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Year 11 Preliminary General Mathematics Revision & Exam Workbook

In this book you will find:

✓ topics covering the Preliminary (Year 11) General Mathematics course
✓ 200 pages of practice exercises, with topic tests for all chapters
✓ two sample examination papers
✓ answers to all questions.

This book has been specifically designed to help Year 11 students thoroughly review all topics in the Preliminary General Mathematics course and prepare for their class tests, half-yearly and yearly exams. Comprehensive revision in Year 11 will enable students to confidently progress into the HSC General Mathematics course in Year 12.

About the author
AS Kalra, MA, MEd, BSc, BEd, has over thirty years experience teaching Mathematics in NSW High Schools. He is also the author of the HSC General Mathematics Study Guide and the Excel Essential Skills Years 7–10 Mathematics Revision & Exam Workbooks.

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AS Kalra
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ESSENTIAL SKILLS

YEAR 11
PRELIMINARY
GENERAL
MATHEMATICS

REVISION & EXAM
WORKBOOK

AS KALRA

PASCAL PRESS
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I would especially like to express my thanks and appreciation to my dear wife, Pammy, and my dear son, Jaani, who have helped me to find the time to write this book. Without their help and support, achievement of all this work would not have been possible.

–AS Kalra

Dedication
This book is dedicated to the new generation of young Australians in whose hands lies the future of our nation and who by their hard work, acquired knowledge and intelligence will take Australia successfully through the 21st century.

This book is also in the loving, living and lasting memory of my dear mum, Amar Kaur Kalra, my dad, Manmohan Singh Kalra, and my uncle, Santokh Singh Kalra, who will remain a great source of inspiration and encouragement to me for times to come.

–AS Kalra

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Students
All care has been taken in the preparation of this study guide, but please check with your teacher or the Board of Studies about the exact requirements of the course you are studying as they can change from year to year.
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Introduction

This workbook is designed for the student to practise the skills needed for the Preliminary Mathematics course. It is intended for students to write in the book, which carefully follows the syllabus with graded exercises. Answers are provided for every question.

Each page has a cross-reference to the Excel Preliminary General Mathematics study guide so that if students are unsure how to approach a question they can easily find worked examples of the same type. There should be sufficient space to answer each question, setting out clearly and working down the page.

At the end of each chapter is a topic test. Each test has been designed to completely cover the content of that topic and to test the understanding of all the skills needed. Marks have been allocated for every question.

Three sample Preliminary examinations have also been included. These should test the knowledge and understanding of all the basic skills and important concepts.

This book is ideal for revision. The best way to study mathematics is by working through examples, and here, all the questions and answers are together in one book. Write notes in the margins and have a complete personalised review. The book can also be used as a diagnostic tool to quickly assess areas of concern and determine weaknesses.

Any student who has worked through all these questions and understands the content should feel confident of doing well in the Preliminary Mathematics course.

Some useful hints for the examination

When confronted with poor or unsatisfactory examination marks, students often feel confused and disappointed. However, by following a few simple rules of examination preparation, students can often improve their marks considerably.

1. Allocate time in the examination very carefully, allowing time for checking and revision.
2. Before attempting a question, read it carefully. Copy the details correctly.
3. If a formula is involved, write down the formula first and then substitute the values into it.
4. Draw diagrams where necessary.
5. Attempt questions that you find easier first. This will give you confidence and more time to spend on harder questions.
6. If you cannot do a question, do not waste much time on it. Go to the next question—you can always come back to this question later.
7. Make sure you include all your working for each question, as you will receive some marks for correct working even if your final answer is incorrect.
8. Set out your work neatly and logically. It is better to work down the page rather than across it.

Good luck in your studies!
CHAPTER 1
Financial Mathematics – Earning Money

Salaries

**QUESTION 1**  John’s annual salary is $43 550. How much is he paid each week?

**QUESTION 2**  Amie receives a salary of $72 852 p.a. What is her gross fortnightly pay?

**QUESTION 3**  Jenny earns $659 per week. What is her annual salary?

**QUESTION 4**  Mladdin is on a salary of $67 440 p.a. paid monthly.
   a. How much does he receive each month?
   b. Mladdin works 200 hours each month. How much does he receive per hour?

**QUESTION 5**  Last year the chief executive of a bank received a total remuneration package of $7 774 624.
   a. How much is this per week?
   b. A newspaper headline read: ‘Bank boss paid $21 300 a day’. Is this correct? Justify your answer.

**QUESTION 6**  Daniel receives $3240 per month. Find his:
   a. annual salary
   b. weekly pay
Financial Mathematics – Earning Money

Wages

QUESTION 1  Angela works a basic week of 40 hours and her hourly rate of pay is $12.50. Calculate her weekly wage.

QUESTION 2  Michael works 35 hours per week and his weekly wage is $756. Find his hourly rate of pay.

QUESTION 3  A painter works a 38-hour week for an hourly rate of $15.95. Find his total weekly wage.

QUESTION 4  Susan works in a shop and is paid $12.40 per hour. Calculate Susan’s wage in a week when she works 40 hours.

QUESTION 5  Cleve works 8 hours a day and a nine-day fortnight. If his pay rate is $23.15 per hour, what is his fortnightly pay?

QUESTION 6  Petra is paid $1845.90 per fortnight. If she works 35 hours per week, what is her hourly rate of pay?

QUESTION 7  Yousef is paid $163.50 for working 7 1/2 hours. What will he be paid for working 5 hours at the same rate of pay?

QUESTION 8  Reno works 6 hours on Monday, 8 hours on Tuesday, 7 hours on Wednesday, 9 hours on Thursday and 6 hours on Friday. If he is paid $18.20 per hour, what is his weekly pay?
Financial Mathematics – Earning Money

Overtime

QUESTION 1  A man is paid a basic rate of $14.70 per hour. Calculate his hourly overtime rate of pay when this is paid at:

a  time-and-a-half  

b  double-time

QUESTION 2  Kelli’s normal pay rate is $16.80 per hour. What will she earn for working:

a  5 hours at time-and-a-half  

b  3 hours at double-time-and-a-half

QUESTION 3

a  John receives a gross pay of $850 for a 40-hour week. Calculate John’s hourly rate of pay.

b  In one busy week, in addition to his normal 40 hours, John works the following overtime; 6 hours on Saturday at time-and-a-half and 5 hours on Sunday at double-time. Find John’s gross pay for that week.

QUESTION 4  Peter is paid an hourly rate of $15.60. His normal working day is 8 hours. He gets paid time-and-a-half for hours worked over 8 hours but less than or equal to 11 hours and double-time for hours worked over 11 per day.

a  How much does he earn for a normal 5 day working week?

b  What does he earn in a week where he works two 8 hour days, one 10 hour day, one 11 hour day and one 12 hour day?

QUESTION 5  Ronnie is an electrician and gets paid $1200 for a 40-hour week. In one week she works 12 hours overtime, of which 8 hours is at time-and-a-half and 4 hours is at double-time. What are her earnings that week?
Financial Mathematics – Earning Money

Penalty rates and special allowances

**Question 1**
Thomas works on a construction site and is paid a special allowance of $6.20 per hour. Find his total weekly wage, given that his basic wage is $28.70 per hour for a 40-hour week.

**Question 2**
Joe and Troy are builder’s labourers. Their award rate of pay is $13.84 per hour.

a How much does Troy receive for a normal 40 hour week?

b Troy is paid a special allowance of 46 cents per hour for working in wet conditions. How much will Troy receive in a week where 7 hours are under wet conditions?

c The award allows an extra $1.54 per hour for working with toxic substances. If Joe spends the whole 40 hour week working with toxic substances, find his weekly wage.

**Question 3**
Adrian gets $875.80 per week. As a result of an indexation decision, his award rate of pay is increased by 4.5%. Find his new weekly wage.

**Question 4**
Michelle gets paid $12.50 per hour. She is paid 40% extra per hour on the weekends. Find her hourly rate of pay on the weekends.

**Question 5**
Mark’s normal wage is $880.80 for a 40-hour week. He worked overtime and earned $1233.12 in one week.

a Find his normal hourly rate.

b How much extra did he get for overtime?

c How many hours of overtime did he work if he was paid double-time for the overtime worked?
Financial Mathematics – Earning Money

Annual leave loading

**QUESTION 1**  Zac’s weekly wage is $627.20.

a  What does he earn for 4 weeks?

b  Zac receives an annual leave loading of $17\frac{1}{2}$% on 4 weeks holiday pay. Find the amount of the annual leave loading.

c  What is Zac’s total holiday pay?

**QUESTION 2**  Michelle gets an annual salary of $48 630.40. If she receives $17\frac{1}{2}$% holiday loading on the 4-week holiday period, calculate:

a  her normal pay for 4 weeks

b  her holiday loading

c  her holiday pay for 4 weeks.

**QUESTION 3**  William earns $19.40 per hour and works a 35 hour week.

a  What will William receive for 4 weeks?

b  Find William’s total holiday pay if he receives a holiday loading of $17\frac{1}{2}$% on 4 week’s pay.

**QUESTION 4**  Maddy works for the Department of Social Security on an annual salary of $52 460. If she receives $17\frac{1}{2}$% holiday loading on the four weeks holiday pay period, calculate her total holiday pay for the 4 weeks.
**Financial Mathematics – Earning Money**

**Commission**

**QUESTION 1** Yasmin receives a commission of 5% on sales. How much commission will she receive in a week in which her sales total $11 000?


**QUESTION 2** David is a car sales representative and is paid a retainer (basic wage) of $350 per week and a commission of 3% on sales made. Find his weekly income in a week in which he sells a car to the value of:

\[ \begin{align*}
  &a \quad $45 000 \\
  &b \quad $70 000
\end{align*} \]


**QUESTION 3** Meena is a sales person and earns $250 a week plus 3.5% commission on sales. Her weekly sales total $60 000. Find:

\[ \begin{align*}
  &a \quad \text{her commission} \\
  &b \quad \text{her total earnings for the week}
\end{align*} \]


**QUESTION 4** Joshua is a real estate agent and receives 2% commission on the first $200 000, 1 1/2% on the next $100 000, 1 1/4% on the next $100 000 and 1% on the value thereafter. Find his commission for selling a property worth $650 000.


**QUESTION 5** Ian works as a sales representative for a medical firm and receives a basic salary of $300 per week plus 7 1/2% commission on that part of sales which exceed $3000 per week. Find his earnings for a week in which he sells medical supplies worth $8500.


Financial Mathematics – Earning Money

Piecework and royalties

**Question 1**
An apricot picker is paid 19 cents for every full bucket she picks. How much will she earn in a day when she picks 78 buckets of apricots.

**Question 2**
Janny works in a clothing factory and is paid $8.50 for each garment completed. What is her weekly wage if she completes 154 garments in one week?

**Question 3**
Matthew is paid a royalty of 14% on the sales of his book. Sales for the first six months total $156,348. How much royalty does he receive?

**Question 4**
Tim works in a factory on a basic wage of $300 a week. In addition to this he is paid a bonus of 10 cents per article, for every article in excess of the weekly quota of 4000. How much will he earn in a week in which 6500 articles are made?

**Question 5**
Brent works as a packer on a banana plantation and is paid $2.00 per box with a bonus of 75 cents for each box packed in excess of 100 boxes per day. Find his income for a day in which he packs 165 boxes.

**Question 6**
Celeste receives royalties on the sales of her book. She receives 10% of the recommended retail price of the first 5000 copies sold and 12% on any further copies. In the first year sales total 12,514 copies and the retail price was $21.95. How much does Celeste receive?
Financial Mathematics – Earning Money

Pensions and government allowances

**QUESTION 1** Natasha earns $45,650 per annum. Her pension fund contributions amount to 9% of her annual salary. How much are the pension fund payments per annum?

**QUESTION 2** When Emma retires at the age of 60, her pension will be 70% of the salary received during her last working year. Find her weekly superannuation payment if, during her last year of work, her salary was $51,800.60.

**QUESTION 3** Employees of the NSW State Public Service contribute to a superannuation scheme which guarantees a pension on retirement. The payment is calculated on the number of units contributed to. The number of units increase with increased salary. Each unit of superannuation results in a payment of $11.60 per fortnight on retirement. Michael retires on a salary of $72,890 and is entitled to 150 units.

a What is his fortnightly pension?  
b How much will he receive per year?  
c What percentage of his retirement salary does he receive on an annual basis?

**QUESTION 4** A single person over the age of 65 is entitled to an age pension of $458.60 per fortnight. If the person owns his or her home, he or she is allowed other assets of $149,500. For every $1000 of assets over $149,500 the pension reduces by $5 per fortnight. The person is also allowed an income of up to $120 per fortnight. For every dollar earned over $120, the pension reduces by 40 cents.

a Frank, a single pensioner, owns his home and has assets of $215,500. He has no other income. How much is Frank’s fortnightly pension?

b Maria has assets of $56,500 apart from her home. She earns $825 per fortnight from a part-time job. What is Maria’s pension?

c George has assets of $167,000 apart from his home. He receives an income of $160 per fortnight from his investments. How much is his fortnightly pension?
CHAPTER 1 – Financial Mathematics – Earning Money

Deductions

QUESTION 1  Alex works as a dentist in a dental hospital and his yearly salary is $64 000. His fortnightly deductions include income tax $980, Medicare levy $45 and union fees $6.50. Calculate his fortnightly take-home pay (net pay).

QUESTION 2  Amanda receives a gross wage of $845.80 per week. The payments deducted from her weekly wage are tax, 35% of gross weekly wage; health insurance, $29.50 per week; superannuation, 22 units at $2.50 per unit. Calculate her net pay for the week.

QUESTION 3  Jane earns $2450 gross per fortnight. Her pay deductions are $465.10 for tax, $150 for superannuation, $5.20 for union fees and $30.60 for health insurance. Find Jane’s net pay per fortnight.

QUESTION 4  Andrew’s gross annual salary is $58 650. (Use 1 year = 52 weeks)
   a  What is his fortnightly income?
   b  If his deductions are $630.65 in income tax, $20.15 in union fees and $125.60 in superannuation contributions, find his net pay per fortnight.
   c  What percentage of Andrew’s gross pay is deducted?

QUESTION 5  Alan’s gross annual income is $48 380. He paid a total of $9268 in deductions, including income tax. Calculate his net weekly pay. (Use 1 year = 52 weeks)
Financial Mathematics – Earning Money

Accounts with financial institutions

**QUESTION 1**  Jed’s bank account has a $5 per month account service fee. How much does Jed pay in bank fees in a year?

**QUESTION 2**  Lucy’s bank account has no monthly fee and allows her 6 free electronic transactions per month. (These include using the bank’s ATM, EFTPOS, phone banking and internet banking.) Any excess transactions are charged at 50 cents each.

a  How much will Lucy pay in fees in a month where she makes 15 electronic transfers?

b  Lucy could instead choose to pay a monthly fee of $6 per month. How many electronic transactions would she need to make in a month in order to be better off paying a monthly fee?

c  What advice could you give Lucy in operating her account?

**QUESTION 3**  Katrina has an account with a financial institution with the following terms. Service fee of $7 per month, minimum monthly balance of $500 to avoid monthly service fee, 10 free withdrawals per month, excess withdrawal fee of 80 cents per transaction. The table shows Katrina’s account for the first six months of the year.

<table>
<thead>
<tr>
<th>Month</th>
<th>Minimum Balance</th>
<th>Number of withdrawals</th>
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<tr>
<td>January</td>
<td>$250</td>
<td>8</td>
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<tr>
<td>February</td>
<td>$370</td>
<td>12</td>
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<tr>
<td>March</td>
<td>$510</td>
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<td>April</td>
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<td>16</td>
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<td>May</td>
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<td>6</td>
</tr>
<tr>
<td>June</td>
<td>$180</td>
<td>14</td>
</tr>
</tbody>
</table>

a  In which month(s) will Katrina pay no fees?

b  Find the total fees paid over the six months.
Creating a budget

QUESTION 1  
Each month Georgie earns $600 from a part-time job, receives $100 as an allowance from her parents and earns $150 babysitting. Her monthly expenses are $180 for music lessons, $120 for repaying a loan and $130 for school needs. She wants to save $150 per month. Whatever is left she divides equally between clothes, entertainment and car expenses.

a  Make a monthly budget for Georgie.

b  What are her car expenses?

<table>
<thead>
<tr>
<th>Income ($)</th>
<th>Expenses ($)</th>
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Question 1

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What percentage of her total income does she save?

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QUESTION 2  
Michael is a year 11 student and receives $25 per week as pocket money from his parents. He also earns $35.50 per week by working part-time. His travel expenses are $10 and miscellaneous expenses are $15. The rest of his income is saved.

a  Make up a weekly budget for Michael.

b  How much does he save?

<table>
<thead>
<tr>
<th>Income ($)</th>
<th>Expenses ($)</th>
</tr>
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<tbody>
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Question 2

<table>
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<th>Expenses ($)</th>
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What percentage of his total income does he save?

<table>
<thead>
<tr>
<th>Income ($)</th>
<th>Expenses ($)</th>
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</tr>
</tbody>
</table>
Financial Mathematics – Earning Money

Operating a budget

**QUESTION 1** Sue works in a bank and her take-home pay is $974.65 per fortnight. Her expenses are shown in the table.

a What is Sue’s annual income?

<table>
<thead>
<tr>
<th>Item</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>250.00</td>
</tr>
<tr>
<td>Food</td>
<td>155.00</td>
</tr>
<tr>
<td>Telephone</td>
<td>75.00</td>
</tr>
<tr>
<td>Clothing</td>
<td>100.00</td>
</tr>
<tr>
<td>Car</td>
<td>125.00</td>
</tr>
<tr>
<td>Entertainment</td>
<td>90.00</td>
</tr>
<tr>
<td>Other expenses</td>
<td>10.00</td>
</tr>
<tr>
<td>Savings</td>
<td>——</td>
</tr>
<tr>
<td>Total</td>
<td>974.65</td>
</tr>
</tbody>
</table>

b What are her savings per fortnight?

c How much can she save towards her holidays each year?


**QUESTION 2** Natalie earns $300 per month from a part-time job, receives $60 for helping her parents and $50 for helping an organisation. Every month her expenses are $90 for food, $30 repayments on a loan and $70 on school needs. She wants to save $85 per month. Whatever is left she divides equally between clothes, entertainment and car expenses.

a Make up a monthly budget for Natalie.

b What percentage of her total income does she save?
Household bills

**QUESTION 1** For the given Telstra bill, answer the following questions.

a What is the date of issue? ____________

b What is the bill number? ____________

c What is the total amount payable? ____________

d What is the difference between the total of this bill and the total of the last bill?

e When is the payment due? ____________

f What are the call charges? ____________

g What are the charges for service and equipment? ____________

**QUESTION 2** Answer the following questions in relation to the gas bill shown.

a What is the payment reference number?

b When is the payment due?

c What is the total amount payable for this bill?

d What is the difference between the total of this bill and the total of the last bill?

e What is the meter number? ____________

f How many units were consumed? ____________

g If 1 unit = 38.196772 megajoules (MJ), convert the gas units consumed in part f to the number of megajoules (MJ). (Answer to the nearest MJ.)

h If 1 MJ is charged at the rate of 1.0595 cents, what is the total cost of the megajoules consumed during this period?

i How much is the supply fee?
Financial Mathematics – Earning Money

TOPIC TEST

Time allowed: 30 minutes  Total marks: 30

SECTION I  Multiple-choice questions  10 marks

Instructions
• This section consists of 10 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1. Kate’s hourly rate of pay is $9.50 for the first 36 hours and time-and-a-half for every extra hour. How much is she paid for 41 hours?
   A $389.50  B $413.25  C $460.75  D $584.25

2. Dale has a salary of $48,984 p.a. His fortnightly pay is:
   A $1884  B $1959.36  C $2041  D $2226.55

3. Barry receives $690.40 for a 40 hour week. What is he paid for each hour worked at time-and-a-half?
   A $8.63  B $17.26  C $25.89  D $43.15

4. Hannah receives a commission of 6.5% on all her sales. How much commission does Hannah earn in a week in which her sales total $2800?
   A $182  B $232.14  C $430.77  D $1820

5. Caleb receives a royalty of 15% on the market price on sales of a book he has written. If the book sells for $12.95, find Caleb’s total royalties for a period when 2180 books have been sold.
   A $1882.07  B $2525.10  C $2823.10  D $4234.65

6. Julian receives an award rate of pay of $18.52 per hour. He receives an additional 32 cents per hour for working in hot conditions. What will Julian earn for working 14 hours in hot conditions?
   A $263.76  B $82.97  C $448.00  D $707.28

7. Courtney is paid $21.20 per hour and works 35 hours per week. Find her holiday pay for 4 weeks, including a 17 1/2% holiday loading.
   A $519.40  B $1696.00  C $3261.40  D $3487.40

8. Jacob’s bank account has a $6 monthly fee plus an excess withdrawal fee of 40 cents for every withdrawal above the free limit of 15 per month. In a month is which Jacob makes 22 withdrawals, how much does he pay in fees?
   A $8.40  B $8.80  C $12.00  D $14.80

9. Morgan’s local council sent a bill for water rates. It showed the following information:

<table>
<thead>
<tr>
<th>Meter Number</th>
<th>Previous Reading (kL)</th>
<th>Present Reading (kL)</th>
<th>Consumption (kL)</th>
<th>Water Usage Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>87912</td>
<td>222</td>
<td>251</td>
<td>29</td>
<td>$0.8500 per kL</td>
</tr>
</tbody>
</table>

10 Hamish has prepared the following monthly budget. In the past he has been saving $280 each month. He hopes to be able to save the same amount each month plus any money left over. If he sticks to his budget, how much should Hamish save each month?

<table>
<thead>
<tr>
<th>INCOME</th>
<th>EXPENSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$3416</td>
</tr>
<tr>
<td>Rent</td>
<td>$820</td>
</tr>
<tr>
<td>Food</td>
<td>$600</td>
</tr>
<tr>
<td>Other living expenses</td>
<td>$550</td>
</tr>
<tr>
<td>Loan repayment</td>
<td>$460</td>
</tr>
<tr>
<td>Car expenses</td>
<td>$350</td>
</tr>
<tr>
<td>Savings</td>
<td>$280</td>
</tr>
<tr>
<td>Balance</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>$3416</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$3416</td>
</tr>
</tbody>
</table>

How much does he hope to save each month?

A $280  B $356  C $608  D $636

11 Lisa is paid $16.55 per hour and works 38 hours at normal time and 8 hours overtime at time-and-a-half.

a Calculate Lisa’s gross pay.  

b Lisa has her private health cover deducted from her gross pay. The yearly contribution is $1065.90. Calculate the amount deducted weekly from her pay.

c Lisa pays 4.5% of her gross pay into superannuation. Calculate the amount of her super contribution.
12 Rebecca receives a salary of $54 800 per annum.
   a Calculate the amount she will receive each fortnight. 1 mark
   
   b She pays 5% of her gross salary in superannuation. Calculate her fortnightly superannuation contribution. 1 mark

13 Chris is paid a wage of $21.65 per hour.
   a If Chris works a normal 38-hour week, calculate his weekly wage. 1 mark
   
   b What will Chris’s wage be in a week when, in addition to his normal hours, he works 5 hours at time-and-a-half and 3 hours double-time. 2 marks
   
   c Chris is paid an extra $1.53 per hour for working in confined spaces. One week Chris spends 25 of his normal 38 hours working in confined spaces. What is his wage that week? 1 mark
   
   d Calculate the total amount Chris will receive for his 4 weeks annual leave, if he is paid an annual leave loading of 17 1/2% on 4 weeks of normal wages. 2 marks

14 Stephanie is a real estate agent and is paid an annual salary of $25 000 plus a commission of 2% on all sales. She is also paid a car allowance of $50 per week. If she sells property worth $1 200 000 in one week, what will be:
   a her commission? 1 mark
   
   b her income during that week? 2 marks
If she sells property worth $5,000,000 during that year, find:

c her commission for the whole year

1 mark

15

Oscar receives an annual allowance of $11,024. He has prepared a budget and aims to save 15% of this allowance. How much does Oscar hope to save each week?

2 marks
CHAPTER 2
Financial Mathematics – Investing Money

Simple Interest (1)

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

a  $4500 at 8% p.a. for 2 years
b  $8000 at 7% p.a. for 6 years

c  $20 000 at 9% p.a. for 8 years
d  $5900 at 12% p.a. for 6 months

e  $20 500 at 7 \frac{1}{2} \% p.a. for 3 months
f  $36 000 at 10.25% p.a. for 4 years

g  $65 000 for 5 years at 6.5% p.a.
h  $82 000 for 2 years at 8.25% p.a.

**QUESTION 2**  $3000 is invested at 5% p.a. simple interest for 4 years. Find:

a  the total amount of interest earned

b  the total value of the investment at the end of the four years.

**QUESTION 3**  Find the length of time for:

a  $500 to be the interest on $1800 at 6% p.a.
b  $850 to be the interest on $2400 at 8% p.a.

**QUESTION 4**  Find the rate percent per annum for:

a  $1500 to be the interest on $5400 for 5 years
b  $900 to be the interest on $2700 for 2 years.
Financial Mathematics – Investing Money

Simple Interest (2)

QUESTION 1  Find the principal required for the simple interest to be:

a  $900 on an amount invested for 2 years at 10% p.a.

b  $250 on an amount invested for 1 year at 9% p.a.

QUESTION 2

a  Complete the table to show the amount of simple interest earned \( I \) if $500 is invested for \( n \) years at each of the given rates.

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<thead>
<tr>
<th>( n )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
<td>7% p.a.</td>
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<tr>
<td>9% p.a.</td>
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</table>

b  Draw the graph of \( I \) against \( n \) for each of the above interest rates.
Financial Mathematics – Investing Money

Interest rates

**QUESTION 1** An interest rate of 6% p.a. is what rate:

a monthly

b quarterly

c six-monthly
d four-monthly

**QUESTION 2** Find the monthly interest rate if the annual rate is:

a 9%

b 7.5%

c 8%
d 5%

**QUESTION 3** Find the quarterly interest rate if the annual rate is:

a 8%

b 5%

c 6%
d 4%

**QUESTION 4** Find the number of:

a months in 5 years

b quarters in 3 years

c six-monthly periods in 8 years
d four-monthly periods in 2 years

**QUESTION 5** Interest on an investment is to be paid quarterly. If the principal is invested for 4 years and the annual interest rate is 9% find:

a the number of quarters

b the quarterly interest rate

c the number of six-monthly periods

d the number of four-monthly periods

**QUESTION 6** Find the annual interest rate:

a 2.5% per quarter

b 0.9% per month
c 6.5% per six-monthly period
d 0.046% per day
Financial Mathematics – Investing Money

Future value (1)

QUESTION 1  Use the formula \( A = P(1 + r)^n \), where \( A \) is the final balance or future value, \( P \) (the principal) is the initial quantity or present value, \( r \) is the interest rate per period and \( n \) the number of periods, to find \( A \) when:

\[ \begin{align*}
   \text{a} & \quad P = $4000, \ r = 6\%, \ n = 3 \\
   \text{b} & \quad P = $9500, \ r = 2\%, \ n = 24 \\
\end{align*} \]

QUESTION 2  Find the future value if the following amounts are invested for the given time at the given interest rate, compounded annually:

\[ \begin{align*}
   \text{a} & \quad $5000 \text{ at } 8\% \text{ p.a. for } 2 \text{ years} \\
   \text{b} & \quad $8500 \text{ at } 9\frac{1}{2}\% \text{ p.a. for } 5 \text{ years} \\
   \text{c} & \quad $15\ 000 \text{ at } 10\% \text{ p.a. for } 3 \text{ years} \\
   \text{d} & \quad $6000 \text{ at } 8\% \text{ p.a. for } 12 \text{ years} \\
\end{align*} \]

QUESTION 3  Find the final balance if the given amount is invested for the given number of years at the given interest rate, compounded monthly:

\[ \begin{align*}
   \text{a} & \quad $4000 \text{ at } 12\% \text{ p.a. for } 3 \text{ years} \\
   \text{b} & \quad $18\ 000 \text{ at } 9\% \text{ p.a. for } 6 \text{ years} \\
\end{align*} \]
Financial Mathematics – Investing Money

Future value (2)

**Question 1** Find the future value if:

a $6000 is invested for 4 years at 8% p.a., compounded quarterly

b $2500 is invested for 3 years at 10% p.a., compounded six-monthly

c $20 000 is invested for 5 years at 7.5% p.a., compounded monthly

d $32 000 is invested for 7 years at 9% p.a. interest, compounded quarterly.

**Question 2** What sum of money would need to be invested to be worth $5000 at the end of 7 years at the given interest rate?

a 6% p.a. compounded annually

b 8% p.a. compounded quarterly
Financial Mathematics – Investing Money

Compound interest

**QUESTION 1**  $8000 is invested for 5 years at 6.5% p.a. interest, compounded annually. Find:

a  the future value

b  the compound interest earned.

**QUESTION 2**  Find the amount of compound interest earned from the following investments:

a  $6000 at 9% p.a. for 4 years, compounded annually

b  $18 000 at 14% p.a. for 2 years, compounded 6-monthly

c  $48 000 at 10% p.a., compounded quarterly for 5 years

d  $32 000 for 3 years at 7.25% p.a. compounded monthly

e  $120 000 for 25 years at 4% p.a. interest, compounded monthly

f  $3650 for 5 years at 6.5% p.a. compounded quarterly.
Financial Mathematics – Investing Money
Tables of future values

**QUESTION 1** The table shows the future value of $1 if invested at the given interest rate for the given number of periods, interest compounded per period.

<table>
<thead>
<tr>
<th>Periods</th>
<th>1%</th>
<th>2%</th>
<th>2.5%</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
<th>10%</th>
<th>12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0100</td>
<td>1.0200</td>
<td>1.0250</td>
<td>1.0400</td>
<td>1.0500</td>
<td>1.0600</td>
<td>1.1000</td>
<td>1.1200</td>
</tr>
<tr>
<td>2</td>
<td>1.0201</td>
<td>1.0404</td>
<td>1.0506</td>
<td>1.0816</td>
<td>1.1025</td>
<td>1.1236</td>
<td>1.1200</td>
<td>1.2544</td>
</tr>
<tr>
<td>3</td>
<td>1.0303</td>
<td>1.0612</td>
<td>1.0769</td>
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<td>1.1576</td>
<td>1.1910</td>
<td>1.3310</td>
<td>1.4049</td>
</tr>
<tr>
<td>4</td>
<td>1.0406</td>
<td>1.0824</td>
<td>1.1038</td>
<td>1.1699</td>
<td>1.2155</td>
<td>1.2625</td>
<td>1.4641</td>
<td>1.5735</td>
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<tr>
<td>5</td>
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<tr>
<td>8</td>
<td>1.0829</td>
<td>1.1717</td>
<td>1.2184</td>
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<td>1.4775</td>
<td>1.5938</td>
<td>2.1436</td>
<td>2.4760</td>
</tr>
</tbody>
</table>

Use the table to find the future value of:

- **a** $2000 invested for 7 years at 5% p.a. compounded annually
- **b** $5500 invested for 2 years at 10% p.a. compounded quarterly
- **c** $14,400 invested for 3 years at 12% p.a. interest, compounded six-monthly
- **d** $9750 invested for 5 months at 12% p.a. interest, compounded monthly.

**QUESTION 2** Use the above table to find the amount of money which could be invested now to give:

- **a** $10,000 at the end of 8 years, at 4% p.a. interest compounded annually
- **b** $15,000 at the end of 18 months, interest of 8% p.a. compounded quarterly.
Financial Mathematics – Investing Money

Graphs of future values

**QUESTION 1** The graph shows the future value of $1000 if invested at 18% p.a. interest, compounded monthly. Use this graph to answer the following questions.

![Graph of future values](image)

**a** What is the approximate value of the investment after 3 years? 
**b** After approximately how many years is the value $5000? 
**c** If $600 was invested at 18% p.a. interest, compounded monthly, what would be its approximate value after 4 years? 
**d** Give a brief description of what will happen to the future value over the next few years.

---

**QUESTION 2** $1000 is invested at 18% p.a. interest, compounded six-monthly.

**a** Briefly explain why the future value, $A$, after $n$ six-monthly periods will be given by $A = 1000(1.09)^n$

**b** Complete the table of values giving $A$ to the nearest whole number.

<table>
<thead>
<tr>
<th>$n$</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**c** Draw a graph to show the future value of this investment on the graph above.

**d** Briefly comment on the expected difference between the two investments over the next few years.
Shares (1)

Question 1

a. Amy wishes to buy 7000 shares in an oil company. The market price of the shares is $4.38 each. Calculate the total cost of the shares.

b. Amy has to pay various fees. The stockbroker charges a basic order fee of $10 plus a commission of 1.5% of the cost of the shares. Find the total fee the stockbroker will charge.

c. The State Government levies stamp duty on the cost of the shares. The rate is 30 cents per $100 or part thereof. Calculate the stamp duty on the shares.

Question 2

A company has an after tax profit of $73.2 million. There are 120 million shares in the company. What dividend per share will the company declare if all the profits are distributed to the shareholders?

Question 3

Sandra bought 12,000 shares at $5.00 each. The face value of the shares was $3.75.

a. Stamp duty is charged at 60 cents for every $100 of the price of the shares. How much does Sandra pay in stamp duty?

b. Sandra also paid a brokerage fee of 4.5 cents per share. What is the total cost of the shares Sandra bought?

c. A few weeks later a dividend of 17.5 cents per share was paid. What was the total dividend Sandra received?

Question 4

A company’s prospectus predicts that the dividend yield for the next year will be 8.9%. Its share price is $24.50. Calculate the dividend per share if the dividend yield in the prospectus is paid.
Financial Mathematics – Investing Money

Shares (2)

QUESTION 1  Find the dividend yield:

a  dividend per share $0.23, price $4.60  

b  dividend per share $1.32, price $24.

QUESTION 2  A company with a share price of $6.80 declares a dividend of 36 cents. Calculate the dividend yield correct to 2 decimal places.

