laid to a depth of 20 cm, how many cubic metres of concrete will be needed?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c If the pool is filled to a depth of 1.5 m, how many litres of water will it hold?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3 The diagram shows a machinery part made up of a triangle and quadrant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a What is the area of the quadrant (to 1 decimal place)?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b Briefly explain why ( b = 8 ).</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c What is the total area of the part (to 1 decimal place)?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d What volume of metal is used to make the part if it is 25 mm thick?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4 The diagram shows a pentagonal prism.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a What is the area of the pentagonal face?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b What is the volume of the prism?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c What is the total surface area of the prism?</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART B**

© Pascal Press ISBN 978 1 74125 271 2          Excel Essential Skills Mathematics Revision & Exam Workbook Year 9
UNIT 1: Basic probability

QUESTION 1 A card is drawn at random from a normal pack of 52 cards. Find the probability that the card is
a a diamond  ___________  b a red card  ___________  c a king  ___________
d not a club  ___________  e a red ace  ___________  f a black card  ___________

QUESTION 2 From the letters of the word FREQUENCY, one letter is selected at random. What is the probability that the letter is
a a vowel?  ___________  b a consonant?  ___________
c the letter R?  ___________  d the letter E?  ___________

QUESTION 3 A die is thrown once. Find the probability that the number is
a a six  ___________  b an even number  ___________
c a number less than 5  ___________  d seven  ___________
e a prime number  ___________  f a square number  ___________

QUESTION 4 A bag contains 8 white, 5 yellow and 7 blue balls. If a ball is drawn at random, find the probability that it is
a white  ___________  b yellow  ___________  c blue  ___________
d not white  ___________  e red  ___________  f either white or blue  ___________

QUESTION 5 A three-digit number is to be formed from the digits 4, 5 and 6 written on separate cards. What is the probability that the number formed is
a odd?  ___________  b even?  ___________
c less than 600?  ___________  d divisible by 3?  ___________
e divisible by 5?  ___________  f greater than 600?  ___________

QUESTION 6 The numbers 1 to 9 are written on separate cards. One card is chosen at random. What is the probability that
a the number is even?  ___________  b the number is odd?  ___________
c it is 5?  ___________  d it is 10?  ___________
e it is a prime number?  ___________  f it is divisible by 3?  ___________

QUESTION 7 A letter is chosen from the word EXCELLENT. What is the probability that the letter is
a a vowel?  ___________  b a consonant?  ___________
c the letter L?  ___________  d the letter N?  ___________
e the letters E or L?  ___________  f the letters T or X?  ___________
UNIT 2: Venn diagrams

QUESTION 1  The Venn diagram shows the number of students studying art and music at a college.

a  How many students study both music and art? __________

b  How many students study neither music nor art? __________

c  How many students study music but not art? __________

d  How many students study art? __________

e  How many students are at the college? __________

f  If a student is chosen at random, what is the probability that he or she studies art but not music? __________

g  What is the probability that a randomly chosen student from the college studies art or music but not both? __________

QUESTION 2  In a year 8 class, students play cricket or basketball or both. Eighteen play cricket, 15 play basketball and 6 play both cricket and basketball.

a  Show this information by drawing a Venn diagram

b  How many students play cricket but not basketball? __________

c  How many students play basketball but not cricket? __________

d  How many students play cricket or basketball but do not play both? __________

e  Find the total number of students in class. __________

f  What is the probability that a student, chosen at random from the class, plays both cricket and basketball? __________

QUESTION 3  Students from a club competed at a show where ribbons were awarded in colours of red, yellow and blue. The Venn diagram shows the number of students who won ribbons.

a  How many students won ribbons in all 3 colours? __________

b  How many students won blue ribbons? __________

c  How many students were there altogether? __________

d  What is the probability that a student, chosen at random, won no ribbons? __________

e  What is the probability that a randomly chosen student won only yellow ribbons? __________

f  What is the probability that a randomly chosen student won both red and blue ribbons but not yellow? __________

g  What is the probability that a student, chosen at random, won ribbons in exactly two colours? __________

QUESTION 4  In a class of 28 students, 14 have at least one brother and 17 have at least one sister. 6 of the students have no brothers and no sisters. What is the probability that a student from the class, chosen at random, has both brothers and sisters? __________
UNIT 3: Two-way tables

Question 1 While in a hospital waiting area, Heather takes note of the number of visitors carrying flowers. The results are recorded in the two-way table, but there are two missing numbers, X and Y.

<table>
<thead>
<tr>
<th></th>
<th>Carrying flowers</th>
<th>No flowers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female visitors</td>
<td>37</td>
<td>68</td>
<td>105</td>
</tr>
<tr>
<td>Male visitors</td>
<td>X</td>
<td>57</td>
<td>106</td>
</tr>
<tr>
<td>Total</td>
<td>86</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

a What is the value of X?

b What is the value of Y?

c How many visitors have been recorded?

d What fraction of the visitors are male?

e Of the female visitors, what fraction are carrying flowers?

f What percentage of male visitors did not carry flowers?

g What is the probability that a visitor is a female carrying flowers?

h What is the probability that a visitor carrying flowers is female?

Question 2 The eye colour and gender of 836 people were recorded and the results are written in the table below.

<table>
<thead>
<tr>
<th>Gender\Eye colour</th>
<th>Brown</th>
<th>Blue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>276</td>
<td>13</td>
<td>289</td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>512</td>
<td>547</td>
</tr>
<tr>
<td>Total</td>
<td>311</td>
<td>525</td>
<td>836</td>
</tr>
</tbody>
</table>

What is the probability that a person selected at random from the sample:

a is a male?

b is a female or has blue eyes?

c has brown eyes?

d is a female and has blue eyes?

e is a male or does not have brown eyes?

Question 3 190 out of 350 women and 265 out of 400 men surveyed were found to be in full employment.

a Complete the two-way table to display this information.

<table>
<thead>
<tr>
<th></th>
<th>Fully employed</th>
<th>Not fully employed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b What is the probability that a fully employed person chosen at random from the surveyed group is a woman?
UNIT 4: Tree diagrams

**Question 1** A coin is tossed two times and the results noted. Use a tree diagram to find the probability of:

a) two heads ________________________

b) a heads and a tail in any order _________________

c) at least one head. _____________________________

**Question 2** There are four cards marked with the numbers 1, 2, 3 and 4. They are put in a box. Two cards are selected at random, one after the other, to form a two-digit number. Draw a tree diagram to find:

a) how many different two-digit numbers can be formed _____________________________

b) the probability that the number formed is less than 34 _____________________________

c) the probability that the number formed is divisible by 3 _____________________________

d) the probability that the number formed is even. _____________________________

**Question 3** Three red balls and two blue balls are placed in a bag. Two balls are selected at random, without replacement. What is the probability of having:

a) two red balls? _____________________________

b) two blue balls? _____________________________

c) one red ball and one blue ball? _____________________________

**Question 4** Tara has a box containing one red marble and two green marbles. She selects two marbles at random. Find the probability of:

a) two green marbles if she replaces the first marble before she selects the second _____________________________

b) one red marble if she does not replace the first marble. _____________________________
UNIT 5: Probability trees

Question 1
A box contains 4 yellow and 5 black balls. A ball is drawn from the box and is not replaced, then a second ball is drawn. Find the probability of:

a. yellow then black being drawn
b. black then yellow being drawn
c. both balls being yellow
d. both balls being black
e. drawing yellow and black in any order.

Question 2
Diana has a box containing three red and two green marbles. She selects two marbles at random. Find the probability of two green marbles if she replaces the first marble before she draws the second.

Question 3
Roger buys three tickets in a raffle in which there is a total of 20 tickets. There are two prizes. Find the probability of him winning:

a. first prize
b. first prize only
c. both prizes
d. no prizes
e. at least one prize
f. one prize only.

Question 4
A jar contains five white and six red jelly beans. Kylie takes a bean at random and eats it. She then takes another jelly bean and eats it. What is the probability that:

a. the first bean eaten is white?

b. the two beans eaten are both red?
UNIT 6: Two dice rolled simultaneously

**Question 1** Two dice are rolled simultaneously. Complete the table showing all the possible numbers on each die.

<table>
<thead>
<tr>
<th>1st die</th>
<th>2nd die</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1, 1</td>
</tr>
<tr>
<td>2</td>
<td>1, 2</td>
</tr>
<tr>
<td>3</td>
<td>1, 3</td>
</tr>
<tr>
<td>4</td>
<td>1, 4</td>
</tr>
<tr>
<td>5</td>
<td>1, 5</td>
</tr>
<tr>
<td>6</td>
<td>1, 6</td>
</tr>
</tbody>
</table>

**Question 2** Use the above diagram to find the probability of the event in each case listed below.

- **a** a double six
- **b** any double
- **c** the sum of the two numbers rolled equals 6
- **d** the two numbers are even
- **e** the sum of the two numbers is 9
- **f** a total of 10
- **g** a score greater than 8
- **h** a score of either 5 or 7
- **i** a score less than 5
- **j** at least one five on the uppermost face of a die
- **k** the sum of the numbers is greater than twelve

**Question 3** Suppose we wish to throw a total of five. Which is a better chance — rolling one die or rolling two dice?

**Question 4** What is the probability of throwing odd numbers on the uppermost faces of both dice in one roll of a pair of dice?
UNIT 7: Miscellaneous questions

QUESTION 1

a A die is rolled. What is the probability that the number showing up is not 5?

b From a pack of 52 cards, one card is drawn at random. What is the probability that it is not a spade?

QUESTION 2

A die is so biased that to throw a four is twice as likely as throwing any other number on the die. Find the probability of throwing:

a a four

b a five.

QUESTION 3

From a set of cards numbered 1 to 9, one card is drawn at random.

a What is the probability that it is even or less than 6?

b What is the probability it is less than 4 or divisible by 5?

QUESTION 4

A die is thrown twice. Find the probability of getting a 2 on the first throw and a 5 on the second throw.

A coin and a die are tossed simultaneously. Find the probability of throwing a head and an odd number.

QUESTION 5

There are 3 red, 1 blue and 2 green pegs in a bag. Two pegs are taken from the bag, one after the other, without replacement. Find the probability that:

a the first peg is red

b both pegs are red

c both pegs are blue

d at least one peg is blue

e the balls are the same colour.

QUESTION 6

There are 3 red, 1 blue and 2 green pegs in a bag. Two pegs are taken from the bag, one after the other. The first peg is replaced before the second peg is taken. Find the probability that:

a the first peg is red

b both pegs are red

c both pegs are blue

d at least one peg is blue

e the balls are the same colour.
UNIT 8: Relative frequencies

**Question 1** For the following sets of scores, write the relative frequency of the score 7 as a fraction.

a 8, 5, 2, 8, 5, 3, 7, 7

b 3, 10, 8, 7, 2, 9, 10, 7, 7, 7

c 4, 7, 9, 8, 9, 7, 6, 7, 7, 5

d 6, 9, 8, 9, 7, 9, 6, 7, 7, 5

e 1, 7, 3, 7, 5, 7, 4

f 8, 7, 6, 7, 6, 7, 4, 7, 5

g 3, 7, 5, 7, 3, 2, 7, 1, 2

h 9, 7, 7, 7, 8, 9, 7, 9, 6, 7, 6, 7, 5, 7

i 4, 8, 3, 2, 7, 8, 7

j 7, 7, 7, 8, 7, 9, 6, 7, 5, 4, 8

k 7, 6, 8, 8, 6, 6, 8, 7, 7

l 5, 7, 9, 6, 5, 7, 7, 7

m 6, 7, 6, 8, 7, 7, 8, 6, 8

n 7, 7, 5, 7, 5, 8, 7, 7

o 7, 5, 8, 5, 5, 7, 7, 7, 6, 9

p 8, 7, 7, 6, 5, 7, 7, 8, 5

**Question 2** Complete the relative frequency column for each table, giving the answer as a decimal correct to two decimal places.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
**UNIT 9: Experimental probability**

**Question 1**  Jeanne tossed a coin many times and the results were tabulated.

<table>
<thead>
<tr>
<th></th>
<th>Heads</th>
<th>Tails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>43</td>
<td>57</td>
</tr>
</tbody>
</table>

Answer these questions based on the information in the table.

a  How many times did Jeanne toss the coin?

b  What is the relative frequency of tossing heads?

c  What is the probability of tossing heads?

d  What is the relative frequency of tossing tails?

e  What is the probability of tossing tails?

f  What is the sum of the relative frequencies?

g  How many tails do you expect to get in 200 tosses of a coin?

**Question 2**  Michelle rolled a die many times and recorded the results.

a  Complete the table showing the relative frequencies as fractions in simplest form.

<table>
<thead>
<tr>
<th>Number</th>
<th>Frequency</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

b  From Michelle’s experiment, find the probability of rolling the following.

i  4

ii an even number

iii 2 or 3

iv 4, 5 or 6

v 5 (as a percentage)

vi an odd number (as a percentage)

vii 6 (as a decimal)

viii 3 (as a decimal)

ix 2 (as a fraction)

x 1 (as a fraction)
### Chapter 14: Probability

### TOPIC TEST

**PART A**

**Time allowed: 15 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

1. In a single throw of one die, find the probability of throwing a number less than 3.
   - **A** 1
   - **B** \(\frac{1}{2}\)
   - **C** \(\frac{1}{3}\)
   - **D** \(\frac{2}{3}\)

2. If two dice are thrown, find the probability of throwing two sixes.
   - **A** \(\frac{1}{6}\)
   - **B** \(\frac{1}{36}\)
   - **C** \(\frac{1}{3}\)
   - **D** \(\frac{11}{36}\)

3. From a pack of 52 cards, one card is drawn at random. Find the probability of drawing a spade.
   - **A** \(\frac{1}{13}\)
   - **B** \(\frac{2}{13}\)
   - **C** \(\frac{1}{4}\)
   - **D** \(\frac{3}{4}\)

4. In the number set 7, 3, 4, 2, 5, 3, 3, 3, write the relative frequency of the score 3 as a fraction.
   - **A** 3
   - **B** 4
   - **C** \(\frac{1}{3}\)
   - **D** \(\frac{1}{2}\)

5. In the number set 3, 9, 4, 5, 9, 3, 9, 6, 3, 9, write the relative frequency of the score 3 as a decimal.
   - **A** 0.1
   - **B** 0.2
   - **C** 0.3
   - **D** 0.4

6. In a single throw of two dice, find the probability of throwing a double.
   - **A** \(\frac{1}{3}\)
   - **B** \(\frac{1}{2}\)
   - **C** \(\frac{2}{3}\)
   - **D** \(\frac{1}{6}\)

7. A die is tossed 60 times. How many times would you expect to get 4?
   - **A** 4
   - **B** 6
   - **C** 10
   - **D** 15

8. When a coin is tossed two times, what is the probability of throwing two heads?
   - **A** \(\frac{1}{4}\)
   - **B** \(\frac{1}{3}\)
   - **C** \(\frac{1}{2}\)
   - **D** \(\frac{2}{3}\)

9. Two dice are thrown. Find the probability that the sum is less than 5.
   - **A** \(\frac{1}{4}\)
   - **B** \(\frac{1}{3}\)
   - **C** \(\frac{1}{12}\)
   - **D** \(\frac{1}{6}\)

10. A card is chosen at random from a normal pack of 52 cards. The probability of a black card is
    - **A** \(\frac{1}{4}\)
    - **B** \(\frac{1}{3}\)
    - **C** \(\frac{1}{2}\)
    - **D** \(\frac{3}{4}\)

11. In a single throw of one die, find the probability of throwing an odd number.
    - **A** \(\frac{1}{6}\)
    - **B** \(\frac{1}{3}\)
    - **C** \(\frac{1}{2}\)
    - **D** \(\frac{2}{3}\)

12. A bag contains 3 white, 2 yellow and 5 brown balls. If a ball is drawn at random, the probability of a brown ball is
    - **A** \(\frac{1}{10}\)
    - **B** \(\frac{3}{10}\)
    - **C** \(\frac{1}{5}\)
    - **D** \(\frac{1}{2}\)

13. A card is chosen at random from a pack of 52 playing cards. Find the probability that the card is a king.
    - **A** \(\frac{1}{4}\)
    - **B** \(\frac{1}{2}\)
    - **C** \(\frac{1}{13}\)
    - **D** \(\frac{2}{13}\)

14. A card is chosen at random from a pack of 52 playing cards. Find the probability that the card is either a three or a four.
    - **A** \(\frac{1}{13}\)
    - **B** \(\frac{2}{13}\)
    - **C** \(\frac{3}{13}\)
    - **D** \(\frac{4}{13}\)

15. A letter is chosen at random from the word PROBABILITY. Find the probability that it is a vowel.
    - **A** \(\frac{1}{11}\)
    - **B** \(\frac{2}{11}\)
    - **C** \(\frac{3}{11}\)
    - **D** \(\frac{4}{11}\)

---

**Total marks achieved for PART A**

15
### TOPIC TEST

**Probability**

#### PART B

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed: 20 minutes**

**Total marks: 15**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> The numbers 1 to 9 are written on separate cards. One card is chosen at random. What is the probability that the number is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a even?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b odd?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c a six?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d less than 5?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e a prime number?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>2</strong> Students in a class were asked if they had taken part in the swimming or athletics carnivals. The results are shown in the Venn diagram.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a How many students are in the class?</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>What is the probability that a randomly chosen student from the class participated in:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b neither carnival?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c both carnivals?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d the swimming carnival</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e the athletics carnival but not the swimming carnival?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>3</strong> A box holds a red, a black and a blue pen. Without looking, Tyler takes two pens from the box, one after the other, without replacement. Find the probability that:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a the first pen is red</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>b both pens are red</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>c one of the pens is red</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d one pen is blue and one is black</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>e the second pen is blue</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

---

**Total marks achieved for PART B**

15
UNIT 1: Basic terms and words in statistics

QUESTION 1  Complete the following statements.

a  The information collected in a survey is called ____________________________

b  The number of times a score occurs is called the ___________________________ of that score.

c  An arrangement of a set of scores is called its ____________________________

d  A table that displays all information in an organised way and shows the frequency of each score is called a ________________________________

e  A column graph that shows the frequency of each score is called a ________________________________

f  A line graph that shows the frequency of each score is called a ________________________________

g  The ___________________________ of a score is the number of scores equal to or less than that score.

h  The ___________________________ of a score is the ratio of the frequency of that score to the total frequency.