QUESTION 3  An after tax profit of $969 500 is to be distributed. If the company has 387 800 shares issued:

a  what dividend per share will be paid?

b  what is the dividend yield if the market price of the share is $50?

QUESTION 4  A company pays a dividend of 19 cents per share. The dividend yield was 4%. What was the market price of the shares?

QUESTION 5  The graph shows the performance of certain shares over 6 months.

Briefly comment on the expected future price movement.
Financial Mathematics – Investing Money

Appreciation and inflation

**QUESTION 1** A house appreciates 4.5% per annum. If it costs $350 000 now, what will it be worth in 3 years time?

**QUESTION 2** The price of a car now is $38 000. If the inflation rate is 2.75% p.a., what would you expect to pay for the car in 2 years time?

**QUESTION 3** The current price of a table is $650. Calculate its price 5 years ago, if the inflation rate during this time was 2.25% p.a.

**QUESTION 4** A block of land increased in value this year from $460 000 to $520 880. What is the rate of appreciation?

**QUESTION 5** What was the price of a home unit 12 years ago, if its current value is $380 000 and it has appreciated at 5% p.a.?

**QUESTION 6** The cost of a television is $6500. If the average inflation rate is 3%, what would be the price of the television in 3 years.

**QUESTION 7** For the following, calculate the cost of the item after one year.

a) a lawnmower costing $750 with an inflation rate of 2.5% p.a.

b) a bottle of milk costing $2.40 with inflation at 6% p.a.
TOPIC TEST

Time allowed: 42 minutes
Total marks: 35

SECTION I Multiple-choice questions 10 marks

Instructions
- This section consists of 10 multiple-choice questions
- Each question is worth 1 mark
- Fill in only ONE CIRCLE
- Calculators may be used

1. A house valued at $240 000 increases in value by 8%. Find the new value.
   A $249 000  
   B $295 000  
   C $257 000  
   D $259 200

2. $500 invested for 2 years at 10% p.a. simple interest becomes:
   A $550  
   B $600  
   C $625  
   D $650

3. Find the simple interest on $300 at 9% p.a. for 5 years.
   A $27  
   B $45  
   C $90  
   D $135

4. $2000 invested for 2 years at 10% p.a. interest, compounded annually, becomes:
   A $2400  
   B $2420  
   C $2666  
   D $5000

5. $800 invested for 3 years at 9% p.a. simple interest becomes:
   A $872  
   B $944  
   C $986  
   D $1016

6. A sum of $9000 amounted to $9360 after being invested for 6 months at simple interest. What was the interest rate earned?
   A 4% p.a.  
   B 6% p.a.  
   C 8% p.a.  
   D 9% p.a.

7. Calculate the compound interest earned on $6000 at 9% p.a. for 4 years compounded monthly (correct to the nearest dollar).
   A $8588  
   B $2588  
   C $2469  
   D $369 511

8. An after tax profit of $1 848 000 is distributed among the shareholders. There are 480 000 shares and the market price of the shares is $55. The dividend yield is:
   A 4%  
   B 5.5%  
   C 7%  
   D 14%

9. A collection of dolls was valued at $1200 five years ago. If it has appreciated at 15% p.a., its value now is closest to:
   A $1300  
   B $2100  
   C $2400  
   D $2800

10. $8000 is invested for 6 years at 10% p.a. interest, compounded quarterly. The future value is closest to:
    A $14 500  
    B $16 900  
    C $17 600  
    D $14 200
SECTION II
Show all necessary working.

11 $4000 is invested for 3 years at 7% p.a. interest, compounded annually.
   a Find the future value. 1 mark
   
   b Find the compound interest earned. 1 mark
   
   c What rate of simple interest would produce the same result? 2 marks

12 Jamie intends to invest $5000 for 2 years. He has two options:
   investing at 6.4% p.a. interest, compounded quarterly
   or investing at 6% p.a. interest, compounded monthly. Which option is better? Justify your answer. 4 marks

13 What single sum of money could be invested now at 5% p.a. interest, compounded six-monthly, to be worth $12 000 at the end of eight years? 3 marks
14 Tomislav bought 5000 shares in a company.
   a Find the total cost of the shares if the price was $6.80 per share, stamp duty is charged at 60 cents per $100 and brokerage fees were 2.5% of the value of the shares.  
   b A month after Tomislav bought the shares, dividends were paid. The dividend yield was 4.5% and the market price was $7.20 per share. Find the total dividend Tomislav received.
   c Tomislav sold all his shares two months later. He received $6.75 per share after costs. Did he make a profit or loss? Justify your answer.

15 $2500 is invested at 7% p.a. for 4 years.
   a Find the simple interest earned.
   b How much more interest would be earned if the interest was compounded annually?

16 Kelly and Bruce both inherit $6000.
   a Kelly placed her $6000 in an account earning 6.6% p.a. interest, compounded monthly. How much compound interest did she earn in 1 year?
   b Bruce bought shares with his money. The total cost per share was $7.50. How many shares did Bruce receive?
   c How much did Bruce earn from his shares during the year if the total of all dividends paid was $0.45 per share?
CHAPTER 3
Financial Mathematics – Taxation

Allowable deductions

QUESTION 1  Sarah has a gross income of $48 950. Her allowable deductions total $3275. What is her taxable income?

__________________________________________________________

QUESTION 2  Claudia’s taxable income is $41 264. Her total deductions are $2157. What is Claudia’s gross income?

__________________________________________________________

QUESTION 3  Sanjeev had a gross income of $51 208. He has calculated that his taxable income is $49 176. What was the total of Sanjeev’s allowable deductions?

__________________________________________________________

QUESTION 4  Dominic has a gross income of $37 600. The allowable deductions he can claim on his tax return are union fees of $560, superannuation contributions of $1880, vehicle expenses of $475 and equipment of $976.

a  What is the total of all allowable deductions?

__________________________________________________________

b  What is Dominic’s taxable income?

__________________________________________________________

QUESTION 5  When completing her tax return, Annabel claims deductions for superannuation contributions of $2500, union fees of $780 and other expenses of $1728 incurred in earning her income. If Annabel’s gross income was $62 184, find her taxable income.

__________________________________________________________

__________________________________________________________

__________________________________________________________

QUESTION 6  Tiffany’s taxable income was $67 835. She claimed deductions of $3000 for superannuation contributions, $575 for membership of a professional association, $1320 for vehicle expenses and $2142 for other expenses. What was Tiffany’s gross income?

__________________________________________________________

__________________________________________________________

__________________________________________________________
Income Tax

The following tax table should be used to answer the following questions.

<table>
<thead>
<tr>
<th>Taxable Income</th>
<th>Tax Payable</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0–$6000</td>
<td>Nil</td>
</tr>
<tr>
<td>$6001–$21 600</td>
<td>17 cents for every $1 over $6000</td>
</tr>
<tr>
<td>$21 601–$52 000</td>
<td>$2652 plus 30 cents for every $1 over $21 600</td>
</tr>
<tr>
<td>$52 001–$62 500</td>
<td>$11 772 plus 42 cents for every $1 over $52 000</td>
</tr>
<tr>
<td>Over $62 500</td>
<td>$16 182 plus 47 cents for every $1 over $62 500</td>
</tr>
</tbody>
</table>

**QUESTION 1** Find the amount of tax payable on a taxable income of:

a $24 370
b $5760
c $57 485
d $78 331

**QUESTION 2** Vivienne’s taxable income is $32 000.

a What tax is payable on her income?

b What percentage of taxable income was paid in tax?

**QUESTION 3** Mary has a taxable income of $43 829.

a Find the tax payable.

b Gary’s taxable income is $6768 more than Mary’s. Find how much more tax Gary pays than Mary.
Financial Mathematics – Taxation

Medicare Levy

In Australia the basic Medicare levy is 1.5% of taxable income.

QUESTION 1  Find the amount of the Medicare levy for each taxable income.

a $62 560  

b $18 390  

c $23 800  

d $93 500  

e $57 980  

f $68 300  

QUESTION 2  Use the table below to find the Medicare levy on the following taxable incomes:

<table>
<thead>
<tr>
<th>Taxable Income</th>
<th>Medicare Levy</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 – $15 062</td>
<td>$0</td>
</tr>
<tr>
<td>$15 063 – $16 283</td>
<td>20 cents for every $1 over $15 062</td>
</tr>
<tr>
<td>Over $16 283</td>
<td>1.5% of taxable income</td>
</tr>
</tbody>
</table>

a $12 500  

b $15 838  

QUESTION 3  

a Calculate the Medicare levy for a person with annual taxable income of $48 450.

b Calculate the Medicare levy for a person with a taxable income of $54 600.

c John has a taxable income of $72 300. Calculate his Medicare levy.

QUESTION 4  Amy has a taxable income of $62 500. Calculate:

a her income tax payable  

b her Medicare levy  

c her total tax payable
Financial Mathematics – Taxation

**Tax payable and tax refunds (1)**

<table>
<thead>
<tr>
<th>Taxable Income</th>
<th>Tax Payable</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0–$6000</td>
<td>Nil</td>
</tr>
<tr>
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<td>17 cents for every $1 over $6000</td>
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</tr>
<tr>
<td>Over $62 500</td>
<td>$16 182 plus 47 cents for every $1 over $62 500</td>
</tr>
</tbody>
</table>

**QUESTION 1** Jill’s gross income is $28 560 and her total deductions are $3640. The tax payable on taxable income is set out in the table below.

a Find Jill’s taxable income.

b Calculate the amount of tax due.

c Find the amount of the medicare levy (1.5% of taxable income).

d If she pays $99 per week in tax, how much refund should she receive for the year?

**QUESTION 2** Lucy’s gross income is $42 580. Her allowable deductions total $5670.

a Find Lucy’s taxable income.

b Calculate the amount of tax due (including medicare levy of 1.5% of taxable income).

c If Lucy pays $179 per week in tax, will she receive a refund or will she have to pay more tax? Justify your answer.

d Find the size of the refund Lucy will receive or the extra tax that she needs to pay.
Financial Mathematics – Taxation

Tax payable and tax refunds (2)

**QUESTION 1**  James has a gross income of $54,560 for the year and his allowable deductions total $1540.

**a**  Find the amount of tax payable by James, (including the medicare levy).

**b**  What percentage of taxable income did James pay in tax?

**c**  Throughout the year James paid tax instalments of $338 per week. Calculate the refund James receives for the financial year.

**QUESTION 2**  Rose received a total income of $53,810 from her job last financial year and she paid a total of $13,400 in tax instalments. In addition to her job Rose earned income of $12,870 from other sources. Her total allowable deductions from income amounted to $6390. How much more tax will Rose need to pay?

**QUESTION 3**  Last financial year, Trevor’s taxable income was $95,826. He paid a total of $39,280 in tax instalments during the year. Determine whether Trevor will receive a tax refund or have to pay more tax. Find the size of the refund or the amount of extra tax Trevor needs to pay.
Financial Mathematics – Taxation

Goods and services tax (GST)

In Australia, the GST is a tax that is equal to 10% of the purchase price of an item.

**QUESTION 1** Calculate the GST payable on each of the following items.

a  Cricket ball at $150

b  Basketball at $90.80

c  Pair of shoes at $320.95

d  Restaurant dinner at $190.60

e  Plant at $140.70

**QUESTION 2** Geoff buys a jumper for $230.50 including GST. Calculate the pre-GST price of the jumper.

**QUESTION 3** An electrician charges $55 for a service call, including GST. What was the pre-GST charge?

**QUESTION 4** Calculate the pre-GST price on a car that costs $36,500, including GST.

**QUESTION 5** The Brunsdon family goes to a restaurant for dinner. The cost is $265.90 including GST. How much GST was paid?

**QUESTION 6** If the pre-GST price of a camera is $583.50, calculate the final price after GST has been added.
Financial Mathematics – Taxation

Value added tax (VAT)

Value Added Tax (VAT) is similar to GST and is used by many countries. The rate varies from country to country, but the same method of calculation is used as for our GST.

**Question 1** New Zealand has VAT rate of 12.5%. Annabel goes on holidays to New Zealand and buys the following items. Calculate the amount of VAT payable on each.

a A suitcase priced at $450

b A scenic tour costing $285

c A pair of trousers costing $120

**Question 2**

a A country has a 12.5% VAT. How much does a television cost including the VAT if it is $3600 before VAT?

b A VAT of 15% is added to the cost of a $2500 computer. What is the price of the computer?

c A VAT of 18% is added to a table costing $900 before tax. What will be the price after tax?

d John buys a CD player for $450 including VAT at 15%. What was the pre-VAT price?
Question 1  The graph shows the tax rates in 1998. Use the graph to answer the following questions.

a  How much tax was paid when the taxable income was $5000? ________________

b  At approximately what income did a taxpayer first pay tax? ________________

c  Find the approximate amount of tax paid on a taxable income of $60 000. ________________

d  Henry paid $5600 in tax in 1998. What was his taxable income in 1998? ________________

Question 2  Draw a graph of the tax rates using the table on page 35.
Financial Mathematics – Taxation

TOPIC TEST

Time allowed: 25 minutes

SECTION I Multiple-choice questions

Instructions
• This section consists of 7 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1. The tax on a salary of $28 355, paid at $4383.68 plus 46 cents for each $1 in excess of $17 894, is:
   A $19 910.49
   B $9195.74
   C $827 507.68
   D $22 323.68

2. A householder receives a gas bill for $163.70, before GST of 10% is added. How much GST must she pay?
   A $1.63
   B $1.64
   C $13.67
   D $16.37

3. Rochelle has a taxable income of $56 214. The amount of medicare levy (1.5% of income) she must pay is:
   A $374.76
   B $843.21
   C $1405.35
   D $3747.60

4. Blair bought a bar fridge for $264, including GST. The amount of GST is:
   A $2.64
   B $24.00
   C $26.40
   D $29.33

5. Last financial year Jimmy had a total of $5612 deducted from his wages in tax. The tax payable on his taxable income is $5472 and the medicare levy is $465. Jimmy will:
   A receive a refund of $325
   B need to pay $325
   C receive a refund of $605
   D need to pay $605

6. Use this table to answer the following questions.

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<thead>
<tr>
<th>Taxable Income</th>
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</tr>
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<tbody>
<tr>
<td>$0–$6000</td>
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</tr>
</tbody>
</table>

6. Corinne has a taxable income of $48 374. The income tax payable on this amount is:
   A $8032.20
   B $10 683.90
   C $10 684.20
   D $14 512.20

7. Max has a gross income of $60 769. The total of all his allowable deductions is $5327. The amount of tax that Max will need to pay, excluding the medicare levy, will be:
   A $13 217.64
   B $15 454.98
   C $15756.20
   D $17 872.12
8 Work out the following.  
A portable CD player was bought in France for 885.10 euros, after a 20.6% VAT (value added tax) was added. What was the original price?

9 Sam earns $995.60 per fortnight. During the year he receives additional income from bank interest $105.50, share dividends $2025.35 and book royalties $861.00. His deductions are union fees $300.90, car expenses $285.95 and professional journals $230.60.  
   a What is the total of Sam’s income during the year?  
   b Calculate Sam’s taxable income.  
   c Use the tax table on the previous page to find the income tax payable.  
   d Find the amount of the medicare levy (1.5% of taxable income).  
   e Find the total tax that Sam must pay.  
   f What percentage, (to 1 decimal place), of his taxable income is the total tax?

10 Nick works in a bank and receives a yearly salary of $52 850. He also receives an income of $3600 per year from an investment. His total deductions are $2560. During the year he paid tax instalments amounting to $12 560. Find:  
   a his taxable income  
   b his total tax payable (including medicare levy)
c Will Nick receive a refund or will he still have tax to pay? Justify your answer. Find the size of this refund or extra tax payable.  

2 marks
CHAPTER 4
Data Analysis – Data Collection and Sampling

Statistics and society

QUESTION 1 Every five years the government conducts a census of the population. Why is this done? How is the information collected important for future planning and decision making? List some examples.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

QUESTION 2 Felix has been given an assignment on statistics. He has to complete each of the following 6 tasks: organise data, write a report, summarise and display data, collect data, analyse data and draw conclusions.

In what order should Felix complete the tasks?

1 ______________________________________________________________________ 4 ______________________________________________________________________

2 ______________________________________________________________________ 5 ______________________________________________________________________

3 ______________________________________________________________________ 6 ______________________________________________________________________

QUESTION 3 Joanne bought a new car. Six weeks later a representative of the car’s manufacturer rang Joanne and requested permission to ask her some questions about her new car.

a What would be some of the benefits to the manufacturer in conducting this research?

________________________________________________________________________

________________________________________________________________________

b What benefits might there be for Joanne in taking part in the survey?

________________________________________________________________________

________________________________________________________________________

QUESTION 4 Willy, a chocolate maker, allows his staff to eat as much of his product as they like. In what way is this a clever statistical idea?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Data Analysis – Data Collection and Sampling

Populations and samples

**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**
A current affairs program on television showed a report on the results of a particular government decision. At the end of the report, the program’s presenter invited viewers to take part in a phone poll. They should phone one number to vote yes if they agreed with the government’s decision or phone a different number if they wished to vote no. The next night the presenter announced that 1056 people had taken part in the poll and the results were that 26% voted yes and 74% voted no. ‘This clearly shows that the overwhelming majority of viewers are against this decision by the government,’ the presenter concluded. Briefly explain why this is wrong.
Data Analysis – Data Collection and Sampling

Classification of data and sample types

**Question 1** State whether the data is quantitative or categorical. If quantitative, 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 or bronze) won at Olympic games
- l. maximum temperatures recorded
- m. favourite movies
- n. sex of chickens
- o. the weights of babies

**Question 2** Determine whether the type of sample is random, systematic or stratified.

- a. choosing the first 100 people that arrive
- b. selecting a boy and a girl from every class
- c. picking names out of a hat
- d. every 100th name from the telephone book
- e. all the members of a club whose membership numbers end in 7

**Question 3** Julie wants to conduct a survey of teachers. She knows that quite a few of the teachers are attending a lunchtime meeting and decides to use these people as her sample. Explain why this is not a random sample.

**Question 4** Greg wants to conduct a survey of the opinion of students of the school uniform. He decides to select a stratified sample. There are 1250 students at the school, 215 in Year 7, 200 in Year 8, 210 in Year 9, 220 in Year 10, 225 in Year 11 and 180 in Year 12. If Greg decides to survey 250 students, how many should he choose from each year?
Capture – recapture technique

**QUESTION 1**  Mitchell had released some silver perch into his dam a few years ago. He wants to try to estimate the number of these fish now living in his dam. To do this he caught 20 fish, tagged them and let them go. A week later he caught 25 fish and found that 2 of them were tagged.

a  What percentage of the fish caught in the second week, were tagged?

b  Estimate the number of fish in the dam.

**QUESTION 2**  A wildlife officer wanted to determine the number of dingoes on an island. One night she set traps and caught 12 dingoes. These were tagged and released. The next night the traps were reset and 9 dingoes were caught, 4 of which were tagged.

a  Use this information to estimate the number of dingoes on the island.

b  Why might this not be a very accurate estimate? Briefly comment.

**QUESTION 3**  Sourav wants to find how many cherries are packed in a box. He paints 50 of the cherries with an edible die and then mixes all the cherries in a large bowl. Sourav removes a handful of cherries from the bowl and finds that he has 19 cherries, 2 of which are painted. Approximately how many cherries were packed in the box?
Data Analysis – Data Collection and Sampling

Questionnaires

**QUESTION 1**  This question appeared in a questionnaire. ‘The workers believe it is the board that should be dismissed not the workers themselves. Do you think they should be sacked?’ Why is this not a good question?

**QUESTION 2**  This question appeared in a survey. ‘Obviously it would be far better to take action immediately rather than risk further problems. Do you agree?’ What is wrong with this question?

**QUESTION 3**

a  A question allows just two responses (Yes or No). Why might this be done?

b  Another question allows 5 possible responses (definitely, probably, perhaps, probably not, definitely not). Why might this be preferable to either a yes or no response?

**QUESTION 4**  List some of the qualities of a good questionnaire.

**QUESTION 5**  List some of the things that should be avoided in a good questionnaire.
Data Analysis – Data Collection and Sampling

TOPIC TEST

Time allowed: 12 minutes

SECTION I Multiple-choice questions

Instructions
• This section consists of 7 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1. Niamh wanted to test a theory that older students preferred a different type of music to younger students. She chose the youngest person from each Year 7 class and the oldest person from each Year 12 class to answer her questions. What type of sample is this?
   A random  B stratified  C systematic  D census

2. A motoring organisation did a survey of the number of breakdowns experienced by motorists over a month. This data is?
   A categorical  B quantitative continuous  C quantitative discrete  D none of these

3. A jar is filled with identical white buttons. Mandy tips the buttons into a bowl and adds 30 more buttons, identical except that they are red, and mixes them together. Mandy then randomly selects a handful of buttons and finds she has 18 buttons, 4 of which are red. How many white buttons should Mandy estimate were originally in the jar?
   A 105  B 135  C 165  D 545

4. 30% of a country’s population is aged over 60. How many people aged over 60 should be included in a sample of 250 people?
   A 30  B 50  C 60  D 75

5. Which is not a valid step in the process of statistical inquiry?
   A fabricating data  B organising data  C summarising data  D analysing data

6. Which is not quantitative data?
   A values of cards chosen from a standard pack  B weights of children  
   C population of flying foxes in a colony  D number of visitors to a theme park

7. Which type of questions should be included in an effective questionnaire?
   A Biased questions  B Ambiguous questions  
   C Long-winded complicated questions  D Clear and concise questions
8 Patrick conducted a survey of students’ opinions of an excursion. He chose the first five people to get off each of the buses as they arrived back at school to answer his questions.

a Explain why this is not a random sample. 1 mark

b Why might the results of this survey be biased? 1 mark

9 Clancy wants to know how many wild horses are in a national park. He organises a roundup of some of the horses. 45 horses are captured, tagged and released. A few weeks later another roundup is conducted and 72 horses are captured, 13 of which are tagged.

a What percentage of the second lot of horses were tagged? 1 mark

b Approximately how many horses are in the national park? 1 mark

10 After the last census government officials began making plans to construct a new school at Kurraglen even though there were very few pupils of school age living in the area. Do you think this is likely to be a government bungle? Justify your answer. 1 mark
# CHAPTER 5
Data Analysis – Displaying Single Data Sets

## Tally charts and frequency tables

### QUESTION 1

**a** A survey involves the test results obtained by a class of 24 students. Complete the frequency distribution table for the set of data given.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<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>
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<tr>
<td>6</td>
<td></td>
<td></td>
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<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>
</tbody>
</table>

**b** The following table shows the heights, in centimetres, of 28 students. Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>172</td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td></td>
<td></td>
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<tr>
<td>168</td>
<td></td>
<td></td>
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<tr>
<td>172</td>
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<tr>
<td>171</td>
<td></td>
<td></td>
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<tr>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td></td>
<td></td>
</tr>
<tr>
<td>174</td>
<td></td>
<td></td>
</tr>
<tr>
<td>172</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### QUESTION 2

**a** A class of 20 students scored the set of marks listed below. Complete the frequency distribution table for the scores.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</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>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**b** Complete the frequency distribution table for the following set of data.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</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>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Data Analysis – Displaying Single Data Sets

### Grouped data

**Question 1**  
The weights (in kg) of 40 men are shown below.

<table>
<thead>
<tr>
<th>85</th>
<th>72</th>
<th>81</th>
<th>79</th>
<th>89</th>
<th>95</th>
<th>73</th>
<th>84</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>91</td>
<td>83</td>
<td>83</td>
<td>76</td>
<td>78</td>
<td>92</td>
<td>96</td>
<td>77</td>
</tr>
<tr>
<td>87</td>
<td>85</td>
<td>80</td>
<td>79</td>
<td>88</td>
<td>90</td>
<td>77</td>
<td>79</td>
<td>85</td>
</tr>
<tr>
<td>82</td>
<td>87</td>
<td>84</td>
<td>91</td>
<td>75</td>
<td>79</td>
<td>82</td>
<td>86</td>
<td>84</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete the grouped frequency distribution table.

<table>
<thead>
<tr>
<th>Class</th>
<th>Class centre</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>72–76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77–81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82–86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87–91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92–96</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 2**  
A survey was conducted of the number of hours worked during one week by a group of people. The results are shown below.

<table>
<thead>
<tr>
<th>35</th>
<th>40</th>
<th>42</th>
<th>48</th>
<th>40</th>
<th>38</th>
<th>50</th>
<th>43</th>
<th>44</th>
<th>40</th>
<th>37</th>
<th>41</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>36</td>
<td>45</td>
<td>55</td>
<td>37</td>
<td>46</td>
<td>40</td>
<td>60</td>
<td>53</td>
<td>48</td>
<td>52</td>
<td>39</td>
</tr>
<tr>
<td>40</td>
<td>57</td>
<td>56</td>
<td>33</td>
<td>47</td>
<td>53</td>
<td>59</td>
<td>36</td>
<td>40</td>
<td>37</td>
<td>57</td>
<td>53</td>
</tr>
<tr>
<td>46</td>
<td>45</td>
<td>38</td>
<td>44</td>
<td>49</td>
<td>39</td>
<td>44</td>
<td>45</td>
<td>41</td>
<td>42</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>38</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a What is the highest number of hours worked? 

b What is the lowest number of hours worked? 

c If these scores are to be organised into 7 groups starting with the lowest number listed, what number of hours will be included in the first class interval? 

d Complete the grouped frequency distribution table.

<table>
<thead>
<tr>
<th>Class</th>
<th>Class centre</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis – Displaying Single Data Sets

Dot plots

QUESTION 1 Fifty families were surveyed to find how many children each family had. The following data was obtained.

<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>
<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>

a Complete the frequency distribution table.

b How many scores are less than 3?

c Draw a dot plot by using the frequency distribution table.

QUESTION 2 The following data show the number of hours a group of 30 students watched a television program in one month.

<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>

a Complete the frequency distribution table.

b Use the table to draw a dot plot.

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
Bar graphs and sector graphs

**QUESTION 1** A group of 65 people were asked to nominate their favourite colour. 19 chose blue, 18 red, 9 chose green, 12 pink and 7 yellow. This information is to be shown on a bar graph.

a Briefly explain why it would be sensible to choose to draw a bar of length 130 mm.

b If the bar is 130 mm long, how long should the section be that represents blue?

c Draw a bar graph to show the information.

**QUESTION 2** A survey of how students travel to school was done for year 11 students. It was found that out of 120 students, 60 travelled by bus, 30 by car, 20 on bicycles and 10 walked. Show this information on a divided bar graph.

**QUESTION 3** Jane’s income is $500 per week and her weekly budget is as follows:
Rent $100, food $125, bills and other payments $75, entertainment $25, car expenses $75, savings $100. This information is to be shown on a sector graph.

a What angle at the centre is used to represent all the information?

b What fraction of Jane’s weekly income is spent on food?

c What angle would represent food expenses?

d What angle represents savings?

e Show the information on a sector graph.
Data Analysis – Displaying Single Data Sets

Histograms and line graphs (1)

**Question 1**  The table shows the marks out of 10 achieved by the 30 members of a class in a spelling quiz. Draw a histogram (column graph) to show the information.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

**Question 2**  One Monday, temperature readings were taken every hour from 9 a.m. until 7 p.m. The results appear in the table below.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 a.m.</td>
<td>15</td>
</tr>
<tr>
<td>10 a.m.</td>
<td>18</td>
</tr>
<tr>
<td>11 a.m.</td>
<td>20</td>
</tr>
<tr>
<td>12 noon</td>
<td>25</td>
</tr>
<tr>
<td>1 p.m.</td>
<td>27</td>
</tr>
<tr>
<td>2 p.m.</td>
<td>31</td>
</tr>
<tr>
<td>3 p.m.</td>
<td>30</td>
</tr>
<tr>
<td>4 p.m.</td>
<td>28</td>
</tr>
<tr>
<td>5 p.m.</td>
<td>20</td>
</tr>
<tr>
<td>6 p.m.</td>
<td>18</td>
</tr>
<tr>
<td>7 p.m.</td>
<td>16</td>
</tr>
</tbody>
</table>

Draw a line graph to illustrate the information.
Question 1

The information on average monthly rainfall (in mm) and maximum and minimum temperatures (in °C) for a particular area has been gathered and is presented below.

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall</th>
<th>Max temp</th>
<th>Min temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>152</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>Feb</td>
<td>200</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>Mar</td>
<td>196</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>Apr</td>
<td>168</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>May</td>
<td>98</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Jun</td>
<td>147</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Jul</td>
<td>50</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Aug</td>
<td>94</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Sep</td>
<td>72</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Oct</td>
<td>120</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>Nov</td>
<td>100</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>Dec</td>
<td>118</td>
<td>27</td>
<td>16</td>
</tr>
</tbody>
</table>

Show the rainfall on a histogram and both sets of temperatures on a line graph.
Data Analysis – Displaying Single Data Sets

**Misrepresentation of displays**

**QUESTION 1**  The graph below appeared in a magazine. Sales of different brands of coffee

![Graph of sales](image)

a  What is wrong with the graph?

______________________________

b  How does this misrepresent the data?

______________________________

c  Beside the graph, draw it as it should be.

**QUESTION 2**  ‘While products A, C and D had similar results on the test, product B clearly performed much better.’

Briefly comment on this statement, explaining how the graph is misleading.

______________________________

______________________________

______________________________

**QUESTION 3**  This graph appeared in a newspaper. What is wrong with it?

______________________________

______________________________

______________________________

______________________________
Data Analysis – Displaying Single Data Sets

**Stem-and-leaf plots**

**QUESTION 1** Complete the stem-and-leaf plot for each set of scores.

| a | 60 48 46 53 50 47 |
|   | 50 49 68 61 62 46 |
|   | 78 48 46 49 48 48 |
|   | 74 50 46 48 66 49 |
|   | 50 46 72 46 77 51 |

| b | 25 37 61 09 17 29 |
|   | 33 41 53 64 08 32 |
|   | 27 62 67 43 63 44 |
|   | 38 33 61 27 18 17 |
|   | 09 15 43 47 52 53 |

**QUESTION 2** Complete the ordered stem-and-leaf plot for each set of scores.

| a | 53 68 57 71 82 94 |
|   | 62 73 56 82 93 95 |
|   | 51 62 38 49 79 68 |
|   | 33 38 55 67 62 91 |
|   | 38 31 69 73 71 82 |

| b | 8 10 15 25 34 57 |
|   | 51 28 10 9 8 15 |
|   | 16 32 43 51 8 41 |
|   | 37 51 38 27 16 9 |
|   | 28 31 43 47 54 16 |

---

**CHAPTER 5 – Data Analysis – Displaying Single Data Sets**

Data Analysis – Displaying Single Data Sets

Radar charts

**QUESTION 1**  An automatic weather station records temperatures every four hours. The average summer temperature at each of the recording times is shown in the table.

<table>
<thead>
<tr>
<th>Time</th>
<th>2am</th>
<th>6am</th>
<th>10am</th>
<th>2pm</th>
<th>6pm</th>
<th>10pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp (°C)</td>
<td>15</td>
<td>19</td>
<td>23</td>
<td>30</td>
<td>27</td>
<td>20</td>
</tr>
</tbody>
</table>

Draw a radar chart to show this information.

**QUESTION 2**  The average monthly production (in thousands) of a factory over a 12-month period is shown in the table.

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1</td>
<td>1.5</td>
<td>2.5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>4.5</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

a  Show this information on the radar chart.

b  Briefly comment on any trends that can be seen.
Data Analysis – Displaying Single Data Sets

Range and interquartile range

**QUESTION 1**  For the scores 5, 9, 2, 5, 8, 4, 9, 7, 6, 5, 2, 4, 8, 6, 3, what is:

a  the highest score

b  the lowest score

c  the range

**QUESTION 2**  Find the range of each set of scores.

a  2, 8, 9, 4, 15, 7, 6, 32

b  5, 6, 7, 2, 3, 8, 14, 17, 5

c  5, 3, 9, 18, 7, 64, 32

d  10, 12, 20, 15, 16, 7

e  46, 33, 46, 10, 14, 44

f  13, 21, 20, 27, 25, 27

g  12, 17, 15, 37, 31

h  124, 132, 116, 132, 128, 166

**QUESTION 3**  For the set of scores 2, 3, 3, 4, 5, 7, 9, 9, 10, 11, 12, 12, find:

a  the 1st quartile (Q1)

b  the 2nd quartile (Q2 or median)

c  the 3rd quartile (Q3)

d  the interquartile range

**QUESTION 4**  Find the interquartile range of each set of scores.

a  5, 2, 3, 6, 8, 9, 6, 8

b  12, 10, 12, 11, 13, 12, 10, 12, 10, 12, 10, 11, 13, 14, 13, 12
## Data Analysis – Displaying Single Data Sets

### Frequency histograms and frequency polygons

#### QUESTION 1
Fifty families were surveyed to find how many children each family had. The following data was obtained. Construct a frequency distribution table and hence draw a frequency histogram and frequency polygon.

<table>
<thead>
<tr>
<th>Score (number of children)</th>
<th>5</th>
<th>3</th>
<th>2</th>
<th>4</th>
<th>1</th>
<th>5</th>
<th>0</th>
<th>2</th>
<th>3</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

#### QUESTION 2
The weights (in kg) of 30 students in a class are shown in the following table. Construct a frequency distribution table and hence draw a frequency histogram and a frequency polygon.

<table>
<thead>
<tr>
<th>Score (weight in kg)</th>
<th>52</th>
<th>48</th>
<th>46</th>
<th>53</th>
<th>50</th>
<th>47</th>
<th>50</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48</td>
<td>51</td>
<td>52</td>
<td>46</td>
<td>48</td>
<td>48</td>
<td>46</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>48</td>
<td>54</td>
<td>50</td>
<td>46</td>
<td>48</td>
<td>46</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>46</td>
<td>52</td>
<td>46</td>
<td>47</td>
<td>51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Cumulative frequency histograms and polygons

### QUESTION 1
A class of 30 students sat for a test. The results are shown in the frequency table.

**a** Complete the frequency distribution table.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</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.

5 1 7 6 7 2 3 5 3 5 9 8 7 6 3 4 7 9 7 2

**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>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
</tbody>
</table>
Data Analysis – Displaying Single Data Sets

Frequency histograms and polygons with grouped data

**Question 1**

The percentage results of 50 students in a Mathematics exam are given below.

| 85 | 86 | 72 | 65 | 78 | 68 | 74 | 75 | 80 | 80 | 75 | 71 | 66 | 86 | 56 | 81 | 64 | 85 |
| 77 | 61 | 71 | 83 | 84 | 77 | 72 | 74 | 82 | 84 | 65 | 76 | 60 | 87 | 88 | 65 | 55 | 82 |
| 64 | 78 | 83 | 79 | 83 | 57 | 58 | 82 | 83 | 66 | 77 | 55 | 76 | 73 |

a. Construct a grouped frequency distribution table.
b. Draw a grouped frequency histogram.
c. Draw a grouped frequency polygon.
d. Draw a grouped cumulative frequency histogram.
e. Draw a grouped cumulative frequency polygon.
Data Analysis – Displaying Single Data Sets

Using the cumulative frequency polygon

**QUESTION 1**

a. Complete the cumulative frequency column in the table.

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

b. Draw a cumulative frequency histogram and polygon.

c. Use the cumulative frequency polygon to find:

i. the median

ii. the lower quartile

iii. the upper quartile

**QUESTION 2**

The weights (in kg) of 30 students in a class are shown below.

52 48 46 53 50 47 50 49 48 51 52 46 48 48 46 49 48 48 46 49 50 46 52 46 47 51

a. Complete a cumulative 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>46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Draw a cumulative frequency histogram.

c. Draw a cumulative frequency polygon.

d. Find the median of the scores.

e. Find the upper quartile.

f. Find the lower quartile.
Data Analysis – Displaying Single Data Sets

Deciles

**QUESTION 1** Regina received a decile 1 in a state-wide exam. This meant she was placed in the top 10% of the state.

a Jed received a decile 4. What does this mean?

b Cameron knows that 50% of the state performed better than he did. What decile did Cameron receive?

c Sasha received a decile 3. What percentage of students did she beat?

**QUESTION 2** The table shows the cut-off marks for each decile in an exam.

<table>
<thead>
<tr>
<th>Decile</th>
<th>1</th>
<th>2</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>Cut-off mark</td>
<td>88%</td>
<td>81%</td>
<td>76%</td>
<td>70%</td>
<td>62%</td>
<td>52%</td>
<td>44%</td>
<td>33%</td>
<td>20%</td>
<td>0%</td>
</tr>
</tbody>
</table>

a Billy scored 68% in the exam. What decile did he receive? ________________

b Suzanne received a decile 3. What is her possible range of marks? ________________

c Justine scored 52% in the exam. What percentage of students did she beat? ________________

**QUESTION 3** 240 students sat for a test which was marked out of 50. A cumulative frequency histogram and polygon was drawn of the results.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>15</td>
<td>36</td>
</tr>
<tr>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>72</td>
</tr>
<tr>
<td>35</td>
<td>84</td>
</tr>
<tr>
<td>40</td>
<td>96</td>
</tr>
<tr>
<td>45</td>
<td>108</td>
</tr>
<tr>
<td>50</td>
<td>120</td>
</tr>
</tbody>
</table>

a Divide the data into deciles.

b Tamara scored 37 out of 50. What decile did she receive? ________________
CHAPTER 5 – Data Analysis – Displaying Single Data Sets

Box-and-whisker plots

**QUESTION 1** The ages of 12 people present at a birthday party are shown below.

9  16  18  20  21  24  31  37  66  72  74  80

Find:

a the lower extreme _________________________  
b the upper extreme _________________________  
c the median _______________________________  
d the lower quartile __________________________  
e the upper quartile _________________________  
f Draw a box-and-whisker plot to represent the distribution.

**QUESTION 2** The number of hours per week spent on homework by each member of a group of students is shown below.

2  4  3  2  1  5  3  6  7  7  1  2  4  3  1  3  4  1  2  3  4  1  5  6  7  2  4  3

a Rearrange these numbers into numerical order.

b Find:

i the lower extreme _________________________  
ii the lower quartile _________________________  
iii the median _______________________________  
iv the upper quartile _________________________  
v the upper extreme _________________________  

Use this five number summary to draw a box-and-whisker plot.

**QUESTION 3** A survey has been taken of the weights of people in a club. The five-number summary is [57, 65, 70, 80, 100]. Draw a box-and-whisker plot.
Data Analysis – Displaying Single Data Sets

Suitability, strengths and weaknesses of displays

**QUESTION 1**
Choose the most appropriate display from histogram, line graph or bar graph to represent the data:

a a breakdown of how your income is spent ____________________________

b the exam results of your class ____________________________

c temperature of a hospital patient over a day ____________________________

**QUESTION 2**
Choose from sector graph, radar chart or dot plot, the most appropriate display:

a average maximum monthly temperatures ____________________________

b numbers of pupils scoring different marks out of ten in a spelling test ____________________________

c favourite sport ____________________________

**QUESTION 3**
A survey has been conducted of the different ways students travel to school. The results are shown in the table.

<table>
<thead>
<tr>
<th>Method</th>
<th>Walk</th>
<th>Cycle</th>
<th>Bus</th>
<th>Train</th>
<th>Car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>32</td>
<td>15</td>
<td>49</td>
<td>6</td>
<td>23</td>
</tr>
</tbody>
</table>

What type of graph would you choose to display this data? Briefly justify your answer.

**QUESTION 4**
The sector graph has been prepared to show the results of a survey of hair colour.

a What are the strengths of this display?

b What are the weaknesses?
TOPIC TEST

SECTION I  Multiple-choice questions  10 marks

Instructions • This section consists of 10 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1 Year 11 students voted for their favourite car. The results are shown as percentages in the sector graph. What is the size of the angle that would be used for Mercedes on the graph?

A 36°  B 18°  C 54°  D 72°

2 A survey of family size produced the information in the table as shown. How many children are there?

A 12  B 15  C 34  D 35

3 Consider the following statements about the ordered stem-and-leaf plot.

I The leaf of the missing number (□) must be 7.
II The range is 36.

Which statement(s) is (are) correct?

A I only  B II only  C neither I nor II  D both I and II

4 The range of the scores 3, 5, 12, 7, 13, 9, 2, 7, 10 is:

A 7  B 9  C 11  D 12
5 Which graph would be the most suitable to display the temperature of a hospital patient over a 24-hour period?
- A bar graph
- B sector graph
- C radar chart
- D dot plot

6 The median of the scores 8, 3, 6, 7, 4, 7, 9, 2, 5 is:
- A 4
- B 6
- C 6.5
- D 7

7 Sonia, a teacher, surveyed her pupils to see which was their favourite day of the school week. The results were: 6 Monday, 7 Tuesday, 4 Wednesday, 10 Thursday and 3 Friday. If these results were to be illustrated in bar graph, using the bar below, the length required to show Monday’s result would be:
- A 2 cm
- B 3 cm
- C 4 cm
- D 5 cm

8 Jill went to an island for a holiday, recorded the number of wet days in each week, and drew the graph shown to represent the information.

How many wet days were there during the holiday?
- A 7
- B 11
- C 18
- D 22

9 The lowest mark in an exam was 43 and the highest mark was 98. A grouped frequency distribution table was prepared. The scores were divided into 8 classes. The first class would be:
- A 43–48
- B 43–49
- C 43–50
- D 43–51

10 This cumulative frequency histogram and polygon was drawn for a set of data.

The interquartile range is:
- A 3
- B 4
- C 5
- D 6
SECTION II
Show all necessary working.

11 Referring to the box-and-whisker plot shown, find: 7 marks

a the highest score _______________________

b the lowest score _______________________

c the range _____________________________

d the median ___________________________

e the upper quartile ______________________

f the lower quartile ______________________

g the interquartile range __________________

12 In a school, 28 students entered an art competition and the entries were scored on a scale from 1 to 40. The results of all entries are shown below. 5 marks

| 23 | 18 | 11 | 36 | 22 | 14 | 20 | 21 | 19 | 22 | 20 | 23 | 21 | 22 |
| 19 | 25 | 29 | 24 | 25 | 30 | 22 | 21 | 20 | 20 | 24 | 25 | 29 | 30 |

a Construct a dot plot for the data.

b How many students scored more than 20 points?

c What fraction of students scored 20 points?

d What is the range of the scores?

e Did more students score above 23 or below 23?

13 The stem-and-leaf plot shows the ages of the people enrolled in a course at the TAFE. 5 marks

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 7 7 8</td>
</tr>
<tr>
<td>2</td>
<td>1 3 3 3 3 3 7 9</td>
</tr>
<tr>
<td>3</td>
<td>0 1 2 2 2 7</td>
</tr>
<tr>
<td>4</td>
<td>1 2 6 6</td>
</tr>
<tr>
<td>5</td>
<td>1 3</td>
</tr>
</tbody>
</table>

a How many people are enrolled?

b How many teenagers are enrolled?

c What is the age of the oldest person?

d What is the age of the youngest person?

e What is the median age?
14 180 people were asked to nominate their favourite exercise. 46 chose walking, 29 running, 57 swimming, 34 gym work and 14 other responses. Show these results in a sector graph.  

5 marks

15 Scores achieved in a quiz by a group of students are listed below.

4 5 3 8 4 7 5 10 9 4 7 6 6 8 10 7 10 9 2 8 4 6 3 7 7 8 5
8 3 7 2 9 10 8 9 7 9 6 4 6 5 7 9 8 9 7 9 10 6 5 3 6 5 8

a Complete the frequency distribution table  

<table>
<thead>
<tr>
<th>Score</th>
<th>Tally</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
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<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>
</tbody>
</table>

3 marks

b Draw a cumulative frequency histogram and polygon.  

4 marks

c Use the cumulative frequency polygon to find the median. ________________  

1 mark
CHAPTER 6
Data Analysis – Summary Statistics

Mean (1)

**QUESTION 1** Find the mean of each set of scores.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>4, 5, 6</td>
<td>b</td>
<td>6, 7, 8, 12</td>
</tr>
<tr>
<td>d</td>
<td>10, 12, 14, 18</td>
<td>e</td>
<td>5, 7, 10, 12</td>
</tr>
<tr>
<td>g</td>
<td>2, 2, 3, 3, 4, 4, 4, 4</td>
<td>h</td>
<td>6, 6, 7, 7, 7, 8, 8, 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QUESTION 2** Find the mean for the following sets of scores (correct to 3 decimal places).

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3, 3, 3, 4, 4, 5, 5, 5, 6, 6</td>
<td>b</td>
<td>2, 2, 3, 3, 3, 5, 5, 5, 6, 6</td>
</tr>
<tr>
<td>c</td>
<td>5, 5, 5, 6, 6, 7, 7, 7, 9, 9, 9</td>
<td>d</td>
<td>5, 5, 5, 6, 6, 7, 7, 7, 8, 8, 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**QUESTION 3** Complete the tables below and calculate the mean.

<table>
<thead>
<tr>
<th>x</th>
<th>f</th>
<th>fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>x</td>
<td>f</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td></td>
</tr>
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<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>x</td>
<td>f</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
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<tr>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Data Analysis – Summary Statistics

Mean (2)

**QUESTION 1** Use your calculator to find the mean of each data set.

a 1, 1, 2, 2, 3, 3, 4, 4, 4, 4, 6, 6, 7, 7, 7, 7, 7, 8, 8, 8, 9, 9, 10, 11, 11, 12, 12, 12, 12, 12, 12, 12, 13, 13, 13, 14, 14, 14, 14, 14, 15, 17, 17, 18, 18, 18, 19, 19, 20

Mean = ________________

b 75, 75, 78, 78, 78, 79, 81, 82, 82, 83, 86, 86, 86, 87, 87, 88, 90, 90, 91, 94, 95, 97, 97, 99

Mean = ________________

**QUESTION 2** Use a calculator to find the mean of each distribution correct to one decimal place.

a

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</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>Frequency</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>14</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>17</td>
<td>16</td>
</tr>
</tbody>
</table>

Mean = ________________

b

<table>
<thead>
<tr>
<th>Score</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Mean = ________________

**QUESTION 3** Find the mean of the grouped data.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Class centre</td>
<td>47.5</td>
<td>55.5</td>
<td>63.5</td>
<td>71.5</td>
<td>79.5</td>
<td>87.5</td>
<td>95.5</td>
</tr>
<tr>
<td>Frequency</td>
<td>17</td>
<td>21</td>
<td>28</td>
<td>29</td>
<td>33</td>
<td>25</td>
<td>19</td>
</tr>
</tbody>
</table>

Mean = ________________

**QUESTION 4** The results of an examination appear in the table below.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Class centre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>8</td>
<td>13</td>
<td>24</td>
<td>25</td>
<td>27</td>
<td>19</td>
<td>20</td>
<td>17</td>
<td>12</td>
</tr>
</tbody>
</table>

a Find the class centre for each class.

b Find the mean. ________________
Data Analysis – Summary Statistics

Standard deviation (1)

**QUESTION 1**  These two sets of data (below) have the same mean.
A: 85 87 88 88 89 91  
B: 80 84 86 89 101
Which has the greater standard deviation? Justify your answer without actually calculating the standard deviation.

**QUESTION 2**  Briefly explain the difference between the two standard deviation buttons on your calculator. ($\sigma_n$ and $\sigma_{n-1}$).

**QUESTION 3**  Which measure ($\sigma_n$ or $\sigma_{n-1}$) would you use if finding the standard deviation of:

a  all the results in an examination  

b  the heights of a sample of 30 students 

**QUESTION 4**  Use your calculator to find the sample standard deviation ($\sigma_{n-1}$) to one decimal place.

a  5 6 6 7 8 10  
b  2 15 13 9 6 1 5 4 23

**QUESTION 5**  Use your calculator to find the population standard deviation ($\sigma_n$) correct to one decimal place.

a  9 12 14 15 18 18 20  
b  18 32 25 27 22 30 27 19

**QUESTION 6**  250 people did a general knowledge quiz. The scores (out of 10) are listed below.

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</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>Frequency</td>
<td>2</td>
<td>8</td>
<td>16</td>
<td>20</td>
<td>23</td>
<td>31</td>
<td>56</td>
<td>48</td>
<td>29</td>
<td>17</td>
</tr>
</tbody>
</table>

Find, correct to one decimal place:

a  the mean  
b  the standard deviation
Data Analysis – Summary Statistics

**Standard deviation (2)**

**QUESTION 1** Use your calculator to find the mean ($\bar{x}$) and sample standard deviation ($\sigma_{n-1}$) correct to 1 decimal place for each set of scores.

<table>
<thead>
<tr>
<th>Set</th>
<th>Scores</th>
<th>$\bar{x}$</th>
<th>$\sigma_{n-1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>2, 4, 8, 9, 10</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>b</td>
<td>7, 11, 12, 13, 14, 15, 16, 17, 18</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>c</td>
<td>8, 3, 7, 3, 9, 5, 8, 8, 6, 9, 3, 6, 2, 3</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>d</td>
<td>5, 7, 9, 11, 13, 15</td>
<td>Frequency: 8 5 7 8 3 6</td>
<td>$\bar{x}$ = ..........</td>
</tr>
</tbody>
</table>

**QUESTION 2** Use your calculator to find the mean ($\bar{x}$) and population standard deviation ($\sigma_{n}$) correct to 1 decimal place for each set of scores.

<table>
<thead>
<tr>
<th>Set</th>
<th>Scores</th>
<th>$\bar{x}$</th>
<th>$\sigma_{n}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1, 2, 3, 4, 5, 6, 7</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>b</td>
<td>35, 46, 48, 40, 36, 41, 42, 37</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>c</td>
<td>5, 8, 10, 15, 15, 10, 8, 9, 18, 20, 18, 15, 10, 15</td>
<td>..........</td>
<td>.............</td>
</tr>
<tr>
<td>d</td>
<td>Score: 10, 20, 30, 40, 50, 60, 70</td>
<td>Frequency: 3 4 3 2 5 2 3</td>
<td>$\bar{x}$ = ..........</td>
</tr>
</tbody>
</table>

**QUESTION 3** The results for 5 of the students who sat for both a mathematics test and a science test are given below:

| Science: | 56 60 69 59 65 |
| Mathematics: | 70 75 86 82 80 |

a Find the mean and standard deviation for each set of scores.

b If Matthew scored 65 in Science and 75 in Mathematics, in which subject did he perform better than the class average?

**QUESTION 4** The results for Tim and Elizabeth in all ten tests given during the term are found below.

| Tim: | 8 10 13 13 14 15 16 16 17 |
| Elizabeth: | 3 11 15 15 9 10 7 16 16 19 |

a Find the mean and standard deviation of both Tim’s and Elizabeth’s results.

b Which person had the most consistent results? Justify your answer.
Data Analysis – Summary Statistics

Median and mode

Question 1  Find the median of each set of scores.

a  6, 7, 8, 9, 10

c  12, 62, 42, 22, 52, 92, 72, 82, 32

e  8, 11, 16, 13, 12, 13, 16, 11, 8, 7, 8

b  4, 5, 6, 7, 7, 8, 8, 8, 9, 9

d  16, 18, 15, 11, 15, 12, 17, 13, 14, 18

f  56, 60, 68, 49, 66, 87, 67, 56

Question 2  Find the mode of each set of scores.

a  2, 2, 3, 4, 4, 5, 5, 6, 5, 6

c  2, 3, 3, 2, 4, 2, 5, 6, 5, 3, 3

e  8, 9, 10, 8, 11, 8, 9, 8, 10, 8, 6, 8

b  4, 8, 8, 9, 9, 9, 9

d  52, 17, 18, 52, 53, 54, 52, 52, 53, 52

f  5, 6, 5, 5, 7, 6, 6, 7, 6, 5

Question 3  Complete the table, then find the mode and median.

a
<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

mode = __________
median = __________

c
<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>8</td>
<td></td>
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<tr>
<td>17</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

mode = __________
median = __________
Data Analysis – Summary Statistics

Using the mean, mode and median

**QUESTION 1**  A foreign language class has just 6 students. The class sat for a test and the following marks resulted: 7, 93, 95, 96, 96, 99

a Find:
   i the median
   ii the mean
   iii the mode

b Barry scored 93. “I did well in the test,” Barry told his mother. “I was way above average.” Do you agree with Barry’s statement? Briefly comment.

**QUESTION 2**  When talking about real-estate, people in the industry and the media refer to the median house price. Why is the median a better means of describing the data than the mean or mode?

**QUESTION 3**  A shop sells women’s clothes. The table shows the numbers of each size of dress sold over the previous month.

<table>
<thead>
<tr>
<th>Size</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number sold</td>
<td>2</td>
<td>13</td>
<td>28</td>
<td>42</td>
<td>35</td>
<td>26</td>
<td>23</td>
<td>19</td>
<td>21</td>
</tr>
</tbody>
</table>

a Find the mean dress size.

b What is the modal dress size?

c What is the median?

d The shop owner is most interested in the modal dress size. Why do you think she would find that important?
Comparisons of samples

QUESTION 1  Every student at a university was given a short general knowledge quiz, marked out of ten. The results of two samples of students are given below.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
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<tr>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
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<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

For each sample find:

a  the mode ______________________

b  the median ___________________

c  the mean _____________________

d  the standard deviation ________

e  Briefly comment on any similarities or differences between the two samples.

f  The mean of all students who did the quiz is 7.5 and the population standard deviation is 1.5. What conclusions, if any, can you draw about the two samples?

QUESTION 2  The coach of a netball team kept statistics on all the games played throughout the season. She found the mean number of goals scored per game by her team was 57.

a  If you selected a random sample of seven of the games would you expect the mean number of goals scored by the team to be 57? Justify your answer.

b  The coach selected the 5 games played against the Bellbirds. The mean number of goals scored by her team in these five games was 41. What conclusion, if any, can be drawn about these opponents?
Data Analysis – Summary Statistics

TOPIC TEST

Time allowed: 30 minutes  
Total marks: 28

SECTION I Multiple-choice questions  
8 marks

Instructions  
- This section consists of 8 multiple-choice questions
- Each question is worth 1 mark
- Fill in only ONE CIRCLE
- Calculators may be used

Questions 1–3 refer to the scores 3, 4, 4, 4, 5, 5, 6, 6, 8, 15

1 The mode is:
   A 3  B 4  C 5  D 6

2 The mean is:
   A 3  B 4  C 5  D 6

3 The median is:
   A 3  B 4  C 5  D 6

4 Which of these measures will always be found in the listed set of data?
   A mean  B median  C mode  D standard deviation

5 For this set of data, which is the greatest?
   A the mean  B the median
   C the mode  D the mean, mode and median are all equal

Questions 6 and 7 refer to the data in this table.

<table>
<thead>
<tr>
<th>Score</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>13</td>
<td>22</td>
<td>35</td>
<td>26</td>
<td>11</td>
</tr>
</tbody>
</table>

6 The population standard deviation of the above data is:
   A 1.80  B 1.81  C 1.82  D 1.83

7 The sample standard deviation of the above data is:
   A 1.80  B 1.81  C 1.82  D 1.83
8 Two data sets, (P and Q), have been illustrated by dot plots. The scale for both dot plots is the same.

Which statement is correct?

A) P has a greater standard deviation than Q
B) Q has a greater standard deviation than P
C) The standard deviations for P and for Q are the same.
D) There is not enough information to make any conclusions about the standard deviations.

SECTION II

Show all necessary working.

9 40 people were randomly selected at a concert and asked their age. The results were recorded in the table below.

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
</tr>
</tbody>
</table>

a) What is the mode? ___________________________ 1 mark
b) What is the median? ___________________________ 1 mark
c) Use a calculator to find:
   i) the mean ___________________________ 1 mark
   ii) the standard deviation to one decimal place ___________________________ 1 mark

10 A group of Year 11 students were surveyed about the number of brothers and sisters they had. The results are shown in the table.

<table>
<thead>
<tr>
<th>No. of siblings</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

a) How many students were surveyed? ___________________________ 1 mark
b) How many siblings are there? ___________________________ 1 mark
c) Find the mode. ___________________________ 1 mark
d) Find the median. ___________________________ 1 mark
e) Find the mean. ___________________________ 1 mark
f) What is the standard deviation to one decimal place? ___________________________ 1 mark
11. The number of gold medals won by Australian athletes in each of the Olympic games held from the 1956 games in Melbourne to the 2000 Sydney Olympics is given in the table.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medals</td>
<td>13</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>9</td>
<td>16</td>
</tr>
</tbody>
</table>

a. What is the mean number of gold medals won? ________________________ 1 mark
b. What is the mode? ________________________ 1 mark
c. What is the range? ________________________ 1 mark
d. What is the median? ________________________ 1 mark

e. Comment briefly on the similarities and differences between these results and those from question 11. 2 marks

12. The number of gold medals won by Australian athletes in each of the first twelve Olympic games held is given in the table.

<table>
<thead>
<tr>
<th>Year</th>
<th>1896</th>
<th>1900</th>
<th>1904</th>
<th>1908</th>
<th>1912</th>
<th>1920</th>
<th>1924</th>
<th>1928</th>
<th>1932</th>
<th>1936</th>
<th>1948</th>
<th>1952</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medals</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

a. What is the mean number of gold medals won? ________________________ 1 mark

b. What is the mode? ________________________ 1 mark
c. What is the range? ________________________ 1 mark
d. What is the median? ________________________ 1 mark

e. Comment briefly on the similarities and differences between these results and those from question 11. 2 marks
CHAPTER 7
Measurement – Units of Measurement

Units of measurement

QUESTION 1 Which of the units kilometre, metre or millimetre would be the most appropriate to measure the:

a height of a tree
b length of a river
c width of a piece of paper
d length of a bus

QUESTION 2 Which of the units gram, kilogram or tonne would be most appropriate to measure the:

a weight of a pencil
b load on a semi-trailer
c mass of a packet of biscuits
d weight of a bus

QUESTION 3 Choose the most appropriate unit from millilitre, litre or megalitre, to measure:

a a dose of medicine
b the capacity of a cup
c the amount of water in a dam
d the capacity of a hot-water service

QUESTION 4 Which of the units cm², m² or hectare would be the most appropriate to measure the area of:

a a postage stamp
b a farm
c the floor of a room
d a sheet of newspaper

QUESTION 5 Choose the most appropriate unit from cm³ or m³ to measure the volume of:

a a tissue box
b a water tank
c a shed
d a cake tin

QUESTION 6 Choose the appropriate unit for each of the following.

a The weight of a person.
b The height of an elephant.
c The distance between two towns.
d The amount of petrol in a car’s petrol tank.
e The length of a pen.
Measurement – Units of Measurement

Conversions between units

**QUESTION 1**  Complete each of the following.

a  50 mm = _______ cm  

b  900 cm = _______ m  

c  6000 m = _______ km  

d  23 cm = _______ mm  

e  24 m = _______ cm  

f  8 km = _______ m  

g  93 mm = _______ cm  

h  3 m = _______ mm  

i  3600 m = _______ km  

j  3.8 cm = _______ mm  

k  8.2 m = _______ cm  

l  8.3 m = _______ cm  

m  65 cm = _______ mm  

n  198 mm = _______ cm  

o  967 cm = _______ m  

**QUESTION 2**  Complete each of the following.

a  4000 g = _______ kg  

b  5000 kg = _______ t  

 c  6783 g = _______ kg  

d  9369 g = _______ kg  

 e  9300 kg = _______ t  

f  9 kg = _______ g  

g  38.5 kg = _______ g  

 h  6.38 t = _______ kg  

i  9.36 t = _______ kg  

j  55.76 kg = _______ g  

 k  8 t = _______ kg  

l  4639 g = _______ kg  

m  6 t = _______ kg  

n  3657 g = _______ kg  

o  98.7 kg = _______ g  

**QUESTION 3**  Complete each of the following.

a  3000 mL = _______ L  

b  35 000 L = _______ kL  

 c  9683 mL = _______ L  

d  4500 mL = _______ L  

 e  5900 L = _______ kL  

f  8939 L = _______ kL  

g  12 000 L = _______ kL  

 h  36.8 L = _______ mL  

i  23.8 L = _______ mL  

j  16 L = _______ mL  

 k  9 kL = _______ L  

l  85.653 L = _______ mL  

m  8.6 kL = _______ L  

 n  19.3 kL = _______ L  

o  1936 mL = _______ L  

**QUESTION 4**  Complete:

a  0.2 m = _______ cm  

b  0.6 L = _______ mL  

 c  0.3 kg = _______ g  

d  0.007 m = _______ mm  

 e  0.8 t = _______ kg  

f  0.05 km = _______ m  

g  0.004 kL = _______ L  

 h  0.1 cm = _______ mm  

i  0.07 m = _______ cm  

j  2 mm = _______ cm  

 k  2 mm = _______ m  

l  40 g = _______ kg  

m  900 L = _______ kL  

 n  50 cm = _______ m  

o  6 kg = _______ t  

**QUESTION 5**  Complete:

a  1 megalitre = ________________ litres  

b  1 hectare = _____________ m²  

c  1 kilometre = ________________ cm  

 d  1 tonne = _____________ g
Measurement – Units of Measurement

Relative error

**QUESTION 1** Each of the following measurements are given to the nearest centimetre. Write the limits between which the true lengths lie.

- a 8 cm ____________________________
- b 11 cm ____________________________
- c 56 cm ____________________________
- d 75 cm ____________________________
- e 83 m ____________________________
- f 61 m ____________________________
- g 92 cm ____________________________
- h 68 cm ____________________________

**QUESTION 2** Each of the following measurements are given to the nearest 10 metres. Write the limits between which the true lengths lie.

- a 70 m ____________________________
- b 830 m ____________________________
- c 300 m ____________________________
- d 1500 m ____________________________
- e 3 km ____________________________
- f 12 km ____________________________
- g 360 m ____________________________
- h 580 m ____________________________

**QUESTION 3** Each of the following measurements are given correct to 1 decimal place. Write the limits between which the true lengths lie.

- a 5.6 m ____________________________
- b 8.3 km ____________________________
- c 0.3 m ____________________________
- d 8.9 km ____________________________
- e 2.5 m ____________________________
- f 13.6 m ____________________________
- g 18.2 m ____________________________
- h 7.7 m ____________________________

**QUESTION 4** A block of land requires a fence which is 50 m long and 30 m wide when measured to the nearest metre.

- a Between which two measurements does the length lie?
- b Between which two measurements does the width lie?
- c Find the smallest possible area.
- d Find the largest possible area.
Measurement – Units of Measurement

Percentage error

**QUESTION 1** Find the percentage error for a measurement of:

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>a</td>
<td>50 cm ± 5 cm</td>
</tr>
<tr>
<td>b</td>
<td>75 m ± 0.5 m</td>
</tr>
<tr>
<td>c</td>
<td>15 g ± 0.5 g</td>
</tr>
<tr>
<td>d</td>
<td>12.5 L ± 0.05 L</td>
</tr>
<tr>
<td>e</td>
<td>16.32 m ± 0.005 m</td>
</tr>
<tr>
<td>f</td>
<td>48.24 km ± 5 m</td>
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</table>

**QUESTION 2** Find the percentage error if each measurement is written correct to the nearest unit.

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<tbody>
<tr>
<td>a</td>
<td>25 m</td>
</tr>
<tr>
<td>b</td>
<td>40 mm</td>
</tr>
<tr>
<td>c</td>
<td>62 kg</td>
</tr>
<tr>
<td>d</td>
<td>37 mL</td>
</tr>
<tr>
<td>e</td>
<td>148 km</td>
</tr>
<tr>
<td>f</td>
<td>87 t</td>
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</table>

**QUESTION 3** Find the percentage error if each measurement is given correct to one decimal place.

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<tbody>
<tr>
<td>a</td>
<td>28.4 m</td>
</tr>
<tr>
<td>b</td>
<td>12.7 kg</td>
</tr>
<tr>
<td>c</td>
<td>2.1 L</td>
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</table>

**QUESTION 4** Find the percentage error if each measurement is given correct to two decimal places.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a</td>
<td>8.88 kg</td>
</tr>
<tr>
<td>b</td>
<td>16.24 km</td>
</tr>
<tr>
<td>c</td>
<td>4.35 t</td>
</tr>
</tbody>
</table>
CHAPTER 7 – Measurement – Units of Measurement

Recognising and reducing error

**QUESTION 1** List three possible sources of error in measuring.


**QUESTION 2** Find the average of these measurements.

a 2.75 m, 2.85 m  
______________________________
______________________________
______________________________

b 456 mL, 462 mL  
______________________________
______________________________
______________________________

c 381 kg, 373 kg, 374 kg  
______________________________
______________________________
______________________________

d 815.3 L, 816.1 L, 815.7 L  
______________________________
______________________________
______________________________

e 6.1 m², 5.8 m²  
______________________________
______________________________
______________________________

f 973 g, 971 g, 974 g, 977 g  
______________________________
______________________________
______________________________

**QUESTION 3** Gary measured the length of a piece of timber and found it to be 2.7 m long. He didn’t feel confident that this was the correct length of the timber. What do you suggest Gary should do?


**QUESTION 4** Heather measured the length of a room twice. The first time she found it to be 6.63 m long and the second time 6.57 m. What do you think Heather should record as the length of the room? Justify your answer.


Measurement – Units of Measurement

Significant figures

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

a  38 653 to 3 significant figures  
b  24 686 357 to 2 significant figures

c  387 006 432 to 1 significant figure  
d  96 481 to 1 significant figure

e  3653.854 to 3 significant figures  
f  857 300 to 2 significant figures

g  0.005 6831 to 2 significant figures  
h  5.238 765 41 to 3 significant figures

i  0.000 035 8132 to 2 significant figures  
j  76.362 to 3 significant figures

k  0.000 139 7643 to 2 significant figures  
l  0.007 5436 to 1 significant figure

QUESTION 2  Write each number correct to 3 significant figures.

a  56 383 420  
b  8 361 000 000  
c  43 682

d  0.036 8735  
e  0.555 8324  
f  0.000 325 69

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.

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.
Scientific notation

QUESTION 1 Write the following numbers in scientific notation.

a 7000 = _______________

b 19 000 = _______________

c 53 000 = _______________

d 647 000 = ________________

e 816 000 000 = __________

f 5 800 000 000 = ___________

g 690 = ___________________

h 873 = ___________________

i 235 000 = _______________

j 56 000 =_________________

k 64 900 = _________________

l 865 000 000 = ____________

QUESTION 2 Write the following in scientific notation.

a 0.035 = ___________________

b 0.0038 = _________________

C 0.06532 = ________________

d 0.000 058 = _______________

E 0.000 0043 = _____________

f 0.00075 = ________________

g 0.00059 =_________________

h 0.0067 = _________________

i 0.000 094 =_______________

j 0.0356 = __________________

k 0.0098 = _________________

l 0.05361 = _______________

QUESTION 3 Express the following as ordinary numerals.

a 4 × 10³ = _________________

b 3.6 × 10⁴ = _______________

c 7.29 × 10⁷ = ______________

d 3.5 × 10⁵ = _______________

E 4.75 × 10³ = ______________

g 7.4 × 10⁶ = _______________

h 2.5 × 10⁶ = ______________

i 5.13 × 10³ = ______________

j 9.5 × 10³ = _______________

k 5.83 × 10² = ______________

l 6.91 × 10⁵ = ______________

QUESTION 4 Express the following as decimal numerals.

a 4.8 × 10⁻² = _______________

b 3.05 × 10⁻⁴ = _______________

c 7.15 × 10⁻⁵ = ______________

d 5.4 × 10⁻³ = _______________

E 3.9 × 10⁻² = _______________

g 6.7 × 10⁻⁶ = _______________

h 5.5 × 10⁻⁵ = ______________

i 8 × 10⁻⁴ = _______________

j 7.69 × 10⁻⁵ = _______________

k 1.6 × 10⁻³ = _______________

l 5.3 × 10⁻⁶ = ______________

QUESTION 5 Calculate the following, expressing answers in scientific notation correct to 2 decimal places.

a (2.5 × 10³) × (1.5 × 10²) = _______________

b (5.4 × 10³) × (4.8 × 10⁵) = _______________

c (5.1 × 10³) × (2.3 × 10³) = _______________

d (8.1 × 10⁴) ÷ (2.7 × 10²) = _______________

e (6.4 × 10⁵) ÷ (1.6 × 10³) = _______________

f (8.5 × 10⁴) – (7.6 × 10³) = _______________

g (3.8 × 10³) × (2.1 × 10⁴) = _______________

h (7.6 × 10³)² = _______________

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

a 6.835 × 10⁹ ÷ 57.6 = _______________

b (30 × 70)² ÷ 3.16 × 10⁻² = _______________

c 5.68 × 10⁴ ÷ 2.13 × 10⁻² = _______________

d \sqrt{5.96 \times 10⁶} ÷ 3.2 \times 10² = _______________

e 8⁻⁹ = _______________

f 0.0025 ÷ 625.7 = _______________
Measurement – Units of Measurement

Rates

QUESTION 1
a  320 km in 5 hours is a rate of ______________ per hour.
b  48 books bought for $360 is at a 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 $248. His rate of pay is ______________ per hour.
e  5 kg of peas cost $12.50, which equals ______________ per kg.