QUESTION 2  Complete the following statements.

a  The average of a set of scores is called the ________________________________

b  When the scores are arranged in order of size (ascending or descending order) the middle value is called the ________________________________

c  The score that occurs the most is called the ________________________________

d  The difference between the highest and the lowest scores is called the ________________________________

e  Any quantity that varies is called a ________________________________

f  ___________________________ data consists of exact values that are generally whole numbers.

g  ___________________________ data involves measurements and can have any value in a given range.
Data representation and analysis

UNIT 2: Techniques for collecting data

**Question 1**
Briefly describe the difference between a survey of a whole population and a sample of the population.

**Question 2**
List a few reasons why it might be appropriate to survey a sample rather than the whole population.

**Question 3**
Daniel, a Year 12 student, surveyed his class and found that 25% had watched a particular movie on television the night before. Daniel concluded that approximately $\frac{1}{4}$ of the school's population would have watched the movie. Is this a reasonable conclusion? Justify your answer.

**Question 4**
This question appeared in a survey. ‘Obviously it would be far better to take action immediately rather than risk further problems. Do you agree?’ Why is this not a good question?

**Question 5**
State whether the data is numerical or categorical. If numerical, also state whether it is discrete or continuous.

| a | the mass of packets of noodles. |
| b | the day of the week on which your birthday falls. |
| c | the type of trees growing in a back yard. |
| d | favourite colours. |
| e | the number of students in each class at school. |
| f | the heights of buildings. |
| g | the heights of saplings. |
| h | the ages of people at a concert. |
| i | the breed of dogs at a dog shelter. |
| j | the number of medals won at Olympic games. |
| k | the type of medal (gold, silver, bronze) won at Olympic games. |
| l | maximum temperatures recorded. |
| m | favourite movies. |
| n | the sex of chickens. |
| o | the weights of babies. |
UNIT 3: Mean

**QUESTION 1**  Find the mean of each of the following sets of scores.

a  10, 11, 12  

b  6, 8, 12, 16  

c  12, 13, 14, 15  

d  11, 15, 19, 23  

e  9, 11, 14, 16  

f  17, 18, 21, 22, 24, 30  

**QUESTION 2**  Find the mean of each of the following sets of scores.

a  5, 5, 7, 7, 7, 7, 9, 9, 9, 9  

b  11, 11, 12, 12, 12, 11, 11, 11, 11  

c  12, 12, 15, 15, 15, 16, 16, 16, 16  

d  6, 6, 6, 6, 6, 7, 7, 8, 8, 9  

e  8, 9, 10, 11, 10, 9, 8, 7  

f  16, 15, 17, 14, 13, 14, 16, 15  

**QUESTION 3**  Find the mean of each of the following sets of scores.

a  15, 15, 15, 18, 18, 20, 20, 20, 20  

b  10, 10, 12, 12, 12, 13, 14, 16  

c  7, 7, 7, 9, 9, 9, 9, 9, 10, 10, 10, 10  

d  8, 8, 8, 9, 9, 9, 10, 10, 10, 11, 11, 11  

**QUESTION 4**  Complete i the frequency distribution tables and ii calculate the mean for each table.

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<thead>
<tr>
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<th>f</th>
<th>fx</th>
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</thead>
<tbody>
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<tr>
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<td></td>
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</table>

**ii**

<table>
<thead>
<tr>
<th>x</th>
<th>f</th>
<th>fx</th>
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</thead>
<tbody>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>x</th>
<th>f</th>
<th>fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
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<tr>
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<td>1</td>
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<td>9</td>
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<td>11</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
UNIT 4: Mode

**Question 1** What is the mode of the following sets of scores?

| a 3, 3, 4, 9, 10, 4, 3, 6, 3, 4 | b 8, 9, 7, 8, 10, 8, 5, 6, 8, 7, 8 |
| c 5, 6, 7, 6, 6, 5, 6, 6, 6, 4 | d 9, 7, 8, 7, 9, 9, 10, 9, 11, 9 |
| e 7, 8, 9, 10, 10, 10, 11, 6, 10, 7 | f 4, 7, 5, 7, 5, 7, 4, 3, 7, 7, 7, 8 |
| g 6, 7, 9, 6, 5, 6, 7, 6 | h 8, 5, 7, 7, 7, 8, 7, 7, 9, 6 |

**Question 2** Find the mode from each set of scores.

| a 9, 8, 10, 8, 11, 9, 8, 10, 8 | b 8, 7, 8, 9, 6, 5, 8, 8, 4, 8 |
| c 6, 7, 5, 8, 8, 6, 8, 6, 5, 8, 9 | d 7, 8, 10, 8, 7, 8, 7, 8, 8, 9, 8, 8 |
| e 11, 10, 11, 14, 11, 12, 11, 11 | f 8, 9, 8, 7, 6, 8, 8, 6, 8, 8 |
| g 37, 32, 33, 37, 38, 37, 37, 39, 37 | h 9, 4, 5, 9, 7, 9, 7, 9, 6, 5, 9, 9, 4, 9 |

**Question 3** Select the mode from each set of scores.

| a 7, 8, 8, 7, 9, 7, 10, 7, 7, 9 | b 5, 6, 7, 7, 5, 5, 6, 5, 9 |
| c 6, 7, 8, 7, 6, 5, 7, 7, 8, 7 | d 7, 6, 9, 9, 6, 9, 8, 9, 10, 9, 9 |
| e 3, 4, 5, 5, 6, 5, 6, 5, 7, 6, 5, 5, 5, 4, 5 | f 5, 6, 7, 5, 8, 5, 6, 5, 7, 5, 7, 5, 3, 5 |

**Question 4** Find the mode from each set of scores.

| a 8, 9, 8, 8, 10, 8, 9, 8, 8, 8 | b 5, 6, 7, 6, 5, 4, 5, 5, 6, 5 |
| c 5, 4, 7, 7, 4, 7, 6, 7, 8, 7, 7 | d 4, 5, 6, 6, 7, 6, 7, 6, 8, 7, 6, 6, 6, 5, 6 |
| e 7, 8, 9, 7, 10, 7, 8, 7, 8, 7, 9, 7, 5, 7 | f 6, 7, 6, 6, 8, 6, 7, 6, 6, 6 |
UNIT 5: Median

QUESTION 1  Find the median of the following sets of scores.

a  4, 5, 6, 8, 6  
   b  1, 2, 3, 4, 5, 6  
   c  4, 7, 8, 7, 8, 9, 8  
   d  10, 14, 16, 12, 11  
   e  5, 3, 6, 8, 4, 7  
   f  18, 20, 17, 15, 15

QUESTION 2  What is the median of each set of scores?

a  5, 6, 7, 9, 7  
   b  15, 18, 22, 15, 17, 16, 15  
   c  5, 8, 9, 8, 9, 10, 9  
   d  7, 11, 13, 9, 8  
   e  6, 4, 9, 7, 5, 8  
   f  15, 13, 17, 14, 12, 12

QUESTION 3  Find the median of the following sets of scores.

a  10, 11, 12, 13, 14  
   b  47, 57, 37, 27, 57, 77, 67  
   c  12, 14, 7, 11, 8, 13, 9, 10, 14  
   d  9, 12, 7, 4, 3, 4, 9, 8, 6, 5, 12  
   e  11, 3, 8, 5, 4, 7, 9, 10, 6, 9, 11, 8  
   f  5, 10, 3, 8, 11, 8, 6, 9, 10, 11, 11

QUESTION 4  Find the median of the following sets of scores.

a  24, 27, 19, 20, 23, 24, 27  
   b  10, 9, 8, 10, 7, 15, 11, 11, 5  
   c  8, 11, 16, 13, 12, 13, 16, 11, 8, 7, 8  
   d  6, 12, 5, 9, 12, 9, 7, 10, 11, 12, 12  
   e  7, 11, 13, 9, 8, 9, 8, 7, 11  
   f  16, 12, 18, 15, 13, 14, 13  
   g  6, 9, 7, 12, 25, 6, 9  
   h  11, 15, 19, 18, 16, 15  
   i  9, 11, 13, 14, 15, 6, 12  
   j  9, 8, 7, 9, 6, 14, 12, 12, 6
UNIT 6: Range

QUESTION 1  Find the range of the following sets of scores.

a  11, 5, 4, 7, 8, 10, 3
b  2, 7, 10, 4, 8, 0, 2, 7, 14

c  7, 10, 5, 6, 4, 15
d  16, 13, 9, 8, 11, 9, 10

e  9, 11, 8, 13, 15, 17
f  11, 8, 9, 16, 21, 8, 7

g  12, 9, 14, 24, 3, 25
h  22, 24, 30, 22, 20, 6, 0

QUESTION 2  Find the range of each set of scores.

a  7, 9, 6, 5, 11, 24, 7, 10
b  0, 2, 3, 4, 5, 8, 21, 2, 0, 6

c  7, 12, 13, 4, 9, 10, 9
b  2, 15, 7, 39, 10, 48

e  5, 12, 7, 5, 18, 21, 27, 39
f  6, 8, 11, 21, 23, 59, 36

g  12, 14, 32, 47, 92, 38
h  6, 12, 14, 27, 48, 54, 69

QUESTION 3  Find the range of the following sets of scores.

a  16, 28, 29, 30, 51, 2, 19
b  3, 8, 0, 5, 9, 22, 31, 64

c  2, 9, 12, 6, 18, 8, 63, 49
b  8, 13, 7, 5, 13, 18, 32, 54

e  48, 38, 49, 14, 14, 53
f  8, 24, 31, 29, 39, 32, 35

QUESTION 4  Find the range of each set of scores.

a  7, 12, 10, 32, 26
b  10, 14, 15, 8, 20, 34, 66

c  9, 12, 8, 15, 43, 79, 25
d  15, 17, 19, 22, 29, 14, 20, 21, 23

e  20, 8, 13, 10, 12, 8, 7, 30, 47
f  4, 2, 9, 18, 9, 65, 32
UNIT 7: Investigating issues

QUESTION 1  This table shows the percentage of the adult population who smoked at two different years.

<table>
<thead>
<tr>
<th></th>
<th>1945</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>72%</td>
<td>16%</td>
</tr>
<tr>
<td>Female</td>
<td>26%</td>
<td>14%</td>
</tr>
</tbody>
</table>

a  The adult female population was about 2.5 million in 1945 and about 7.2 million in 2010. Did the number of female smokers increase or decrease over that time? Justify your answer.

b  Identify two different trends or issues that can be seen from this table.

QUESTION 2  A group of 100 students were asked how many serves of fruit they ate each day. The results are shown in the graph.

a  How many of the students ate 6 or more serves of fruit per day?

b  What was the most common number of serves eaten per day?

The minimum recommended fruit consumption is 3 serves per day.

c  What percentage of students ate just the minimum amount?

d  What percentage of students ate less than the minimum recommended amount?

e  What percentage of students ate more than the minimum recommended amount?

f  What conclusions can be drawn from the data and what issues are raised?

g  The same group of students were also asked how many serves of vegetables they ate each day. The results were almost identical to those for fruit. The recommended minimum vegetable consumption is 4 serves per day. Comment.
UNIT 8: Frequency histograms and frequency polygons

**Question 1** For the set of scores given,

a. complete the frequency distribution table

b. draw a frequency histogram

c. draw a frequency polygon

5 10 8 5 4 7 7 10 7 5

9 6 7 9 10 4 7 10 8 6

8 11 9 9 8 9 10 11 9 7

7 9 8 10 8 9 8 9 9 8

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

**Question 2** From the following distribution table, draw a frequency histogram and a frequency polygon.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
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<td>11</td>
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<tr>
<td>13</td>
<td>8</td>
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<tr>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
</tr>
</tbody>
</table>
UNIT 9: Cumulative frequency histograms and polygons

**QUESTION 1** A class of 25 students sat for a test. The results are shown in the frequency table.

a. Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
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</tr>
<tr>
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<tr>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

b. Draw a cumulative frequency histogram and polygon.

**QUESTION 2** A class of 20 students obtained the following results in a class test.

8 4 10 9 10 5 6 8 6 8
12 11 10 9 6 7 10 12 10 5

a. Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT 10: Description of data (1)

QUESTION 1 The graph drawn opposite shows the distribution of a set of scores on a class test.

a Is the graph symmetrical? ________________

b Is the graph bi-modal? ________________

c Find the mode(s). ________________

d Can we see the mean and the median from the graph?


QUESTION 2 For the distribution drawn opposite, answer the following questions.

a Is the graph symmetrical? ________________

b Is the graph bi-modal? ________________

c Find the mode(s). ________________

d Describe the skewness of the data.


QUESTION 3 For the distribution drawn opposite, answer the following.

a Is the graph symmetrical? ________________

b Is the graph bi-modal? ________________

c Find the mode(s). ________________

d Describe the skewness of the data.


QUESTION 4 The table below shows the number of goals scored by a team during the last season.

a Show this information in a frequency histogram.

b Is the graph symmetrical? ________________

c Is the graph bi-modal? ________________

d Find the mode(s). ________________

e Can we see the mean and median from the graph and if so, what are their values?


<table>
<thead>
<tr>
<th>Number of goals</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
UNIT 11: Description of data (2)

**QUESTION 1**  For each of the following histograms, state whether the distribution is symmetrical, positively skewed, negatively skewed or none of these.

a

b

c

d

**QUESTION 2**  State whether each set of the following data is symmetrical, positively skewed, negatively skewed or none of these.

a

b

c

d
UNIT 12: Dot plots

**Question 1** Fifty families were surveyed to find how many children each family had. The following data was obtained.

```
5 3 2 4 1 5 0 2 3 2
2 1 1 2 2 4 1 3 2 1
3 3 2 3 2 3 2 1 3 1
2 3 0 1 1 5 3 4 5 0
3 0 2 0 2 3 1 5 4 3
```

a Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b How many scores are less than 3?

c Draw a dot plot by using the frequency distribution table.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**Question 2** The following data show the number of hours a group of 30 students watched a television program in one month.

```
6 8 8 7 10 6 6 7 8 12
8 7 6 6 6 9 9 8 6 9
11 9 6 9 6 8 9 12 13 6
```

a Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b Use the table to draw a dot plot.

<table>
<thead>
<tr>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
</table>

**Question 3** Sketch a dot plot for each set of data.

a 3, 6, 3, 2, 5, 7, 3, 4, 6, 5, 4, 3, 3, 4, 5

b 3, 4, 2, 1, 2, 5, 3, 6, 7, 7, 1, 2, 4, 3, 1, 3, 4, 1, 2, 3, 4, 5, 5, 5, 2, 3, 1
UNIT 13: Stem-and-leaf plots

**Question 1**  The following stem-and-leaf plot shows the ages of a group of people who responded to a survey.

<table>
<thead>
<tr>
<th>1</th>
<th>2 3 4 5 5 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0 0 0 1 2 3 5</td>
</tr>
<tr>
<td>3</td>
<td>1 2 2 3 3 3 3 4 5</td>
</tr>
<tr>
<td>4</td>
<td>0 0 0 1 3 5 5 8</td>
</tr>
<tr>
<td>5</td>
<td>0 1 1 2 3 4</td>
</tr>
</tbody>
</table>

Find:

a  how many people responded

b  the range of the ages

c  how many were over the age of 50

d  how many people were the same age as another person in the survey

e  the median age

f  the mode.

**Question 2**  Draw a stem-and-leaf plot for the following set of scores obtained by students in their mathematics class test.