QUESTION 2  Find the given rates.
a  Michael drives 180 km in 3 hours. Find his average speed.

b  John delivers 840 bottles of milk every day between 6 a.m. and 10 a.m. Find his hourly rate of delivery.

c  A tree grows 32.4 metres over a period of $8 \frac{1}{2}$ years. What is the average annual growth rate is metres per year?

d  Eva earns $850 for a 40 hour week. Find her hourly rate of pay.

e  A car travels 600 km on a journey and covers this distance in 6 hours 15 minutes. Calculate the car’s average speed in kilometres per hour.

QUESTION 3  198 litres of water flows through a filter in $5\frac{1}{2}$ minutes.
a  What is the volume flow rate in litres per minute?

b  At this rate how many litres will flow through the filter in 1 hour?

c  How long will it take for 540 litres to flow through the filter?
Measurement – Units of Measurement

Conversion of rates

**QUESTION 1**  Complete these 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 = _________ °/s

**QUESTION 2**  A speed of 54 kilometres per hour is how many:

a  metres per hour  
b  metres per minute  
c  metres per second

**QUESTION 3**  A speed of 23 metres per second is how many:

a  metres per minute  
b  metres per hour  
c  kilometres per hour

**QUESTION 4**  A flow rate of 5 millilitres per second is how many:

a  millilitres per minute  
b  millilitres per hour  
c  litres per hour

**QUESTION 5**  A car is travelling at 90 km/h. How many metres does it travel in one second?

**QUESTION 6**  Change:

a  78 km/h to m/s  
b  10 m/s to km/h

**QUESTION 7**  Sand is flowing from a truck at the rate of 300 kg per second. At this rate how many tonnes would flow in an hour?
Measurement – Units of Measurement

Concentrations

**Question 1**  A brand of antiseptic recommends that it should be diluted at the rate of 1 mL of antiseptic for every 20 mL of water. How many millilitres of antiseptic should be used in 600 mL of water?

**Question 2**  A hospital patient needs to receive 2 litres of a medication per day. He receives the medication intravenously by means of a drip. 18 drops make up one mL.

a  How many drops must the patient receive in a day?

b  At what rate, in drops per minute, must the drip flow?

**Question 3**  Cows are fed 2 kg of grain each per day. They need to receive 30 g of a supplement each per day and the easiest way to do this is to mix the supplement with the grain. How many kg of the supplement should be added to a tonne of grain?

**Question 4**  A type of weedkiller recommends it be mixed with water at the rate of 500 mL of weedkiller per 100 L of water.

a  How much weedkiller would need to be added to a spray unit which contains 750 litres of water?

b  It is recommended that the spray mixture be applied to paddocks at the rate of 120 L per hectare. How many litres of spray mixture will be needed to spray an area of 25 hectares?

c  How much weedkiller is needed to spray 25 hectares?

d  If the capacity of the spray unit is 800 L, how many times must it be filled to spray 25 hectares?
Percentage changes

QUESTION 1  All items in a shop are on sale at 15% discount off the marked price.

a  Find the sale price of a shirt marked $48.

b  A shop assistant receives a staff discount of 10%. Find the price the shop assistant must pay for the shirt if the staff discount is taken off the already discounted price.

c  What is the total percentage discount the shop assistant has received?

QUESTION 2  An amount of $760 is decreased by 30% and the resulting amount is then increased by 20%.

a  What is the final amount?

b  What is the overall percentage change in the amount?

QUESTION 3  An amount of $420 is subjected to an increase of 20% followed by a decrease of 20%. Find the overall change in the amount.

QUESTION 4  Billy has an insurance policy on his car. The total premium on the policy is $1080.

a  Billy has a 60% no-claim bonus, meaning he receives a 60% discount on the premium. How much will Billy need to pay after the discount has been applied?

b  Billy also receives a 15% discount for having multiple policies with the insurance company. This discount is applied after any other discounts. What actual percentage discount does Billy receive on his premium for having multiple policies?
Measurement – Units of Measurement

Ratios

QUESTION 1  Express the following ratios in simplest form.

a  $3 : 6 = \underline{\quad}$

b  $5 : 5 = \underline{\quad}$

c  $6 : 18 = \underline{\quad}$

d  $12 : 4 = \underline{\quad}$

e  $14 : 22 = \underline{\quad}$

f  $90 : 80 = \underline{\quad}$

g  $16 : 12 = \underline{\quad}$

h  $8 : 84 = \underline{\quad}$

i  $10 : 20 : 30 = \underline{\quad}$

j  $\frac{1}{2} : \frac{1}{4} = \underline{\quad}$

k  $2\frac{1}{2} : 2 = \underline{\quad}$

l  $1.5 : 2 = \underline{\quad}$

QUESTION 2  Simplify the following ratios.

a  $30c : $6

b  $1\ h : 40\ min$

c  $6\ mm : 10\ cm$

d  $3\ days : 6\ weeks$

e  $500\ g : 3\ kg$

f  $6\ days : 48\ h$

g  $10\ h : 1\ day$

h  $13\ weeks : 1\ year$

QUESTION 3  There are 30 cows and 18 calves in a paddock. What is the ratio, in simplest form, of cows to calves?

QUESTION 4  Kelly counts 42 trucks and 105 cars passing through an intersection. What is the ratio of trucks to cars in simplest form?

QUESTION 5  A rectangle has length 20 cm and breadth 12 cm. What is the ratio of its length to its perimeter?

QUESTION 6  Find the ratio of the areas of two squares whose sides are 4 cm and 5 cm respectively.
Using ratios

**QUESTION 1**  The ratio of boys to girls is 2 : 3. If there are 24 boys, how many girls are there?

**QUESTION 2**  The ratio of flour to sugar in a recipe is 3 : 2. If a recipe uses 240 g of flour, how much sugar should be used?

**QUESTION 3**  Divide:

   a  $36 in the ratio 4 : 5
   
   b  $80 in the ratio 3 : 2

**QUESTION 4**  Damien and Ricky share $48 000 in the ratio 5 : 3. What is Ricky’s share?

**QUESTION 5**  The ratio of adults to children on a train trip is 4 : 1. If the train is carrying 600 passengers, find the number of adults and children on the train.

**QUESTION 6**  The three angles of a triangle are in the ratio 1 : 2 : 3. Find the size of each angle.
Measurement – Units of Measurement

Unitary method

**QUESTION 1** 12 cans of dog food cost $15.60. What is the price of:

a 1 can

b 23 cans?

**QUESTION 2** 7 bales of silage hay weigh 4.2 t. How much would 12 bales weigh?

**QUESTION 3** Find the whole amount if:

a 25% is $16

b 10% is 56 cm

c 15% is 480 L

**QUESTION 4** John’s income increased by 4%. If his income rose by $850, find his previous income.

**QUESTION 5** I spent 48% of my allowance on a movie which cost $15.60. How much is my allowance?

**QUESTION 6** 5.2 litres of fruit punch will fill 16 glasses.

a How many litres of punch are needed to fill 25 glasses?

b How many glasses can be filled if there are 13 litres of punch?
CHAPTER 7 – Measurement – Units of Measurement

TOPIC TEST

Time allowed: 30 minutes  Total marks: 25

SECTION I  Multiple-choice questions  12 marks

Instructions
• This section consists of 12 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1  How many mL in 3.5 L?
   A  35  B  350  C  3500  D  35 000

2  Change 90 km/h into km/min.
   A  1 km/min  B  1.5 km/min  C  2 km/min  D  2.5 km/min

3  The capacity of a glass would be closest to:
   A  30 mL  B  300 mL  C  3000 mL  D  3500 mL

4  10 litres per hour equals how many litres per day?
   A  210  B  220  C  230  D  240

5  A car travels 441 km in 5\(\frac{1}{4}\) hours. Calculate the average speed.
   A  48 km/h  B  77 km/h  C  80 km/h  D  84 km/h

6  In a school of 957 students, boys and girls are in the ratio 6 : 5. How many girls are there?
   A  552  B  87  C  435  D  348

7  If $24 000 is divided in the ratio 2 : 3, what is the smaller share?
   A  $9600  B  $14 400  C  $10 500  D  none of these

8  Which would be the most appropriate unit to measure the amount of water in a full bucket?
   A  millilitres  B  litres  C  kilolitres  D  megalitres

9  A piece of timber is measured to be 1.65 m long to the nearest centimetre. The percentage error is closest to:
   A  ± 0.3%  B  ± 0.6%  C  ± 6%  D  ± 30%

10  An amount of money is subjected to a decrease of 20% followed by an increase of 20%. The final amount is:
    A  less than the original amount  B  equal to the original amount
    C  greater than the original amount  D  there is not enough information
11 A petrol tank when half full holds 40 litres. How much more petrol does it hold if it is three quarters full?

A 10 L  B 15 L  C 20 L  D 60 L

12 A speed of 20 m/s is how many km/h?

A 56  B 70  C 72  D 75

SECTION II

13 Light travels at a speed of $3 \times 10^8$ m/s. How many kilometres does it travel in 1 hour? 2 marks

14 Three business partners share their annual profit in the ratio 3 : 4 : 5. How much does each receive if the profit is $108 000? 3 marks

15 A packet of dried fruit weighs 500 g. If this is correct to the nearest 10 g, between what measurements does the weight lie? 2 marks

16 A piece of paper is 254 mm long, to the nearest mm. What is the percentage error? 2 marks

17 A brand of bleach recommends that it should be diluted at the rate of $1\frac{1}{2}$ tablespoons per litre of water.

a How many tablespoons of bleach should be added to 5 litres of water? 1 mark

b How much water should be used with 12 tablespoons of bleach? 1 mark

c If a standard tablespoon is 20 mL, find the recommended ratio of bleach to water, in simplest form. 1 mark

18 Change 180 km/h into m/s. 1 mark
CHAPTER 8
Measurement – Applications of Area and Volume

Area of triangles and quadrilaterals

**QUESTION 1** Find the area of each triangle.

- **a**
  \[ \frac{1}{2} \times 8 \, \text{cm} \times 12 \, \text{cm} = 48 \, \text{cm}^2 \]

- **b**
  \[ \frac{1}{2} \times 9 \, \text{cm} \times 28 \, \text{cm} = 126 \, \text{cm}^2 \]

- **c**
  \[ \frac{1}{2} \times 6 \, \text{cm} \times 8 \, \text{cm} = 24 \, \text{cm}^2 \]

**QUESTION 2** Find the area of each quadrilateral.

- **a**
  \[ 8 \, \text{cm} \times 8 \, \text{cm} = 64 \, \text{cm}^2 \]

- **b**
  \[ 12 \, \text{m} \times 6 \, \text{m} = 72 \, \text{m}^2 \]

- **c**
  \[ 14 \, \text{cm} \times 37 \, \text{cm} = 518 \, \text{cm}^2 \]

- **d**
  \[ 11 \, \text{m} \times 8 \, \text{m} = 88 \, \text{m}^2 \]

- **e**
  \[ 5 \, \text{cm} \times 5 \, \text{cm} = 25 \, \text{cm}^2 \]

- **f**
  \[ 12 \, \text{m} \times 15 \, \text{m} = 180 \, \text{m}^2 \]

**QUESTION 3** Find the area.

- **a**
  \[ \frac{1}{2} \times 4 \, \text{m} \times 5 \, \text{m} = 10 \, \text{m}^2 \]

- **b**
  \[ \frac{1}{2} \times 12 \, \text{km} \times 14 \, \text{km} = 84 \, \text{km}^2 \]

- **c**
  \[ \frac{1}{2} \times 17 \, \text{m} \times 8 \, \text{m} = 68 \, \text{m}^2 \]
Measurement – Applications of Area and Volume

Field diagrams

**QUESTION 1**  The following field diagrams have been drawn of blocks of land. Find the area of each block.

(a) 

(b) 

**QUESTION 2**  The diagram represents a paddock. Find the area of the paddock in hectares.
Classifying polyhedra

**QUESTION 1** State whether the solid is a prism, pyramid or other.

- a
- b
- c
- d
- e
- f

**QUESTION 2** Name these solids.

- a
- b
- c
- d
- e
- f
- g
- h
- i
Nets of solids

**QUESTION 1**  
Match each net to the correct name of the solid.

- **a** Cube  
- **b** Triangular prism  
- **c** Square pyramid

**A**[Diagram of a net of a cube]  
**B**[Diagram of a net of a triangular prism]  
**C**[Diagram of a net of a square pyramid]

**QUESTION 2**  
Draw the net of each solid.

- **a** Rectangular prism  
- **b** Triangular pyramid (Tetrahedron)  
- **c** Cylinder  
- **d** Cone

**a**[Diagram of a net of a rectangular prism]  
**b**[Diagram of a net of a triangular pyramid]  
**c**[Diagram of a net of a cylinder]  
**d**[Diagram of a net of a cone]

**QUESTION 3**  
Which solids will be formed from the following net?

- **a**  
- **b**

- **c**  
- **d**
CHAPTER 8 – Measurement – Applications of Area and Volume

Geometric drawings

**Question 1** Sketch each of the following solids:
- a. cube
- b. cone
- c. triangular prism
- d. square pyramid
- e. sphere
- f. cylinder

**Question 2** Draw each solid below using the isometric dot paper:
- a. rectangular prism
- b. rectangular pyramid

**Question 3** Draw each of the following on the isometric grid paper:
- a. triangular pyramid
- b. hexagonal prism
Measurement – Applications of Area and Volume

Vanishing points

**QUESTION 1** The diagram below shows a triangular prism.

a  Beginning at point A, draw a line through B and beginning at D draw a line through C, extending the lines to find the vanishing point.

b  Draw a line from A through D, from B through C and from F through E to find a vanishing point.

c  Draw a line from A through F and from D through E to find a vanishing point.

d  Draw a line from B through F and from C through E to find a vanishing point.

**QUESTION 2** Extend the lines from the two given vanishing points. Use these lines to draw a rectangular prism.
Surface area of right prisms

**QUESTION 1** Find the surface area of each cube.

(a) \[ \text{Side length: 7 m} \]

(b) \[ \text{Side lengths: 8.5 cm} \]

**QUESTION 2** Find the surface area of each rectangular prism.

(a) \[ \text{Length: 12 cm, Width: 8 cm, Height: 7 cm} \]

(b) \[ \text{Length: 20.3 cm, Width: 7.6 cm, Height: 5.8 cm} \]

**QUESTION 3** Find the surface area of each triangular prism.

(a) \[ \text{Base edges: 12 cm, 20 cm, Height: 8 cm} \]

(b) \[ \text{Base edges: 12 cm, 23.6 cm, Height: 5 cm} \]
Measurement – Applications of Area and Volume

Surface area of prisms and pyramids

**QUESTION 1**  Find the surface area of each prism.

a  
![Prism Image](image)

b  
![Pyramid Image](image)  
Shaded area = 260 cm²

**QUESTION 2**  The diagram shows a square pyramid.

a  How many faces are there?

b  What is the area of the base?

c  What is the area of ΔEBC?

d  What is the total surface area?

**QUESTION 3**  Find the surface area of these pyramids.

a  
![Pyramid Image](image)

b  
![Pyramid Image](image)
Volume of right prisms

QUESTION 1  Find the volume of each cube.

a  

b  

 c  


QUESTION 2  Find the volume of each rectangular prism.

a  

b  


QUESTION 3  Find the volume of each prism, given the area of the shaded face.

a  

b  


QUESTION 4  For the triangular prism, find:

a  the area of the shaded face  

b  the volume of the prism
Volume of pyramids

**QUESTION 1** Calculate the volume of the following square pyramids correct to one decimal place.

**a**

[Diagram of a square pyramid with dimensions: base 9.3 cm, height 10.8 cm]

**b**

[Diagram of a square pyramid with dimensions: base 8.7 cm, height 6.9 cm]

**QUESTION 2** Calculate the volume of the following rectangular pyramids.

**a**

[Diagram of a rectangular pyramid with dimensions: base 6.8 cm, height 15.7 cm]

**b**

[Diagram of a rectangular pyramid with dimensions: base 1.6 m, height 2.3 m]

**QUESTION 3** Calculate the volume of the following pyramids correct to one decimal place.

**a**

[Diagram of a triangular pyramid with dimensions: base 7.5 cm, height 9.3 cm]

**b**

[Diagram of a triangular pyramid with dimensions: base 10.2 cm, height 23.8 cm]

**QUESTION 4** The area of the base of a hexagonal pyramid is 114 cm² and its height is 13 cm. Find its volume.
Volume of cylinders and cones

**Question 1** Find the volume of each cylinder. (Give the answer correct to one decimal place.)

a

![Diagram of a cylinder with dimensions](image)

b

![Diagram of a cylinder with dimensions](image)

**Question 2** Find the volume of a cylinder with:

a diameter 14 cm, height 6 cm

b radius 25 cm, height 85 cm

**Question 3** Find the volume of each cone.

a

![Diagram of a cone with dimensions](image)

b

![Diagram of a cone with dimensions](image)

**Question 4** Which has the larger volume? A cone of radius 8 cm and height 24 cm or a cylinder of diameter 16 cm and height 8 cm? Justify your answer.
Volume of a sphere

**Question 1** Find the volume, correct to one decimal place, of a sphere with:

- **a** radius 9 cm
- **b** diameter 20 cm
- **c** radius 30 mm
- **d** diameter 35 m
- **e** radius 15.3 km
- **f** diameter 56 cm

**Question 2** Calculate the volume of the following spheres correct to one decimal place.

- **a**
- **b**

**Question 3** Calculate the volume of the following hemispheres correct to one decimal place.

- **a**
- **b**

**Question 4** The radius of the Earth is approximately 6400 km. If we assume that the Earth is a sphere, find its volume. (Give your answer in scientific notation, correct to two significant figures.)
Measurement – Applications of Area and Volume

The relationship between capacity and volume

QUESTION 1  Complete:

a  $1 \text{ cm}^3 = \underline{\phantom{000}} \text{ mL}$  b  $1000 \text{ cm}^3 = \underline{\phantom{000}} \text{ L}$  c  $1 \text{ m}^3 = \underline{\phantom{000}} \text{ L}$

QUESTION 2  A jug has a volume of $12000 \text{ cm}^3$. How many litres of water can it hold?

QUESTION 3  A fish tank is in the shape of a rectangular prism. It measures $80 \text{ cm} \times 60 \text{ cm} \times 15 \text{ cm}$.

a  Find its volume in cubic centimetres.

b  How many litres of water will it hold?

QUESTION 4  A rectangular roof is $18 \text{ m} \times 11 \text{ m}$.

a  What volume of water will fall on the roof if we receive $10 \text{ mm}$ of rain?

b  A tank catches all the rain that falls on the roof. How many litres of water will flow into the tank from $10 \text{ mm}$ of rain?

c  The tank holds $20000 \text{ litres}$. How much rain would need to fall to fill the tank if it is empty and it only catches rain from the above roof?

QUESTION 5  A cylindrical diesel tank is $1.25 \text{ m} \times 60 \text{ cm}$.

a  What is the capacity of the tank?

b  If the tank can only be filled to $85\%$ of its capacity to allow for expansion and contraction of the fuel, what is the maximum useable capacity?
Measurement – Applications of Area and Volume

TOPIC TEST

Time allowed: 55 minutes Total marks: 50

SECTION I Multiple-choice questions 15 marks

Instructions
• This section consists of 15 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1 Calculate the volume of a cube with side length 5 cm.
   A 30 cm$^3$  B 125 cm$^3$  C 150 cm$^3$  D none of these

2 Find the area of a square with side length 12 cm.
   A 48 cm$^2$  B 288 cm$^2$  C 144 cm$^2$  D none of these

3 A rectangular prism has sides of length 9 cm, 11 cm and 12 cm. Find its volume.
   A 32 cm$^3$  B 339 cm$^3$  C 594 cm$^3$  D 1188 cm$^3$

4 How many cm$^2$ are there in a square metre?
   A 100  B 1000  C 10 000  D 100 000

5 If the perimeter of a square is 36 cm, then the area of the square is:
   A 6 cm$^2$  B 9 cm$^2$  C 36 cm$^2$  D 81 cm$^2$

6 This could be the net of:
   A a rectangular prism
   B a rectangular pyramid
   C a triangular prism
   D a triangular pyramid

7 Which solid is not a prism?

A  
B  
C  
D  

110
8 A cube has a volume of 4913 cm$^3$. Find the length of each side of the cube.
   \[A\] 70 cm \hspace{1cm} [B] 8.4 cm \hspace{1cm} [C] 181 cm \hspace{1cm} [D] 17 cm

9 A cylinder has height 6 m and diameter 4 m. Its volume is closest to:
   \[A\] 75 m$^3$ \hspace{1cm} [B] 113 m$^3$ \hspace{1cm} [C] 302 m$^3$ \hspace{1cm} [D] 452 m$^3$

10 The area of this triangle is:
   \[A\] 66 m$^2$ \hspace{1cm} [B] 71.5 m$^2$ \hspace{1cm} [C] 120 m$^2$ \hspace{1cm} [D] 130 m$^2$

11 The volume of a rectangular prism is 216 cm$^3$. Find the total surface area of a cube having the same volume.
   \[A\] 64 cm$^2$ \hspace{1cm} [B] 216 cm$^2$ \hspace{1cm} [C] 144 cm$^2$ \hspace{1cm} [D] 196 cm$^2$

12 A carton has a volume of 1600 cm$^3$. Its capacity is:
   \[A\] 16 mL \hspace{1cm} [B] 1.6 L \hspace{1cm} [C] 16 L \hspace{1cm} [D] 1600 L

13 A rectangular prism is 12 cm long, 10 cm wide and 7 cm high. Its surface area is:
   \[A\] 840 cm$^2$ \hspace{1cm} [B] 274 cm$^2$ \hspace{1cm} [C] 548 cm$^2$ \hspace{1cm} [D] 116 cm$^2$

14 The area of this irregular shaped block of land is:
   \[A\] 1696.5 m$^2$ \hspace{1cm} [B] 3393 m$^2$ \hspace{1cm} [C] 16 269 m$^2$ \hspace{1cm} [D] there is not enough information

15 A pyramid has base area 16 m$^2$ and height 3 m. Its volume is:
   \[A\] 5.3 m$^3$ \hspace{1cm} [B] 16 m$^3$ \hspace{1cm} [C] 24 m$^3$ \hspace{1cm} [D] 48 m$^3$

---

**SECTION II**

Show all necessary working.

16 Sketch
   \[a\] a square pyramid \hspace{1cm} \[b\] a triangular prism
17 Find the area of each shape. (All measurements are in cm.)

a

\[ \text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \]

\[ = \frac{1}{2} \times 14.8 \times 3.7 \]

\[ = 27.06 \text{ cm}^2 \]

b

\[ \text{Area} = \text{base} \times \text{height} \]

\[ = 25 \times 5.7 \]

\[ = 142.5 \text{ cm}^2 \]

c

\[ \text{Area} = \frac{1}{2} \times (\text{base} + \text{top base}) \times \text{height} \]

\[ = \frac{1}{2} \times (7.3 + 5.8) \times 12.5 \]

\[ = 107.375 \text{ cm}^2 \]

d

\[ \text{Area} = \text{base} \times \text{height} \]

\[ = 26 \times 17 \]

\[ = 442 \text{ cm}^2 \]

18 Find the surface area of each solid. (All measurements are in cm.)

a

\[ \text{Surface Area} = 2 \times (\text{length} \times \text{width}) + 2 \times (\text{length} \times \text{height}) + 2 \times (\text{width} \times \text{height}) \]

\[ = 2 \times (16 \times 6) + 2 \times (16 \times 20) + 2 \times (6 \times 20) \]

\[ = 384 + 640 + 240 \]

\[ = 1264 \text{ cm}^2 \]

b

\[ \text{Surface Area} = 2 \times (\text{length} \times \text{width}) + 2 \times (\text{length} \times \text{height}) + 2 \times (\text{width} \times \text{height}) \]

\[ = 2 \times (18.2 \times 18.2) + 2 \times (18.2 \times 18.2) + 2 \times (18.2 \times 18.2) \]

\[ = 648.64 + 648.64 + 648.64 \]

\[ = 1946.92 \text{ cm}^2 \]

c

\[ \text{Surface Area} = \text{Base Area} + 2 \times (\text{Base Perimeter} \times \text{Height}) \]

\[ = 2 \times 14 \times 20 + 2 \times (14 + 20 + 14 + 20) \]

\[ = 560 + 140 \]

\[ = 700 \text{ cm}^2 \]

d

\[ \text{Surface Area} = \text{Base Area} + 2 \times (\text{Base Perimeter} \times \text{Height}) \]

\[ = \text{Area of base} + 2 \times \left( \frac{1}{2} \times (12 + 30) \times 12 \right) \]

\[ = 30 \times 12 + 2 \times 12 \times 6 \]

\[ = 360 + 144 \]

\[ = 504 \text{ cm}^2 \]
19 Find the volume of each solid. (All measurements are in cm.)

\[ \text{a} \]
\[ \text{b} \]
\[ \text{c} \]
\[ \text{d} \]

20 Find the volume.

\[ \text{a} \]
\[ \text{b} \]
\[ \text{c} \]
\[ \text{d} \]
21 The base of a pyramid of height 2 m, has an area of 7 m².  

a What is the volume of the pyramid?  

__________________________________________________________________________  
__________________________________________________________________________  
__________________________________________________________________________  

b What is the capacity in litres?  

__________________________________________________________________________  
__________________________________________________________________________  
__________________________________________________________________________  

22 Find the area of this field, in hectares.  

__________________________________________________________________________  
__________________________________________________________________________  
__________________________________________________________________________  
__________________________________________________________________________  
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CHAPTER 9
Measurement – Similarity

Properties of similar figures

QUESTION 1  State whether the following statements are true or false.

a  If two figures are similar, they are the same shape. ________________

b  If two figures are similar, they are the same size. ________________

c  If two figures are similar, the corresponding angles must be equal. ________________

d  If two figures are similar, the corresponding sides must be equal. ________________

e  If two similar figures have a scale factor of 2, then each side of the second figure is twice as long as the corresponding side of the first figure. ________________

f  If two similar figures have a scale factor of 3, then each side of the second figure is three units longer than the corresponding side of the first figure. ________________

g  If two similar figures have a scale factor of 1, they are congruent. ________________

h  If two figures are congruent they are the same shape and the same size. ________________

i  An enlargement factor of $\frac{1}{2}$ is the same as a reduction factor of 2. ________________

QUESTION 2  Darren drew this design. ‘It makes use of similar figures,’ he commented. Do you agree? Briefly comment.

________________________________________

________________________________________

________________________________________

QUESTION 3  List some of the similar figures that appear in the design of this building.

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

QUESTION 4  List a few places where you might see similar figures in everyday life.

________________________________________

________________________________________

________________________________________
Measurement – Similarity

Scale factors

**QUESTION 1** A diagram that was 6 cm long and 4.5 cm wide, has been enlarged by a factor of 2. What are its new dimensions?

**QUESTION 2** A drawing was 18 cm long and 13.2 cm wide. If it was reduced by a factor of 3, what will be its new length and width?

**QUESTION 3** A diagram was not thought to be large enough and so was enlarged by a factor of 4. If it is now 26 cm long and 18 cm high, what were its original dimensions?

**QUESTION 4** Two triangles are congruent. The first triangle has a base of length 19 cm and a height of 13 cm. For the second triangle, what is:

a) the length of its base

b) its height

**QUESTION 5** Two rectangles are similar. The first rectangle is 9 cm long and 4 cm high. The second rectangle is 45 cm long.

a) What is the scale factor?

b) How wide is the second rectangle?

**QUESTION 6** Each side of a regular hexagon is 6 cm long. If the hexagon is enlarged by a factor of 4 and then reduced by a factor of 3, how long will each side be?

**Question 7** A triangle has sides of length 30 cm, 72 cm and 78 cm. It is reduced to 2/3 the size. For the reduced triangle, what is the length of:

a) the shortest side

b) the longest side

**QUESTION 8** A design is 27.6 cm long and 15.6 cm wide. The design is too large and is reduced so that the length is 20.7 cm.

a) What is the reduction factor?

b) What is the width of the reduced design?
Solving problems involving similar triangles

**QUESTION 1** Complete the following sentences.

a. Two triangles are similar if two angles of one triangle are equal to \( \text{__________} \) of the other.

b. Two triangles are similar if their corresponding sides are in the \( \text{__________} \).

c. Two triangles are similar if an angle of one triangle is equal to \( \text{__________} \) of the other and the lengths of the sides that form the angle are in the \( \text{__________} \).

d. The symbol for similar triangles is \( \text{__________} \).

**QUESTION 2** Use the diagram to answer the following questions.

a. Name a pair of similar triangles.

b. What is the enlargement factor between these two triangles?

c. Find the value of \( x \).

**QUESTION 3** In \( \triangle PQR \), ST is drawn parallel to QR.

a. Name two similar triangles.

b. Complete: \( \frac{PS}{QR} = \frac{ST}{ST} \)

c. PT = 8 cm and TR = 4 cm. What is the enlargement factor between the two triangles?

d. If ST = 6 cm find the length of QR.

**QUESTION 4** A post 1 m high casts a shadow, on level ground, that is 1.3 m long. At the same time a tree casts a shadow 71.5 m long.

Use similar triangles to find the height of the tree.
Measurement – Similarity

Scales

QUESTION 1
Write each of the following scales in simplest ratio form.

a 1 mm to 1 m
b 1 cm to 1 m
c 1 cm to 100 m
d 10 cm to 1 km
e 4 mm to 1 m
f 5 cm to 1 m
g 1 mm to 20 m
h 20 cm to 1 m
i 1 mm to 6 m

QUESTION 2
Using a scale of 1 : 100, what length, in metres, is represented by:

a 1 cm?
b 3 cm?
c 5 cm?
d 8 mm?
e 6 mm?
f 12 m?

QUESTION 3
Using a scale of 1 : 1000, what is the real length represented by each of the following?

a 8 mm
b 5 cm
c 6 m
d 9.5 cm
e 8.3 m
f 63.25 m

QUESTION 4
The distance between two points in real life is given. What is this distance on a scale drawing with scale 1 cm to 100 m?

a 500 m
b 400 m
c 1260 m
d 80 m
e 3000 m
f 2835 m

QUESTION 5
A map has a scale of 1 : 100 000.

a A distance of 1 cm on the map will represent a real distance of how many kilometres?

b The distance between two towns on the map is 8.4 cm. How far apart are the two towns?

c The real straight line distance between A and B is 26 km. How long will this distance be on the map?
CHAPTER 9 – Measurement – Similarity

Scale drawings

QUESTION 1 A drawing of a block of land, along with the proposed building, has been drawn using a scale of 1 : 500. By measurement and calculation find:

a the width of the block

b the depth of the block

c the area of the block

d how far the proposed building is from the southern boundary

e the area of the proposed building

QUESTION 2 The diagram shows a scale-drawing of a cross-section of a pipe. The outer diameter of the pipe is 1.44 m.

a By measurement and calculation find the scale used for the drawing.

b What is the inside diameter of the pipe?

QUESTION 3 Toby has made a rough sketch of a block of land he is considering buying.

a Make a scale drawing of the block (below) using a scale of 1 : 400.

b What is the perimeter of the block to the nearest metre?
 Measurement – Similarity

Floor plans and elevations

**Question 1** A garage with a flat roof and its floor plan are drawn below (not to scale). Sketch and show its different elevations.

- **a** South elevation
- **b** East elevation
- **c** North elevation
- **d** West elevation
Interpreting floor plans

**QUESTION 1** The diagram shows a floor plan of a house.

**a** What is the width of the house? ________________________

**b** What is the feature marked D1? ________________________________

**c** What is the feature labelled WIR? ______________________________

**d** What are the dimensions of bedroom 3? _______________________

**e** What is the width of each internal wall? _________________________

**f** What is the width of the external walls? _______________________

**g** In which elevation is there not a door? _______________________

**h** One of the measurements for the living room is missing. What should it be?

**i** If building costs are $775 per square metre, how much will it cost to build this house?

**j** Lisa has drawn a sketch, not to scale, of one side of the house. Which elevation did she sketch?
Measurement – Similarity

TOPIC TEST

Time allowed: 25 minutes  Total marks: 20

SECTION I Multiple-choice questions  8 marks

Instructions
• This section consists of 8 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1 A map has been drawn of the local area using a scale of 1 : 10 000. A distance of 1 cm on the map represents a real distance of:
   A 10 m  B 100 m  C 1 km  D 10 km

2 The diagrams show a floor plan and elevation of a beach shack, neither drawn to scale. Which elevation is shown?

   N

   [Diagram of floor plan and elevation]
   A North  B South  C East  D West

3 Consider the statements:
   I similar figures are the same shape but not necessarily the same size
   II similar figures are the same size but not necessarily the same shape
   Which statement(s) is(are) correct?
   A I only  B II only  C both I and II  D neither I nor II

4 On a scale drawing a length of 7 cm represents a real length of 3.5 m. The scale is:
   A 1 : 20  B 1 : 50  C 1 : 200  D 1 : 500

5 Two figures are similar. They are related by a scale factor of 1. Which statement is correct?
   A The second figure is one size larger than the first figure.
   B The second figure is one size smaller than the first figure.
   C One figure is twice as big as the other.
   D The two figures are congruent.
6 \( x = ? \)

A 8.4  
B 14.4  
C 18  
D 28

The diagram shows a scale drawing of a block of land. The perimeter of this block of land must be:

A 240 m  
B 300 m  
C 480 m  
D There is not enough information to determine the perimeter.