60 48 70 80 91 88
73 85 92 67 86 95
52 68 39 32 77 83
45 69 72 78 83 92
53 58 78 63 95 67

**Question 3**  Construct a stem-and-leaf plot for the following data, which show the number of telephone calls made by 35 people in 1 month.

25 33 49 49 57 65 73
81 89 26 33 49 47 54
61 68 75 82 89 76 71
66 61 56 51 46 49 49
33 25 65 73 72 81 48

Find:

a  the range

b  the mode

c  the median

d  the mean.
UNIT 14: Back-to-back stem-and-leaf plots

**QUESTION 1** The following stem-and-leaf plot shows the number of dollars spent by a group of 50 tourists, when having dinner at a Sydney restaurant.

<table>
<thead>
<tr>
<th>Dollars spent</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 5 3 3 1</td>
<td></td>
<td>3 4 5 5 6</td>
</tr>
<tr>
<td>2 2 1 4</td>
<td></td>
<td>1 2 2 3</td>
</tr>
<tr>
<td>6 3 2 1 5</td>
<td>6 5 5 6</td>
<td></td>
</tr>
<tr>
<td>7 7 8</td>
<td>5 6 7 7 7 9 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 8 7 7 0 3 9 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 5 4 4 2 8 2 5 5 7 8</td>
<td></td>
</tr>
</tbody>
</table>

a How many tourists were male? _______________

b How many were female? _______________

c How many spent over $60? _______________

d How many spent less than $50? _______________

e How many of the group spent less than $40? _______________

**QUESTION 2** The following sets of data show the ages of males and females who went on a cruise during the holidays.

a Display these sets of data on a back-to-back stem-and-leaf plot.

Males

<table>
<thead>
<tr>
<th>Age</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>30 25 18 10 28 32 35 23 21</td>
</tr>
<tr>
<td>18</td>
<td>10 23 32 31 42 38 41 23 25</td>
</tr>
</tbody>
</table>

Females

<table>
<thead>
<tr>
<th>Age</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>16 25 19 12 27 31 32 36 43</td>
</tr>
<tr>
<td>48</td>
<td>31 16 27 31 27 32 16 31 43</td>
</tr>
</tbody>
</table>

b What is the range for males? __________
c What is the range for females? __________

d What is the mode for males? __________
e What is the mode for females? __________
f What is the median for males? __________
g What is the median for females? __________

**QUESTION 3** The following sets of data show the assessment marks (as percentages) for 2 different tasks given to a group of students.

Task A

<table>
<thead>
<tr>
<th>Marks</th>
<th>Task A</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 10 15 30 32 34 35 38 43 52</td>
<td></td>
</tr>
<tr>
<td>56 61 63 68 70 71 73 78 79 80</td>
<td></td>
</tr>
<tr>
<td>84 84 92 92 92 92 98 98 98 99</td>
<td></td>
</tr>
</tbody>
</table>

Task B

<table>
<thead>
<tr>
<th>Marks</th>
<th>Task B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 6 7 12 15 21 22 23 23 25</td>
<td></td>
</tr>
<tr>
<td>28 31 31 31 48 52 53 56 62</td>
<td></td>
</tr>
<tr>
<td>69 69 69 81 85 88 93 94 99 100</td>
<td></td>
</tr>
</tbody>
</table>

a Display these sets of data on a back-to-back stem-and-leaf plot.

b Find the range for task A. __________
c What is the range for task B? __________

d Find the range for both the tasks combined. __
e What is the total number of students? __________
f Find the mode for task A. __________
g Find the mode for task B. __________
h What is the median for task A? __________
i What is the median for task B? __________
j Which task did students find easier? __________
UNIT 15: Comparing data

**Question 1** Two classes sat for the same test, marked out of ten. The results are shown in the table.

<table>
<thead>
<tr>
<th>Mark</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>9J</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9M</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

a Find the mean, to 2 decimal places, for 9J?

b Find the mean, to 2 decimal places, for 9M?

c What is the mode for 9J?

d What is the mode for 9M?

e What is the median for 9J?

f What is the median for 9M?

g What is the range for 9J?

h What is the range for 9M?

i Which class had the more consistent results? Justify your answer.

j Which class performed better? Justify your answer.

**Question 2** The heights of a group of male students and of a group of female students were measured and the results (in centimetres) are shown in the stem-and-leaf plot.

<table>
<thead>
<tr>
<th>Males</th>
<th>12</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>13 0 4 8</td>
</tr>
<tr>
<td></td>
<td>7 6</td>
<td>14 1 3 3 5 7 9</td>
</tr>
<tr>
<td></td>
<td>9 8 4</td>
<td>15 0 2 3 4 6</td>
</tr>
<tr>
<td></td>
<td>9 6 6 5 3 2</td>
<td>16 1 2 7</td>
</tr>
<tr>
<td></td>
<td>8 8 7 6 4 3 3 1 0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>9 5 4 2</td>
<td>18</td>
</tr>
</tbody>
</table>

| Females | 0 3 4 8 7 7 4 0 |

a How many males are taller than the tallest female?

b Which group has the biggest range and by how much?

c Which group has heights that are more consistent?

d What is the median for males?

e What is the median for females?

f Find the mean height, to 2 decimal places, for males.

g Find the mean height, to 2 decimal places, for females.

h Comment on any similarities and differences between the groups. Give reference to the measures of location and the shape of the plot.
Data representation and analysis

**TOPIC TEST**

**PART A**

**Instructions**
- This part consists of 10 multiple-choice questions.
- Fill in only ONE CIRCLE for each question.
- Each question is worth 1 mark.

**Time allowed: 15 minutes**

**Total marks: 10**

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

1. For the set of scores 6, 1, 2, 8, 9, 3, 2, 14, 18, 3, 2, 19, find the range.
   - A 1
   - B 2
   - C 18
   - D 19

2. The median of the numbers 8, 3, 7, 5, 10, 8, 3 is
   - A 3
   - B 5
   - C 7
   - D 8

3. The mean of the numbers 4, 8 and \( x \) is the same as the mean of the numbers 4, 6, 8 and 10. Find the value of \( x \).
   - A 6
   - B 7
   - C 8
   - D 9

4. Which shows data that is negatively skewed?
   - A
   - B
   - C
   - D

5. Which is NOT an example of numerical data?
   - A The numbers of students in classes
   - B The heights of students
   - C The postcodes of students
   - D The ages of students

Questions 6 to 9 refer to the set of scores

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

6. The mode is
   - A 3
   - B 5
   - C 7
   - D 8

7. The mean to the nearest whole number is
   - A 2
   - B 3
   - C 4
   - D 5

8. The median is
   - A 2
   - B 3
   - C 4
   - D 5

9. The range is
   - A 4
   - B 5
   - C 7
   - D 8

10. For the set of scores 5, 7, 3, 7, 6, 7, 9, 7, 8, 7, 7, 5, 3, find the difference between the mode and the median.
    - A 0
    - B 1
    - C 2
    - D 3

**Total marks achieved for PART A**

10
# TOPIC TEST

**Instructions**
- This part consists of 15 questions.
- Each question is worth 1 mark.
- Write only the answer in the answer column.
- For any working use the question column.

**Time allowed:** 20 minutes  
**Total marks:** 15

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> In a competition, competitors are given scores for skill and for artistic endeavour. The dot plots show the scores for a recent competition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a Which set of scores is bimodal?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b Which dot plot is symmetrical?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c What is the mean of the artistic scores? Give the answer correct to 2 decimal places.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d Which scores are more consistent?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e What is the difference between the medians of the scores?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Competition Results</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skills</strong></td>
<td><strong>Artistic</strong></td>
</tr>
<tr>
<td>3 4 5 6 7 8 9 10</td>
<td>3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>9P</strong></td>
<td><strong>9Y</strong></td>
</tr>
<tr>
<td>8 4 4 7 6 3 2 1 5 4 5 6 7 7</td>
<td>8 7 5 4 0 6 2 3 3 6 8 9 9 7 6 5 5 2 7 0 4 4 5 7 8 8 7 6 4 1 0 8 1 5 6 9 9 8 3 9 0</td>
</tr>
</tbody>
</table>

| **2** The stem-and-leaf plot shows the results from two classes in the same exam. | | |
| a What is the range for 9P? | | |
| b What is the mode for 9Y? | | |
| c What is the median for 9Y? | | |
| d Which class had the more consistent scores? | | |
| e What percentage of 9Y students scored more than the median mark of 9P students? | | |

<table>
<thead>
<tr>
<th><strong>9P</strong></th>
<th><strong>9Y</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 4 4 7 6 3 2 1 5 4 5 6 7 7</td>
<td>8 7 5 4 0 6 2 3 3 6 8 9 9 7 6 5 5 2 7 0 4 4 5 7 8 8 7 6 4 1 0 8 1 5 6 9 9 8 3 9 0</td>
</tr>
</tbody>
</table>

| **3** A class of 20 students scored the following marks in a Mathematics test. | | |
| a Complete the frequency distribution table. | | |
| b Draw a cumulative frequency histogram. | | |
| c Draw a cumulative frequency polygon. | | |
| | | |
| **Score (x)** | **Tally** | **Frequency (f)** |
| 7 3 9 8 9 11 10 9 8 5 4 5 7 5 7 6 9 11 9 4 | | |

| **4** Determine whether the following statements are true or false. | | |
| a The scores are bimodal. | | |
| b The histogram is positively skewed. | | |

<table>
<thead>
<tr>
<th><strong>Score (x)</strong></th>
<th><strong>Cumulative frequency (f)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7 3 9 8 9 11 10 9 8 5 4 5 7 5 7 6 9 11 9 4</td>
<td></td>
</tr>
</tbody>
</table>

**Total marks achieved for PART B**

15
Exam Paper 1

Instructions for all parts • Attempt all questions.
Time allowed: 1 hour

Part A: Allow about 20 minutes for this part.
Part B: Allow about 20 minutes for this part.
Part C: Allow about 20 minutes for this part.

Total marks: 75

EXAM PAPER 1

Fill in only one circle for each question.

1. If 638 718 is rounded off to the nearest thousand, the number is
   A. 638 700  
   B. 638 800  
   C. 638 000  
   D. 639 000

2. $0.8 \times 0.15 =$
   A. 0.0012  
   B. 0.12  
   C. 0.012  
   D. 1.2

3. $0.000 \, 38$ equals
   A. $3.8 \times 10^{-3}$  
   B. $3.8 \times 10^{3}$  
   C. $3.8 \times 10^{4}$  
   D. $3.8 \times 10^{-4}$

4. $5a^3 \times 6a^4$ equals
   A. $30a^{12}$  
   B. $11a^{12}$  
   C. $30a^7$  
   D. $11a^7$

5. $9 \times p \times p \times q \times q \times q \times q$ is equal to
   A. $9p^2q^3$  
   B. $9p^3q^2$  
   C. $9p^2q^2$  
   D. $9p^3q^3$

6. $36 \, 500 \, 000$ written in scientific notation is
   A. $3.65 \times 10^6$  
   B. $36.5 \times 10^{-6}$  
   C. $3.65 \times 10^7$  
   D. $36.5 \times 10^{-7}$

7. $6y^0$ equals
   A. $6y$  
   B. 0  
   C. 1  
   D. 6

8. If $a = 5 - 3b^2$ and $b = 2$ then $a$ is equal to
   A. $-31$  
   B. $-7$  
   C. 17  
   D. 41

9. How many microseconds are in 1 second?
   A. 10000  
   B. 100000  
   C. 1000000  
   D. 1000000000

Continued on the next page
10. 3.25 km =
   A. 325 m
   B. 32 500 mm
   C. 3250 m
   D. 32 500 m

11. The angles of a triangle are in the ratio 1:2:3. Find the smallest angle.
   A. 30°
   B. 45°
   C. 60°
   D. 72°

12. Which is the equation of a circle?
   A. $x + y = 1$
   B. $x^2 + y^2 = 1$
   C. $y = x^2 + 1$
   D. $y = 2^x$

13. 20% of an amount is $10. The amount is
   A. $20
   B. $30
   C. $40
   D. $50

14. A square has a perimeter of 32 cm. Its area is
   A. 32 cm²
   B. 48 cm²
   C. 64 cm²
   D. 72 cm²

15. Write 100 000 as a power of 10.
   A. $10^7$
   B. $10^6$
   C. $10^5$
   D. $10^4$

16. When a die is thrown, find the probability of getting an even number.
   A. $\frac{1}{4}$
   B. $\frac{1}{3}$
   C. $\frac{1}{2}$
   D. $\frac{2}{3}$

17. The mode of the set of scores 2, 3, 3, 4, 5, 3, 8, 3, 6, 4 is
   A. 2
   B. 3
   C. 4
   D. 5

18. The angle sum of a quadrilateral is always equal to
   A. 90°
   B. 180°
   C. 270°
   D. 360°

19. The hypotenuse of a right-angled triangle is always opposite to the
   A. acute angle
   B. right angle
   C. obtuse angle
   D. straight angle

20. Write $y = -3x + 7$ in general form.
   A. $-3x + y + 7 = 0$
   B. $3x - y + 7 = 0$
   C. $3x + y - 7 = 0$
   D. $-3x - y + 7 = 0$

Total marks achieved for PART A: 20
<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>21  Write 85 634 correct to three significant figures.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22  Simplify $6 : 3 \frac{1}{2}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>23  Write $\frac{7}{9}$ as a decimal.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>24  Evaluate $2^4 \times 5^2$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>25  Write 243 as a power of 3</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>26  Simplify $9x^0 + (9x)^0$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>27  Find the value of $x$ in $3^5 \times 3^{-8} = 3^y$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>28  Use your calculator to evaluate $\sqrt[4]{46 \times 52}$ correct to 3 decimal places.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>29  Dennis earns $65 832 p.a. Find his weekly pay.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>30  A dinner set with a mark-up of 15% sells for $430. How much profit is made?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>31  How many centimetres are in 1 kilometre?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>32  Find the area of the sector given opposite, to two decimal places.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>33  Write five million using powers of 10.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>34  Express 482 600 in scientific notation.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>35  If the probability of an event is $\frac{1}{8}$, about how many times would you expect it to occur in 2000 trials?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>36  A number from 1 to 10 is chosen at random. What is the probability of choosing a seven or an even number?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>37  Find the range for the set of scores 3, 8, 12, 15, 32, 41, 85.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>38  Find the value of $y$.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>39  Find the size of each interior angle of a regular polygon with 12 sides.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>40  Find the value of $\frac{83.6 \cos 58^\circ}{\sin 60^\circ}$ to two decimal places.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>41  Find acute angle $A$ to the nearest degree if $\tan A = \frac{28 \sin 85^\circ}{17}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>42  Find the midpoint of (5, 7) and (1, 3).</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>43  Does the point $(-1, 3)$ lie on the line $y = 2x + 5$?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>44  For the parabola $y = 4 - x^2$ what is the largest possible value of $y$?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>45  Find the volume of a pentagonal prism that is 10 cm high and has a base area of 76.4 cm$^2$.</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART B  25
Show all working for each question.

### 46
**a** Expand $5(x + 4) - 3(x + 3)$

**b** Solve $5(x + 4) - 3(x + 3) = 36$

---

### 47
**a** Name a pair of similar triangles.

**b** Why are the triangles similar?

**c** Find the value of $x$.

---

### 48
Toby buys a car priced at $9900. He pays 20% deposit and takes out a loan for the remainder. Simple interest of 5% pa is charged on the loan and it is to be repaid with equal monthly instalments over 3 years.

**a** How much is the deposit?  

**b** How much does Toby borrow?  

**c** How much is the interest?  

**d** What is the total to be repaid?  

**e** How much is the monthly payment?

---

### 49
For the equation $2x - 3y = 6$,

**a** find the $x$-intercept  

**b** find the $y$-intercept

---

**c** draw the graph of the line.

If the line cuts the $x$-axis at $A$ and $y$-axis at $B$,

**d** find the distance $AB$  

**e** find the gradient of the line $AB$.

---

Continued on the next page
Show all working for each question.

50 A bag contains 5 balls, 2 white and 3 blue. A ball is withdrawn at random and not replaced. 
A second ball is then withdrawn at random. Find the probability that:

a  the first ball is blue ______________________

b both balls are blue ______________________

c both balls are the same colour. ______________________

If the first ball was replaced, find the probability that:

d both balls are blue ______________________

e both balls are the same colour. ______________________

51 The following back-to-back stem-and-leaf plot shows
the ages of a group of 50 tourists (males and females)
who toured Sydney.

a How much greater is the range for males than
for females? ______________________

b Find the median age for females. ______________________

c How much higher is the median age for males
than for females? ______________________

d Which group (males or females) has a more symmetrical distribution? ______________________

e The distribution for the other group is slightly skewed. Is this positive or negative?
______________________________

52 The diagram shows a shed. The cross-section is made up of a triangle and rectangle.

a Use trigonometry to find the value of x (to one decimal place).

b Use Pythagoras’ theorem to find the length of the
hypotenuse of the triangle.

c Find the area of the
d Find the area of the
e Find the volume of the shed.

triangle. cross-section.
Exam Paper 2

Instructions for all parts • Attempt all questions.
Time allowed: 1 hour

Part A: Allow about 20 minutes for this part.
Part B: Allow about 20 minutes for this part.
Part C: Allow about 20 minutes for this part.

Total marks: 75

EXAM PAPER 2 PART A

Fill in only one circle for each question.

1 \[ \frac{7}{10} + \frac{13}{1000} \] equals
A 0.137 \hspace{1cm} B 0.173
C 0.713 \hspace{1cm} D 0.317

2 \(-8 - (-9)\) equals
A \(-17\) \hspace{1cm} B \(1\)
C \(-1\) \hspace{1cm} D \(17\)

3 $90 is divided in the ratio 1:2:3. The largest portion is:
A \$15 \hspace{1cm} B \$30
C \$45 \hspace{1cm} D \$60

4 The reciprocal of \(\frac{1}{2} + \frac{1}{4}\) is
A \(\frac{3}{4}\) \hspace{1cm} B \(\frac{4}{3}\)
C \(\frac{1}{3}\) \hspace{1cm} D \(\frac{1}{8}\)

5 The mode of the set of scores 2, 3, 2, 4, 2, 6, 2, 8, 3, 4, 3 is
A 2 \hspace{1cm} B 3
C 4 \hspace{1cm} D 6

6 0.000 005 632 written in scientific notation is
A \(5.632 \times 10^{-6}\) \hspace{1cm} B \(5.632 \times 10^{-6}\)
C \(56.32 \times 10^{-7}\) \hspace{1cm} D \(56.32 \times 10^{-7}\)

7 If \(2.5 - x = 3\) then \(x\) equals
A \(5.5\) \hspace{1cm} B \(-5.5\)
C \(0.5\) \hspace{1cm} D \(-0.5\)

8 The size of the exterior angle of a regular hexagon is
A \(30^\circ\) \hspace{1cm} B \(60^\circ\)
C \(90^\circ\) \hspace{1cm} D \(120^\circ\)

9 \((-2m^3)^2\) can be expanded to
A \(2m^6\) \hspace{1cm} B \(-4m^5\)
C \(-4m^6\) \hspace{1cm} D \(4m^6\)

Continued on the next page
### EXAM PAPER 2

**PART A**

Fill in only one circle for each question.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>((2^3)^2 \div (2^3)^3) equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 4</td>
<td>B (\frac{3}{4})</td>
</tr>
<tr>
<td></td>
<td>C (\frac{1}{4})</td>
<td>D 1</td>
</tr>
<tr>
<td>11</td>
<td>27352 written to three significant figures is equal to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 274</td>
<td>B 284</td>
</tr>
<tr>
<td></td>
<td>C 27300</td>
<td>D 27400</td>
</tr>
<tr>
<td>12</td>
<td>2 \text{ km} + 75 \text{ m} + 36 \text{ cm} equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 2.075 36 \text{ m}</td>
<td>B 275.36 \text{ m}</td>
</tr>
<tr>
<td></td>
<td>C 2075.36 \text{ m}</td>
<td>D 27 536 \text{ m}</td>
</tr>
<tr>
<td>13</td>
<td>((1)^7 + (-1)^7) equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A -2</td>
<td>B -1</td>
</tr>
<tr>
<td></td>
<td>C 0</td>
<td>D 2</td>
</tr>
<tr>
<td>14</td>
<td>20 - 3 \times 4 + 7 equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 75</td>
<td>B -11</td>
</tr>
<tr>
<td></td>
<td>C 15</td>
<td>D -13</td>
</tr>
<tr>
<td>15</td>
<td>Find the gradient of the line whose equation is (2x - 5y = 10).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A (\frac{5}{2})</td>
<td>B (-\frac{5}{2})</td>
</tr>
<tr>
<td></td>
<td>C (\frac{2}{5})</td>
<td>D (-\frac{2}{5})</td>
</tr>
<tr>
<td>16</td>
<td>The graph (3x + 2y - 2 = 0) cuts the x-axis at the point where (x) is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A (-\frac{2}{3})</td>
<td>B (\frac{2}{3})</td>
</tr>
<tr>
<td></td>
<td>C (-\frac{3}{2})</td>
<td>D (\frac{3}{2})</td>
</tr>
<tr>
<td>17</td>
<td>Anna was paid $320 for 16 hours of work. What was her hourly rate of pay?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A $19</td>
<td>B $20</td>
</tr>
<tr>
<td></td>
<td>C $21</td>
<td>D $22</td>
</tr>
<tr>
<td>18</td>
<td>Which one of the following fractions lies between (\frac{3}{4}) and (\frac{3}{2})?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A (\frac{3}{5})</td>
<td>B (\frac{9}{8})</td>
</tr>
<tr>
<td></td>
<td>C (\frac{8}{9})</td>
<td>D (\frac{5}{6})</td>
</tr>
<tr>
<td>19</td>
<td>(5a \times 9b) equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A (14ab)</td>
<td>B (45ab)</td>
</tr>
<tr>
<td></td>
<td>C (a^2b^9)</td>
<td>D none of these</td>
</tr>
<tr>
<td>20</td>
<td>((1\frac{1}{2})^2) equals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A 3</td>
<td>B (\frac{4}{4})</td>
</tr>
<tr>
<td></td>
<td>C (\frac{2}{4})</td>
<td>D (\frac{2}{2})</td>
</tr>
</tbody>
</table>

**Total marks achieved for PART A**

166

Excel ESSENTIAL SKILLS Year 9 Mathematics Revision & Exam Workbook

© Pascal Press ISBN 978 1 74125 271 2  Excel Essential Skills Mathematics Revision & Exam Workbook Year 9
Write only the answer in the answer column. For any working use the question column.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Round 635.7 to one significant figure.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22 Simplify $60c : $15$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>23 Find the missing term. $\boxed{\times a^2y^2 = 7a^b y^6}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>24 A gardener works from 7 am to 4 pm each day from Monday to Friday earning $23.65 per hour. Find his weekly earnings.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>25 Find the percentage rate of commission when a car sales assistant earns $1560 on the sale of a car worth $60800.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>26 Find the perimeter of a regular octagon with side length 8.5 cm.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>27 The radius of the Earth is about 6400 km. What is the circumference of the Earth?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>28 Write $10^{-2}$ as a fraction.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>29 The diameter of a small virus is $3 \times 10^{-7}$ mm. Write this as an ordinary decimal number.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>30 From a pack of 52 cards, a card is drawn at random. What is the probability that it is not a spade?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>31 A die is rolled. What is the probability that the number rolled is not a six?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>32 Find the mean of the set of scores 8, 6, 4, 6, 5, 6, 10.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>33 Write the name for a polygon with 10 sides.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>34 For the triangle given opposite, find the value of $a$.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>35 Find the sum of the interior angles of a polygon with 15 sides.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>36 For the triangle given opposite, find the value of $\cos A$ as a fraction.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>37 Find the value of $\frac{15.4 \tan 27^\circ}{6.3}$ correct to 2 significant figures.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>38 What is the probability of two tails when 2 coins are tossed at the same time?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>39 Simplify $\frac{ab^2}{(ab)}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>40 Find the midpoint of (5, −7) and (−5, 7).</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>41 Write down the gradient and $y$-intercept for the equation $y = \frac{1}{2}x + 3$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>42 Does the point (3, −4) lie on the equation $2x + 7 = 10$?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>43 What is the equation of the $y$-axis?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>44 Find the surface area of a cube with side length of 4.5 cm.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>45 What is the volume of a packet of muesli bars that is 18 cm long, 10.5 cm high and 5 cm wide?</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Total marks achieved for PART B

25
Show all working for each question.

46 Two circular garden beds are surrounded by the rectangular concrete border as shown in the diagram. The minimum distance from each garden bed to the border, and from one garden bed to the other, is 0.5 m.

a Find the area, to 1 decimal place, of a garden bed.

b Find the length of the rectangle.

c Find the area of the rectangle.

d Find the concreted area, correct to 2 decimal places.

e Laying the concrete costs $85/m². Find the cost of the concrete border. Give the answer to the nearest dollar.

47 A question in an exam was marked out of 10. The results were as follows:

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>40</td>
</tr>
</tbody>
</table>

a What was the mode? _________________

b What was the median? _________________

c How many students scored more than 8? _________________

d What was the relative frequency, as a percentage, of a score of 7?

______________________________

e If a frequency histogram was drawn from this data would it be symmetrical, positively skewed or negatively skewed?

______________________________

48 For the line shown in this graph, write down:

a the gradient _________________

b the y-intercept _________________

c the equation of the line. _________________

49 The diagram shows the graph of \( y = ax^2 + c \).

a What is the value of \( c \)? _________________

b The parabola passes through the point (1, 3). What is the value of \( a \)? _________________

Continued on the next page
Show all working for each question.

50 For this cylinder, find (correct to 3 significant figures):
   a the curved surface area ____________________________
   b the area of the circular end ________________________
   c the total surface area ____________________________
   d the volume ________________________________
   e the capacity in kilolitres _________________________

51 Write true or false for each statement:
   a All equilateral triangles are similar. ________________
   b All isosceles triangles are similar. ________________
   c All right-angled triangles are similar. ______________
   d All congruent triangles are similar. ________________
   e All similar triangles are congruent. ________________

52 a Expand and simplify \(x(2x - 5) - 3(x^2 - 8)\)
   ____________________________ ________________________
   ____________________________ ________________________
   ____________________________ ________________________

   b Solve \(4x - 4 + 6x - 2 = 5x + 4\)
   ____________________________ ________________________
   ____________________________ ________________________

   c An amount of $5000 earns $1000 in simple interest over 4 years. 
   What annual rate of simple interest is paid?
   ____________________________ ________________________
   ____________________________ ________________________
   ____________________________ ________________________

   d Find the length of a diagonal of a 9 cm square (correct to 1 decimal place).
   ____________________________ ________________________
   ____________________________ ________________________
   ____________________________ ________________________

   e Find the value of \(x\).
   ____________________________ ________________________
   ____________________________ ________________________

Total marks achieved for PART C

30
**Exam Paper 3**

**Instructions for all parts**  •  Attempt all questions.

**Time allowed: 1 hour**

**Part A:** Allow about 20 minutes for this part.

**Part B:** Allow about 20 minutes for this part.

**Part C:** Allow about 20 minutes for this part.

**Total marks: 75**

---

**EXAM PAPER 3**

**PART A**

Fill in only one circle for each question.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>$\frac{8}{50}$ is equivalent to</td>
<td><strong>Marks</strong></td>
</tr>
<tr>
<td>A</td>
<td>4%</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>16%</td>
<td></td>
</tr>
</tbody>
</table>

| **2** | $8a^4 \times a^3$ equals |   |
| A | $8a^{12}$ |   |
| B | $8a^7$ | 1 |
| C | $9a^{12}$ |   |
| D | $9a^3$ |   |

| **3** | A rectangle has perimeter 28 cm and area 48 cm$^2$. What are its dimensions in cm? |   |
| A | 3 and 4 | 1 |
| B | 1 and 28 |   |
| C | 2 and 14 |   |
| D | 6 and 8 |   |

| **4** | Convert 2.6 square metres to square centimetres. |   |
| A | 26 |   |
| B | 260 | 1 |
| C | 2600 |   |
| D | 26 000 |   |

| **5** | $(-3)^3 + (-2)^2$ equals |   |
| A | -31 |   |
| B | 31 | 1 |
| C | -23 |   |
| D | 23 |   |

| **6** | Which of the following expressions is equal to $a^{12}$? |   |
| A | $(a^3)^2 \times a^2$ |   |
| B | $a^4 \times a^3$ | 1 |
| C | $(a^3)^3 \times a^3$ |   |
| D | $(a \times a^2 \times a^3 \times a^4)^2$ |   |

| **7** | $5 - (5 \times 3 - 9)$ equals |   |
| A | 11 |   |
| B | -11 | 1 |
| C | -1 |   |
| D | 1 |   |

| **8** | $a \times a \times a \times a \times a = $ |   |
| A | $6a$ |   |
| B | $a^6$ | 1 |
| C | $a + 6$ |   |
| D | $6^a$ |   |

| **9** | $3^0 + 2x^0 =$ |   |
| A | 1 | 1 |
| B | 2 |   |
| C | 3 |   |
| D | 5 |   |

---

Continued on the next page
EXAM PAPER 3

PART A

Fill in only one circle for each question.

10 The volume of a cube is 216 cm³. What is the surface area in cm²?
   A 12  B 36  C 72  D 216

11 2x + y = 8 cuts the x-axis at the point
   A (4, 0)  B (8, 0)  C (0, 4)  D (0, 8)

12 The simple interest earned when $5000 is invested at 6% p.a. for 3 years is:
   A $1000  B $900  C $100  D $90

13 Express $2^{-1} + 3^{-1}$ as a single fraction.
   A $\frac{1}{5}$  B $\frac{1}{6}$  C $\frac{5}{6}$  D $\frac{6}{5}$

14 If 10 000 km is divided in the ratio 3:7, the longer distance is:
   A 3000 km  B 6000 km  C 7000 km  D 8000 km

15 $3 - 2(x - 1) =$
   A 5 - 2x  B 4 - 2x  C 2 - 2x  D 1 - 2x

16 Write 395 000 000 in scientific notation.
   A $3.95 \times 10^7$  B $0.395 \times 10^7$  C $3.95 \times 10^8$  D $3.95 \times 10^{-8}$

17 The line $y = x$ passes through the point
   A (0, 1)  B (0, -1)  C (0, 0)  D (0, 2)

18 A card is chosen at random from a normal pack of 52 cards. What is the probability that it is a black ace?
   A $\frac{1}{13}$  B $\frac{2}{13}$  C $\frac{1}{26}$  D $\frac{1}{52}$

19 The value of $5x^2 - 4x$ when $x = -1$ is
   A -9  B -1  C 1  D 9

20 The equation of a straight line with gradient $\frac{3}{4}$ and y-intercept -7 is
   A $y = \frac{3}{4}x + 7$  B $y = \frac{3}{4}x - 7$  C $y = -\frac{3}{4}x + 7$  D $y = -\frac{3}{4}x - 7$

Total marks achieved for PART A

20
## Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Estimate 3586 + 7493 by rounding to the nearest 100.</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Express 860 km in 5 hours as km/h.</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>Write 72 as a product of its prime factors in index form.</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>Find the value of x in (3^x = 81).</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Christine is paid $5 for every calculator she assembles in a factory. How much does she earn if she assembles 325 calculators in a week?</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Find Jaani’s net pay for the week if he earns $2060 but pays 30% of this in tax, pays 10% super, and his other deductions are $230.50 per week.</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>Find the perimeter of a regular nonagon with side length 5.3 cm.</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>Find the area of a circle with radius 14 cm. Leave your answer in terms of (\pi).</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>Write 100,000 as a power of 10.</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>Simplify (10^8 \times 10^3 \times 10^6).</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>A die is rolled. Find the probability of getting a 3 or a 5.</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>What is the relative frequency of the letter A in the word MATHEMATICS?</td>
<td>1</td>
</tr>
<tr>
<td>33</td>
<td>Find the range of the set of scores 4, 6, 4, 4, 8, 4, 6, 4, 3, 2.</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>Find the mode of the set of scores given in Question 33.</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>What is the exterior angle sum of any convex polygon?</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>Find the size of the exterior angle of a regular octagon.</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>Evaluate (9.6 \cos 48^\circ) correct to three significant figures.</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>If (\sin A = 0.6983), find angle A to the nearest degree.</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>Simplify (7x^3 - 5xy + 3yx - 4x^3).</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>((-3x^2y)^3) equals</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>A straight line (y = kx + 3) passes through the point ((1, 5)). Find the value of (k).</td>
<td>1</td>
</tr>
<tr>
<td>42</td>
<td>Write (\frac{1}{10^3}) as a decimal</td>
<td>1</td>
</tr>
<tr>
<td>43</td>
<td>Find the point of intersection of the line (x - y = 5) and the x-axis.</td>
<td>1</td>
</tr>
<tr>
<td>44</td>
<td>Find the surface area of a cube with side length 10 cm.</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>A pentagonal prism has base area 5.2 (\text{m}^2) and height 3.4 m. Find its volume.</td>
<td>1</td>
</tr>
</tbody>
</table>

### Total marks achieved for PART B

25
Show all working for each question.

46 A survey was conducted of the students at a school to find the number of televisions in their homes. The results are shown in the table.