8 These two triangles are similar. Which side corresponds to JK?

A PQ  
B QR  
C PR  
D There is not enough information.

SECTION II  
12 marks

Show all necessary working.

9 In the diagram, DE is parallel to BC.
   \( a \) Name a pair of similar triangles.  

b Which side corresponds to AC?

c Find the length of DB.
10 A doctor runs his surgery in a small building. The building’s appearance and floor plan are given. Sketch the building’s various elevations.  

South elevation  East elevation  North elevation  West elevation

11 The diagram shows a scale drawing of a block of land.

a The side AB of the land is actually 80 m long. What is the scale?  

b What is the actual length of side BC?  

CHAPTER 10
Measurement – Right-angled Triangles

Pythagoras’ theorem

QUESTION 1 Find the length of the hypotenuse.

a

b

QUESTION 2 Find the length of the side.

a

b

QUESTION 3 Find the length of the unknown side, giving the answer correct to one decimal place.

a

b

c
Measurement – Right-angled Triangles

Applications of Pythagoras’ theorem (1)

QUESTION 1  Determine whether the triangle is right-angled.

a

\[\frac{20}{99} \sqrt{101}\]

b

\[\frac{155}{155}\]

c

\[\frac{109}{233}\]

QUESTION 2  A 5 metre ladder has its foot 2 metres from the foot of a wall. How far up the wall does the ladder reach? (Give the answer to the nearest cm.)

\[\text{Distance} = \sqrt{5^2 - 2^2} = \sqrt{25 - 4} = \sqrt{21} \approx 4.58 	ext{ cm}\]

QUESTION 3  Carlo is building a rectangular gate from steel pipe. The gate is 4.2 m long and 1.2 m high. In order to brace the gate, Carlo wants to add a centre brace and two diagonal braces as shown in the diagram. He has 6 m of pipe left. Is this enough for the bracing he wants to do? Justify your answer.

\[\text{Total length of pipes} = \sqrt{4.2^2 + 1.2^2} + \sqrt{4.2^2 + 1.2^2} = 9.68 + 9.68 = 19.36 \text{ m}\]

He has 6 m of pipe left, which is not enough.
Measurement – Right-angled Triangles

Applications of Pythagoras’ theorem (2)

**QUESTION 1**  Find the length of the unknown side. (All measurements are in cm.)

- **a**
  - \[ x = \sqrt{17^2 - 11^2} = \sqrt{289 - 121} = \sqrt{168} = 13.00 \\
  - \[ x = 13.00 \text{ cm} \]

- **b**
  - \[ x = \sqrt{5^2 + 6^2} = \sqrt{25 + 36} = \sqrt{61} = 7.81 \\
  - \[ x \approx 7.81 \text{ cm} \]

**QUESTION 2**  Find the perimeter of each block of land. (Give each answer to the nearest metre.)

- **a**
  - \[ P = 60 + 45 + 36 + 32 = 173 \text{ m} \]

- **b**
  - \[ P = 45 + 50 + 75 + 70 = 240 \text{ m} \]

- **c**
  - \[ P = 54 + 32 + 60 + 40 = 186 \text{ m} \]

- **d**
  - \[ P = 60 + 15 + 75 + 70 = 210 \text{ m} \]
Measurement – Right-angled Triangles

Sine, cosine and tangent ratios

**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 marked angle.

```
\begin{align*}
\text{abc} & : x: \quad y: \quad z: \\
\text{def} & : x: \quad y: \quad z: \\
\end{align*}
```

**Question 2**  Complete each ratio for the following triangles.

```
\begin{align*}
\text{abc} & : \sin \theta = \quad \cos \theta = \quad \tan \theta = \\
\text{def} & : \sin \theta = \quad \cos \theta = \quad \tan \theta = \\
\end{align*}
```

### Chapter 10 – Measurement – Right-angled Triangles

#### Trigonometric ratios and the calculator

**Question 1** Find the value of the following correct to 3 decimal places.

- a \( \sin 69^\circ = \) 
- b \( \cos 70^\circ = \) 
- c \( \tan 23^\circ = \) 
- d \( \cos 83^\circ = \) 
- e \( \tan 21^\circ = \) 
- f \( \sin 75^\circ = \) 
- g \( \tan 23^\circ = \) 
- h \( \sin 36^\circ = \) 
- i \( \cos 48^\circ = \)

**Question 2** Find the value of the following correct to 3 significant figures.

- a \( 3.8 \sin 56^\circ = \) 
- b \( \tan 63^\circ 8' = \) 
- c \( \sin 43^\circ 19' = \) 
- d \( 9 \cos 29^\circ = \) 
- e \( \sin 68^\circ 31' = \) 
- f \( \cos 65^\circ 34' = \) 
- g \( \sin 64^\circ 35' = \) 
- h \( 53.7 \cos 68^\circ 14' = \) 
- i \( \tan 24^\circ 45' = \)

**Question 3** Find the value of the following correct to 2 decimal places.

- a \( \tan 65^\circ 7' = \) 
- b \( \cos 75^\circ 6' = \) 
- c \( 18.6 \sin 55^\circ = \) 
- d \( \sin 28^\circ 43' = \) 
- e \( \cos 34^\circ 21' = \) 
- f \( \tan 27^\circ 58' = \) 
- g \( 23.8 \cos 34^\circ 21' = \) 
- h \( \tan 48^\circ 33' = \) 
- i \( 864 \sin 85^\circ 38' = \)

**Question 4** A is an acute angle. Find its size to the nearest degree.

- a \( \sin A = 0.4356 \) 
- b \( \tan A = 0.7885 \) 
- c \( \cos A = 0.5463 \) 
- d \( \cos A = 0.4963 \)

- e \( \tan A = 1.635 \) 
- f \( \tan A = 1.4885 \) 
- g \( \cos A = 0.3149 \) 
- h \( \sin A = 0.8939 \)

- i \( \cos A = \frac{1}{3} \) 
- j \( \sin A = \frac{15}{19} \) 
- k \( \tan A = \frac{18.5}{13.63} \) 
- l \( \tan A = \frac{17}{23} \)

**Question 5** A is an acute angle. Find its size in degrees and minutes.

- a \( \sin A = 0.6 \) 
- b \( \cos A = 0.4831 \) 
- c \( \tan A = 2.356 \) 
- d \( \cos A = 0.3985 \)

- e \( \tan A = 0.8657 \) 
- f \( \sin A = 0.4823 \) 
- g \( \cos A = \frac{7.5}{12.3} \) 
- h \( \sin A = \frac{1}{4} \)
Measurement – Right-angled Triangles

Finding the length of a side (1)

**Question 1** Find the length of the unknown side. (Give the answer correct to one decimal place.)

- **a**
  - \(30^\circ\) 15.6 cm
  - \(x\)
  - \(\overline{\text{length}}\)

- **b**
  - 70° 9.5 cm
  - \(x\)
  - \(\overline{\text{length}}\)

- **c**
  - 55° 14.9 cm
  - \(x\)
  - \(\overline{\text{length}}\)

- **d**
  - 20° 12 cm
  - \(x\)
  - \(\overline{\text{length}}\)

- **e**
  - 41° 15.6 cm
  - \(x\)
  - \(\overline{\text{length}}\)

- **f**
  - 55° 30.6 cm
  - \(x\)
  - \(\overline{\text{length}}\)

**Question 2** Find the value of the pronumeral correct to 2 decimal places.

- **a**
  - 25° 7.8 cm
  - \(a\)
  - \(\overline{\text{value}}\)

- **b**
  - 60° 18.9 cm
  - \(y\)
  - \(\overline{\text{value}}\)

- **c**
  - 28° 13.6 cm
  - \(m\)
  - \(\overline{\text{value}}\)
Finding the length of a side (2)

**Question 1** Find the length of the hypotenuse correct to 1 decimal place.

(a) $\triangle abc$ with $h = 5\,\text{cm}$ and $\angle A = 25^\circ$

(b) $\triangle abc$ with $h = 8\,\text{cm}$ and $\angle A = 60^\circ$

(c) $\triangle abc$ with $h = 12\,\text{cm}$ and $\angle A = 38^\circ$

**Question 2** Find the length of the unknown side. Give the answer correct to one decimal place.

(a) $\triangle abc$ with $12\,\text{m}$ and $\angle A = 68^\circ$

(b) $\triangle abc$ with $7\,\text{cm}$ and $\angle A = 65^\circ$

(c) $\triangle abc$ with $5\,\text{cm}$ and $\angle A = 22^\circ$

(d) $\triangle abc$ with $9\,\text{m}$ and $\angle A = 37^\circ$

(e) $\triangle abc$ with $3\,\text{cm}$ and $\angle A = 40^\circ$

(f) $\triangle abc$ with $36\,\text{cm}$ and $\angle A = 30^\circ$
Measurement – Right-angled Triangles

Finding an angle

**Question 1** Find $\theta$. Give the answer to the nearest whole degree.

a

![Diagram](https://via.placeholder.com/150)

b

![Diagram](https://via.placeholder.com/150)

c

![Diagram](https://via.placeholder.com/150)

**Question 2** Find the size of angle A. Give the answer to the nearest degree.

a

![Diagram](https://via.placeholder.com/150)

b

![Diagram](https://via.placeholder.com/150)

c

![Diagram](https://via.placeholder.com/150)

**Question 3** Find the size of the marked angle, to the nearest minute.

a

![Diagram](https://via.placeholder.com/150)

b

![Diagram](https://via.placeholder.com/150)

c

![Diagram](https://via.placeholder.com/150)

d

![Diagram](https://via.placeholder.com/150)

e

![Diagram](https://via.placeholder.com/150)

f

![Diagram](https://via.placeholder.com/150)
CHAPTER 10 – Measurement – Right-angled Triangles

Angles of elevation and depression

QUESTION 1  The angle of elevation of the top of a tower AB, is 64° from a point C on the ground at a distance of 30 m from the base of the tower. Calculate the height of the tower to the nearest metre.

[Diagram: Triangle ABC with angle 64°, base 30 m, height h]


QUESTION 2  A 4 m high pole casts a shadow on level ground that is 6.2 m long.

a What is the angle of elevation of the sun (to the nearest degree)?

[b] At the same time a tree casts a shadow which is 73 m long. How tall is the tree (to the nearest metre)?

[Diagram: Right triangle with height 4 m, base 6.2 m, angle θ]

[Diagram: Right triangle with height h m, base 73 m, angle θ]

QUESTION 3  From the top of a cliff the angle of depression of a buoy is 23°. If the buoy is 105 m from the base of the cliff find the height of the cliff to the nearest metre.

[Diagram: Right triangle with angle 23°, base 105 m, height of cliff h m]

QUESTION 4  From the top of a building, 85 metres high, the angle of depression of a car on the ground is 48°. Find the distance, correct to 1 decimal place of the car from the base of the building.

[Diagram: Right triangle with angle 48°, height 85 m, base x m]
Measurement – Right-angled Triangles

Problems

QUESTION 1 Michelle is flying a kite on a 55 metre long string, that makes on angle of 65° with the horizontal. Calculate the height of the kite to the nearest metre.

QUESTION 2 Find the length of the diagonal of a rectangle, if the length of the rectangle is 10.7 cm and the diagonal makes an angle of 30° with the longer side.

QUESTION 3 An 18 m ladder standing on level ground reaches 14 m up a vertical wall. Find the angle that the ladder makes with the ground. (Give your answer correct to the nearest degree.)

QUESTION 4 Rowan is building a loading ramp so that his cattle can walk from the ground up onto his truck. He wants the ramp to be 1.2 m high at the point where it will meet the truck and inclined at an angle of 20° with the horizontal. He calculates that the length of the ramp should be approximately 1.6 m. Does this answer seem reasonable? Use a diagram, drawn roughly to scale, to help you decide.
TOPIC TEST

Time allowed: 45 minutes  Total marks: 40

SECTION I  Multiple-choice questions  10 marks

Instructions
- This section consists of 10 multiple-choice questions
- Each question is worth 1 mark
- Fill in only ONE CIRCLE
- Calculators may be used

1. Evaluate $12 \sin 85^\circ$ correct to 2 decimal places.
   - A  12.05
   - B  11.95
   - C  1.05
   - D  137.16

2. If $\sin \theta = \frac{4}{7}$, calculate the size of angle $\theta$ to the nearest degree.
   - A  55°
   - B  30°
   - C  35°
   - D  45°

3. In relation to the diagram, which statement is correct?
   - A  $\sin \theta = \frac{4}{5}$
   - B  $\sin \theta = \frac{3}{5}$
   - C  $\cos \theta = \frac{3}{5}$
   - D  $\tan \theta = \frac{4}{3}$

4. From the diagram, the correct expression for $h$ is:
   - A  $h = 35 \tan 40^\circ$
   - B  $h = \frac{35}{\tan 40^\circ}$
   - C  $h = \frac{\tan 40^\circ}{35}$
   - D  $h = 40 \tan 35^\circ$

5. If $\cos \theta = \frac{1}{2}$, find the size of angle $\theta$.
   - A  30°
   - B  60°
   - C  45°
   - D  55°

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

7. The value of $x$ in the diagram, is given by
   - A  $43 \times \cos 28^\circ$
   - B  $43 \times \sin 28^\circ$
   - C  $\frac{43}{\cos 28^\circ}$
   - D  $\frac{43}{\sin 28^\circ}$

8. The value of $\tan 28^\circ 35'$ is closest to:
   - A  0.545
   - B  0.540
   - C  0.880
   - D  0.700
9 16.25° equals:
A 16°25’     B 16°15’     C 16°45’     D 16°42’

10 The three sides of a right-angled triangle measure 312 m, 313 m and 25 m. The length of the hypotenuse is:
A 312 m     B 313 m     C 25 m
D there is insufficient information to determine the length of the hypotenuse.

SECTION II 30 marks
Show all necessary working.

11 Find the length of the unknown side. 4 marks

a

b

12 A triangle has sides of lengths 145 m, 408 m and 433 m. Is the triangle right-angled? Justify your answer. 2 marks

13 Evaluate, correct to two decimal places: 4 marks
a \( \tan 69° \)

b \( \cos 65°38’ \)

c \( 18.6 \sin 79°40’ \)

d \( \frac{23.7}{\sin 53°} \)

14 Find the size of \( \theta \), to the nearest whole degree. 2 marks
a \( \cos \theta = \frac{3}{7} \)

b \( \tan \theta = 0.5596 \)
15 Find $\theta$ to the nearest minute if:

\[ a \quad \sin \theta = \frac{13}{17} \]

\[ b \quad \tan \theta = 2.3 \]

16 Calculate the length of the unknown side in each right-angled triangle. Give your answer correct to 2 decimal places.

\[ a \]

\[ \text{side} \]

\[ b \]

\[ \text{side} \]

17 Find the size of $\theta$ to the nearest degree.

\[ a \]

\[ \text{angle} \]

\[ b \]

\[ \text{angle} \]

18 A boat is 150 metres from the base of a vertical cliff. Roman, who is sitting in the boat, notes the angle of elevation to the top of the cliff as $28^\circ$. How high is the cliff, to the nearest metre?

\[ \text{Cliff} \]

\[ 150 \text{ m} \]

\[ 28^\circ \]
19. A diagonal of a rectangle makes an angle of 68° with one of the shorter sides. The width of the rectangle is 10 cm.
   a. Show this information on a diagram.
   b. Find the length of the diagonal.

20. a. Find the length of AB correct to one decimal place.
   b. Find the size of \( \angle ABC \).
CHAPTER 11
Probability – The Language of Chance

Language of probability

QUESTION 1  Using the terms of probability, rate these events as certain, likely, unlikely, impossible or even chance.

a  The sun will rise tomorrow

b  A lion having four legs

c  If a die is rolled, a seven appears

d  Monday will follow Sunday next week

e  Sunday will follow Monday next week

f  John will live to the age of 142 years

g  Scoring an even number when a die is thrown

h  A year having 460 days

QUESTION 2  Select the most appropriate from 0%, 30%, 50%, 70% and 100% to describe the chance implied by each of the following words.

a  maybe

b  definitely

c  perhaps

d  sure

e  an outside chance

f  50–50

g  against all odds

h  probably

QUESTION 3  Choose from certain, most likely, even chance, unlikely or impossible to best describe an event which has a probability of:

a  10%

b  0

c  100%

d  \( \frac{7}{8} \)

e  \( \frac{1}{2} \)

f  95%

g  0.005

h  \( \frac{3}{97} \)

i  \( \frac{4}{5} \)

j  1

k  \( \frac{1}{64} \)

l  75%
Probability – The Language of Chance

Sample space

**QUESTION 1** Write the sample space for each of the following.

a Rolling a die once

b Tossing a coin once

c Choosing a letter from the alphabet

d Choosing a vowel

e Choosing a digit from the counting numbers less than 10

f Selecting a 10 from a normal pack of playing cards

g Selecting a day of the week

h Selecting a month of the year

**QUESTION 2** The letters of the word W00L00M00L00 are written on cards and turned face down. A card is then selected at random.

a Write the sample space.

b How many elements has the sample space? ________________________________

c How many different elements are in the sample space? __________________________

**QUESTION 3** For each of the following probability experiments, write the number of elements in the sample space.

a Selecting a card from a normal pack of 52 playing cards.

b Selecting a ball drawn in a Lotto draw. (The balls are numbered 1–45.)

c Selecting the winner of a 12 horse race.

d Selecting a number from 1 to 500 inclusive.
Probability – The Language of Chance

Outcomes

**QUESTION 1** For each of the following, state whether each element of the sample space is equally likely to occur.

a. Rolling a die __________________________

b. Tossing a coin __________________________

c. Choosing a letter from the alphabet __________________________

d. Selecting a card from a normal pack of cards __________________________

e. Choosing a digit from the counting numbers less than 10 __________________________

f. The result of a tennis game between two players __________________________

g. Winning the first prize from a raffle with 500 tickets __________________________

h. Tossing two coins at the same time __________________________

**QUESTION 2** Write the outcomes for each of the following.

a. Selecting a letter from the word PROBABILITY. __________________________

b. Selecting a marble from a bag consisting of white marbles only. __________________________

c. A letter from X to Z. __________________________

d. A letter after Z. __________________________

**QUESTION 3** A card is drawn from a normal pack of cards. How many outcomes are there for each event below?

a. A queen __________________________

b. A picture card __________________________

c. A red card __________________________

d. A spade __________________________

e. A red ten __________________________

f. A five of clubs __________________________

g. A nine or a ten __________________________

h. A blue jack __________________________
Probability – The Language of Chance

Multi-stage events – listing outcomes

**QUESTION 1**  One red, one blue and one white ball are in a box. The balls are removed, one at a time, and placed in a row.

a  List all the possible outcomes.

b  How many different possibilities are there for the first ball?

c  Once the first ball has been chosen, how many possibilities are there for the second ball?

d  Once the first two balls have been chosen, how many possibilities are there for the last ball?

**QUESTION 2**  The numbers 1, 2, 3 and 4 are written on 4 cards, one on each card. The cards are shuffled and then placed side by side to form a 4-digit number.

a  List all the possible outcomes.

b  How many outcomes are possible?

c  If a fifth card, with the number 5 on it, is added and the 5 cards are now shuffled and placed side-by-side, how many different 5-digit numbers are possible? Justify your answer.

**QUESTION 3**  The letters A, B and C are written on three cards, one on each card. The cards are shuffled, one card is selected, the letter is written on a blackboard and then the card is replaced. The cards are reshuffled and another card chosen, the second letter being written beside the first and the card replaced. Again the cards are reshuffled and a third card is drawn and the third letter is written on the blackboard beside the other two.

a  List the possible outcomes.

b  How many outcomes are possible?

c  If a 4th card was selected in the same way, how many total possible outcomes are there?

d  If 8 selections were made, how many possible outcomes would there be? Justify your answer.
CHAPTER 11 – Probability – The Language of Chance

Multi-stage events – determining outcomes

**Question 1** Some car number plates consist of three letters, followed by three digits. How many different number plates of this type are possible?

**Question 2** In a country town all telephone numbers have 8 digits. If the first five digits must be the same for every phone number in the town, how many different phone numbers are possible?

**Question 3** A small café serves two-course lunches and three-course dinners.

a The lunch menu has three choices for the main course and three courses for dessert. How many different two-course lunches are possible?

b The dinner menu has four choices of entrée, five choices for the main meal and three choices for dessert. How many different three-course dinners are possible?

**Question 4** Each participant at a sports carnival was identified by a code number. This code number consisted of a letter of the alphabet followed by a single digit number. How many participants could be identified by this method?

**Question 5** To access information from a club’s computer, each member was required to choose a password of 4 characters. Each character could be either a letter of the alphabet or a digit from 0 to 9.

a How many different characters are there? 

b How many possible passwords are there?

**Question 6** There are seven balls in a hat, each identical except they are numbered from 1 to 7. The balls are drawn at random, one after the other without replacement, and placed on a rack to form a seven-digit number. How many different seven-digit numbers could be formed?
Probability – The Language of Chance

Investigating Outcomes

QUESTION 1  Barney was considering buying a house that he knew could be affected by a one-in-a-hundred-year flood. Barney read in the local paper that such a flood occurred in 1963. He concluded that he could buy the house and be safe from such a flood for quite a few years. Do you agree with Barney? Discuss.

QUESTION 2  Anna decided to enter a talent quest. “Either I will win or I won’t,” she said. “Therefore, I have a 50-50 chance of winning.” Briefly explain what is wrong with Anna’s statement.

QUESTION 3  Ken was planning a holiday to a region that claimed to receive snow on half the days each year. Ken concluded that he could expect it to be snowing on half the days of his holiday. Do you agree? Justify your answer.

QUESTION 4

a  ‘If I choose a letter at random from the alphabet it could either be a vowel or a consonant. Therefore I have a 50-50 chance of choosing a consonant.’ Is this statement true or false? Discuss.

b  ‘If I choose a letter at random from the page of a book, it could either be a vowel or a consonant. Therefore I have a 50-50 chance of choosing a consonant.’ Is this statement true or false? Discuss.
Probability – The Language of Chance

TOPIC TEST

Time allowed: 20 minutes  Total marks: 15

SECTION I Multiple-choice questions  8 marks

Instructions
• This section consists of 8 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1 500 tickets are sold in a raffle. One ticket is drawn at random to win first prize. Jason bought five tickets in the raffle. His chance of winning first prize is:
   A impossible  B unlikely  C likely  D certain

2 Two dice are thrown together and the numbers on the uppermost faces added together. How many elements are in the sample space?
   A 6  B 11  C 12  D 36

3 Shane travels from P to Q to R. He has the choice of 4 routes from P to Q and 5 routes from Q to R. How many different routes can Shane take when travelling from P to R?
   A 1  B 9  C 20  D 45

4 Employees at a company each have an identity number that is made up of a letter of the alphabet followed by a two-digit number (from 00 to 99). What is the maximum number of employees that could be identified using this system?
   A 2340  B 2574  C 2600  D 2626

5 There are 37 slots on a roulette wheel; 18 red, 18 black and one green. An experiment is conducted by spinning the wheel 50 times and recording the colour of the slot on which the wheel lands. The number of different outcomes in the sample space is:
   A 3  B 18  C 37  D 50

6 Which event has a 50-50 chance of happening?
   A getting two heads when tossing two coins
   B getting an odd number when throwing a die
   C getting a picture card when choosing a card from a standard pack of cards
   D randomly picking the winner of a 5 horse race

7 Which outcomes are not equally likely?
   A the result from tossing a fair coin
   B the result from throwing a fair die
   C noting the suit when randomly selecting a card from a standard pack
   D the colour of the traffic light when reaching an intersection
8 The four aces from a standard pack of cards are shuffled and placed face up in a row. How many different arrangements are possible?

A  4  B  10  C  24  D  256

SECTION II  7 marks
Show all necessary working.

9 The numbers 7, 8 and 9 are written on three cards, one on each card. The cards are shuffled and then placed face up in a row.

a List all the possible arrangements.  1 mark

b Another card, with the number 5 on it, is added. The four cards are shuffled and placed face up in a row. How many different arrangements are possible?  1 mark

10 ‘On any given day you can either be well or ill. Therefore you have a 50-50 chance of being sick on any day.’ Comment briefly.  2 marks

11 The letters A, B, C, D, E and F are written on 6 cards, one on each card. The cards are shuffled. One card is selected at random and placed on a table. A second card is then randomly selected and placed beside the first. The process is continued until 5 of the 6 cards are on the table.

a How many different arrangements are possible?  1 mark

b Briefly describe in words the likelihood that the cards spell out the word FACED. Justify your answer.  2 marks
CHAPTER 12
Probability – Relative Frequency and Probability

Relative frequencies

**QUESTION 1** For the following sets of scores write the relative frequency, as a fraction, of the score 5:

- a 10, 6, 4, 10, 6, 7, 5, 5
- b 3, 10, 12, 9, 3, 14, 10, 9, 5, 5
- c 5, 9, 8, 9, 7, 8, 9, 5, 5
- d 8, 11, 10, 11, 11, 8, 7, 5, 5
- e 4, 11, 7, 11, 5, 11, 8
- f 9, 9, 7, 9, 7, 9, 5, 5
- g 3, 10, 8, 10, 6, 5, 10, 4, 3
- h 5, 6, 6, 7, 8, 10, 7, 9, 7, 6, 7, 5, 5
- i 6, 10, 5, 4, 7, 6, 10, 7
- j 8, 7, 8, 9, 10, 12, 14, 8, 5, 5, 5
- k 5, 9, 11, 11, 9, 11, 9, 11, 5
- l 4, 6, 6, 8, 5, 4, 6, 5, 5, 5
- m 4, 5, 5, 4, 6, 5, 6, 4, 6
- n 5, 5, 3, 5, 3, 6, 5, 5
- o 5, 3, 6, 3, 5, 5, 5
- p 4, 5, 5, 3, 2, 5, 5, 6, 3
- q 5, 9, 11, 11, 9, 11, 9, 11, 5
- r 4, 6, 6, 8, 5, 4, 6, 5, 5, 5
- s 5, 3, 6, 3, 5, 5
- t 4, 5, 5, 3, 2, 5, 5, 6, 3

**QUESTION 2** Complete the relative frequency column for each table, giving the answer as a decimal.
Probability – Relative Frequency and Probability

Experimental probability

**Question 1**  Annabel tossed a coin many times and the results were tabulated.

<table>
<thead>
<tr>
<th>Heads</th>
<th>Tails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>59</td>
</tr>
</tbody>
</table>

a) How many times did Annabel 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 100 tosses of a coin? ________________

**Question 2**  Lucy rolled a die many times and recorded the results.

<table>
<thead>
<tr>
<th>Number</th>
<th>Frequency</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

a) Complete the table showing the relative frequencies as fractions in simplest form.

b) From Lucy’s experiment, find the probability of rolling:

i) 3

ii) an odd number

iii) 5 or 6

iv) 1, 2 or 3

v) 4 (as a percentage)

vi) an even number (as a percentage)

vii) 5 (as a decimal)

viii) 6 (as a decimal)
Probability – Relative Frequency and Probability

Simple probability (1)

QUESTION 1 A card is drawn at random from a normal pack of 52 cards. Find the probability that the card is:

a a spade ........................................... b a black card ...........................................

c a queen ........................................... d not a diamond ........................................

e a red ten ........................................ f a jack or king ........................................

QUESTION 2 From the letters of the word MATHEMATICS, one letter is selected at random. What is the probability that the letter is:

a a vowel? ........................................... b a consonant?

c the letter M? ................................... d the letter T?

e the letter M or T? .............................. f the letter S?

QUESTION 3 A die is thrown once. Find the probability that it shows:

a a six ........................................... b a four ...........................................

c a seven ........................................... d an even number ...................................

e a number less than 4 ................................... f 5 or higher ...................................

QUESTION 4 A bag contains 4 red balls, 5 blue balls and 1 white ball. If a ball is drawn at random, find the probability that it is:

a white ........................................... b red ...........................................

c blue ........................................... d not white ...........................................

e yellow ........................................... f either blue or white ...................................

QUESTION 5 A three-digit number is to be formed from the digits 3, 5 and 2. (No digit is repeated in the number.) What is the probability that the number formed is:

a even? ........................................... b odd? ...........................................

c less than 500? ................................... d divisible by 5? ......................................

e less than 200? ................................... f divisible by 3? ......................................

QUESTION 6 The numbers from 1 to 5 are written on separate cards. One card is chosen at random. What is the probability that the number is:

a odd? ........................................... b zero? ...........................................

c even? ........................................... d 5? ...........................................

e divisible by 3? ................................... f a prime number? ..............................
Simple probability (2)

**QUESTION 1** A bag contains 4 white marbles and 1 black marble. If one marble is drawn out at random, what is the probability, as a decimal, that it is:

a) black 

b) white 

c) yellow 

**QUESTION 2** A raffle ticket is drawn from a box containing 100 tickets numbered from 1 to 100. Find the percentage chance that the number of the ticket is:

a) divisible by 10 

b) less than 10 

c) greater than 10 

d) a multiple of 5 

e) greater than 90 

f) a number containing the digit 9

**QUESTION 3** A spinner used in a game is in the shape of a pentagon, and has an equal chance of landing on any of its sides. The sides are numbered 1, 2, 3, 4 and 5. What is the probability, as a percentage, that the spinner lands on:

a) 2 

b) an odd number 

**QUESTION 4** The internal phone numbers at a factory have three digits.

a) How many phone numbers are possible? 

b) If the numbers are allocated at random, what is the probability, as a decimal, that Lucas has a phone number that ends in 5?

**QUESTION 5** A bag holds 9 blue, 6 red and 3 yellow golf tees. If a tee is selected at random from the bag at random, what is the probability, (as a fraction in simplest form), that the tee is:

a) blue 

b) red 

c) yellow 

d) red or blue 

e) green 

f) red, yellow or blue 

**QUESTION 6** Complete:
The probability of any event is always in the range from _______ to _______ .
Comparing probabilities and experimental results

**Question 1** Lara made a cardboard spinner to use in a game. The spinner had seven sides, numbered from 1 to 7. Lara tested the spinner, with the following results:

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>8</td>
<td>11</td>
<td>5</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

a. How many times did Lara spin the spinner in the test? __________________

b. If the spinner has an equal chance of landing on any of its seven sides, what is the actual probability that it lands on:

   i. 1
   ii. 2
   iii. 3
   iv. 4
   v. 5
   vi. 6
   vii. 7

   __________________
   __________________
   __________________
   __________________
   __________________
   __________________
   __________________

c. Using the results of Lara’s test, what is the probability that this spinner lands on:

   i. 1
   ii. 2
   iii. 3
   iv. 4
   v. 5
   vi. 6
   vii. 7

   __________________
   __________________
   __________________
   __________________
   __________________
   __________________
   __________________

d. Do you think Lara’s spinner is fair? Justify your answer. What suggestions would you have for Lara?

   __________________

**Question 2** Trevor believed that if he asked people to choose any card from a standard pack, there were three cards, (the ace of spades, the queen of hearts and the jack of clubs) that people were more likely to select. To test his theory, Trevor surveyed 155 people and recorded the results.

<table>
<thead>
<tr>
<th>Card</th>
<th>Ace of spades</th>
<th>Queen of hearts</th>
<th>Jack of clubs</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3</td>
<td>15</td>
<td>9</td>
<td>128</td>
</tr>
</tbody>
</table>

a. What is the probability, as a decimal correct to 3 decimal places, of selecting at random a particular card from a standard pack? __________________

b. What is the experimental probability based on Trevor’s results, (as a decimal correct to 3 decimal places) of choosing:

   i. the ace of spades
   ii. the queen of hearts
   iii. the jack of clubs

   __________________
   __________________
   __________________

   c. Do you think Trevor was correct in believing that these cards were more likely to be selected? Justify your answer.

   __________________
**Illustrating the results of experiments**

**Question 1**  Two dice were tossed together 36 times and the number on the uppermost faces added to form the score. The results are shown below:

a  Show these results in a column graph.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

b  Briefly comment on any observations that can be made from the graph.

---

**Question 2**  A large group of people were surveyed and asked to give a number from 0 to 9. The results are shown in the table.

<table>
<thead>
<tr>
<th>Number</th>
<th>Frequency</th>
</tr>
</thead>
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<td>17</td>
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<tr>
<td>9</td>
<td>15</td>
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</table>

a  How many numbers were recorded? ________________________

b  What is the relative frequency of 0? ________________________

c  Illustrate these results in the bar chart below.
Probability – Relative Frequency and Probability

Complementary events

**QUESTION 1** A die is rolled. What is the probability of:

a not getting a 6  

b not getting a 3  

c not getting a 4 or 5  

d not getting an even number

**QUESTION 2** From a pack of 52 playing cards one card is drawn at random. What is the probability that it is not a club?

**QUESTION 3** The probability of winning a competition is \( \frac{1}{500} \). What is the probability of losing?

**QUESTION 4** A coin is tossed once. What is the probability that the result is:

a not a head  

b neither a head nor a tail  

c either a head or a tail

**QUESTION 5** The probability of a train arriving on time is \( \frac{19}{32} \). What is the probability that it will not arrive on time?