<table>
<thead>
<tr>
<th>Number of televisions</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>3</td>
<td>15</td>
<td>37</td>
<td>24</td>
<td>18</td>
<td>8</td>
</tr>
</tbody>
</table>

a  How many students are at the school? ________________________________
b  How many televisions are there in total? ________________________________
c  What is the mean number of televisions for each student? ________________________________

47 Simplify:

a  \(6ab^2c \times -3ac^5 + 9a^2bc\)  
b  \(3(2x + 5) - 4(x + 3)\)

48 The diagonal of a rectangle makes an angle of 72° with one of the shorter sides. The width of the rectangle is 12 cm.

a  Show this information on a diagram.
b  Find the length of the diagonal (correct to one decimal place).

49 a  Find the length of \(AB\) correct to one decimal place.

b  What type of triangle is \(\triangle ABC\)?
c  What is the size of \(\angle ABC\)?

50 Solve:

a  \(3 - (4 - x) = 5x\)  
b  \(4x + 7 = 3(x - 2)\)

51 If \(y = 48\) when \(x = 8\) and \(y\) varies directly as \(x\), find \(y\) when \(x = 9\).

52 A bus travels at an average speed of 72 km/h.

a  How long will it take to travel 450 km?
b  What is the speed in m/s?
Show all working for each question.

53 The Venn diagram shows the number of farmers at a meeting who have cattle or sheep.
   a How many farmers are at the meeting?
   
   What is the probability that a randomly chosen farmer attending the meeting:
   b has cattle but not sheep?
   c has neither cattle nor sheep?
   d has sheep?

54 $A$ is the point $(-3, 7)$ and $B$ is the point $(3, -1)$.
   a Find the distance from $A$ to $B$.
   b Find the coordinates of the midpoint of $AB$.
   c Find the gradient of $AB$.
   d What is the equation of the line $AB$?
   e What is the equation of the circle that has its centre at the origin and which passes through the midpoint of $AB$?

55 The diagram shows a triangular prism.
   a Use Pythagoras’ theorem to find the value of $x$.
   b Find the area of the triangle.
   c Find the surface area of the prism.

56 a Name a pair of similar triangles.
   b Explain why they are similar.
   c Find the value of $x$.
Exam Paper 4

**Instructions for all parts** • Attempt all questions.
**Time allowed: 1 hour** • Calculators are NOT allowed for Part A.

**Part A: Allow about 20 minutes for this part.**
**Part B: Allow about 20 minutes for this part.**
**Part C: Allow about 20 minutes for this part.**

**Total marks: 75**

**EXAM PAPER 4**

**PART A**

Fill in only one circle for each question.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The gradient of the line $y = 3x + 5$ is</td>
<td><img src="image" alt="A: 5" />, <img src="image" alt="B: 3" />, <img src="image" alt="C: 3/5" />, <img src="image" alt="D: 5/3" /></td>
</tr>
<tr>
<td>2</td>
<td>If $a = -2$, the value of $2a^2$ is</td>
<td><img src="image" alt="A: 16" />, <img src="image" alt="B: -16" />, <img src="image" alt="C: 8" />, <img src="image" alt="D: -8" /></td>
</tr>
<tr>
<td>3</td>
<td>Which of the following is the best estimate for $8.85 \times \frac{72}{71}$?</td>
<td><img src="image" alt="A: 0.1" />, <img src="image" alt="B: 1" />, <img src="image" alt="C: 10" />, <img src="image" alt="D: 100" /></td>
</tr>
<tr>
<td>4</td>
<td>$2xy^2$ equals</td>
<td><img src="image" alt="A: $2xy \times 2xy$" />, <img src="image" alt="B: $2 \times xy \times xy$" />, <img src="image" alt="C: $2 \times xy \times 2$" />, <img src="image" alt="D: $2 \times x \times y \times y$" /></td>
</tr>
<tr>
<td>5</td>
<td>In a class of 24 students, 10 are boys. The ratio of girls to boys is</td>
<td><img src="image" alt="A: 5:12" />, <img src="image" alt="B: 12:5" />, <img src="image" alt="C: 7:5" />, <img src="image" alt="D: 5:7" /></td>
</tr>
<tr>
<td>6</td>
<td>$2.08 \times 10^{-6}$ equals</td>
<td><img src="image" alt="A: 0.000 020 8" />, <img src="image" alt="B: 0.000 002 08" />, <img src="image" alt="C: 20 800" />, <img src="image" alt="D: 208 000" /></td>
</tr>
<tr>
<td>7</td>
<td>Simplify $8m - 6n - 2m - 7n$.</td>
<td><img src="image" alt="A: $-7mn$" />, <img src="image" alt="B: $6m - 13n$" />, <img src="image" alt="C: $8m - 11n$" />, <img src="image" alt="D: $-6m - n$" /></td>
</tr>
<tr>
<td>8</td>
<td>The solution to the equation $\frac{x}{3} = \frac{1}{5}$ is</td>
<td><img src="image" alt="A: $x = \frac{5}{3}$" />, <img src="image" alt="B: $x = \frac{3}{5}$" />, <img src="image" alt="C: $x = 15$" />, <img src="image" alt="D: $x = \frac{1}{15}$" /></td>
</tr>
<tr>
<td>9</td>
<td>For the scores 16, 21, 16, 22, 17, 18, 21, 21, 20, the median is</td>
<td><img src="image" alt="A: 18" />, <img src="image" alt="B: 20" />, <img src="image" alt="C: 20.5" />, <img src="image" alt="D: 21" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marks</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>-------</td>
</tr>
<tr>
<td><strong>10</strong> Which could not be the probability of an event?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 0.83</td>
<td>B (\frac{3}{4})</td>
<td>D 20%</td>
</tr>
<tr>
<td>C (\frac{4}{3})</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11</strong> (6 - 3(2x - 1)) simplifies to</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A (-6x)</td>
<td>B (5 - 6x)</td>
<td></td>
</tr>
<tr>
<td>C (9 - 6x)</td>
<td>D (6x - 9)</td>
<td></td>
</tr>
<tr>
<td><strong>12</strong> Which of these is not in correct scientific notation?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A (3.5 \times 10^{-3})</td>
<td>B (6 \times 10^{-5})</td>
<td></td>
</tr>
<tr>
<td>C (8.25 \times 10^{-2})</td>
<td>D (0.8 \times 10^{-5})</td>
<td></td>
</tr>
<tr>
<td><strong>13</strong> How many significant figures does the number 0.005 83 have?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 5</td>
<td>B 4</td>
<td></td>
</tr>
<tr>
<td>C 3</td>
<td>D 2</td>
<td></td>
</tr>
<tr>
<td><strong>14</strong> Simplify (a^6 \times a^4 \div a^3)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A (a^8)</td>
<td>B (a^8)</td>
<td></td>
</tr>
<tr>
<td>C (a^7)</td>
<td>D (a^{-7})</td>
<td></td>
</tr>
<tr>
<td><strong>15</strong> ((0.2)^2) equals</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 0.04</td>
<td>B 0.4</td>
<td></td>
</tr>
<tr>
<td>C 4.0</td>
<td>D 0.02</td>
<td></td>
</tr>
<tr>
<td><strong>16</strong> If (x = -2) and (y = -3), the value of (x^2 - xy) is</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 2</td>
<td>B (-2)</td>
<td></td>
</tr>
<tr>
<td>C 10</td>
<td>D (-10)</td>
<td></td>
</tr>
<tr>
<td><strong>17</strong> Express 180 tonnes per hour as kilograms per second.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 5</td>
<td>B 50</td>
<td></td>
</tr>
<tr>
<td>C 180</td>
<td>D 1800</td>
<td></td>
</tr>
<tr>
<td><strong>18</strong> (a^3 + a^3) equals</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A (a^6)</td>
<td>B (a^6)</td>
<td></td>
</tr>
<tr>
<td>C (2a^6)</td>
<td>D (2a^3)</td>
<td></td>
</tr>
<tr>
<td><strong>19</strong> A square has a perimeter of 20 cm. What is its area?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 5 cm(^2)</td>
<td>B 25 cm(^2)</td>
<td></td>
</tr>
<tr>
<td>C 100 cm(^2)</td>
<td>D 400 cm(^2)</td>
<td></td>
</tr>
<tr>
<td><strong>20</strong> The number 8 657 482 rounded to the nearest hundred is</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A 8 657 400</td>
<td>B 8 657 000</td>
<td></td>
</tr>
<tr>
<td>C 8 657 500</td>
<td>D 8 657 480</td>
<td></td>
</tr>
<tr>
<td><strong>Total marks achieved for PART A</strong></td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
## PART B

Write only the answer in the answer column. For any working use the question column.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Simplify $16 : 4 \frac{1}{2}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>22 Find the radius of the circle $x^2 + y^2 = 4$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>23 Simplify $5a^4 \times a^3 \times 3a^2 \times a$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>24 Simplify $\frac{(8a^2) \times (3a)^3}{4a^2 \times (3a)^2}$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>25 Laura is paid $400 per week plus a commission of 15% on all sales over $3000. If the total sales for the week are $34,000, what is Laura’s pay for the week?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>26 Calculate Kristina’s holiday loading if she is paid 17\frac{1}{2}% on 4 weeks pay, given that she earns $2150.20 per fortnight.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>27 Calculate the radius of a semicircle whose area is $32\pi$ cm$^2$.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>28 Find the area of a rhombus that has diagonals 30 cm and 24 cm.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>29 Simplify $10^3 \times 10^9 \times 10^2$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>30 Write $5 \times 10^6$ as an ordinary numeral.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>31 List all the possible outcomes when a die is rolled.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>32 A coin is tossed 100 times. How many tails can be expected?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>33 Find the mean of the set of scores 5, 7, 5, 5, 9, 5, 8, 7, 6, 5</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>34 Find the median of the set of scores given in Question 33.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>35 What is a special name for a three-sided regular polygon?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>36 Find the sum of the interior angles of a hexagon.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>37 Find $7.4 \tan 68^\circ$ correct to two decimal places.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>38 If $\tan A = 1.6832$, find $\angle A$ to the nearest degree.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>39 Write down the gradient $m$ and the $y$-intercept $b$ for $3x - 7y = 21$</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>40 Are (0, 2), (6, 0) and (3, 1) collinear?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>41 Find the equation of the $y$-axis.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>42 Does the point (1, –3) lie on the line $4x - y = 7$?</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>43 Find the point of intersection of the line $2x - 5y = 10$ and the $y$-axis.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>44 Find the volume of a cube of side length 12 cm.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>45 A square prism has volume 158 m$^3$ and height 6.9 m. Calculate the length of a side of its base correct to one decimal place.</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

| Total marks achieved for PART B | 25 |
Show all working for each question.

46 Anna buys some furniture worth $3240 on terms of 20% deposit and six monthly payments of $448.20. Find:
   a the deposit
   b the balance owing
   c the total paid for the furniture
   d the total interest paid
   e the rate, per annum, of simple interest paid.

47 Express the following in scientific notation.
   a 0.007651 _________________________________
   b half a million ______________________________

48 It is known that $y$ varies directly with $x$. Given that $y = kx$, and that $y = 40$ when $x = 16$, find:
   a $k$
   b $y$ when $x = 40$
   c $x$ when $y = 16$

49 A can of tennis balls contains three balls squeezed in with no room for the balls to move. Give answers correct to one decimal place.
   a What is the radius of a tennis ball?
   
   For the closed can find:
   b the area of a circular end
   c the area of the curved surface
   d the total surface area
   e the volume.

Continued on the next page
Show all working for each question.

50 The surface area of a cube is 384 cm². Find:
   a  the area of one face
   b  the length of each side.

51 A room is 6 m long, 5 m wide and 4 m high. Find:
   a  the area of the four walls and ceiling
   b  the cost of painting that area at $4.50 per square metre.

52 Find the value of $x$.

53 Simplify:
   a  \( \left( \frac{t^3}{7} \right)^2 \)
   b  \( \frac{8a \times 5b \times 3c}{10b \times c \times 4a} \)
   c  \( 9x - 2(3 - 2x) + 16 \)
   d  \( 9(m + 7) - 5(m + 3) \)

54 There are 2 blue and 2 red balls in a bucket. Without looking, two balls are taken from the bucket. What is the probability that both balls are blue if the first ball is:
   a  not replaced before the second is drawn
   b  replaced before the second is drawn.

55 A survey was conducted into the number of magazines bought by people in 2 months. The results are displayed in the following stem-and-leaf plot.

<table>
<thead>
<tr>
<th>Magazines bought</th>
</tr>
</thead>
<tbody>
<tr>
<td>males</td>
</tr>
<tr>
<td>females</td>
</tr>
<tr>
<td>3 2 1 0</td>
</tr>
<tr>
<td>5 5 5 0 1</td>
</tr>
<tr>
<td>2 2 1 1 1 1</td>
</tr>
<tr>
<td>3 3 2 3 1 1 2 3</td>
</tr>
<tr>
<td>7 1 4 5 6 7 7 5</td>
</tr>
<tr>
<td>6 3 2 2 5 2 2</td>
</tr>
</tbody>
</table>

a  What is the range?
b  What is the mode?
c  What is the median for males?
d  What is the median for females?
Answers

Chapter 1 - Rates and proportion

Page 1
1 a 1:2 b 1:1 c 3:1 d 1:3 e 5:1 f 4:1 g 1:6 h 1:5 i 8:1 j 4:1 k 1:3 l 1:4 m 1:8 n 11:7 o 1:7 p 11:1 q 1:6 r 1:3 s 1:2 t 2:21 u 1:23 v 2:1 w 5:4 x 1:3 y 3:2 z 5:1 a 1:5 b 3:7 i 2:3 j 3:4 k 4:1 l 1:2 m 3:1 n 1:3 o 1:20 p 5:12 q 2:5 r 5:9 s 1:7 t 3:25 u 1:3 v 1:5 w 2:5 x 5:1 y 1:6 z 0:1 o 1:4 p 3:2

Page 2
1 a $16, b $20 c $24, d $16 e $80 f $25 s $2 3 a 1:3 b 25 c $240 000 d 480 adults, 320 children

Page 3
1 a 64 km b $7.50 c 7.5 L d $14.50 e 0.5 km e 60 km/h f 2 km/min g 50 m/s h 135 bottles/h i 90 km j 496 km/h k 3.81 m/year l 5 hours, 36 km/h

Page 4
1 a 110 km b $9.60 c $17.75 d $9.30 e 5 L f 98 km/h g 223.2 km h 202.95 L i 55.556 m k 4.32 L l 29.76 hours

Page 5
1 a 4800 b 100 c 1020.83 d 3600 e 0.275 f 2400 g 2 h 0.45 i 540 000 j 14 100 k 2 a 3480 l 208 800 m 208.8 n 5011.2 o 1833.3 p 4 a 2700 q 162 000 r 162 s 0.165 t 5.266 u 108 c 33.3 d 1200

Page 6
1 a 44 gallons b 88 gallons c 35 gallons d 57 gallons e 77 gallons f 11 gallons g 2 a 45 L h 410 L i 250 L j 300 L k 355 L l 465 L m 3 a 225 b 22 500 L c 8 000 gallons d 4 a 30 – 40 minutes e 10 – 15 minutes f the line is not as steep

Page 7
1 a 266 b 19 c 2 a 24 b 86 c 35.4 d 3 a 57 b 627 c 1368 d 4 a 3.5 b 63 e 45 f 95.2 g 168 h 72

Page 8
1 a 24 b 12 c 8 = 2.8 d 41 e 3080 km f 143.5 g 3 a 168 c 55.556 h 55 hours

Page 9
1 C 2 8 3 4 A 5 6 D 7 8 C 9 C 10 C 11 B 12 C 13 C 14 C 15 B

Page 10
1 a 2:25 b 50 c $560 d 7 hours e $1110 f 2 a 2.16 × 10 km g 44.4 m/s h $36 000, $54 000 and $72 000 i 3:10 j 49:81 k 144 km/h l 24 L/m n 3 a 12 b 84 c 21

Chapter 2 - Algebra

Page 11
1 a $x + 9 \times 7 b + 7 c y c a d p – q e \sqrt{3} f 7x g d 4 h 5 \times i 0(j + 3) j 3\sqrt{2} k 4(x + 9) l \frac{1}{2} m 6 n \sqrt{5}x

Page 12
1 a 2 b 5 c 7 d 6 e 9 f 1 g 3 h 13 i 25 j 10 k 13 l 21 m 14 n 25 o 1 p 2 q \frac{5}{2} r 5 s 2 t 7 u 0 c 1 d 13 e – 1 f 49 g 1 h 12 i 15 j 41 k – 54 l 14 m – 36 n \frac{1}{2} o – \frac{1}{2} p 3 q 2 r 3 s 20 t \frac{1}{2} u 9 v 1 f 9 \times 10 g 1 f 0 h 10 i g 10 x j 11 k 10 l 4 x m 14 n 2 x o 6 x p 16 q 9 r 10 a g 10 x^2 h 11 p i x j – a b k 9 m 17 y s 3 a 15 a – 8 b 10 a + 9 b c 15 a^2 – 8 b + 7 d 2 d – c e 9 x + 3 f 3 x^2 g 10 m + 15 n h 14 m n i 5 x + 11 j 5 x + 3 y k 14 – 5 x l 5 l 12 m 4 a 5 a + 7 n 9 x^2 o 4 m + 6 n d 10 x e 7 x + y f 19 y g 5 a^5 h 8 x m 4 i + 5 j 19 k x + 5 k 18 – n x 9 l o 8 p 9 a b

Page 13
1 a 40a b 36m^n c 12m d 15ab e – 15x f 48mn^2 g – 24a h 54ab i 19ab j 35ab k 9ab l a^2 b^2 m 27m b 6ab^n c 7x^2 d 40x^2 e 20 a^2d f 75g g 60ab h 148p j – 5xy k – 24a^2m l 148p m 3 n 45y o 42a p 44b q 21a d – 44ab r 8e r 8x f 3^2 r 3^2 s 18a^2 b h 80x^2 i 4x^8 j 60xy k 7q l 6q y m 3 a 2 n 12 o 6 p 8 q 9 a b^2 c 24 r 9 a^2 b^2 s 14 s 7 t 2 g 12s^3 u 7 v 2 g 12s^3 u 7 v 2

Page 15
1 a 4 a b 20 c 2 b d e – 2a f 2 g 8 h 6 i 2 j 9 k x – 1 2 b m 1 n 2 c o 6 p – 18 q r 2 a 2 a 2 b 2 a 2 c 3 q y

Page 16
1 a \frac{5a}{6} b \frac{1}{25} c g 4 h – 10 i – 2 j 4 k 4 e 3 l n \frac{1}{3} m 3 o 3 a 12 p 4 q 2 c 2 d 6 e 8 f 2

Page 17
1 a 3 x + 6 b 2a + 10 c 5 y + 20 d 8x – 8 e 7m – 14 f 9x – 45 g 6a + 9 h 20a + 12 i 56a + 49 j – 10a + 14 k – 18m + 27 l 16a – 48 m –x^2 – 9x n – y^2 + 3 o =2m^2 – 9m 2 a 6a + 27 b 5x – 11 c 7m – 6 d 15a + 16 e y – 7 f 14 x – 2 g 9x – 1 h 7x^2 – 7 i 130 j 15a – 9 k 13 + 11 l 27 x + 11 m 2 2 a 4b – 16 n 14 e 4m + 27 f 15y – 75 g x^2 + 8x + 5 h p^2 + 5 + 3 i 1 a^2 + 2ab – b^2 j 14x + 25 k 9x + 22 12x^2 + 3x

Page 18
1 a 24 b 35 c 47 5 d 2 a 160 b 432 c 378 3 a 40 b 24 c 48 4 a 88 b 616 c 11 498 5 100 6 25 7 a 12 b 8

Page 19
1 a 4 b 5 c 6 d 7 e 8 f 9 g 10 h 11 i 12

Chapter 3 - Indices

Page 20
1 a 2 \times 2 b 4 \times 4 c 4 \times 4 d 4 \times 4 e 7 \times 7 f 7 \times 7 g 7 \times 7 h 7 \times 7 i 7 \times 7 j 7 \times 7 k 7 \times 7 l 7 \times 7 m 7 \times 7 n 7 \times 7 o 7 \times 7 p 7 \times 7 q 7 \times 7 r 7 \times 7 s 7 \times 7 t 7 \times 7 u 7 \times 7 v 7 \times 7 w 7 \times 7 x 7 \times 7 y 7 \times 7 z 7 \times 7

Excel ESSENTIAL SKILLS Year 9 Mathematics Revision & Exam Workbook

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Chapter 4 – Pythagoras’ theorem

Page 29 1 a c b r e n d RS e UV f JK 2 a AC b PR c LM d PT e CD f FG 3 a d b e c f d e f 2

Page 30

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Page 31 1 a 2 c 3 b 4 a 5 a 6 b 7 b 8 a 9 a 10 a 11 b 12 a

Page 32 1 a 225 b 169 c 1600 d 784 e 25 f 4761 g 100 h 289 i 6561 j 64 k 1681 l 1980 m 2 a 13 n 29 o 24 p 69 q 10 f 38 g 12 h 21 i 140 j 53 k 28 175 l 3 b 4 5 c 6 c 7 i 8 j 9 k 10 l 4 a 3² + 4² = 5² b 12² + 5² = 13²

Page 33 1 a 5 cm b 25 cm c 10 dm d 13 cm e 34 cm f 26 cm 2a 6.1 cm b 5.8 cm c 8.2 cm d 8.1 cm e 3.6 cm f 7.4 cm

Page 34 1 a 5 cm b 16 cm c 8 cm d 8 cm e 9 cm f 24 cm 2 a 12.4 cm b 12.6 cm c 13.3 cm d 14.4 cm e 11.4 cm f 13.3 cm

Page 35 1 a 16 m b 89 m c 6.3 m d 99 m e 149 cm f 19.7 m 2 a 10.2 cm b 13.4 cm c 13.4 cm d 15 cm e 65 cm f 73.4 cm

Page 36 1 a 13 cm b 10 cm c 12 cm d y = 5 cm, x = 5.4 cm e 16 cm f 18 cm 2 a 10.82 cm b 11.62 cm c 8.06 cm d 11.66 cm e 23.47 cm f 14.70 cm

Page 37 1 a 7.07 cm b 37 cm 2 13.86 cm 3 14.46 m 4 24 cm 5 35 cm 6 80 m

Answers

h = 1 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9

\begin{align*}
(\frac{1}{2})^2 & = \frac{1}{4} \\
2^2 & = 4 \\
3^2 & = 9 \\
4^2 & = 16 \\
5^2 & = 25 \\
6^2 & = 36 \\
7^2 & = 49 \\
8^2 & = 64 \\
9^2 & = 81
\end{align*}
4  a  8 \times 10^3, 8 \times 10^5, 8 \times 10^6, b  3.9 \times 10^3, 5.3 \times 10^4, 7.6 \times 10^5, c  3.2 \times 10^3, 2.1 \times 10^4, 1.5 \times 10^5 d  8 \times 10^3, 6 \times 10^5, 5 \times 10^6 e  7 \times 10^3, 5 \times 10^3, 4 \times 10^3 f  9.1 \times 10^2, 8.3 \times 10^3, 5.6 \times 10^4 g  5 a  7 \times 10^2, 7 \times 10^3, 7 \times 10^4 b  2.3 \times 10^2, 3.6 \times 10^3, 8.9 \times 10^4 c  2.4 \times 10^3, 8.6 \times 10^2, 3.6 \times 10^3 d  5.8 \times 10^4, 6.8 \times 10^2, 4.3 \times 10^3 e  7.8 \times 10^4, 8.6 \times 10^3, 9.5 \times 10^4 f  4.7 \times 10^4, 6.5 \times 10^2, 3.2 \times 10^2 g  6 a  6.3 \times 10^3 b  6.2 \times 10^6 c  8 \times 10^5 d  1.3 \times 10^4 e  4.5 \times 10^2 f  9.3 \times 10^5

**Page 64**

\[ a 3, 1, 1, b \]

c  2 d  negative e  left f  2 d  yes h  3 i  yes

\[ 3 a  i 8 ii 5 b 2 ii 3 c  i 3 ii 7 \]
Answers

Page 67  1 a $3x + 5y - 9 = 0$  b $2x - y - 7 = 0$  c $3x - y - 4 = 0$  d $4x - 3y - 8 = 0$  e $9x - y - 7 = 0$  f $2x + y + 6 = 0$

$g \quad 9x - 7y - 5 = 0 \quad h \quad 4x - 13y + 18 = 0 \quad i \quad x - 5y + 10 = 0 \quad 2 \quad a \quad y = 6x - 10 \quad b \quad y = 2x + 8 \quad e \quad y = \frac{-2}{3}x + \frac{1}{3} \quad d \quad y = \frac{1}{2}x + 2 \quad e \quad y = -5x$

$f \quad y = \frac{9}{4}x - 3 \quad g \quad y = -x + 2 \quad h \quad \frac{3}{2}x - \frac{7}{2} \quad i \quad \frac{3}{4}x - 2 \quad 3 \quad a \quad m = 3, b = 1 \quad b \quad m = 9, b = -5 \quad c \quad m = -1, b = -3 \quad d \quad m = -4, b = 7$

$e \quad m = \frac{3}{5}, b = -5 \quad f \quad m = \frac{1}{2} \quad b = -2 \quad 4 \quad a \quad y = 3x + 2 \quad b \quad y = 9x - 3 \quad c \quad y = -x + 7 \quad d \quad y = \frac{3}{2}x + 5 \quad e \quad y = \frac{-3}{5} + 1 \quad f \quad y = -7x + 8$

$5 \quad a \quad y = 4x + 14 \quad b \quad y = 2x - 9 \quad c \quad y = \frac{1}{2}x + \frac{9}{2} \quad d \quad y = \frac{2}{7}x + \frac{22}{7} \quad e \quad y = \frac{-1}{7}x + \frac{17}{7} \quad f \quad y = -3x + 8$

Page 68  1 b yes  2 a yes  b yes  c yes  d no  e yes  f no  3 a no  b yes  c yes  d no  e yes  f no  4 a (0, -5)  b (2, -1)  c (3, 1)  d (-2, -9)  e (1, -3)  f (5, 5)  5 a $p = 3 \quad b \quad m = 1$

Page 69  1 C  2 C  3 C  4 C  5 C  6 D  7 C  8 B  9 A  10 C  11 B  12 D  13 C  14 D  15 B

Page 70  1 a $\sqrt{26}$ units  b $\left(\frac{1}{2}, \frac{1}{2}\right)$  c $\frac{1}{3}$  d $x + 5y - 28 = 0 \quad e \quad y = \frac{-1}{2}x + \frac{28}{5} \quad 2 a 10 units  b $\sqrt{80}$ units  d (0, 0)  e (5, 7)  3 a yes  b (2, 5)  c (6, -16)  d (2, 2)  e $y = \frac{-1}{2}x + 6$

Chapter 8 – Linear and non-linear relationships

Page 71

a $y = 2x + 1$

b $y = 3x + 2$

c $y = 2x - 3$

d $y = 5x - 4$

e $y = 4x + 1$

Page 72

a $x = 2$

b $x = 4$

Page 73

1 a $5$  b the fixed amount of pocket money per week, $55$

c $5$  d The rate that Andrew’s mother pays him per hour when he helps.

2 a $90$  b Clair is 90 km from Baxton  c $15$  d Melissa rides at a constant speed of 15 km/h  e $d = -15t + 90$

Page 74

1 a $2x - 5y - 9 = 0 \quad b \quad 3x + 4y - 8 = 0 \quad c \quad 5x - 2y - 7 = 0 \quad d \quad 4x - 8y + 3 = 0 \quad e \quad 2x + y - 9 = 0 \quad f \quad 8x - y + 7 = 0$

g $2x - 3y + 6 = 0 \quad h \quad 8x - 9y + 12 = 0 \quad i \quad x - 6y + 3 = 0 \quad 2 a \quad y = \frac{-2}{3}x + \frac{8}{3} \quad b \quad m = \frac{2}{3}, b = \frac{8}{3} \quad b \quad y = \frac{-1}{3}x + \frac{7}{5} \quad m = \frac{1}{5}, b = \frac{7}{5}$
Answers

\( c \ y = \frac{3}{2}x - \frac{3}{2}; m = \frac{3}{2}, b = -\frac{3}{2} \)
\( d \ y = x + 7; m = 1, b = 7 \)
\( e \ y = -2x + 9; m = -2, b = 9 \)
\( f \ y = \frac{5}{6}x + \frac{11}{6}; m = \frac{5}{6}, b = \frac{11}{6} \)
\( g \ y = \frac{3}{2}x^2 - 3; m = \frac{3}{2}, b = -3 \)
\( h \ y = -\frac{4x}{3} - \frac{3}{2}; m = -\frac{4}{3}, b = -\frac{3}{2} \)
\( i \ y = 2x + 6; m = 2, b = 6 \)
\( a \ y = 4x + 3; 4x - y + 3 = 0 \)
\( b \ y = 2x - 5; 2x - y - 5 = 0 \)
\( c \ y = 3x + 7; 3x - y + 7 = 0 \)
\( d \ y = \frac{1}{2}x^2 + 4; x - 2y + 8 = 0 \)
\( e \ y = \frac{5}{2}x + 6; 2x - 3y + 18 = 0 \)
\( f \ y = -\frac{5}{6}x + 3; 5x + 6y - 18 = 0 \)

Page 75

1 a i 5 ii 3 iii -2 b i 4 ii -5 iii -2 c i x = 4 ii x = -5 iii x = -2 2 a x = 1 b x = 2 c x = -1 d x = -2 e x = 3

Page 76

1 a -5, -2, 1, 4 b

d i x = 2 ii x = 4 iii x = 1 iv x = -1

Page 77

1

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3

\( y = x^2 + 1 \)

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<td>d no x-intercepts</td>
<td>e y = 1</td>
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Page 78

1 a y = \( x^2 \) b y = \( x^2 + 1 \) c y = 2x \( x \) d y = -x \( x \) e y = \( x^2 - 4 \) f y = 1 - x \( x \) g y = \( \frac{1}{2}x^2 \) h y = 2x \( x + 3 \) 2 a 64 m b 48 m c 84 m d 100 m e 10 s if 1.6 s and 18.4 s g 20 s

Page 79

1 a \( \frac{1}{5}, \frac{1}{3}, \frac{1}{2} \), 1, 2, 4, 8 b c becomes very large d gets closer and closer to 0 e 1

Answers
Answers

2 a $\frac{1}{3}, \frac{1}{7}, 1, 3, 9$ b and d

4 $(y = 2^2 - 3) \frac{1}{8}, \frac{1}{4}, \frac{1}{2}, 1, 2, 4, 8; (y = 2^3 + 1) \frac{1}{5}, \frac{1}{3}, \frac{1}{2}, 2, 3, 5, 9; (y = 2^4 - 1) \frac{11}{8}, \frac{3}{4}, \frac{1}{2}, 0, 1, 3, 7;

Page 80
1 a $(0, 0)$ b $5$ c $x^2 + y^2 = 25$ d $4^2 + 3^2 = 25$ 2 a $10$ b $x^2 + y^2 = 100$ 3 a $x^2 + y^2 = 36$ b $x^2 + y^2 = 9$ c $x^2 + y^2 = 16$

d $x^2 + y^2 = 81$

Page 81
1 C 2 B 3 C 4 C 5 A 6 B 7 C 8 D 9 D 10 B 11 C 12 A

Page 82
1 a $(0, 0)$ b 10 units c $x^2 + y^2 = 100$ d $98$ e inside 2 a $2$ b $-4$ c $y = 2x - 4$ d $x = 2$ e $x = 6$

Page 83
1 a $x = 7$ b $a = 11$ c $n = 10$ d $y = 4$ e $n = 2$ f $k = 17$ g $a = 12$ h $t = 3$ i $x = 14$ j $m = 9$ k $p = 3$ l $y = 6$ 2 a $a = 16$
b $x = 28$ c $m = 28$ d $n = 11$ e $a = 28$ f $a = 7$ g $y = 3$ h $t = 1$ i $y = -3$ j $x = 28$ k $p = 16$ l $m = -10$ 3 a $a = 16$ b $x = 14$ c $b = 5$
d $k = 10$ e $n = 4$ f $a = 26$ g $m = 34$ h $t = 34$ i $y = 26$ j $x = 27$ k $a = 27$ l $x = 37$ 4 a $x = 15$ b $n = 5$ c $m = 17$ d $y = 12$ e $x = 13$
f $y = 16$ g $m = 14$ h $t = 8$ i $a = 4$

Page 84
1 a $x = 3$ b $y = 6$ c $t = 3$ d $m = 18$ e $n = 16$ f $a = 20$ g $x = 5$ h $y = 10$ i $x = 12$ j $x = 28$ k $x = 22$ l $t = -6$ 2 a $a = 8$
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d $m = -9$ e $t = 4$ f $y = 7$ g $a = 11$ h $p = 48$ i $x = 14$ j $n = -70$ k $x = -24$ l $y = -56$ 4 a $x = 54$ b $x = 5$ c $x = -12$ d $x = -2$
e $y = -5$ f $m = 27$ g $y = 32$ h $a = -63$ i $x = 11\frac{1}{2}$ j $y = 5$ k $x = 7\frac{1}{2}$ l $m = -33$

Page 85
1 a $x = 2$ b $x = 5$ c $y = 3$ d $a = 5$ e $a = 5$ f $m = 4$ g $x = 23$ h $a = 20$ i $x = 7$ 2 a $x = 8$
b $y = 3$ c $p = 3$ d $a = 33$
e $a = 3$ f $a = \frac{1}{2}$ g $x = 7$ h $x = 10$ i $x = 19$ 3 a $y = 15$ b $y = 1$ c $x = 4$ d $t = 2$ e $m = 39$ f $x = 9$ g $y = 1$ h $y = 6$ i $x = 8$ j $x = 40$
k $y = -5$ p $= -1$