**QUESTION 6** The probability of it raining today is \( \frac{1}{5} \). What is the probability of it not raining today?

**QUESTION 7** A bag holds only two-dollar coins. If a coin is selected at random from the bag, what is the probability that it is not a two-dollar coin.

**QUESTION 8** There is a 27% chance of winning a game. What is the probability of not winning the game?

**QUESTION 9** The probability of a baby being born with a particular defect is 0.005. What is the probability of the baby being born without that defect?

**QUESTION 10** As the result of an experiment it is determined that the chance that any motorist at a particular location is exceeding the speed limit is 1 in 5. If a motorist at that location is randomly selected, what is the probability that she or he is travelling at, or less than, the speed limit?
Probability – Relative Frequency and Probability

TOPIC TEST

Time allowed: 30 minutes Total marks: 30

SECTION I Multiple-choice questions 10 marks

Instructions
• This section consists of 10 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1. Which could not be the probability of an event?
   A 26%  B 0.3  C 0.875  D \( \frac{7}{5} \)

2. Sharon tossed a coin a number of times and recorded the results, which are shown in the table.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>Heads</td>
<td>20</td>
</tr>
<tr>
<td>Tails</td>
<td>30</td>
</tr>
</tbody>
</table>

The relative frequency of heads is:
   A \( \frac{2}{5} \)  B \( \frac{1}{2} \)  C \( \frac{3}{5} \)  D \( \frac{2}{3} \)

3. The probability of getting an even number when a die is rolled is:
   A \( \frac{1}{6} \)  B \( \frac{1}{3} \)  C \( \frac{1}{2} \)  D 1

4. If the probability of tomorrow being a sunny day is \( \frac{1}{4} \), then the probability of tomorrow not being sunny is:
   A \( \frac{1}{4} \)  B \( \frac{1}{3} \)  C \( \frac{1}{2} \)  D \( \frac{3}{4} \)

5. From a pack of 52 playing cards, the probability of drawing an ace is:
   A \( \frac{1}{4} \)  B \( \frac{1}{2} \)  C \( \frac{1}{13} \)  D \( \frac{2}{13} \)

6. A bag contains 4 white, 3 red and 2 black balls. The probability of drawing a white ball is:
   A \( \frac{4}{5} \)  B \( \frac{4}{9} \)  C \( \frac{5}{9} \)  D none of these

7. A box contains 100 white tickets, 50 yellow tickets and 50 red tickets. One ticket is selected at random from the box. What is the probability that the ticket is red?
   A 25%  B \( 33 \frac{1}{3} \% \)  C 50%  D 75%
8 500 tickets are sold in a school raffle. If Li buys 5 tickets, find the probability of her winning first prize.

A 0.002  B 0.001  C 0.01  D 0.05

9 There is a 45% chance of winning a prize in a competition. What is the chance of not winning a prize?

A 45%  B 55%  C 65%  D there is not enough information

10 A three-digit number is formed from the digits 1, 2 and 3, each digit used once only. What is the probability that 2 is the middle number?

A $\frac{1}{3}$  B $\frac{1}{6}$  C $\frac{1}{2}$  D $\frac{3}{8}$

SECTION II  20 marks

Show all necessary working.

11 A die is thrown once. Find the probability that it shows:

a a six ______________________________

b one or five ______________________________

c zero ______________________________

d any number from 1 to 6 ______________________________

12 A three-digit number is made up of the digits 4, 5 and 8. If the digits are not repeated, what is the probability that the number:

a is odd ______________________________

b is even ______________________________

c is less than 800 ______________________________

d ends in 5 ______________________________

e does not begin with 4 ______________________________

13 A bag contains 6 red, 5 white and 9 green marbles. If one marble is selected at random, what is the probability of drawing:

a a red marble?

b a white marble?

c a green marble?

d a yellow marble?

e either a red or white marble?

f not a red marble?

g either a red, white or green marble?
14 The scores in a quiz are shown in the table below.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
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<tr>
<td>7</td>
<td>5</td>
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<td>8</td>
<td>6</td>
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<tr>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

a What is the relative frequency of the score 7? ________________

b Based on these results what is the percentage chance of scoring 10?

15 Jade threw a die 100 times and recorded the results. She calculated that the relative frequency of the result 5 was 0.23. ‘That is a lot higher than I would have thought’ she said. Do you agree? Briefly comment, justifying your answer.

________________________________________________________________________________________
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CHAPTER 13
Algebraic Modelling – Basic Algebraic Skills

General number patterns

QUESTION 1 For each of the following number patterns find the number that is added to one term to get the next and write the next three terms.

a 4, 8, 12, 16, 20, ________, ________, ________
b 3, 10, 17, 24, 31, ________, ________, ________
c 0, 15, 30, 45, 60, ________, ________, ________
d 6, 11, 16, 21, 26, ________, ________, ________
e 3, 3.5, 4, 4.5, 5, ________, ________, ________

QUESTION 2 For each of the following number patterns find the number that is subtracted from one term to get the next and write the next three terms.

a 18, 16, 14, 12, 10, ________, ________, ________
b 60, 54, 48, 42, 36, ________, ________, ________
c 37, 32, 27, 22, 17, ________, ________, ________
d 53, 48, 43, 38, 33, ________, ________, ________
e 67, 58, 49, 40, 31, ________, ________, ________

QUESTION 3 For each of the following number patterns find the number that multiplies one term to get the next and write the next three terms.

a 3, 9, 27, 81, 243, ________, ________, ________
b 2, 8, 32, 128, 512, ________, ________, ________
c 1, 5, 25, 125, 625, ________, ________, ________
d 10, 20, 40, 80, 160, ________, ________, ________
e 4, 12, 36, 108, 324, ________, ________, ________

QUESTION 4 For each of the following number patterns find the number that divides each term to get the next and write the next three terms.

a 6400, 3200, 1600, 800, ________, ________, ________
b 729, 243, 81, 27, ________, ________, ________
c 100 000, 10 000, 1000, 100, ________, ________, ________
d 512, 256, 128, 64, 32, ________, ________, ________
e 4374, 1458, 486, 162, 54, ________, ________, ________
Algebraic Modelling – Basic Algebraic Skills

Rules for number patterns

**QUESTION 1** Find the first five terms generated by each of the following number pattern rules, beginning with \( n = 1 \)

a \( T = n + 5 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

b \( T = 2n + 1 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

c \( T = n - 3 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

d \( T = 3n - 1 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

e \( T = n^2 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

f \( T = 5n \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

g \( T = 100 - 2n \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

h \( T = 4n + 3 \) 
\[ \text{__________}, \text{__________}, \text{__________}, \text{__________}, \text{__________} \]

**QUESTION 2** In each of the following, complete the table of values using the given rule.

a \( T = 2n + 5 \) 
<table>
<thead>
<tr>
<th>( n )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td>( T )</td>
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</table>

c \( b = 2a + 4 \) 
| \( a \) | 1 | 4 | 6 | 8 |
| \( b \) |   |   |   |   |

d \( y = x - 8 \) 
| \( x \) | 40 | 30 | 24 | 12 |
| \( y \) |   |   |   |   |

e \( n = 5m - 1 \) 
| \( m \) | 1 | 3 | 5 | 7 |
| \( n \) |   |   |   |   |

f \( d = 2c + 7 \) 
| \( c \) | 0 | 1 | 2 | 3 |
| \( d \) |   |   |   |   |

g \( b = 3a \) 
| \( a \) | 1 | 5 | 10 | 15 |
| \( b \) |   |   |   |   |

**QUESTION 3** For each of the tables below write the rule.

a \( n \) 0 1 2 3 
| \( T \) | 0 | 4 | 8 | 12 |

c \( a \) 1 2 3 4 
| \( b \) | 3 | 5 | 7 | 9 |

b \( n \) 1 2 3 4 
| \( T \) | 7 | 8 | 9 | 10 |

d \( x \) 1 2 3 4 
| \( y \) | 1 | 4 | 9 | 16 |
Algebraic Modelling – Basic Algebraic Skills

Like terms

**QUESTION 1**  Circle the like terms in the following.

- **a**  \(m, n, mn, 2m\)
- **b**  \(3x, xy, x^2, 4x, 5x\)
- **c**  \(8a, a, am, a^2, a^3\)
- **d**  \(xy, 2x^2y, 3xy, xy^2\)
- **e**  \(5m, mn, m^2, 6m, 8m\)
- **f**  \(ab, ba, 3b, ab^2, 5ab\)
- **g**  \(y, xy, 2xy, 3x^2y, y^2\)
- **h**  \(a, ae, 3a, 5af, a^2\)
- **i**  \(a^2, a, a^3, 2a^2, ab\)
- **j**  \(9c, 3cd, 5dc, 8a, c^2d\)
- **k**  \(xy, x^2y, 3xy, 5xy^2\)
- **l**  \(9l, 6l^2, 5lm, 3ml\)
- **m**  \(7mn, 9m^2n, 6mn^2, 8m^2n\)
- **n**  \(5ab, 3ba, 8ab, 9a^2b\)
- **o**  \(5x, 8xy, 9yx, 6x^2y\)
- **p**  \(3m^2n, 5mn^2, 6mn^2, 7m\)
- **q**  \(3abc, 5a^2bc, 6abc\)
- **r**  \(3mn, 5mn, 8mn^2, 7m\)
- **s**  \(9a, 8a^2, 10a, 5a, 8ab^2\)
- **t**  \(3xy^2, 5xy^2, 8x^3y, 3xy\)
- **u**  \(3x, 9x, 7x, 8x^2\)
- **v**  \(5l, 6lm, 9ml, 7m\)
- **w**  \(3ab, 5bc, 6a^2b, 9ab\)
- **x**  \(8n, n^2l, 6l^n, 5mn\)
- **y**  \(8bc, 9b^2c, 3cb^2, 4b^2\)
- **z**  \(2x, 3xy, 5yx, 8xy^2\)

**QUESTION 2**  Choose the term (or terms) in the brackets that belong to the given group of like terms.

- **a**  \(9t, 5t, \) \(\text{__________} [x, 3t, 5y]\)
- **b**  \(x^2, 5x^2, \) \(\text{__________} [3x^2, x^3y]\)
- **c**  \(3k, 5k, \) \(\text{__________} [9m, 6l, 7k, 3x]\)
- **d**  \(a^3, 5a^3, \) \(\text{__________} [15a^3, 6a^2]\)
- **e**  \(8, 9, \) \(\text{__________} [15, 3x, 9y]\)
- **f**  \(5ab, \) \(\text{__________} [7ab, 8ba]\)
- **g**  \(9x, 7x, \) \(\text{__________} [5x, 3x^2, 8xy]\)
- **h**  \(6a^2b^2, \) \(\text{__________} [9a^2b^2, 11ab^2]\)
- **i**  \(3c, -2c, \) \(\text{__________} [5c^2, 6c, 2c]\)
- **j**  \(-4e^3, \) \(\text{__________} [7e^3, 8e^6]\)
- **k**  \(19p, 10p, \) \(\text{__________} [8p, 3p^2, 3p]\)
- **l**  \(6a^2, \) \(\text{__________} [9a^2, 5a^2b^2]\)
- **m**  \(24c, 16c, \) \(\text{__________} [14c, 18c^2, c^3]\)
- **n**  \(9m^2, \) \(\text{__________} [6n^2, 8m^2, m^2]\)
- **o**  \(3w, 4w, \) \(\text{__________} [5w, 6w^2, 8w]\)
- **p**  \(xyz, \) \(\text{__________} [3xyz, 2yz]\)
- **q**  \(9y, y, \) \(\text{__________} [6y, 3y^2, 9y]\)
- **r**  \(ab^2, \) \(\text{__________} [a^2b, 5ab^2]\)
- **s**  \(3xy, 5xy, \) \(\text{__________} [8xy, 3xy^2]\)
- **t**  \(y^3, \) \(\text{__________} [4y^3, 3y^6, 2y^3]\)
- **u**  \(3t^2, 9t^2, \) \(\text{__________} [6t^2, 5t^2]\)
- **v**  \(6p^2, \) \(\text{__________} [8p^2, 9p^3]\)
- **w**  \(-q, -3q, \) \(\text{__________} [q, q^2, q^3]\)
- **x**  \(3p, \) \(\text{__________} [4p, 6p^2]\)
- **y**  \(am, 5am, \) \(\text{__________} [6am, 8ma]\)
- **z**  \(6x^2y, \) \(\text{__________} [7xy^2, 10x^2y]\)
Algebraic Modelling – Basic Algebraic Skills

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  \(5mn + 13mn = \) ___________________

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  \(9x - 3x - 2x = \) ______________________

b  \(9k + 5k + 3k - k = \) __________________

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  \(8a^2 + 7 - 6b + 7a^2 - 2b = \) __________

b  \(9c - 7c - 3c + 2d = \) ________________

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  \(6m + 9mn - 2m - 3mn = \) ______________

b  \(8x - 3x + 7x - 2x = \) _______________

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  \(9ab + 3ab - 2ab - ab = \) __________
CHAPTER 13 – Algebraic Modelling – Basic Algebraic Skills

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  \( 8mn \times \frac{1}{4}n = \) ________________________________
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  \( \frac{1}{6}a \times 16b \times -a = \) ________________________________
h  \( 7p \times 8q \times \frac{1}{4}p = \) ________________________________
i  \( m \times \frac{3m}{2} = \) ________________________________
j  \( \frac{8c}{3} \times 4c = \) ________________________________
Algebraic Modelling – Basic Algebraic Skills

**Division of pronumerals**

**QUESTION 1**  Divide the following.

a  \[ 12a + 3 = \]  
b  \[ 20xy + xy = \]  
c  \[ 8a^2b + 4a^2 = \]  
d  \[ abc + bc = \]  
e  \[ 16a - 8 = \]  
f  \[ 6m + 3m = \]  
g  \[ -64a - 8a = \]  
h  \[ 18m + 3m = \]  
i  \[ 60ab + 30ab = \]  
j  \[ 36a + 4a = \]  
k  \[ 9x - 9 = \]  
l  \[ -10ab + 5a = \]  
m  \[ 9x + 9x = \]  
n  \[ 8x^2 + 4 = \]  
o  \[ -42mn - 7m = \]  
p  \[ 18a - a = \]  
q  \[ -36abc + 9ab = \]  
r  \[ 16a^2b + 8ab = \]  

**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  \[ \frac{12}{24n} = \]  
o  \[ \frac{16x^3}{8x^3} = \]  

**QUESTION 3**  Simplify the following.

a  \[ 9x \times \frac{8}{6x} = \]  
b  \[ (8a)^2 + 16a = \]  
c  \[ 18xyz + 9xy + z = \]  
d  \[ 9x \times 4y + 6xy = \]  
e  \[ 16mn \times 4m + 8n = \]  
f  \[ 48ab + 8b + 3a = \]
Algebraic Modelling – Basic Algebraic Skills

Removing grouping symbols

**QUESTION 1** Expand the following expressions.

a. \(6(a + 5) = \) ______________________________

b. \(8(x - 3) = \) ______________________________

c. \(8(2x + 3) = \) ______________________________

d. \(5(3x - 7) = \) ______________________________

e. \(a(13a - 9) = \) ______________________________

f. \(2a(5 + a) = \) ______________________________

g. \(m(2n - p) = \) ______________________________

h. \(-3(a + 7) = \) ______________________________

i. \(-6(4p - 5) = \) ______________________________

j. \(-2a(a - 2) = \) ______________________________

k. \(-(a + b) = \) ______________________________

l. \(-3(x + 2) = \) ______________________________

m. \(-4(x + 3) = \) ______________________________

n. \(-3x(2x - 5) = \) ______________________________

o. \(-(4y - 5) = \) ______________________________

p. \(2p(3p - 7) = \) ______________________________

q. \(x(3x^2 + 7) = \) ______________________________

r. \(6(mn - m^2 - 3n) = \) ______________________________

s. \(2x^2(x + 5) = \) ______________________________

**QUESTION 2** Expand and simplify.

a. \(4(a + 3) + 5a = \) ______________________________

b. \(3(x - 3) + 5x + 8 = \) ______________________________

c. \(8y(y + 3) - 3y^2 = \) ______________________________

d. \(5(p - 5) + 5p - 6 = \) ______________________________

e. \(8(x + 2) + 6(x - 2) = \) ______________________________

f. \(9(m - 2) + 4(m + 2) = \) ______________________________

g. \(a(a + 3) + 6(a - 3) = \) ______________________________

h. \(8(2x - 7) + 3(x - 1) = \) ______________________________

i. \(t(2t - 1) - 3(t + 1) = \) ______________________________

j. \(6(n - 5) - 3(n + 7) = \) ______________________________

k. \(y(y + 1) - (y - 3) = \) ______________________________

l. \(a(a + 2b) - b(a - 2b) = \) ______________________________
Algebraic Modelling – Basic Algebraic Skills

Substitution into formulae

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 \( A = \frac{1}{2}h(a + b) \), 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 \( r = 14 \) 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 \( B = \frac{m}{h^2} \), 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 \( y = 8 \)
One-step equations

**Question 1** Solve the following one-step equations.

a) \( x + 4 = 10 \)

b) \( b + 5 = 27 \)

c) \( x - 4 = 19 \)

d) \( x - 3 = 5 \)

e) \( y + 2 = -3 \)

f) \( x + 7 = -9 \)

g) \( 9 + a = 12 \)

h) \( p - 3 = 9 \)

i) \( m + 7 = -18 \)

j) \( a - 9 = 9 \)

k) \( n + 3 = 12 \)

l) \( t - 5 = 12 \)

m) \( x - 3 = 15 \)

n) \( p - 5 = -10 \)

o) \( 10 + a = 18 \)

**Question 2** Solve these equations.

a) \( 5a = 25 \)

b) \( \frac{x}{2} = 9 \)

c) \( 7t = 28 \)

d) \( 6p = -48 \)

b) \( 3a = 15 \)

f) \( \frac{x}{3} = 15 \)

g) \( \frac{t}{5} = 7 \)

h) \( \frac{m}{6} = 9 \)

i) \( 7t = -42 \)

j) \( 6a = 24 \)

k) \( 9a = 36 \)

l) \( \frac{y}{3} = -8 \)

m) \( \frac{x}{9} = -3 \)

n) \( \frac{y}{2} = -14 \)

o) \( 3a = 27 \)

p) \( 4x = -32 \)

q) \( \frac{p}{7} = -3 \)

r) \( \frac{a}{6} = -8 \)
### Algebraic Modelling – Basic Algebraic Skills

#### Two-step equations

**Question 1** Solve the following equations.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>a</strong></td>
<td>(3x + 1 = 7)</td>
<td></td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>(7y - 8 = 13)</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>(4x + 7 = 19)</td>
<td></td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>(\frac{x}{5} - 1 = 3)</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>(\frac{m}{2} + 5 = 7)</td>
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<tr>
<td><strong>f</strong></td>
<td>(\frac{x}{3} - 5 = -2)</td>
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<tr>
<td><strong>g</strong></td>
<td>(3k + 3 = 33)</td>
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<tr>
<td><strong>h</strong></td>
<td>(4x - 7 = 33)</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>(3x + 7 = 16)</td>
<td></td>
</tr>
<tr>
<td><strong>j</strong></td>
<td>(\frac{7m}{2} = 14)</td>
<td></td>
</tr>
<tr>
<td><strong>k</strong></td>
<td>(\frac{x - 2}{3} = 6)</td>
<td></td>
</tr>
<tr>
<td><strong>l</strong></td>
<td>(20 = 5x - 15)</td>
<td></td>
</tr>
<tr>
<td><strong>m</strong></td>
<td>(2x + 3x = 15)</td>
<td></td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>(6a - a = 25)</td>
<td></td>
</tr>
<tr>
<td><strong>o</strong></td>
<td>(10n - 3n = 28)</td>
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</tbody>
</table>

**Question 2** Solve.

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</thead>
<tbody>
<tr>
<td><strong>a</strong></td>
<td>(2x - 4 = 8)</td>
<td></td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>(\frac{y}{3} + 6 = 15)</td>
<td></td>
</tr>
<tr>
<td><strong>c</strong></td>
<td>(\frac{x - 3}{8} = 2)</td>
<td></td>
</tr>
<tr>
<td><strong>d</strong></td>
<td>(\frac{x - 5}{6} = -1)</td>
<td></td>
</tr>
<tr>
<td><strong>e</strong></td>
<td>(\frac{6m}{5} = 12)</td>
<td></td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>(18 - 3m = 0)</td>
<td></td>
</tr>
<tr>
<td><strong>g</strong></td>
<td>(9y + 5 = -4)</td>
<td></td>
</tr>
<tr>
<td><strong>h</strong></td>
<td>(3a - 2 \frac{1}{2} = 6 \frac{1}{2})</td>
<td></td>
</tr>
<tr>
<td><strong>i</strong></td>
<td>(5b + 0.3 = 4.8)</td>
<td></td>
</tr>
</tbody>
</table>
Three-step equations

Question 1  Solve the following equations.

a  \(3x - 5 = 2x + 7\)  
b  \(2y - 1 = y + 9\)  
c  \(3m - 2 = 2m + 7\)  
d  \(4x + 9 = 3x - 12\)  
e  \(6x - 20 = 4x + 48\)  
f  \(6m + 7 = 7m + 10\)  
g  \(6t - 10 = 4t + 12\)  
h  \(7y - 14 = 5y + 20\)  
i  \(2x - 6 = 3 - x\)  
j  \(9m - 3 = 7m + 9\)  
k  \(12a - 3 = 7a + 32\)  
l  \(2x + 3 = x - 9\)  
m  \(3a + 5 = 21 - a\)  
n  \(6x - 4 = 2x + 16\)  
o  \(6x - 2 = 3x - 6\)  

Question 2  Solve.

a  \(2x - 7 = x - 3\)  
b  \(4a - 3 = 3a + 9\)  
c  \(7y - 3 = 4y + 15\)  
d  \(11m - 6 = 7m + 14\)  
e  \(12p - 3 = 5p + 32\)  
f  \(2x - 14 = x - 12\)  
g  \(5x + 17 = 3 - 4x\)  
h  \(10y - 6 = 5y + 19\)  
i  \(4 + m = 16 - 3m\)
Equations involving fractions

**Question 1** Solve the following equations.

\[ \frac{x}{2} + \frac{x}{3} = 20 \]  
\[ \frac{x + 5}{7} = 3 \]  
\[ \frac{4x}{5} = 8 \]  
\[ \frac{m + 5}{7} = 6 \]  
\[ \frac{x}{2} - \frac{x}{3} = 2 \]  
\[ \frac{3y - 1}{2} = 10 \]  
\[ \frac{3p - 5}{2} = 8 \]  
\[ \frac{x + 2}{3} = 8 \]  
\[ \frac{4x}{5} - 2 = 3 \]  
\[ \frac{5x}{3} = 7 \]  
\[ -\frac{4x}{5} = 8 \]  
\[ \frac{m + 3}{2} = 6 \]  
\[ \frac{2a - 5}{3} = 3 \]  
\[ \frac{3m - 1}{7} = 8 \]  
\[ \frac{2x - 4}{3} = 10 \]  
\[ \frac{a}{2} + \frac{a}{3} = 5 \]  
\[ \frac{3x}{4} - \frac{x}{2} = 15 \]  
\[ \frac{m}{2} - \frac{m}{3} = 7 \]
Algebraic Modelling – Basic Algebraic Skills

Equations involving grouping symbols

**QUESTION 1** Solve the following equations.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>$6(m - 1) = 24$</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>$5(a + 4) = 4(a - 3)$</td>
<td>e</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>$2(m + 1) = 5$</td>
<td>h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j</td>
<td>$7(x - 8) = 6(x + 2)$</td>
<td>k</td>
</tr>
</tbody>
</table>

**QUESTION 2** Solve the following equations.

<p>| | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a</td>
<td>$5(2n - 1) = 25$</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>$2(3p - 1) = 22$</td>
<td>e</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td>$3(x + 4) = 18$</td>
<td>h</td>
</tr>
</tbody>
</table>
Algebraic Modelling – Basic Algebraic Skills

Equations arising from substitution in formulae

QUESTION 1  Given the formula \( v = u + at \), find:

a  \( u \) if \( v = 24, a = 5 \) and \( t = 3 \)

b  \( t \) if \( v = 39, u = 15 \) and \( a = 8 \)

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

a  \( P = 50, B = 8 \)

b  \( P = 60, B = 10 \)

c  \( P = 48, B = 6 \)

QUESTION 3  Find \( h \), given that \( A = 42 \) and \( b = 12 \) if:

a  \( A = \frac{1}{2}bh \)

b  \( A = \frac{1}{2}h(a + b) \) and \( a = 16 \)

QUESTION 4  If \( v^2 = u^2 + 2as \), find:

a  \( u \) if \( v = 15, a = 9 \) and \( s = 8 \) \((u > 0)\)

b  \( a \) if \( v = 20, u = 10 \) and \( s = 30 \)

QUESTION 5  Find the value of \( r \), correct to one decimal place, if:

a  \( C = 2\pi r \) and \( C = 120 \)

b  \( A = P(1 + r)^n \), and \( A = 9750, P = 5000 \), and \( n = 7 \)
TOPIC TEST

SECTION I Multiple-choice questions 15 marks

Instructions
• This section consists of 15 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1. \(a^3 + a^3\) equals:
   - A) \(a^6\)
   - B) \(a^9\)
   - C) \(2a^3\)
   - D) \(2a^6\)

2. \(3ab^2\) equals:
   - A) \(3 \times a \times b \times 2\)
   - B) \(3 \times ab \times ab\)
   - C) \(3ab \times 3ab\)
   - D) \(3 \times a \times b \times b\)

3. \(8x - 3x - x\) equals:
   - A) \(4x\)
   - B) \(6x\)
   - C) \(8x - 3\)
   - D) \(5\)

4. \(x(x - 5)\) equals:
   - A) \(x^2 - 5\)
   - B) \(x^2 - 5x\)
   - C) \(-4x\)
   - D) \(-5x^2\)

5. \(4y - 3(7 - y)\) equals:
   - A) \(y + 21\)
   - B) \(7y - 21\)
   - C) \(y - 21\)
   - D) \(7y + 21\)

6. \(2(x - 7) + x\) equals:
   - A) \(3x - 7\)
   - B) \(3x - 14\)
   - C) \(x - 7\)
   - D) \(x - 14\)

7. In the formula \(s = ut + \frac{1}{2}at^2\), the value of \(s\) when \(u = 3\), \(t = 4\) and \(a = 5\) is:
   - A) \(52\)
   - B) \(86\)
   - C) \(112\)
   - D) \(212\)

8. If \(2p - 5 = 23\), then \(p\) equals:
   - A) \(8\)
   - B) \(9\)
   - C) \(14\)
   - D) \(28\)

9. \(-9x + x - 3x\) equals:
   - A) \(-11x\)
   - B) \(13x\)
   - C) \(11x\)
   - D) \(-13x\)

10. If \(7x - 3 = 81\), what is the value of \(x\)?
    - A) \(\frac{28}{7}\)
    - B) \(27\)
    - C) \(12\)
    - D) \(9\)

11. Evaluate \(a^2 - 7a + 5\) if \(a = -1\):
    - A) \(-3\)
    - B) \(11\)
    - C) \(13\)
    - D) \(12\)
12 If $3x - 8 = 31$, what is the value of $x$?

A 6  B 8  C 13  D 26

13 Simplify $\frac{12x^2}{24x^3}$.

A $\frac{x}{2}$  B $\frac{1}{2x}$  C $\frac{2}{x}$  D $2x$

14 $2x^2 - 3x + 5x^2 - 6x =$

A $-3x^2 - 9x$  B $-3x^2 + 3x$  C $7x^2 + 3x$  D $7x^2 - 9x$

15 Given $A = P(1 + r)^n$ find $A$ when $P = 2000$, $r = 0.1$ and $n = 3$.

A 2662  B 2061  C 2003  D 2420

SECTION II

Show all necessary working.

16 Simplify. 13 marks

a $7 \times 3y$

______________________________

b $12x^3 + 6$

______________________________

c $8m \times -2m$

______________________________

d $24mn + 8n$

______________________________

e $-4p^2 \times -3p$

______________________________

f $18k^2 + 9k$

______________________________

g $\frac{xy}{2x}$

______________________________

h $\frac{p}{6p}$

______________________________

i $\frac{15m}{20m}$

______________________________

j $5x^2 + 9x^2$

______________________________

k $-8m + 12m$

______________________________

l $6x + 5y + 4x - 7y$

______________________________
17 Expand and simplify, where possible.  

\[ m \quad 15ab + 7a^2 + 5ba - a^2 \]

\[ 17 \quad \text{Expand and simplify, where possible.} \quad 6 \text{ marks} \]

**a** \[ 3p(p - q) \]

**b** \[ 4(a - 3) + 3a + 2 \]

\[ c \quad t(6 - t) + 3(6 - 2t) \]

**d** \[ 2(x + 4) + 3(x - 6) \]

\[ e \quad 5(2x - 3y) - 2(x - 4y) \]

**f** \[ 2x^2(3x + 2) + 4x(x^2 - 3) \]

18 Solve the following equations.  

\[ 18 \quad \text{Solve the following equations.} \quad 12 \text{ marks} \]

**a** \[ 2k - 13 = 17 \]

\[ b \quad \frac{x}{3} + 7 = 10 \]

\[ c \quad 8m - 11 = 6m + 15 \]

**d** \[ \frac{2x + 3}{5} = 7 \]

\[ e \quad 4(2y - 3) = 3(y + 5) \]

**f** \[ \frac{2x}{3} - \frac{x}{2} = 1 \]

19 Given \( D = \frac{mA}{150} \), find:  

\[ 19 \quad \text{Given } D = \frac{mA}{150}, \text{ find:} \quad 4 \text{ marks} \]

**a** \[ D \text{ when } m = 18 \text{ and } A = 30 \]

\[ b \quad A \text{ when } D = 4.8 \text{ and } m = 36 \]
CHAPTER 14
Algebraic Modelling – Modelling Linear Relationships

Tables of values

QUESTION 1 Complete each table of values.

a \( y = x + 1 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
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<tbody>
<tr>
<td>0</td>
<td>-1</td>
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<tr>
<td>1</td>
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<td>2</td>
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b \( y = 2x - 1 \)

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c \( y = 2x + 1 \)

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d \( y = x + 3 \)

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e \( y = 2x + 1 \)

<table>
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<th>( y )</th>
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f \( y = 3x - 2 \)

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</table>

QUESTION 2 Complete each of the following.

a \( p = 2q - 3 \)

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<tr>
<th>( p )</th>
<th>( q )</th>
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b \( C = d - 5 \)

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<th>( d )</th>
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c \( n = 2 - m \)

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<th>( m )</th>
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d \( x = 5t + 6 \)

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<th>( t )</th>
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<tbody>
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<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

e \( h = 4x - 3 \)

<table>
<thead>
<tr>
<th>( h )</th>
<th>( x )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

f \( x + y = 4 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
### Straight line graphs

**Question 1**  
Complete each table of values and then graph the equation on the number plane.

- **a** \( y = x - 1 \)
- **b** \( y = 3x \)
- **c** \( y = 2x + 2 \)

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 2**  
Complete each table of values and then graph the equation on the number plane.

- **a** \( x = 2 \)
- **b** \( y = 3 \)
- **c** \( y = x \)

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question 3**  
On the same number plane, graph the following equations by first completing the tables of values.

- **a** \( y = x - 3 \)

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **b** What are the coordinates of the point of intersection of \( y = x - 3 \) and \( y = -x + 3 \)?
**Independent and dependent variables**

**QUESTION 1**  Consider the equation \( C = 5n + 3 \).

- **a** When drawing up a table of values, for which variable (\( C \) or \( n \)) do we choose different values? _____________________________
- **b** Which is the independent variable? _____________________________
- **c** Which variable depends on the independent variable? ____________
- **d** Which is the dependent variable? _____________________________
- **e** Draw up a table of values for \( C = 5n + 3 \), \( n \geq 0 \)

- **f** Graph \( C = 5n + 3 \) on the axes provided.

**QUESTION 2**  Determine which is the dependent and which the independent variable for each equation.

- **a** \( y = 4x - 1 \)  
  - independent: ____________  
  - dependent: ____________

- **b** \( P = 6 - 2k \)  
  - independent: ____________  
  - dependent: ____________

- **c** \( x = 3t + 17 \)  
  - independent: ____________  
  - dependent: ____________

**QUESTION 3**  Complete each table of values and graph, remembering to correctly label the axes.

- **a** \( p = 2q + 4 \)  
  
  \[ \begin{array}{ccc|c} 0 & 1 & 2 & 3 \\ \hline & & & \end{array} \]

- **b** \( C = k + 8 \)  
  
  \[ \begin{array}{ccc|c} 0 & 1 & 2 & 3 \\ \hline & & & \end{array} \]
CHAPTER 14 – Algebraic Modelling – Modelling Linear Relationships

Graphs of linear functions

QUESTION 1 Elizabeth drew the following graph to give the weekly cost of running her car.

a What is Elizabeth’s weekly cost if she travels 400 km? 

b One week Elizabeth calculates her weekly cost to be $37.50. How many kilometres did she travel that week? 

c What is the cost if Elizabeth does not travel at all? 

d Why is this cost (in part c) not $0. Briefly explain.

QUESTION 2 A truck will deliver fuel for $1.15 per litre plus a $100 delivery charge.

a Complete the table.

<table>
<thead>
<tr>
<th>Amount of fuel (litres)</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b Draw a graph to show the cost for amounts of fuel up to 2000 litres.

c Dale pays $2170 for a fuel delivery. Use the graph to find the amount of fuel he received.

QUESTION 3 A car’s petrol tank holds 60 litres of fuel when full. Felicity fills the tank and drives 400 km. She then fills the tank again and finds that it takes 25 litres of petrol.

a Assuming that the car uses fuel at a constant rate, draw a graph showing the amount of fuel in the petrol tank for each kilometre travelled.

b What restrictions must be put on the graph? Briefly comment.
Algebraic Modelling – Modelling Linear Relationships

Gradients

Question 1 State whether the gradient of the line \( l \) will be positive or negative.