Page 86
1 a $a = 10$ b $x = -7$ c $x = -10$ d $a = \frac{2}{3}$ e $t = -15$ f $a = -1$ g $y = 4$ h $a = -4$ i $t = -1$ 2 a $m = \frac{2}{3}$ b $x = 15$
c $a = \frac{14}{7}$
d $x = 4$ e $a = 1$ f $x = -2$ g $x = 3$ h $m = 15$ i $x = -26$ 3 a $x = -2$ b $a = 26$ c $x = -1$ d $x = 6$ e $y = -5$ f $y = 8$ g $y = 1$ h $y = 15$
i $t = -45$ j $t = 0$ k $x = -\frac{7}{13}$ l $y = -5$ m $a = 10$ n $x = -3$ o $x = 12$

Page 87
1 a $x = 3$ b $y = 4$ c $m = 6$ d $x = 3$ e $x = 4\frac{1}{2}$ f $x = 3$ g $x = 5$ h $x = -3$ i $y = -6$ 2 a $x = 4\frac{1}{2}$ b $m = 11$
c $t = 3$ d $p = -3
**Answers**

\[ e \times 1 = f \times a = -32 \quad g \times x = 3 \quad h \times a = 14 \quad i \times x = 43 \quad 3 \times m = -4^2 \quad b \times x = 18 \quad c \frac{1}{9} \quad d \times a = 13 \quad e \times m = -13 \quad f \times t = 1^1 \quad g \times a = 3 \quad h \times n = -19 \quad i \times a = 2^1 \quad j \times x = 4 \quad k \times y = 31 \quad l \times a = -28 \]

**Page 88** 1 B 2 D 3 D 4 B 5 C 6 B 7 B 8 C 9 C 10 A 11 B 12 C 13 A 14 B 15 C

**Page 89** 1 a x = 35 \quad b \times x = 7 \quad c \times y = -72 \quad d \times m = 48 \quad e \times x = \frac{\sqrt{3}}{3} \quad f \times x = -\frac{1}{3} \quad g \times p = 15 \quad h \times x = -\frac{1}{8} \quad i \times x = -9 \quad j \times x = 29 \quad k \times x = -\frac{2}{9} \quad l \times m = 15

\[ 2 \times x = 10 \quad 3 \times a \times S = 2460 \quad b \times n = 17 \]

**Chapter 10 – Trigonometry**

**Page 90** 1 a x = opp, y = adj, z = hyp \quad b \times x = hyp, y = adj, z = opp \quad c \times x = adj, y = hyp, z = opp

**Page 91**

\[ \frac{a}{b} = \frac{b}{c} = \frac{a}{c} \quad f = \frac{b}{c} \quad e \times g = \frac{c}{d} \times \frac{e}{f} \times \frac{g}{h} \times \frac{i}{j} \times \frac{k}{l} \times \frac{m}{n} \]

**Page 92** 1 a sin A, sin B \quad b \sin D, \sin E \quad c \sin P, \sin Q \quad 2 \cos A, \cos B \quad 3 \cos C \quad 4 \cos D, \cos E \quad 5 \cos P, \cos Q

**Page 93**

\[ a \times b = 25.19 \quad b \times c = 0.52 \quad c \times d = 0.77 \quad d \times e = 0.5 \quad f = 0.62 \quad g = 8.14 \quad h = 0.50 \quad i = 12.05 \quad j = 0.287 \quad k = 0.055 \quad l = 23.073 \quad m = 0.312 \quad n = 0.059 \]

**Page 94**

\[ a \times b = 3.5 \quad b \times c = 3.9 \quad c \times d = 4.4 \quad 2 \times a = 16.1 \quad b \times 27.0 \quad c \times 24.9 \quad 3 \times a = 9.9 \quad b \times 5.6 \quad c \times 12.6 \quad 4 \times a = 8.86 \quad b \times 24.9 \quad c \times 11.08 \]

**Page 95**

\[ a \times x = 4.2 \quad b \times a = 4.9 \quad c \times p = 5.3 \quad 2 \times a = 7.56 \quad b \times m = 9.77 \quad c \times p = 10.64 \quad 3 \times a = 3.35 \quad b \times t = 9.18 \quad c \times l = 7.49 \]

**Page 96**

\[ a \times 16.6 \times b \times 15.6 \times c \times 16.7 \times 2 \times 2 \times 16.0 \times b \times 14.15 \times c \times 19.30 \times 3 \times 31.4 \times b \times 34.7 \times c \times 24.4 \times d \times 20.2 \times e \times 12.0 \times f \times 19.5 \times cm \]

**Page 97**

\[ a \times b \times c \times d \times 2 \times 2.5 \times b \times 4.7 \times m \times 8.8 \times m \times 11.1 \times m \times 3.3 \times m \times 2.8 \times m \times 3.3 \times b \times 8.0 \times c \times 49.10 \]

**Page 98**

\[ a \times \theta = 31^\circ \quad b \times \alpha = 57^\circ \quad c \times \beta = 76^\circ \quad 2 \times \alpha = 68^\circ \quad b \times \theta = 24^\circ \quad c \times \alpha = 37^\circ \quad 3 \times \beta = 71^\circ \quad b \times \alpha = 35^\circ \quad e \times \theta = 60^\circ \quad c \times \beta = 74^\circ \]

**Page 100**

\[ 1 \times a \times 3 \times b \times 3 \times 2 \times B \times 3 \times B \times 5 \times C \times 7 \times B \times 8 \times C \times 9 \times A \times 10 \times B \times 1 \times 11 \times C \times 12 \times 13 \times B \times 14 \times B \times 15 \times C \]

**Page 101**

\[ a \times i = 1.03 \quad ii \times 29.31 \quad iii \times 41.25 \quad b \times i = 1.43 \quad ii \times 56^\circ \quad iii \times 60 \times 2 \times a \times x = 8.06 \times cm \times b \times m = 14.38 \times cm \times c \times y = 11.93 \times cm \times d \times h = 20.71 \times cm \times e \times c = 15.34 \times cm \times 3 \times a \times right-angled \times isosceles \times b \times 45^\circ \times e \times 8.8 \times cm \times d \times 0.707 \times e \times 1 \]

**Chapter 11 – Geometry**

**Page 102**

\[ a \times triangle \quad b \times quadrilateral \quad c \times pentagon \quad d \times hexagon \quad e \times heptagon \quad f \times octagon \quad g \times nonagon \quad h \times decagon \quad 2 \times a \times yes, \quad b \times yes, \quad c \times yes, \quad d \times no \times 3 \times a \times tetragon, \quad e \times square, \quad f \times regular \quad g \times octagon, \quad h \times scalene \times triangle, \quad i \times irregular \quad 4 \times a \times hexagon, \quad b \times rectangle, \quad c \times convex \quad e \times hexagon, \quad b \times non-convex \quad f \times quadrilateral, \quad e \times kite, \quad d \times non-convex \quad f \times pentagon, \quad g \times non-convex \]

**Page 103**

\[ \begin{array}{|c|c|c|} \hline \text{Name} & \text{Number of sides} & \text{Number of } \Delta \text{s formed} & \text{Angle sum of the interior angles} \\hline \text{Triangle} & 3 & 1 & 180^\circ \\hline \text{Quadrilateral} & 4 & 2 & 360^\circ \\hline \text{Pentagon} & 5 & 3 & 540^\circ \\hline \text{Hexagon} & 6 & 4 & 720^\circ \\hline \text{Heptagon} & 7 & 5 & 900^\circ \\hline \text{Octagon} & 8 & 6 & 1080^\circ \\hline \text{Nonagon} & 9 & 7 & 1260^\circ \\hline \text{Decagon} & 10 & 8 & 1440^\circ \\hline \end{array} \]

3 a 1800^\circ \quad b \times 2880^\circ \quad c \times 3960^\circ \quad 4 \times a \times b \times 8 \times c \times 10 \times 5 \times a \times x = 158 \quad b \times x = 132 \quad c \times x = 132

**Page 104**

\[ a \times 108^\circ, \quad a = 72 \quad b \times 120^\circ, \quad a = 60 \quad c \times 135^\circ, \quad a = 45 \quad 2 \times a \times 144^\circ \quad b \times 156^\circ \quad c \times 162^\circ \quad 3 \times a \times 8 \times sides \quad b \times 10 \times sides \quad c \times 12 \times sides \quad 4 \times a \times 120^\circ \quad b \times 140^\circ \quad c \times 150^\circ \quad 5 \times a \times 22 \quad e \times 163.6^\circ \]

**Page 105**

\[ a \times 60^\circ \quad b \times 110^\circ \quad 2 \times a \times 60^\circ \quad b \times 45^\circ \quad c \times 36^\circ \quad 3 \times a \times 5 \times sides \quad b \times 108^\circ \quad c \times 540^\circ \quad 4 \times a \times 15^\circ \quad b \times 165^\circ \quad c \times 3960^\circ \quad 5 \times a \times 60^\circ \quad b \times 120^\circ \quad c \times 720^\circ \]
Answers

Page 106  1 ΔABC and ΔMLP; ΔGHI and ΔYZA; ΔMNO and ΔJKL; ΔVWX and ΔPQR; ΔDEF and ΔSUT 2 a i ∠A and ∠C; ΔABD and ΔCDB; ΔABD and ΔCDB ii AD = CD; AB = CB; BD = BD b i ∠E = ∠G; ΔEHF = ΔGFH; ΔEFH = ΔGHF ii EH = FG, EF = HG, HF = HF f i UZ = XV, ZX = XW, VX = XW, WV = WV, UW = XY

Page 107  1 a ≡ b three angles c two angles and a side d two sides and the included angle e the hypotenuse and one side 2 a RHS b SAS c AAS d SSS 3 a OC b OA = OB c yes d RHS

Page 108  1 B 2 B 3 D 4 A 5 A 6 D 7 C 8 C 9 B 10 D 11 C 12 D 13 C 14 C 15 D

Page 109  1 a PQR b SSS 2 a 3 b 4 c 720° d 120° e 60° 3 a yes b 360° c 18° d 162° e 3240° 4 a SAS b 72° 5 45°

Chapter 12 – Similarity

Page 110  1 a 2, 2, b 2 c O 2 a 1 b 1 1 1 2 b 1 3 3 a i ∠A = ∠A', ∠B = ∠B', ∠C = ∠C', ∠D = ∠D' ii AB/BC = CD/DA = 2 3 b i ∠P = ∠P', ∠Q = ∠Q', ∠R = ∠R', ∠S = ∠S' ii PQ/QR = RS/ST = SP/TP = 1/3 c i ∠D = ∠D', ∠E = ∠F', ∠F = ∠G, ∠G = ∠G' ii DE/EF = FG/FG = GD/DF = 1/2 d i ∠L = ∠L', ∠M = ∠M', ∠N = ∠N, ∠O = ∠O, ∠P = ∠P' ii LM/MP = MN/NO = NO/OP = PL/PT = 5/7 4 a equal b ratio


Page 113  1 a ∠L = ∠O, ∠M = ∠P, ∠N = ∠Q b LM = OP, MN = PQ, LN = OQ 2 a AB/AC = 1/2 b AC/BC = 1/2 c BC/BC = 1/2

Page 114  1 a DEF b x = 6, y = 15 2 a DCE b x = 4, y = 10 a ABC b x = 45, y = 6 4 a EDC b x = 15, y = 16 5 a DFE b x = 9, y = 15 6 a DFE b x = 24, y = 65 7 a TRS b x = 21, y = 64 8 a QNP b x = 24, y = 35 9 a EDC

Page 115  1 a Sides in the same ratios, m = 30° 2 a x = 40, y = 8 b x = 12, y = 12 c x = 9, y = 20

Page 116  1 a two angles b same ratio c one angle, the same ratio d hypotenuse, right-angled triangle e III 2 a equiangular b sides in the same ratio c two sides in the same ratio and included angle equal d equiangular 3 a equiangular

Page 117  1 a x = 6 b x = 1.5, m = 16 d y = 2 e h = 9 f x = 4 2 a x = 2.5 b x = 12 c x = 6 d x = 10

Page 118  1 A 2 A 3 B 4 D 5 C 6 D 7 A 8 B 9 A 10 B
Answers

Page 119 1 a $\angle CED$ b equiangular c $DEC$ d 2.5 2 a equiangular b 45 m 3 a 4 b 4 c 4 d sides in the same ratio e $\angle FED$ f $CBA$ 4 a $\frac{1}{3}$ b $\frac{1}{5}$ c two sides in proportion and included angles equal

Chapter 13 – Measurement, area, surface area and volume

Page 120 1 a 15.68 cm$^2$ b 56.7 cm$^2$ c 37.21 cm$^2$ d 70 cm$^2$ e 105.84 cm$^2$ f 41.6 cm$^2$ g 18 cm$^2$ h 60 cm$^2$ i 153.9 cm$^2$ j 2 a 73.1 cm$^2$ b 189 cm$^2$ c 96 cm$^2$

Page 121 1 F, D, C, E, A, B 2 a 22 cm$^2$ b 190 cm$^2$ c 50 cm$^2$ d 240 cm$^2$ e 240 cm$^2$ f 320 cm$^2$ 3 a 144$\pi$ cm$^2$ b 216$\pi$ cm$^2$

Page 122 1 a 380 cm$^2$ b 340 cm$^2$ c 54 cm$^2$ d 160 cm$^2$ e 300 cm$^2$ f 117 cm$^2$ 2 a 710 cm$^2$ b 926 cm$^2$ c 2047.6 cm$^2$ d 298.45 cm$^2$ e 322 cm$^2$ f 102.73 cm$^2$ 3 a 292.25 cm$^2$ b 201.06 cm$^2$ c 35.16 cm$^2$ d 181.44 cm$^2$ e 20.62 cm$^2$ f 678.58 cm$^2$

Page 123 1 a 384 m$^3$ b 541.5 m$^3$ c 1861.56 m$^3$ d 3 a 896 m$^3$ e 1432 cm$^3$ f 1249.12 cm$^3$ g 10.2925 m$^3$

Page 124 1 a 210.01 m$^3$ b 1005.31 m$^3$ c 176.71 m$^3$ d 1696.46 m$^3$ e 20.9768 m$^3$ f 448.8 cm$^3$ 3 a 145 cm$^3$

Page 125 1 a 7.3 m$^3$ b 5.8 cm$^3$ c 7.1 cm

Page 126 1 a 318 cm$^2$ b 121.5 cm$^2$ c 380.22 cm$^2$ d 736 cm$^2$ e 712.8 cm$^2$ f 187.2 cm$^2$ g 337.2 m$^2$ h 262.8 m$^2$ i 655.35 m$^2$ j 502.65 cm$^2$ k 452.4 cm$^2$ l 1218.3 cm$^2$

Page 127 1 a 27 cm$^2$ b 125 cm$^3$ c 592.704 cm$^3$ d 3 a 350 cm$^3$ e 192 cm$^3$ f 280 cm$^3$ g 4200 m$^3$ h 17.5 m$^2$ i 70 m$^3$

Page 128 1 a 195.1 cm$^3$ b 188.2 cm$^3$ c 213.6 cm$^3$ d 2 a 1220 cm$^3$ e 223.2 cm$^3$ f 1235 cm$^3$ g 6117.53 cm$^3$ h 351 m$^3$ i 1716.63 cm$^3$ j 4 a 1072.5 m$^3$ k 1968 m$^3$ l 520 m$^3$

Page 129 1 a 10$^9$ b 10$^8$ c 10$^7$ d 10$^{-3}$ e 10$^0$ f 10$^{-3}$ g 10$^{-6}$ h 10$^{-9}$ i 10$^{-12}$ j 10$^{-15}$ 2 a 8.5385 × 10$^1$ L b 4.383 × 10$^7$ c 3.15576 × 10$^7$ d 1.49 × 10$^9$ e 8 minutes f 7 × 10$^{-6}$

Page 130 1 C 2 B 3 D 4 C 6 D 7 C 8 B 9 B 10 B

Page 131 1 a 7.1 m$^2$ b 47.1 m$^2$ c 61.3 m$^2$ d 35.5 m$^2$ e 35.16 m$^3$ f 384.85 cm$^3$ g 664.64 cm$^3$ h 7754.7 cm$^3$ i 1012.1 cm$^3$ j 695.2 cm$^3$

Page 135 1 a 1 b 2 c 3 d 2 a 2 b 3 c 4 d 3 a 5 b 6 c 7 d 8 e 9 f 10 g 11 h 12 i 13 j 14 k 15

Page 136 1 a $\frac{5}{18}$ b $\frac{5}{18}$ c $\frac{5}{9}$ d $\frac{5}{25}$ e $\frac{2}{7}$ f $\frac{4}{35}$ g $\frac{1}{3}$ h $\frac{3}{20}$ i $\frac{30}{1}$ j $\frac{30}{1}$ k $\frac{1}{3}$ l $\frac{1}{17}$

Page 137 1 a $\frac{1}{6}$ b $\frac{1}{7}$ c $\frac{1}{8}$ d $\frac{1}{9}$ e $\frac{1}{10}$ f $\frac{1}{11}$ g $\frac{1}{12}$ h $\frac{1}{13}$ i $\frac{1}{14}$ j $\frac{1}{15}$ k $\frac{1}{16}$ l $\frac{1}{17}$

Page 138 1 a $\frac{1}{6}$ b $\frac{1}{7}$ c $\frac{1}{8}$ d $\frac{1}{9}$ e $\frac{1}{10}$ f $\frac{1}{11}$ g $\frac{1}{12}$ h $\frac{1}{13}$ i $\frac{1}{14}$ j $\frac{1}{15}$ k $\frac{1}{16}$ l $\frac{1}{17}$

Answers

Page 131 1 a $\angle CED$ b equiangular c $DEC$ d 2.5 2 a equiangular b 45 m 3 a 4 b 4 c 4 d sides in the same ratio e $\angle FED$ f $CBA$ 4 a $\frac{1}{3}$ b $\frac{1}{5}$ c two sides in proportion and included angles equal

Chapter 14 – Probability

Page 133 1 a $\frac{1}{6}$ b $\frac{1}{2}$ c $\frac{1}{3}$ d 0 e $\frac{1}{2}$ f $\frac{1}{3}$ g $\frac{1}{4}$ h $\frac{1}{5}$ i $\frac{1}{6}$

Page 134 1 a 49 b 125 c 211 d $\frac{106}{105}$ e $\frac{53.77}{105}$ f $\frac{37}{105}$ g $\frac{37}{836}$ h $\frac{289}{836}$ i $\frac{560}{836}$ j $\frac{140}{836}$ k $\frac{311}{836}$ l $\frac{512}{836}$ m $\frac{128}{836}$ n $\frac{209}{836}$ o $\frac{801}{836}$

Page 135 1 a $\frac{1}{4}$ b $\frac{1}{6}$ c $\frac{1}{8}$ d $\frac{1}{10}$ e $\frac{1}{12}$ f $\frac{1}{14}$ g $\frac{1}{16}$ h $\frac{1}{18}$ i $\frac{1}{20}$ j $\frac{1}{22}$ k $\frac{1}{24}$ l $\frac{1}{26}$

Page 136 1 a $\frac{5}{18}$ b $\frac{5}{18}$ c $\frac{5}{18}$ d $\frac{5}{25}$ e $\frac{2}{7}$ f $\frac{4}{35}$ g $\frac{1}{3}$ h $\frac{3}{20}$ i $\frac{30}{1}$ j $\frac{30}{1}$ k $\frac{1}{3}$ l $\frac{1}{17}$

Page 137 1 a $\frac{1}{6}$ b $\frac{1}{7}$ c $\frac{1}{8}$ d $\frac{1}{9}$ e $\frac{1}{10}$ f $\frac{1}{11}$ g $\frac{1}{12}$ h $\frac{1}{13}$ i $\frac{1}{14}$ j $\frac{1}{15}$ k $\frac{1}{16}$ l $\frac{1}{17}$

Page 138 1 a $\frac{1}{6}$ b $\frac{1}{7}$ c $\frac{1}{8}$ d $\frac{1}{9}$ e $\frac{1}{10}$ f $\frac{1}{11}$ g $\frac{1}{12}$ h $\frac{1}{13}$ i $\frac{1}{14}$ j $\frac{1}{15}$ k $\frac{1}{16}$ l $\frac{1}{17}$
Answers

Page 139  1 a \( \frac{1}{2} \)  b \( \frac{1}{2} \)  c \( \frac{1}{2} \)  d \( \frac{3}{10} \)  e \( \frac{3}{7} \)  f \( \frac{1}{2} \)  g \( \frac{1}{7} \)  h \( \frac{1}{2} \)  i \( \frac{3}{10} \)  j \( \frac{1}{2} \)  k \( \frac{1}{2} \)  l \( \frac{1}{2} \)  m \( \frac{3}{5} \)  n \( \frac{3}{5} \)  o \( \frac{2}{3} \)  p \( \frac{1}{3} \)
2 a 0.12, 0.08, 0.16, 0.20, 0.24, 0.12, 0.08  b 0.15, 0.10, 0.20, 0.10, 0.15, 0.05, 0.25  c 0.19, 0.25, 0.13, 0.06, 0.13, 0.06, 0.19  d 0.07, 0.11, 0.19, 0.15, 0.07, 0.22, 0.19  e 0.10, 0.07, 0.13, 0.20, 0.23, 0.10, 0.17  f 0.13, 0.09, 0.06, 0.19, 0.25, 0.22, 0.06

Page 140  1 a 100  b 0.43  c \( \frac{43}{100} \)  d 0.57  e \( \frac{57}{100} \)  f 1  g 100 tails  2 a \( \frac{1}{8} \)  b \( \frac{1}{8} \)  c \( \frac{3}{20} \)  d \( \frac{3}{80} \)  e \( \frac{9}{80} \)  f \( \frac{13}{80} \)  b i \( \frac{3}{35} \)  ii \( \frac{41}{80} \)  iii \( \frac{9}{20} \)  iv \( \frac{17}{40} \)  v 11\%  vi 48\%

Page 141  1 C  2 B  3 C  4 D  5 C  6 D  7 C  8 A  9 D  10 C  11 C  12 D  13 C  14 B  15 D

Page 142  1 a \( \frac{4}{9} \)  b \( \frac{5}{9} \)  c \( \frac{7}{9} \)  d \( \frac{1}{9} \)  e \( \frac{4}{9} \)  f 2 a 3 5 \( \frac{8}{35} \)  c \( \frac{1}{3} \)  d \( \frac{18}{35} \)  e \( \frac{9}{35} \)  f \( \frac{3}{1} \)  b 0  c \( \frac{2}{3} \)  d \( \frac{1}{3} \)  e \( \frac{1}{3} \)  f \( \frac{1}{3} \)

Chapter 15 – Data representation and analysis

Page 143  1 a data  b frequency  c distribution  d frequency distribution table  e frequency histogram  f frequency polygon  g cumulative frequency  h relative frequency  2 a mean  b median  c mode  d range  e variable  f Discrete  g Continuous

Page 144  A survey of the population would interview all the people in the group under consideration, for example, all the students in your school. A sample is a part of the population, for example, selecting one person to be surveyed from each class in your school. A survey is cheaper as fewer people are interviewed and the results can be quickly analysed. 3 This is not a reasonable conclusion. The film could have been rated M so younger students should not have been watching or it may have been a film closely linked to a 12 year subject so more year 12 students than other year levels would have watched it. 4 This is a leading question, because it implies the answer the interviewer wants.

Page 145  1 a 11  b 10.5  c 13.5  d 17  e 12.5  f 22  2 a 7.4  b 11.3  c 14.7  d 6.9  e 9  f 15  3 a 17.8  b 12.375  c 8.83  d 9.538

Page 146  1 a 3  b 8  c 6  d 9  e 10  f 7  g 6  h 7  2 a 8  b 8  c 8  d 8  e 11  f 8  g 37  h 9  i 3 7  b 5  c 7  d 9  e 5  f 5  4 a 8  b 5  c 7  d 6  e 7  f 6

Page 147  1 a 6  b 3.5  c 8  d 12  e 5.5  f 17  2 a 7  b 16  c 9  d 9  e 6.5  f 13.5  3 a 12  b 57  c 11  d 7  e 8.5  f 9  4 a 24  b 10  c 11  d 10  e 9  f 14  g 9  h 15.5  i 12  j 9

Page 148  1 a 8  b 14  c 11  d 8  e 9  f 14  g 22  h 30  2 a 19  b 21  c 66  d 46  e 34  f 53  g 80  h 63  3 a 49  b 64  c 61  d 49  e 39  f 31  4 a 25  b 58  c 71  d 15  e 40  f 63

Page 149  1 a Increase; there were about 650 000 in 1945 and just over one million in 2010.  2 a 5  b 2  c 23%  d 53%  e 24%  f In this group of students more than half ate less than the recommended minimum amount of fruit and only a quarter ate more than the minimum amount. If this is representative of the rest of the population more fruit needs to be consumed by students.  

Page 150

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Excel ESSENTIAL SKILLS Year 9 Mathematics Revision & Exam Workbook

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### Answers

**Page 151**

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b

![Graph of cumulative frequency](chart.png)

**Page 152**

2 a

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b

![Graph of cumulative frequency](chart.png)

**Page 153**

1 a

- a: Yes
- b: Yes
- c: 7 and 9
- d: Yes

2 a

- a: No
- b: Yes
- c: 2
- d: Positively skewed

3 a

- a: No
- b: No
- c: 4
- d: Negatively skewed

4 a

- Yes
- c: Yes
- d: 0 and 4
- e: Yes, 2 (mean = median)

**Page 154**

1 a

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b

- 28 scores

![Frequency Distribution](chart.png)
Answers

2 a

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<tr>
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<td>I</td>
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b

Page 155 1 a 40 people  b 42 c 6 people  d 25 people  e 33 f 33

Page 156 1 a 23 males  b 27 females  c 27 tourists spent over $60  d 16 tourists spent less than $50  e 9 tourists spent less than $40 2 a

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<td>2 1</td>
<td>4</td>
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</table>

b 32 c 36 d 23 e 31 f 25 g 29

Page 157 1 a 6.66 b 6.70 c 6 d 6 e 6.5 f 7 g 7 h 5 i 9M; range is smaller j 9M; mean and median are higher 2 a 14

b males by 11 cm  c female  d 170 cm  e 148 cm  f 168.12 cm  g 147.33 cm  h males are taller on average by about 20 cm as the differences in the mean and the median are about 20. The heights of the females are more consistent, lower range, and the display for females is more symmetrical while that for the males is negatively skewed.

Page 158 1 C 2 C 3 D 4 B 5 C 6 B 7 C 8 B 9 A 10 A

Page 159 1 a skills  b skills  c 8.12 d artistic  e 2 2 a 54 b 63 c 69 d 9Y e 44%
### Answers

#### Exam Papers

**Page 160**  
1 D 2 C 3 D 4 C 5 A 6 C 7 D 8 B 9 C

**Page 161**  
10 C 11 A 12 B 13 D 14 C 15 C 16 17 B 18 D 19 B 20 C

**Page 162**  
21 85 600 22 12.7 23 0.7 24 800 25 31 26 10 27 $x = -3$ 28 4.740 29 $\$1266$ 30 $\$56.09$ 31 100 000 cm

32 $13.09 \text{ cm}^2$ 33 $5 \times 10^2$ 34 $4.826 \times 10^2$ 35 250 times 36 $\frac{2}{5}$ 37 82 38 85 39 $150^\circ$ 40 $51.15$ 41 $59^\circ$ 42 (3, 5) 43 yes 44 4 45 $764 \text{ cm}^3$

**Page 163**  
46 $2x + 11$  
47 $\triangle AED, \triangle ABC$  
equilateral  
48 $\$1980$  
49 $\$7920$  
50 $\$1188$  
51 $\$9108$  
52 $\$253$

**Page 164**  
50 $\frac{3}{7}$  
51 $\frac{3}{2} \ b = 1$  
52 $\frac{1}{2}$

**Page 165**  
1 C 2 B 3 C 4 B 5 A 6 B 7 D 8 B 9 D

**Page 166**  
10 D 11 D 12 C 13 C 14 C 15 C 16 B 17 B 18 A 19 B 20 C

**Page 167**  
21 125 22 123 23 $7a^2y^4$ 24 $\$1064.25$ 25 $2.57\%$ 26 68 cm 27 40 212 km 28 $\frac{4}{100}$ 29 $0.0000003 \text{ mm}$ 30 $\frac{3}{4}$ 31 $\frac{5}{6}$

32 6.4 33 decagon  
34 $a = 20$  
35 2340°  
36 $\frac{2}{\sqrt{65}}$ 37 1.2 38 $\frac{1}{4}$ 39 $\frac{1}{a}$ 40 (0, 0) 41 $m = \frac{1}{3}$  
42 no 43 $x = 0$  
44 $121.5 \text{ cm}^2$  
45 $945 \text{ cm}^3$

**Page 168**  
46 $38.5 \text{ m}^2$  
47 $15.5 \text{ m}$  
48 $124 \text{ m}^2$  
49 47.03 m$^2$  
50 $\$3998$  
51 $\$47$  
52 $\$9$  
53 $\$26$  
54 $10%$  
55 $\text{negatively skewed}$

48 $\frac{3}{7}$  
49 $\frac{3}{2} \ c = \frac{3}{2}x - 1$  
50 $\frac{2}{3} \ b = 1$

**Page 169**  
50 $322 \text{ m}^2$  
51 $91.6 \text{ m}^2$  
52 $506 \text{ m}^2$  
53 $870 \text{ m}^2$  
54 $870 \text{ kL}$  
55 true  
56 false  
57 false  
58 true  
59 false  
60 true  
61 false  
62 true  
63 false  
64 true  
65 false  
66 true  
67 false  
68 true  
69 false  
70 true  
71 false  
72 true  
73 false  
74 true  
75 false  
76 true

**Page 170**  
1 D 2 B 3 D 4 D 5 C 6 C 7 C 8 B 9 C

**Page 171**  
10 D 11 A 12 B 13 C 14 C 15 A 16 C 17 C 18 C 19 D 20 B

**Page 172**  
21 11 000 22 172 km/h 23 $23^2 \times 3^2$ 24 $x = 4$ 25 $\$1625$ 26 $\$1005.50$ 27 47.7 cm 28 $196\pi \text{ cm}^2$ 29 $10^5$ 30 $10^{11}$

31 $\frac{3}{7}$  
32 $\frac{32}{33}$  
33 $6$  
34 $4$  
35 $360^\circ$  
36 $365^\circ$  
37 $6.42$  
38 $44^a$  
39 $3x^2 - 2xy$  
40 $-27x^6y^3$  
41 $k = 2$  
42 $0.0001$  
43 $\left(5, 0\right)$  
44 $440 \text{ cm}^2$  
45 $17.68 \text{ m}^3$

**Page 173**  
46 $105$  
47 $273$  
48 $2.6$  
49 $-2ab^2c^3$  
50 $2x + 3$  
51 $38.8 \text{ cm}$  
52 $21.2 \text{ cm}$  
53 $\text{isosceles}$  
54 $45^\circ$  
55 $ax = -\frac{1}{4}$  
56 $6.5\text{ hours}$  
57 $20 \text{ m/s}$

**Page 174**  
53 $67$  
54 $\frac{3}{2}$  
55 $\frac{3}{67} \ d = \frac{30}{67}$  
56 $10 \text{ units}$  
57 $b = 0, 3$  
58 $c = -\frac{4}{3}$  
59 $x = -\frac{4}{3} + 3$  
60 $x^2 + y^2 = 9$  
61 $24 \text{ b}$  
62 $84 \text{ m}^2$  
63 $616 \text{ m}^2$  
64 $\triangle PQR, \triangle TSR$  
equilateral  
65 $c 4$
Answers

Page 175  1 B  2 C  3 C  4 D  5 C  6 B  7 B  8 B  9 B
Page 176  10 C  11 C  12 D  13 C  14 C  15 A  16 B  17 B  18 D  19 B  20 C
Page 177  21 32:9  22 2  23 15\(^{10}\)  24 \(\frac{16}{9}\)  25 \$5 050  26 \$752.57  27 8 cm  28 360 cm\(^2\)  29 \(10^{14}\)  30 5 000 000
31 \{1, 2, 3, 4, 5, 6\}  32 50  33 6.2  34 5.5  35 equilateral triangle  36 720°  37 18.32  38 59°  39 \(m = \frac{3}{7}\), \(b = -3\)  40 yes  41 \(x = 0\)  42 yes
43 (0, –2)  44 1728 cm\(^3\)  45 4.8 m
Page 178  46 a \$648  b \$2592  c \$3337.20  d \$97.20  e 7.5%  47 a 7.651 \times 10^{-3}  b 5 \times 10^5  48 a 2.5  b 100  c 6.4  49 a 3.4 cm
b 36.3 cm\(^2\)  c 435.8 cm\(^2\)  d 508.4 cm\(^3\)  e 740.9 cm\(^3\)
Page 179  50 a 64 cm\(^3\)  b 8 cm  51 a 118 m\(^3\)  b \$531  52 6.5  53 a \(r^3\)  b 3  c 13x + 10  d 4m + 48  54 a \(\frac{1}{6}\)  b \(\frac{1}{4}\)
55 a 56  b 52  c 21  d 29
### Topic Test Feedback Chart

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### Exam Paper Feedback Chart

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- Answers to all questions

About the author

AS Kalra is the author of many successful Mathematics books, including the Excel Essential Skills Mathematics Revision & Exam Workbook series for Years 7–10 (eight titles), and the Excel Mathematics General Revision & Exam Workbooks for Years 11–12.

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