(a)  
(b)  
(c)  
(d)  

Question 2 Find the gradient of each line.

(a)  
(b)  
(c)  
(d)  
(e)  
(f)  
(g)  
(h)  
(i)  

Meaning for gradient and vertical intercept

**Questions**

**Question 1** Liam receives a fixed amount of pocket money each week. In addition, if Liam chooses to help his mother she gives him an extra amount per hour for the time spent. The graph shows the amount of money Liam 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** Dorian intends to ride a bicycle from Aden to Barton to raise money for the local hospital. The graph shows his expected distance from Barton 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?
Algebraic Modelling – Modelling Linear Relationships

The graph of \( y = mx + b \)

**Question 1** For each given equation, write down the gradient and \( y \)-intercept.

- \( a \) \( y = 2x + 7 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( b \) \( y = 3x + 1 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( c \) \( y = 7x \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( d \) \( y = 4x - 3 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( e \) \( y = \frac{1}{2}x + 6 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( f \) \( y = x + 4 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( g \) \( y = -3x + 8 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( h \) \( y = -x - 5 \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

- \( i \) \( y = 11 - 2x \)  
  - Gradient: _________  
  - \( y \)-intercept: _________

**Question 2** Find the \( y \)-intercept and the gradient and hence sketch the graph of each line.

- \( a \) \( y = 3x + 2 \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________

- \( b \) \( y = 2x - 1 \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________

- \( c \) \( y = 3x - 5 \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________

- \( d \) \( y = x \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________

- \( e \) \( y = -2x + 1 \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________

- \( f \) \( y = \frac{1}{2}x + 4 \)  
  - \( y \)-intercept: _________  
  - \( y \)-intercept: _________
Algebraic Modelling – Modelling Linear Relationships

Graphs involving variation

**Question 1**  It is known that \( y \) varies directly with \( x \). When \( x = 5 \), \( y = 30 \).

a) Draw the graph of \( y \) against \( x \).

b) Find the gradient of the graph.

c) Write the equation connecting \( x \) and \( y \).

**Question 2**  A car is travelling at a constant speed. It travels 80 m in 5 seconds.

a) Draw the graph of distance against time.

b) What distance would the car travel in 3 seconds?

c) How many seconds would it take the car to travel 120 m?

**Question 3**  The pay Sally earns in a day is directly proportional to the number of hours she works. For an 8 hour day she receives $120.

a) Draw the graph of pay against hours worked.

b) Write an equation connecting pay and hours worked.

c) For how many hours would Sally need to work to earn $90?
Algebraic Modelling – Modelling Linear Relationships

Stepwise and piecewise linear functions

**QUESTION 1**  The step graph shows parking charges at a parking station. Use the graph to answer the following questions.

a  What is the cost of parking for one hour? ________________

b  For how long can you park for $7.50? ________________

c  What is the cost for 2 \( \frac{1}{2} \) hours of parking? ________________

d  What is the parking cost for 5 hours? ________________

e  What is the maximum cost shown on the graph? ________________

**QUESTION 2**  The cost of hiring a small car for a day is $55 plus 30 cents per kilometre over 200 km travelled.

a  Complete the table of values.

<table>
<thead>
<tr>
<th>Distance travelled (km)</th>
<th>0</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b  Draw a graph of the cost.

c  Dion hired the car for one day and paid $160. How far did Dion travel that day?

**QUESTION 3**  Calls to a certain information service are charged at 15 cents connection fee plus 45 cents per minute or part thereof. (So a call lasting 30 seconds will cost 60 cents, 15c plus 45c for the part of a minute.)

a  How much will a call cost that lasts:

- i  1 minute
- ii  2 minutes
- iii  \( 1\frac{1}{2} \) minutes

b  Show the charges on a graph.
Conversion graphs

**QUESTION 1** The conversion graph on the right changes students’ test marks out of 150 to percentages. Use the graph to answer the following questions.

a. A student obtains 120 marks out of 150. What percentage is this?

b. As 50% is a pass mark, how many marks out of 150 must a student obtain to pass?

c. A distinction mark is 80% or better. How many marks are needed, out of 150, to gain a distinction?

d. A student has to be demoted to a lower class if he gets 30 marks or less out of 150. What percentage is this?

**QUESTION 2** When Nelly was planning her overseas trip, one hundred Australian dollars ($AUD) was worth 72 U.S. dollars ($US).

a. Use this fact and the fact that the graph goes through the origin ($0 AUD = $0 US) to draw a straight line graph. Use the graph to answer the following questions.

b. What was the value in U.S. dollars of $75 AUD?

c. What was the value in Australian dollars of $40 US?

**QUESTION 3** A graph to convert degrees Celsius ($^\circ$C) to degrees Fahrenheit ($^\circ$F) is a straight line graph.

a. Use the fact that freezing point is 0$^\circ$C or 32$^\circ$F and that boiling point is 100$^\circ$C or 212$^\circ$F to draw the conversion graph.

b. Debbie finds an old recipe for a ginger cake. It needs to be cooked at 325$^\circ$F. At what temperature ($^\circ$C), should Debbie set her oven to cook the ginger cake?

c. The forecast temperature is 35$^\circ$C. What is that in degrees Fahrenheit?
Algebraic Modelling – Modelling Linear Relationships

Graphical solution of simultaneous equations

**QUESTION 1** The graph shows the cost charged by two different companies to cater for a party. In each case the total cost (\(C\)) depends on the number of people attending \((n)\).

a. For what number of people attending do the 2 companies charge the same amount?

b. What is the total cost then?

c. If 9 people are to attend the party, what company would you recommend? Justify your answer.

d. If 24 people are to attend the party, what is the difference in the cost per person between the two companies?

---

**QUESTION 2** For producing up to 30 items, the cost to a factory is $100 plus $30 for every item. The factory receives $35 for every item sold.

a. Complete the table of values.

<table>
<thead>
<tr>
<th>Number of items</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return from sales ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Show both the total cost and the return on the graph provided at right.

c. The factory ‘breaks even’ when the total cost and the return are equal. How many items does the factory need to produce to break even?

d. How many items do you recommend the factory produce? Justify your answer.
**Algebraic Modelling – Modelling Linear Relationships**

**Lines of best fit**

**QUESTION 1** A piece of elastic string is fixed at one end and different masses are hung on its free end. The results are shown in the table.

<table>
<thead>
<tr>
<th>Mass (g)</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of elastic (cm)</td>
<td>10</td>
<td>14</td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>33</td>
<td>37</td>
<td>42</td>
</tr>
</tbody>
</table>

a. For this information, plot the points.
b. Draw a line of best fit.
c. Use the graph to estimate the length of the elastic when the mass attached weighs:
   i. 12 g
   ii. 40 g
   iii. 50 g

d. Use the graph to find which mass would need to be attached to make the length of the elastic 30 cm.

**QUESTION 2** The table shows the number of mistakes found in John’s examination papers.

<table>
<thead>
<tr>
<th>Pages (P)</th>
<th>3</th>
<th>5</th>
<th>6</th>
<th>9</th>
<th>10</th>
<th>12</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors (E)</td>
<td>6</td>
<td>9</td>
<td>11</td>
<td>15</td>
<td>21</td>
<td>25</td>
<td>34</td>
</tr>
</tbody>
</table>

a. Plot these points on the number plane.
b. Draw a line of best fit.
c. Find the equation of this line.
d. Use this equation to estimate the number of errors in an examination paper of 20 pages.
e. Also using the equation, find the average number of errors per page.

**QUESTION 3** The table shows the temperature of water in a kettle, measured at intervals of 10 seconds.

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. (°C)</td>
<td>16</td>
<td>27</td>
<td>39</td>
<td>50</td>
<td>60</td>
<td>71</td>
<td>80</td>
</tr>
</tbody>
</table>

a. Plot the points on the number plane.
b. Draw a line of best fit.
c. Estimate the temperature of water after 25 seconds.
d. At what time would you expect the water to boil (i.e. to reach 100°C)?
Algebraic Modelling – Modelling Linear Relationships

TOPIC TEST

Time allowed: 30 minutes  Total marks: 30

SECTION I Multiple-choice questions 10 marks

Instructions
• This section consists of 10 multiple-choice questions
• Each question is worth 1 mark
• Fill in only ONE CIRCLE
• Calculators may be used

1 The equation of a linear graph with a y-intercept 3 and gradient –1 is:
   A) \( y = -x - 3 \)  B) \( y = -x + 3 \)  C) \( y = 3x - 1 \)  D) \( y = -3x - 1 \)

2 The line \( y = 2x \) passes through the point:
   A) (0, -1)  B) (0, 0)  C) (0, 1)  D) (0, 2)

3 The line \( y = 2x - 2 \) has:
   A) gradient 2 and y-intercept 2  B) gradient -2 and y-intercept 2
   C) gradient 2 and y-intercept -2  D) gradient -2 and y-intercept -2

4 The gradient of this line is:
   A) \( \frac{2}{3} \)  B) 1  C) \( 1 \frac{1}{2} \)  D) 2

5 The cost of sending parcels by post for different masses is shown in the step graph. Two parcels weighing 1 kg and 3.75 kg are sent separately to the same address.
   How much would have been saved by sending them together?
   A) 40c  B) 60c  C) 80c  D) $1.00
6 The solution of these two simultaneous equations is:
A) $x = 3$ and $y = 4$
B) $x = 6$ and $y = 8$
C) $x = 4$ and $y = 3$
D) $x = 8$ and $y = 6$

7 The equation of this line is:
A) $y = \frac{1}{2}x + 1$
B) $y = 2x + 1$
C) $y = x + 2$
D) $y = x + \frac{1}{2}$

8 Which is the graph of $y = 2 - x$?
A) ![Graph A]
B) ![Graph B]
C) ![Graph C]
D) ![Graph D]

9 This conversion graph has been drawn to convert kilometres to miles.
90 miles is approximately:
A) 55 km
B) 75 km
C) 145 km
D) 175 km
10 For the equation $h = 20t + 50$, consider the following statements:
   I $h$ is the independent variable
   II $t$ is the dependent variable
Which is correct?
   A I only  B II only  C both I and II  D neither I nor II

SECTION II  20 marks
Show all necessary working.

11 For the equation $y = 4x + 1$:
   a complete the table of values  2 marks

<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b graph the line on the number plane provided.  2 marks

12 For this line find:
   a the gradient  1 mark

   b the $y$-intercept  1 mark

   c the equation of the line.  1 mark
13 Grace makes batches of home-made lemonade which she sells to her friends by the jug. Grace has calculated that the cost of producing the jugs of lemonade is $8 plus $3 for every jug.

a Complete the table of values 2 marks

<table>
<thead>
<tr>
<th>Number of Jugs</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost ($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

draw a graph of the cost on the number plane provided. 2 marks

b Draw a graph of the cost on the number plane provided.

c What is the intercept on the vertical axis? Briefly explain what this represents. 2 marks

d What is the gradient of the line? Briefly explain what it represents? 2 marks

e What is the cost of producing 12 jugs of lemonade? 1 mark

f The total cost of a batch Grace made was $56. How many jugs did this batch contain? 1 mark

g If Grace sells the lemonade for $4 per jug, draw the graph of her return from sales on the same number plane. 1 mark

h Where do the two lines intersect? Briefly explain what this means. 2 marks
CHAPTER 15
Sample Preliminary Examinations

Sample Preliminary Examination 1

Time allowed: 2 hours
Total marks: 100

Instructions
• This section consists of 25 objective-response questions.
• Each question is worth 1 mark.
• Circle only ONE option.
• Calculators may be used.

SECTION I

Time allowed: 30 minutes
Total marks: 25

1 An amount of $542.40 is to be paid in equal monthly instalments of $45.20. How many instalments are needed?
   A 8  B 10  C 12  D 14

2 One litre of water has a mass of 1 kg. What is the mass of 1 mL of water?
   A 1 g  B 10 g  C 100 g  D unknown

3 $7mn - 5mn - 4mn$ equals:
   A $6mn$  B $-2mn$  C $16mn$  D $-16mn$

4 $8a \times (-4a) \times 5$ equals:
   A $4a + 5$  B $-20a$  C $160a^2$  D $-160a^2$

5 If $s = ut + \frac{1}{2}at^2$, the value of $s$ when $u = 0$, $t = 5$ and $a = 10$ is:
   A 125  B 130  C 2500  D 2505

6 The solution of the equation $2(x + 3) = x - 4$ is:
   A $x = -10$  B $x = 2$  C $x = 8$  D none of these

7 A cone has height 10 cm and radius 3 cm. Its volume is closest to:
   A 31 cm$^3$  B 94 cm$^3$  C 314 cm$^3$  D 30 cm$^3$

8 The area of a triangle with base 4 cm and height 3.5 cm is:
   A 7 cm$^2$  B 14 cm$^2$  C 1.75 cm$^2$  D 2 cm$^2$

9 A cube has a volume of 3375 cm$^3$. Find the length of each side of the cube.
   A 5 cm  B 15 cm  C 25 cm  D 35 cm

10 The gradient of the line $y = 2x + 3$ is:
   A 3  B 2  C $\frac{3}{2}$  D $\frac{2}{3}$
Sample Preliminary Examination 1

11 Michelle earns $2429 per calendar month. How much does she earn per week?
   A $607.25   B $312.00   C $936.00   D $560.54

12 $500 invested for 2 years at 10% p.a. simple interest becomes:
   A $550   B $600   C $625   D $650

13 In a sector graph, which sector angle represents 25%?
   A 5°   B 25°   C 60°   D 90°

14 Find the range of the scores 1, 3, 8, 4, 7, 8, 1, 10, 12.
   A 6   B 7   C 9   D 11

15 Find the mode of the scores 4, 6, 8, 6, 6, 7, 5, 6, 3, 6, 4.
   A 3   B 4   C 5   D 6

16 John tosses an unbiased coin five times, each time obtaining a head as a result. On the sixth toss of this coin, the probability of obtaining a head is:
   A \( \frac{1}{5} \)   B \( \frac{1}{6} \)   C \( \frac{1}{2} \)   D \( \frac{1}{3} \)

17 \( S = 6x^2 \). If \( x = 3 \) then \( S \) equals:
   A 18²   B 36 \times 9   C 92   D 6 \times 9

18 For a single throw of one die, what is the probability of throwing an even number?
   A \( \frac{1}{3} \)   B \( \frac{1}{6} \)   C \( \frac{1}{36} \)   D \( \frac{1}{2} \)

19 Joe bought a new printer for $489.50. The amount of GST included in the price is:
   A $48.95   B $46.70   C $45.40   D $44.50

20 In the diagram shown, \( \cos \theta = \)
   A \( \frac{5}{12} \)   B \( \frac{12}{5} \)   C \( \frac{12}{13} \)   D \( \frac{5}{13} \)

21 In a class of 30 pupils, 18 are boys. The ratio of girls to boys is:
   A 2 : 3   B 3 : 2   C 3 : 5   D 5 : 3

22 An amount of money is increased by 40%. This new amount is then decreased by 40%. The final amount is:
   A less than the original amount   B greater than the original amount
   C equal to the original amount   D there is not enough information

23 One-third of a half is:
   A \( \frac{2}{3} \)   B \( \frac{3}{2} \)   C 6   D \( \frac{1}{6} \)
Sample Preliminary Examination 1

24 If the volume of a cube is 1331 cm³, then its side length is:
   A 13.31 cm  
   B 36.48 cm  
   C 11 cm  
   D 13 cm

25 Simplify 10 – (2x – 5)
   A –2x + 5  
   B –2x + 15  
   C 2x – 15  
   D 2x – 5

SECTION II

Instructions
• This section consists of 5 questions.
• Show all necessary working.
• Calculators may be used.

Time allowed: 2 hours  
Total marks: 75

Question 26

a Evaluate (3.8 × 10⁷) – (7.9 × 10⁴).  
   1 mark

b The body-mass index formula is \( B = \frac{m}{h^2} \), where \( m \) = mass in kg, \( h \) = height in metres. Find the body mass for a person who weighs 65 kg and is 1.65 m tall.  
   2 marks

c On the weekend, motorists were randomly breath tested and 8% of them were charged with drink driving. If 120 people were charged, how many people were tested?  
   2 marks

d Simplify each of the following.
i \( 5(3x – 8) – 15x \)  
   2 marks

ii \( \frac{a^4}{18} \times \frac{45}{a} \)  
   2 marks
Sample Preliminary Examination 1

Question 26 cont.

e Solve the equation \( \frac{5x}{4} - 3 = 7 \) for \( x \).  

f If a lift operates at a speed of 426 metres per minute, calculate its speed in km/h.  

g $8000 is invested at 6% p.a. interest compounded monthly. Find the value of the investment at the end of 3 years.

Question 27

a Matthew earns $21.30 per hour and normally works a 40-hour week.

i What does he earn for working 40 hours?  

ii Find Matthew's pay in a week when he works 40 hours at normal time and 7 hours at time-and-a-half.
Sample Preliminary Examination 1

Question 27 cont.

iii Matthew takes 4 weeks annual leave and receives a $17\frac{1}{2}\%$ leave loading. Find the total of Matthew’s holiday pay. 3 marks

b For the line $l$ shown in the diagram, answer the following questions.

i Find the gradient, $m$. 1 mark

ii State the $y$-intercept, $b$. 1 mark

iii Find the equation of $l$. 1 mark

iv Find the value of $y$ when $x = 18$. 1 mark

c A leaking tap at Andrew’s house loses water at a rate of 3 mL/min.

i How many litres of water will leak from the tap in one day? 2 marks

ii The tap is left leaking at the same rate for 15 days before Andrew fixes it. If each litre of water costs 30 cents, how much did the leaking tap cost Andrew? 2 marks

Question 28

a A fair die has 12 faces marked with the numbers 1 to 12. The die is thrown once and the number showing on the uppermost face is noted. Find the probability that the number obtained is:

i odd 1 mark
Sample Preliminary Examination 1

Question 28 cont.

ii larger than 6 1 mark

iii between 5 and 10 1 mark

iv greater than 12 1 mark

b In Lotto, 44 balls, numbered 1 to 44, are mixed in a large clear container. One ball at a time is selected at random. For the first ball selected, find the probability of selecting:

i 29 1 mark

ii a number with 5 in it 1 mark

\[
\begin{array}{|c|c|}
\hline
\text{Taxable income} & \text{Tax payable} \\
\hline
$0–$6000 & \text{Nil} \\
$6001–$21600 & 17 cents for every $1 over $6000 \\
$21601–$52000 & $2652 plus 30 cents for every $1 over $21600 \\
$52001–$62500 & $11772 plus 42 cents for every $1 over $52000 \\
Over $62500 & $16182 plus 47 cents for every $1 over $62500 \\
\hline
\end{array}
\]

\[c\] Joanne, with a total income of $56,835, has allowable deductions of $1650.

i Calculate her taxable income. 1 mark

ii Using the table below, calculate the tax payable. 2 marks

PrelimGEN_maths_WB_exams.indd   195
18/01/12   12:31 PM
Sample Preliminary Examination 1

Question 28 cont.

iii Joanne must pay the Medicare levy of 1.5% of taxable income. Find the amount of Medicare levy that Joanne must pay. 2 marks

iv During the year $12,876.40 has been deducted from Joanne’s pay for tax. Will she receive a refund or will she need to pay more tax? Justify your answer. 2 marks

v Calculate the refund due or tax payable. 2 marks

Question 29

a 50 students sat for a mathematics test. The results are given below.

<table>
<thead>
<tr>
<th>Score</th>
<th>Tally</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
</tbody>
</table>

i Complete the frequency distribution table. 3 marks

ii Find the mean. 2 marks

iii Find the standard deviation, correct to one decimal place. 2 marks
Sample Preliminary Examination 1

Question 29 cont.

iv Draw a cumulative frequency histogram and polygon. 3 marks

![Cumulative Frequency](image)

b The diagram shows a triangular prism.
i Use Pythagoras' theorem to find the value of \(x\). 1 mark

![Triangular Prism](image)

ii Find the surface area of the prism. 2 marks

iii Find the volume. 2 marks

Question 30

a B.J., an athlete, receives an income from four different sources. He has two part-time jobs, receiving 40% of his income from one and 35% from the other. He receives 15% from a sponsor and 10% from a government allowance. Represent these sources of income on the sector graph, showing the angles at the centre. 4 marks

![Sector Graph](image)
Sample Preliminary Examination 1

Question 30 cont.

b The angle of elevation of the top of a tree, from a point A, is 57°. If the distance AB is 25 metres, find the height of the tree correct to one decimal place.

2 marks

c Two partners in a business hold shares in the ratio 7 : 5. If they share a profit of $72 000 in the same ratio, how much does each partner receive?

2 marks

d There are 1 250 000 shares held in a company. The company makes an after-tax profit of $3.4 million. If all the profit is distributed to the shareholders, find:

i the amount of the dividend per share.

1 mark

ii the dividend yield, if the market price of the shares is $17 per share.

2 marks

e The average June temperature for the last 10 years has been 15.2°C. This year the average June temperature was 14.5°C. What is the new average over 11 years? (Answer to 1 decimal place.)

2 marks

f In order to estimate the number of fish in a lake, Sean caught 24 fish, tagged them and released them. Some time later, Sean caught 40 fish and found that three were tagged. Approximately how many fish are in the lake?

2 marks
Sample Preliminary Examinations

Sample Preliminary Examination 2

Time allowed: \(2\frac{1}{2}\) hours  Total marks: 100

Instructions
• This section consists of 25 objective-response questions.
• Each question is worth 1 mark.
• Circle only ONE option.
• Calculators may be used.

Time allowed: 30 minutes  Total marks: 25

1. \(7.06 \times 10^{-6}\) equals:
   A 0.000 0706  B 0.000 007 06  C 70 600  D 706 000

2. The capacity of a drinking glass is closest to:
   A 2 mL  B 20 mL  C 200 mL  D 2 L

3. Simplify \(-8x + 7y - 4x - 9y\).
   A \(-14xy\)  B \(-12x - 2y\)  C \(-8x - 6y\)  D \(-x - 13y\)

4. Find \(S\), correct to one decimal place, where \(S = 2\pi r(h + r)\) and \(r = 2.1\) and \(h = 10.3\).
   A 163.6  B 138.0  C 158.7  D 26.6

5. The solution to the equation \(\frac{x}{4} = \frac{2}{3}\) is:
   A \(x = \frac{1}{6}\)  B \(x = 6\)  C \(x = 4 \frac{2}{3}\)  D \(x = 2 \frac{2}{3}\)

6. David is paid $8.95 per hour. His earnings for a 26-hour week are:
   A $232.70  B $8.95  C $465.40  D $349.05

7. $3000 invested for 3 years at 10% p.a. interest, compounded annually, becomes:
   A $3900  B $3930  C $3966  D $3993

8. A card is chosen at random from a normal pack of 52 cards. What is the probability that it is a red king?
   A \(\frac{1}{13}\)  B \(\frac{2}{13}\)  C \(\frac{1}{26}\)  D \(\frac{1}{52}\)

9. 15 cm as a percentage of 2 metres is:
   A \(7 \frac{1}{2}\%\)  B 75%  C 15%  D 750%

10. For the scores 4, 4, 9, 10, 11, 6, 7, 10, 10, 9 the median is:
    A 7  B 8  C 8.5  D 9
Sample Preliminary Examination 2

11 The average of 1.6 kg, 2000 g and 8.4 kg is:
   A 3900 kg    B 4000 g    C 0.394 kg    D 39 kg

12 At a sale, Karen buys a pair of shoes for $95. The price before the sale was $120. The sale price represents a saving of approximately:
   A 21%    B 25%    C 26%    D 79%

13 Joe won the final of a tennis tournament after playing seven matches. The number of aces served by Joe in those matches were 13, 9, 12, 9, 13, 9, 12. The difference between the median and the mean is:
   A 0    B 1    C 2    D 3

14 The value of $3x^2 - 7x$ when $x = -2$ is:
   A -26    B -2    C 2    D 26

15 In the triangle PQR, tan $x$ equals:
   A $\frac{8}{15}$    B $\frac{8}{17}$    C $\frac{15}{17}$    D $\frac{15}{8}$

16 The equation of the straight line with gradient $\frac{1}{5}$ and y-intercept $-3$ is:
   A $y = \frac{1}{5}x + 3$    B $y = \frac{1}{5}x - 3$    C $y = -3x + \frac{3}{5}$    D $y = 3x + 5$

17 A metal alloy is produced by combining iron, aluminium and copper in the ratio 7 : 4 : 1. If 350 kg of iron is used, how much aluminium is needed?
   A 50 kg    B 200 kg    C 612.5 kg    D 1400 kg

18 From the diagram, the value of $x$, correct to 1 decimal place, is:
   A 6.2    B 5.8    C 4.9    D 4.7

19 When a coffee urn is $\frac{2}{3}$ full, 24 cups of coffee can be made. How many cups of coffee can be made when the urn is half full?
   A 8    B 16    C 18    D 36

20 A plank is 8 cm wide to the nearest centimetre. The percentage error is:
   A $\pm 12.5\%$    B $\pm 8\%$    C $\pm 6.25\%$    D $\pm 4\%$

21 Which type of data is categorical?
   A heights of seedlings    B weights of tomatoes
   C colour of hair    D numbers of siblings

22 How many different four-digit postcodes are possible if no digit may be repeated anywhere in the number? (Postcodes may begin with 0.)
   A 10000    B 8064    C 5040    D 3024
Sample Preliminary Examination 2

23 John paid $25 for a CD, 10% GST included. The amount of GST was:

A $2.50  
B $22.73  
C $2.27  
D $2

24 Calculate the area of the shaded part of the rectangle shown below.

A 32 cm²  
B 64 cm²  
C 96 cm²  
D 128 cm²

25 Which of the following is an example of discrete data?

A the height of Year 11 students  
B the colour of eyes of the students of a Year 11 maths class  
C the time taken by Year 11 students to complete an assessment task  
D the number of students in Year 11

SECTION II

Instructions
• This section consists of 5 questions.  
• Show all necessary working.  
• Calculators may be used.

Time allowed: 2 hours  
Total marks: 75

Question 26

a Simplify each of the following.

i \[ 5a^2 + 3a + 6a + 4a^2 \]

ii \[ \frac{5a^3b \times -6ab^3}{2ab} \]

b Solve the following equations.

i \[ \frac{3x}{2} - 1 = 11 \]
Sample Preliminary Examination 2

Question 26 cont.

ii \[ 8a + 5 = 11a - 4 \] 2 marks


c

i John can run at an average speed of 6.45 metres per second. How far can John run in 1 minute? 1 mark


ii If John can maintain this speed, how long would it take him to run 2 km? 2 marks


d Penny runs a boutique. She bought a silk shirt for $40, added 50% profit margin and then reduced the price by 50%.

i What is the sale price of the shirt? 2 marks


ii Penny says the sale price should be $40 because if you add 50% and then take off 50%, the price should not change. Explain the error in her reasoning. 2 marks
Sample Preliminary Examination 2

Question 27

a  In order to assess the amount being paid to its salespeople, a company completed the histogram shown.

i  Complete the frequency table to represent the information given in the histogram.  3 marks

<table>
<thead>
<tr>
<th>Earning (x)</th>
<th>Number of salespeople (f)</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ii  Calculate the mean earnings of a salesperson.  1 mark

iii  Find the median.  1 mark

iv  Find the range.  1 mark

v  Find the mode.  1 mark

b  Find the volume of each solid.

i  182 mm  3 marks

ii  3 marks
Sample Preliminary Examination 2

Question 27 cont.

c Annabel is a salesperson. She is paid $300 per week and in addition receives a commission of 6.5% on her sales in excess of $500. What does she earn in a week when she makes sales of $1580?

2 marks

Question 28

a A body is projected vertically upward with a speed of 100 m/s. Owing to the pull of gravity, the speed decreases with time according to the relationship \( v = 100 - 10t \). The table gives values of \( v \) for some values of \( t \).

<table>
<thead>
<tr>
<th>( t )</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>( v )</td>
<td>80</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

i Complete the table.

ii Plot these points on the number plane and draw a graph showing the relationship between speed and time.

Use the graph to find the value of:

iii \( v \) when \( t = 5.5 \)

1 mark

iv \( t \) when \( v = 84 \)

1 mark

b A cone has a slant height of 10 cm and a perpendicular height of 8 cm.

i Use Pythagoras' theorem to calculate \( r \), the radius of the base of the cone.

1 mark

ii Calculate the volume of the cone.

2 marks
Sample Preliminary Examination 2

Question 28 cont.

iii The radius and the perpendicular height of the cone are now doubled. How many times greater will the volume of the new cone be compared to the previous cone? 2 marks

---

c An aircraft, flying at an altitude of 14,000 metres, sights a target at an angle of depression of 38°. What is the horizontal distance to the target in kilometres, correct to one decimal place? 3 marks

---

Question 29

a Scores out of 10 in a quick quiz are given below.
2, 2, 3, 5, 5, 6, 6, 6, 7, 7, 7, 7, 7, 7, 8, 8, 8, 8, 9, 9, 9

i What is the median? 1 mark

---

ii What is the lower quartile? 2 marks

---

iii What is the upper quartile? 2 marks

---

iv Draw a box-and-whisker plot to illustrate the data. 3 marks
Sample Preliminary Examination 2

Question 29 cont.

b $9000 is invested for 5 years.
   i Find the compound interest earned if the money is invested at 8% p.a., compounded annually. 2 marks

   ii What rate of simple interest, as a percentage correct to one decimal place, would produce the same result? 3 marks

   iii How much extra interest would be earned if the interest compounded quarterly? 2 marks

Question 30

a A bank charges customers with a particular type of account a fee of $5 per month whenever the minimum monthly balance in the account falls below $600. In addition there is a charge of 50 cents for every withdrawal over the limit of eight free withdrawals per month. Tracey has this type of account with the bank. The table shows the minimum monthly balance and number of withdrawals on Tracey’s account over the first six months of the year.

<table>
<thead>
<tr>
<th>Month</th>
<th>Minimum balance</th>
<th>Withdrawals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>$400</td>
<td>7</td>
</tr>
<tr>
<td>Feb</td>
<td>$700</td>
<td>5</td>
</tr>
<tr>
<td>Mar</td>
<td>$800</td>
<td>10</td>
</tr>
<tr>
<td>Apr</td>
<td>$250</td>
<td>6</td>
</tr>
<tr>
<td>May</td>
<td>$650</td>
<td>12</td>
</tr>
<tr>
<td>Jun</td>
<td>$550</td>
<td>9</td>
</tr>
</tbody>
</table>

i In which month did Tracey pay no fees? 1 mark
Sample Preliminary Examination 2

Question 30 cont.

ii In which month did Tracey pay both types of fees? 1 mark

iii How much did Tracey pay in fees in May? 1 mark

iv Find the total fees Tracey paid in the six months. 2 marks

b i Eddie decides to sell some round bales of hay. He charges $60 per bale plus GST. If Joy buys
24 bales of hay from Eddie, how much must she pay in total? 2 marks

ii With the money from the sale of his hay, Eddie buys two cows for a total, including GST, of $1551.
How much were the two cows before the GST was added? 2 marks

c The numbers 4, 5 and 6 are written on three cards, one number on each card. The cards are shuffled and then
placed in a row to form a three-digit number.

i List the possible numbers. 2 marks

ii What is the probability that the number is odd? 1 mark

iii A fourth card, numbered 7, is included. The four cards are shuffled and put down in a row. How many
different four-digit numbers are possible? 2 marks

iv What is the probability that the number is odd? 1 mark
Sample Preliminary Examinations

Sample Preliminary Examination 3

Time allowed: 2 hours and 30 minutes Total marks: 100

SECTION I

Instructions
• This section consists of 25 objective-response questions.
• Each question is worth 1 mark.
• Circle only ONE option.
• Calculators may be used.

Time allowed: 30 minutes Total marks: 25

1 Convert 8.5 metres to millimetres.
   A 850   B 8500   C 85   D 0.085

2 Write 367 000 in scientific notation.
   A $3.67 \times 10^5$   B $0.367 \times 10^5$   C $3.67 \times 10^5$   D $3.67 \times 10^{-5}$

3 The solution to the equation $3(p - 2) = 5p + 2$ is:
   A $p = -4$   B $p = -2$   C $p = -1$   D $p = 1$

4 $a + b \div c \times 2$ is equal to:
   A $\frac{a + 2b}{c}$   B $2\left(\frac{a + b}{c}\right)$   C $\frac{a + b}{2c}$   D $\frac{a + b}{2c}$

5 $8 - 2(3t - 4)$ simplifies to:
   A $-6t$   B $4 - 6t$   C $18t - 24$   D $16 - 6t$

6 Simplify $2(3x - 1) - 2(x - 5)$.
   A $4x - 6$   B $4x + 4$   C $4x + 8$   D $4x + 12$

7 A formula is given as $C = mp^2$. If $m = 2$ and $p = 5$, then $C$ equals:
   A 27   B 49   C 50   D 100

8 For which of the following equations is $x = 12$ not a solution?
   A $\frac{5x}{4} + 1 = 16$   B $4x - 7 = 53 - x$   C $4x - 12 = 48 - x$   D $\frac{x - 4}{2} = -x$

9 An increase of 5%, followed by a decrease of 5%, represents an overall change of:
   A 0%   B 0.25%   C 5.25%   D 10%

10 Which could not be the probability of an event?
   A $\frac{2}{3}$   B 16%   C $\frac{9}{5}$   D 0.87
Sample Preliminary Examination 3

11 If \( \sin x = 0.381 \), what is the value of \( x \) correct to the nearest minute?
   A \( 22^\circ23' \)    B \( 22^\circ24' \)    C \( 0^\circ22' \)    D \( 0^\circ23' \)

12 Workers were offered a pay rise, the larger of either 4% or $20 per week. Before the rise, Sue earned $700 per week and Wal earned $400 per week. The total of their pay rises was:
   A $36    B $60    C $44    D $48

13 In the diagram, what is the correct expression for \( x \)?
   \[
   \begin{align*}
   A & \quad 24^2 - 18^2 \\
   B & \quad 24^2 + 18^2 \\
   C & \quad \sqrt{24^2 - 18^2} \\
   D & \quad \sqrt{24^2 + 18^2}
   \end{align*}
   \]

14 Jack’s racing car uses 17 litres of fuel to travel 50 km. How far can the car travel on 102 litres of fuel?
   A 300 km    B 34.68 km    C 250 km    D 159 km

15 Kyle has a collection of model cars. It was valued at $12,000 five years ago. If it has appreciated at the rate of 3.5% p.a., its value now is closest to:
   A $14,100    B $14,250    C $15,430    D $33,000

16 Which of these is not in correct scientific notation?
   A \( 6.8 \times 10^{-3} \)    B \( 0.8 \times 10^{-4} \)    C \( 8 \times 10^{-7} \)    D \( -6.23 \times 10^{-3} \)

17 The three dot plots P, Q and R are all drawn on the same scale and all have the same mean. Which has the greatest standard deviation?
   A P    B Q    C R    D All have the same standard deviation.

18 1.04 kg is equal to:
   A 10.4 g    B 0.0104 t    C 1040 g    D 1040 mg

19 Mark has a taxable income of $63,210. The amount of Medicare levy (1.5% of taxable income) that he must pay is:
   A $948.15    B $9481.50    C $4214    D $421.40

20 Zac has to travel from P to S, passing through first Q and then R on the way. If he can take any of four routes from P to Q, either of two routes from Q to R and any of three routes from R to S, how many different routes are there altogether?
   A 9    B 10    C 18    D 24
Sample Preliminary Examination 3

21 How many significant figures does the number 0.034 have?
  A 4  B 3  C 2  D 1

22 A wire which is 36 cm long is bent to form a rectangle. If the width of the rectangle is 6 cm, what is the area?
  A 72 cm²  B 36 cm²  C 48 cm²  D 96 cm²

23 A calculator displays an answer in this way: 0.0307085. What is the number to three significant figures?
  A 0.03  B 0.0307  C 0.030709  D 0.031

24 At a party of 36 people there were 10 men, 12 women and 14 children. What was the ratio of children to adults?
  A 7 : 6  B 7 : 11  C 7 : 4  D 7 : 22

25 20 cm as a percentage of 4 metres is:
  A 5%  B 80%  C 20%  D 500%

SECTION II

Instructions
- This section consists of 5 questions.
- Show all necessary working.
- Calculators may be used.

Time allowed: 2 hours  Total marks: 75

Question 26

a Simplify the following.

i \[10x - 4(5x + 2) + 7\]  2 marks

ii \[\frac{3a}{2} \times 4a\]  2 marks

b Calculate \(h\), correct to one decimal place, given \(h = \frac{V}{\pi(R^2 - r^2)}\) and \(V = 200, R = 6.2\) and \(r = 3.5\).  2 marks
Sample Preliminary Examination 3

Question 26 cont.

c Solve the following equations.
i \[3x - 1 = 7 + 2x\] 2 marks

ii \[2(t + 5) - 3t = 0\] 2 marks

d A number is made up of three digits chosen at random from the digits 3, 5 and 7 without repetition.
i List the possible numbers. 1 mark

What is the probability that the number is:

ii even 1 mark

iii odd 1 mark

iv greater than 700 1 mark

v divisible by 5 1 mark

Question 27

a A cylindrical water tank has a diameter of 3 m. It holds water to a height of 1.6 m.
i What is the volume of water in the tank in cubic metres (to 1 decimal place)? 2 marks

ii How many litres of water does the tank hold? 2 marks

A number is made up of three digits chosen at random from the digits 3, 5 and 7 without repetition.
Question 27 cont.

iii If the water is used at the rate of 720 litres per day, how long will the water last if there is no rain to replenish the supply?  

2 marks

b Over many years doctors have observed that there is a linear relationship between life expectancy $(E)$ and the number of cigarettes smoked per day $(n)$ by Australian males. The results of the study are shown in the table.

<table>
<thead>
<tr>
<th>$n$</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E$</td>
<td>82</td>
<td>76</td>
<td>74</td>
<td>72</td>
<td>66</td>
<td>64</td>
<td>61</td>
</tr>
</tbody>
</table>

i Plot the data on the number plane.  

1 mark

ii Draw the line of best fit.  

1 mark

iii Find the equation of the line of best fit.  

2 marks

iv Use either the graph or the equation to find the life expectancy of an Australian male who smokes 28 cigarettes per day.  

1 mark

c A bullet train makes a journey between two cities in 2 hours, travelling at 200 km/h. Use the formula $S = \frac{d}{t}$, where $S$ is the speed in km/h, $d$ is the distance travelled in kilometres and $t$ is the time taken in hours, to answer the following questions.

i What is the length of the journey?  

2 marks
Sample Preliminary Examination 3

Question 27 cont.

ii If the train’s speed is increased to 220 km/h, how many minutes will be saved on the same journey?

2 marks

Question 28

a A survey of the heights of 100 students produced the results below. The heights were recorded in centimetres, to the nearest centimetre.

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Class centre (x)</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
<th>f \times x</th>
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<tr>
<td>125–127</td>
<td>126</td>
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<td>128–130</td>
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<td>132</td>
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<td>140–142</td>
<td>141</td>
<td>5</td>
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<td></td>
</tr>
</tbody>
</table>

i Complete the frequency distribution table. 3 marks

ii What is the modal class? 1 mark

iii Calculate the average height of the students. 1 mark

iv How many students are shorter than 134 cm? 1 mark

v What percentage of students are taller than 133 cm? 1 mark

vi Construct a cumulative frequency histogram and polygon. 4 marks
Sample Preliminary Examination 3

Question 28 cont.

Find:

vii the median height

viii the lower quartile

ix the upper quartile

x the interquartile range

Question 29

a Travis earns $693.00 for a 35-hour week.

i What is Travis’s hourly rate of pay?

ii What would Travis earn for working 7 hours at time-and-a-half?

iii One Sunday Travis worked 6 hours at double-time. How much did he earn for working that Sunday?

iv Travis earned a gross income of $44 200 last financial year. His allowable deductions were superannuation contributions of $4800, union fees of $615 and work-related expenses of $1285. What was Travis’s taxable income?
Sample Preliminary Examination 3

Question 29 cont.

v Travis must pay tax at the rate of $2652 plus 30 cents for every dollar over $21600. Find the amount of tax that Travis must pay?  
2 marks

b The figure shows a rectangular gable roof. The triangle AEB is isosceles with AE = EB and EN is drawn perpendicular from E to AB. The length AB is 6400 mm, BC is 8200 mm and EN is 2000 mm.

i The pitch of the roof is the size of the angle between the actual roof and the horizontal (\angle EAN). Find the pitch of the roof to the nearest degree.  
2 marks

ii Calculate the length of the rafter AE to the nearest mm.  
2 marks

iii Find the area, in square metres, of roofing material required to surface the two sloping rectangular halves of the roof.  
2 marks

iv This roof needs to be painted with two coats of paint. How many 4-litre cans of paint need to be purchased, given that 1 litre covers 12 square metres?  
2 marks
Sample Preliminary Examination 3

Question 30

a A power supply company charges for electricity according to the following schedule.
   - $22.00 service availability charge
   - Domestic rate of 11.75 cents per kilowatt hour
   - Off-peak rate of 4.42 cents per kilowatt hour

Find the amount payable by a customer who uses 360 kilowatt hours of domestic power and 250 kilowatt hours of off-peak power. 3 marks

b Terri has 2400 shares in a company. The dividend yield is 7.5% and the market price of the shares is $6.00.

Find the total amount of the dividends Terri receives. 2 marks

c Megan wanted to get an idea of the distribution of ages in her school. Knowing that most of the students travel to school by bus, she chose three different buses and asked the age of each student on each bus. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Age</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
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<tbody>
<tr>
<td>Number</td>
<td>16</td>
<td>29</td>
<td>26</td>
<td>21</td>
<td>18</td>
<td>15</td>
<td>10</td>
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</tbody>
</table>

i Is this a random sample? Justify your answer. 2 marks

ii What is the relative frequency of age 15? 1 mark

iii What is the mean? 2 marks

iv What is the sample standard deviation to one decimal place? 2 marks
Sample Preliminary Examination 3

Question 30 cont.

d Carole wants to have an amount of $6000 in three years time. What amount of money should be invested at 9% p.a. interest, compounded monthly, to give $6000 at the end of three years? 3 marks

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
**Answers**

**Page 1**
1. $837.50
2. $2802
3. $34268
4. $5620
5. $28.10
6. $149512
7. $21358.86 per day, the headline is correct.
8. $38880
9. $774.69
10. $218

**Page 2**
1. $290
2. $2802
3. $34268
4. $5620
5. $28.10
6. $149512
7. $21358.86 per day, the headline is correct.
8. $38880
9. $774.69
10. $218

**Page 3**
1. $22.05
2. $126
3. $21.25
4. $624
5. $842.40
6. $1800

**Page 4**
1. $500
2. $21.60
3. $606.10
4. $496
5. $21.25
6. $1253.75
7. $624
8. $842.40

**Page 5**
1. $2508.80
2. $439.04
3. $2947.84
4. $3740.80
5. $654.64
6. $4395.44
7. $2716
8. $3191.30
9. $4741.57
10. $9250

**Page 6**
1. $1396
2. $553.60
3. $615.20
4. $915.21
5. $22.02
6. $352.32
7. $8 hours

**Page 7**
1. $14.82
2. $1309
3. $21888.72
4. $550
5. $378.75
6. $30766.88

**Page 8**
1. $4108.50
2. $697.32
3. $1740
4. $45240
5. $62.07%
6. $1740
7. $45240
8. $355.10
9. $30766.88

**Page 9**
1. $1430.04
2. $465.27
3. $1799.10
4. $2255.77
5. $1479.37
6. $34.42%

**Page 10**
1. $60
2. $1700
3. $2450
4. $9250
5. $712

**Page 11**
1. $90
2. $35.50
3. $17.65%
4. $35.50
5. $58.68%

**Page 12**
1. $25340.90
2. $169.65
3. $4410.90
4. $20.73%
5. $4.50
6. More than 18 electronic transactions
7. To reduce costs don’t take the monthly fee option and limit the electronic transactions to a maximum of 6 per month.
8. $128.60
9. $176.60
10. $355.10
11. $30766.88

**Page 13**
1. 10 Dec, 2000
2. T 596 545 432–3
3. $156.35
4. $129.22
5. $36.06
6. $129.22
7. $156.35
8. $74.11
9. $82.25
10. $74.11
11. $105.22
12. $24
13. $2107.69
14. $36.06
15. $24

**Page 14-17**
1. $500
2. $3600
3. 4.63 years
4. 4.43 years
5. 5.56%
6. 16.67%
7. $24

**Pages 1-3**
Income ($) | Expenses ($) |
---|---|
Job | 600 | Music lessons | 180 |
Allowance | 100 | Loan | 120 |
Baby sitting | 150 | School needs | 130 |

| Income ($) | Expenses ($) |
---|---|
Pocket money | 25 | Travel | 10 |
Earnings | 35.50 | Miscellaneous | 15 |

Total | 850 | Total | 850 |

b | $90 | c | 17.65%
---|---|---|---|

Page 12
1. $25340.90
2. $169.65
3. $4410.90

| Income ($) | Fixed expenses ($) | Variable expenses ($) |
---|---|---|
Job | 300 | Food | 90 |
Parents | 60 | Loan | 30 |
Organisation | 50 | School | 70 |

Total | 410 | Total | 275 |

b | $35.50 | c | 58.68%
---|---|---|---|

Page 13
1. $24
2. $37.24
3. $3191.30
4. $4741.57
5. $9250
6. $712
7. $218
8. $38880
9. $774.69
10. $218

Pages 14-17
1. $216.30
2. $606.10
3. $496
4. $1666.80
5. $26.37
6. $109
7. $865.20
8. $1800
9. $34268
10. $5620
11. $28.10
12. $149512
13. $21358.86
14. $38880
15. $774.69
16. $218

Page 18
1. $720
2. $3360
3. $14400
4. $354
5. $384.38
6. $14760
7. $21125
8. $13530

Page 19
1. $4500
2. $2777.78
Answers

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<tr>
<td>9</td>
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Page 20

1 a 0.5%  
2 a 2%  
3 a 3%  
4 a 60 months  
5 a 16 six-months  
6 a 2.25%  

Page 21

1 a $4764.06  
2 a $5832  
3 a $19 965  

Page 22

1 a $8236.71  
2 a $3325.29  

Page 23

1 a $10 960.69  
2 a $2469.49  

Page 24

1 a $2814.20  
2 a $7306.74  

Page 25

1 a $1700  
2 a $2469.49  
3 a $30 653.59  
4 a $7748.87  

Page 26

1 a $30 660  
2 a $3325.29  

Page 27

1 a 5%  
2 a 5.29%  
3 a $2.50  
4 a $4.75  

Page 28

1 a $399 408  
2 a $40 119  
3 a $581.56  
4 a $10 302  
5 a $179.38  

Page 32

1 a $45 675  
2 a $43 421  
3 a $2032  
4 a $3891  


ANSWERS

219
**Answers**

**Page 33**

1 a $3483 b $0 c $14 075.70 d $23 622.57 2 a $5772 b 18.04% 3 a $9320.70 b $2030.40

**Page 34**

1 a $938.40 b $275.85 c $357 d $1402.50 e $869.70 f $1024.50 2 a $0 b $155.20 3 a $726.75 b $819 c $1084.50 4 a $16 182 b $937.50 c $17 119.50

**Page 35**

1 a $24 920 b $3648 c $373.80 d $1126.20 2 a $36 910 b $7798.65 c & d Lucy has paid $9308 in taxes, she will receive a refund of $1509.35

**Page 36**

1 a $12 995.70 b 24.51% c $4580.30 2 $2758.15 3 A refund of $5997.39

**Page 37**

1 a $15 b $9.08 c $32.10 d $19.06 e $14.07 2 a $209.55 b $357 e $14.07 3 $50 4 $814.15 5 $28 060.00 6 $641.85

**Page 38**

1 a $56.25 b $35.63 c $15 2 a $4050 b $2875 c $1062 d $391.30

**Page 39**

1 a $0 b $5000 c $19 200 d $28 500

**Pages 40–42**

1 B 2 D 3 B 4 B 5 B 6 C 7 A 8 733.91 euros 9 a $28 877.45 b $28 060.00 c $4590.00 d $420.90 e $5010.90 f 17.9% 10 a $53 890 b $13 374.15 c Nick must pay an additional amount of $814.15

**Page 43**

1 A census is conducted to gather current information about the population. Federal and state governments would use the information to decide where, for example, hospitals, schools and free-ways are to be built. Businesses use census data to make decisions on where to build factories, where to advertise products and which products to sell. 2 i Collect data ii Organise iii Summarise and display iv Analyse v Draw conclusions vi Write a report 3 a The manufacturer could use positive feedback for advertising purposes. The information can be used as a check to see if the sales representatives are doing their job effectively and efficiently. Joanne would be more likely to make future purchases from the manufacturer. b If Joanne responded positively to the survey she may receive discounts on future services and purchases. Defects on the vehicle would be quickly corrected and could be free of change. c The workers would be more content and work harder. If there were problems with quality control they would be quickly identified and corrected.

**Page 44**

1 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. 2 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 year 12 subject so more year 12 students than other year levels would have watched it. 4 The sample would be biased, only people watching that particular TV station and interested in the government decision would respond. Individuals could make many calls and distort the results.

**Page 45**

1 a quantitative, discrete b categorical c categorical d categorical e quantitative, discrete f quantitative, discrete g quantitative, continuous h quantitative, discrete i categorical j quantitative, discrete k categorical l quantitative, continuous m categorical n categorical o quantitative, continuous p quantitative, continuous q categorical r categorical s categorical t categorical u systematic v systematic w systematic x systematic y systematic z systematic

**Page 46**

1 a 8% b 250 fish 2 a 27 dingoes b Dingoes are territorial so the dingoes released on the first night would be likely to be caught again 3 475 cherries

**Page 47**

1 The subject of the question is not clear, does if refer to the board or the workers. 2 This is a leading question, the question implies the answer the interviewer wants. 3 a It is easy to process and a definite answer is obtained b This style of question allows for a range of opinions 4 Questions should be relevant, precise, clearly worded and unambiguous. 5 Avoid expressing an opinion in the questions, being too vague and avoid giving too many choices in the one question.

**Pages 48–49**

1 C 2 C 3 A 4 D 5 A 6 A 7 D 8 a It is not random because each student on the bus does not have an equal chance of being selected b The opinions of students who sit at the back of buses may differ from those who sit at the front 9 a 18.06% b 250 horses 10 No, a major housing development could be planned for Kurraglen
Answers

Page 50

1 a

<table>
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<th>Frequency (f)</th>
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Page 51

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2 a 60 hours  b 33 hours  c 33, 34, 35 and 36 hours.

d

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1 b 28 scores  c

ANSWERS
Answers

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3 a

Page 53 1 a 2 mm would represent 1 person  b 38 mm

c

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2

Bus  Car  Bicycle  Walk

3 a 360°  b 0.25 or \( \frac{1}{4} \)  c 90°  d 72°  e

Page 54 1

Page 55 1
Answers

Page 56 1 a The vertical axis is not clearly labelled, do sales represent the number of the products sold, the income received from the sales or the mass of the products sold. Products, A, B, C and D may not be directly comparable, for example, product C may be sales of 150 g jars of coffee and product A may be sales of 1 kg containers. b This misrepresents the data because the volume of sales and the income received may be greatest for product A. c On the graph label the vertical axis as the number of products sold (in 1000’s) and include a description of each product. 2 With the section of the vertical axis shown, it appears sales of product B are at least 50% greater than each of the other products. If the full axis was drawn a smaller variation would be seen, the maximum difference in sales is 20%. 3 There is no label on the vertical axis, this could be the percentage of the population liking or disliking each product. The products are not described and with the graph style is it the height or the surface area which is meant to represent the product variable.

Page 57 1 a Stem | Leaf
4 | 8 9 8 6 6 6 9 8 6 8 8 7 6 8 9
5 | 0 0 0 3 0 1
6 | 0 8 1 2 6
7 | 8 4 2 7

2 a Stem | Leaf
3 | 1 3 8 8 8
4 | 9
5 | 1 3 5 6 7
6 | 2 2 7 8 8 9
7 | 1 1 3 3 9
8 | 2 2 2
9 | 1 3 4 5

b Stem | Leaf
0 | 9 9 8
1 | 5 7 8 7
2 | 5 7 7 9
3 | 3 8 7 3 2
4 | 1 3 3 7 4
5 | 3 2 3
6 | 2 1 7 1 4 3

Page 58 1

2 a There is highest production in the winter season and lowest production during summer

Page 59 1 a 9 b 2 c 7 2 a 30 b 15 c 61 d 13 e 36 f 14 g 25 h 50 3 a 3.5 b 8 c 10.5 d 7 a 4 a 1 b 2

Page 60

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Answers

b & c

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d & e

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b

Page 65
1 a

2 a

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Page 66
1 a
Answers

Page 66  1  a  Bar graph  b  Histogram  c  Line graph  2  a  Radar chart  b  Dot plot  c  Sector graph  3  A bar graph. If the length was 125 mm then 1 mm would represent 1 student. The section for walking would be 32 mm, the section for cycling 15 mm, etc.  4  a  It is easy to see the order, from the most common to least common hair colour  b  The number of people with each hair colour cannot be determined.

Pages 67–70  1  D  2  C  3  B  4  C  5  C  6  B  7  B  8  C  9  B  10  B  11  a  50  b  10  c  40  d  30  e  35  f  15  g  20  12  a  19 students

Page 71  1  a  5  b  8.25  c  8.5  d  13.5  e  8.5  f  10  g  3.2  h  7.22  i  4.78  2  a  4.455  b  4.133  c  7.167  d  6.667

Page 72  1  a  10  b  86  c  6.3  d  20.1  e  37.4  f  4.7  g  3.6  h  2.1  2  a  4.0  b  4.4  c  4.4  d  4.0  e  3.9  f  4.7  3  a  Science;  b  Science

Page 73  1  List B has the greater standard deviation, this list has a wider spread of numbers.  2  σn is used to calculate the population standard deviation, σn–1 is used for a sample  3  a  σn  b  σn–1  4  a  1.7  b  7.2  5  a  3.6  b  4.7

Page 74  1  a  6.6, σn–1 = 3.4  b  13.7, σn–1 = 3.4  c  5.7, σn–1 = 2.5  d  9.6, σn–1 = 3.5  2  a  4.0, σn = 2.0  b  4.0, σn = 4.4  c  12.6, σn = 4.4  d  39.1, σn = 19.8  3  a  Science;  b  61.8, σn–1 = 5.2  4  a  78.6, σn = 6.2  b  4.0  c  14, σn = 3.0  d  12.1, σn = 4.7

Page 75  1  a  8  b  7.5  c  52  d  15  e  11  f  63  2  a  5  b  9  c  3  d  52  e  8  f  5 and 6

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EXCEL PRELIMINARY GENERAL MATHEMATICS REVISION & EXAM WORKBOOK

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Excel Essential Skills Preliminary General Mathematics Revision and Exam Workbook Year 11
Answers

3 a Cumulative frequency; 3, 9, 17, 24, 29, 33; mode = 3 median = 3 b Cumulative frequency; 12, 31, 49, 64, 74, 87; mode = 6 median = 7 c Cumulative frequency; 8, 14, 21, 31, 36; mode = 19 median = 18 d Cumulative frequency; 5, 12, 20, 34, 40 mode = 19 median = 18.5

Page 76 1 a i 95.5 ii 81 iii 96 b Barry was above the average but he did not do well, he was second lowest in the class. When data includes atypical scores, the median should be used as the measure of “the middle” 2 Few houses would have identical prices so the mode is not used. If one or several very expensive homes were sold this would significantly increase the mean, the mean would no longer be a good indicator of the price of the majority of houses sold. The median would be unaffected by the few high prices. 3 a 16.7 b 14 c 16 d The shop owner would sell more of this size and so would need to stock more of the modal size

Page 77 1 a 8, 9 b 8, 7 c 7.7, 7.4 d 1.6, 1.5 e The second sample did not do as well as the first sample, the mean mark and median mark were lower. The second sample was more consistent, the standard deviation was lower f The first sample did better than the overall group of students but were more inconsistent. The second sample did not achieve as well but had the same consistency 2 a The mean would not necessarily be 57 but should be close to that number b The conclusion is Bellbirds are a better team. If 41 goals were scored in only 1 match, the coach could conclude her team played poorly that game or it could have been key players were out injured.

Pages 78–80 1 B 2 D 3 C 4 C 5 D 6 B 7 C 8 A 9 a 15 b 15 c i 14.9 ii 1.7 10 a 41 b 62 c 2 d 2 e 1.5 f 1.0 11 a 675 b 8 c 16 d 6.5 12 a 1.9 b 0, 2 and 3 c 6 d 2 e By comparing the means Australia has shown a significant increase in the number of gold medals won in the more recent Olympics. The earlier results are more consistent (by comparing the standard deviations) but they are consistently low.

Page 81 1 a Metre b Kilometre c Millimetre d Metre e Gram f Tonne 2 a Millilitre b Millilitre c Megalitres d Litre 4 a cm² b ha c m² d cm² 5 a cm² b m² c m³ d cm³ 6 a Kilogram b Metre c Kilometre d Litre e Centimetre or Millimetre.

Page 82 1 a 5 cm b 9 m c 6 km d 230 mm e 2400 cm f 8000 g 9.3 cm h 3000 mm i 3.6 km j 38 mm k 820 cm l 830 cm m 650 mm n 19.8 cm o 9.67 m 2 a 4 kg b 5 t c 6.783 kg d 9.369 kg e 9.3 t f 9000 g g 38500 h 6380 kg i 9360 j 5750 g k 8000 l 4639 kg m 6000 kg n 3.657 kg o 98700 p 3 a 3 L b 35 L c 9.683 L d 4.5 L e 5.9 L f 8939 L g 12 L k 86 000 mL i 23 800 mL j 16 000 mL k 9000 L l 85 653 mL m 8600 L n 19 300 L o 1936 L 4 a 20 cm b 600 mL c 300 g d 7 mm e 800 kg f 50 m g 4 L h 1 mm i 7 cm j 0.2 cm k 0.002 mL l 0.04 kg m 0.9 mL n 0.5 m o 0.006 t 5 a 1 000 000 L b 10 000 m³ c 100 000 cm d 1 000 000 g

Page 83 1 a 7.5 cm, 8.5 cm b 10.5 cm, 11.5 cm c 55.5 cm, 56.5 cm d 74.5 cm, 75.5 cm e 82.995 mm, 83.005 mm f 60.995 mm, 61.005 mm g 91.5 cm, 92.5 cm h 67.5 cm, 68.5 cm i 2 a 65 m, 75 m b 825 m, 835 m c 295 m, 305 m d 1495 m, 1505 m e 2995 km, 3005 km f 11995 km, 12005 km g 355 m, 365 m h 575 m, 585 m i 3 a 5.55 m, 5.65 m b 8.25 km, 8.35 km c 0.25 m, 0.35 m d 8.85 km, 8.95 km e 2.45 m, 2.55 m f 13.55 m, 13.65 m g 18.15 m, 18.25 m h 7.65 m, 7.75 m i 4 a 49.5 m, 50.5 m b 29.5 m, 30.5 m c 1460.25 m² d 1540.25 m²

Page 84 1 a ±10% b ±0.67% c ±3.33% d ±0.4% e ±0.03% f ±0.01% 2 a ±2% b ±1.25% c ±0.81% d ±1.35% e ±0.34% f ±0.57% 3 a ±0.18% b ±0.39% c ±2.38% 4 a ±0.06% b ±0.03% c ±0.11%

Page 85 1 The measuring instrument may be faulty, the measuring instrument may not be used correctly or the measurement may not be read correctly 2 a 2.80 m b 459 mL c 375 kg d 815.7 L e 6.0 m² f 974 g 3 Use a different tape-measure or ruler and re-measure the piece of timber. Gary should also estimate the length to see if the measurement is reasonable 4 Heather should record 6.60 m as the length of the room, this is the average of the two measurements.

Page 86 1 a 38 700 b 25 000 000 c 400 000 000 d 100 000 e 3650 f 860 000 g 0.0057 h 5.24 i 0.000 036 j 76.4 k 0.00 014 l 0.008 2 a 40 000 b 8 360 000 c 43 700 d 0.0369 e 0.556 f 0.00 326 3 No, with a tape measure it would be difficult to measure accurately to the nearest millimetre 4 The accuracy would be to the nearest 20 gram with a possible error of ±10 gram

Page 87 1 a 7.0 x 10³ b 1.9 x 10¹ c 5.3 x 10³ d 6.47 x 10² e 8.16 x 10³ f 5.8 x 10³ g 6.9 x 10³ h 8.73 x 10³ i 2.35 x 10³ j 5.6 x 10³ k 6.49 x 10³ l 8.65 x 10³ m 2 a 3.5 x 10² n 3.8 x 10³ o 6.532 x 10³ p 5.8 x 10³ q 4.3 x 10³ r 7.5 x 10³ s 5.9 x 10³ t 6.7 x 10³ u 9.4 x 10³ v 3.56 x 10² w 9.8 x 10² x 3.00 x 10² y 4.00 x 10² z 8.42 x 10² a 7.98 x 10² b 5.78 x 10² c 1.0 x 10² d 1.4 x 10² e 7.5 x 10³ f 4.0 x 10⁶

Page 88 1 a 64 km/h b 7.50$\$/book c 7.5 km/min d $24.80/h e $2.50/kg f 2 a 60 km/h g 210 bottles/h h 3.81 metres/day i 21.67 metres/s j 36 km/h k 1080 t

ANSWERS
Answers

Page 90  1  30 mL  2 a 36 000 drops  b 25 drops/min  3 15 kg  4 a 3.75 L  b 3000 L  c 14.93 L  d 4 times.

Page 91  1 a $40.80  b $36.72  c 23.5%  2 a $638.40  b Decrease of 16%  3 Decrease of $16.80  4 a $432  b 66%

Page 92  1 a 1 : 2  b 1 : 1  c 1 : 3  d 3 : 1  e 7 : 11  f 9 : 8  g 4 : 3  h 2 : 21  i 1 : 2 : 3  j 2 : 1  k 5 : 4  l 3 : 4  2 a 1 : 20  b 3 : 2  c 3 : 50  d 1 : 14  e 1 : 6  f 3 : 1  g 5 : 12  h 1 : 4  i 3 : 5  j 4 times.

Page 93  1 a $40.80  b $36.72  c 23.5%  2 a $638.40  b $48, $32  c $18 000  3 480 adults, 120 children  6 30º, 60º and 90º

Page 94  1 a $1.30  b $29.90  2 7.2 t  3 a $64  b 560 cm  c 3200 L  4 $21 250  5 $32.50  6 a 8.125 L  b 40 glasses

Pages 95–96  1 C  2 B  3 B  4 D  5 D  6 C  7 A  8 B  9 A  10 A  11 C  12 C  13 1.08 × 109 km  14 $27 000, $36 000, $45 000  15 495 g and 505 g  16 ± 0.20%  17 a 7 1/2 tablespoons  b 8 L  c 3 : 100

Page 97  1 a 48 cm²  b 126 cm²  c 24 cm²  2 a 64 cm²  b 72 m²  c 518 cm²  d 112 m²  e 25 cm²  f 90 m²  3 a 8 m²  b 198 km²  c 60 m²

Page 98  1 a 2419 m²  b 2349 m²  2 10.07375 ha

Page 99  1 a Prism  b Pyramid  c Other  d Pyramid  e Prism  f Prism  2 a Triangular prism  b Triangular pyramid or Tetrahedron  c Cylinder  d Octagonal prism  e Sphere  f Rectangular pyramid  g Cone  h Square based pyramid  i Rectangular prism

Page 100  1 a C  b A  c B  2 a

Page 101  1 a  2 a

Page 102  1 a b c d
Answers

Page 103  1  a  294 m²  b  433.5 cm²  2  a  472 cm²  b  632.2 cm²  3  a  736 cm²  b  768 cm²
Page 104  1  a  655.35 m²  b  1600 cm²  2  a  5 faces  b  144 cm²  c  90 cm²  d  504 cm²  3  a  56 m²
   b  564 cm²
Page 105  1  a  27 m³  b  125 cm³  c  592.704 cm³  2  a  350 cm³  b  192 cm³  3  a  280 cm³  b  4200 m³
   4  a  17.5 m²  b  70 m³
Page 106  1  a  361.6 cm³  b  174.1 cm³  2  a  306 cm³  b  2.33 m³  3  a  216.2 cm³  b  776.8 cm³  4  494 cm³
Page 107  1  a  19 085.2 m³  b  44 254.8 mm³  2  a  923.6 cm³  b  166 897.1 cm³  3  a  40 212.4 cm³
   b  4310.3 m³  4 Each has a volume of 1608.5 cm³
Page 108  1  a  3053.6 cm³  b  4188.8 cm³  c  113 097.3 mm³  d  22 449.3 m³  e  15 002.5 km³  f  91 952.3 cm³
   2 a  4188.8 cm³  b  150 532.6 cm³  c  1526.8 cm³  b  15 529.7 cm³  4  1.1 × 10¹² km³
Page 109  1  a  1 mL  b  1 L  c  1000 L  2  a  12 L  3  a  72 000 cm³  b  72 L  4  a  1.98 m³  b  1980 L
c  101 mm  5  a  1413.7 L  b  1201.6 L
Pages 110–114  1  B  2  C  3  D  4  C  5  D  6  B  7  C  8  D  9  A  10  A  11  B  12  B  13  C
Page 115  1  a  True  b  False  c  True  d  False  e  True  f  False  g  True  h  True  i  True  j  True
   2 Yes, the diagram of trains
Page 116  1  12 cm long and 9 cm wide  2  6 cm long and 4.4 cm wide  3  6.5 cm long and 4.5 cm high
   4 a  19 cm
   b  13 cm  5  a  5  b  20 cm  6  8 cm  7  a  20 cm  b  52 cm  8  a  4/3  b  11.7 cm
Page 117  1  a  Two angles  b  same ratio  c  one angle, same ratio  d  |||| or ~
   2 a  ADE and ACB  b  3  c  9  3 a PST and POR  b  PQR  c  1.5  d  9 cm  4  55 m
Page 118  1  a  1 : 1000  b  1 : 100  c  1 : 10 000  d  1 : 10 000  e  1 : 250  f  1 : 20  g  1 : 20 000  h  1 : 5
   i  1 : 6000  2 a  1 m  b  3 m  c  5 m  d  0.8 m  e  0.6 m  f  1200 m  3 a  8 m  b  50 m  c  6 km  d  95 m
   e  8.3 km  f  63.25 km  4  a  5 cm  b  4 cm  c  12.6 cm  d  8 mm  e  30 cm
   f  28.35 cm  5  a  1 km  b  8.4 km  c  26 cm
Page 119  1  a  30 m  b  13 m  c  390 m²  d  3.5 m  e  104 m²  2  a  1 : 45  b  1.26 m
   3 a  12 cm
Page 120
Page 121  1  a  8 m  b  sliding door  c  walk-in robe  d  3.865 m by 2.93 m  e  7 cm  f  10 cm  g  south
   h  4835 i $89 900  j west
Pages 122–124  1  B  2  C  3  A  4  B  5  D  6  B  7  A  8  B  9  a  ADE and ABC  b  AE  c  18 cm
   10 a  11 a  1 : 1600  b  48 m
Answers

Page 125  1 a 5 b 37 cm c 19.7 m 2 a 12 b 24 m c 8 cm 3 a 10.9 cm b 12.0 m c 10.6 km
Page 126  1 a Right-angled b Not right-angled c Right-angled 2 4.58 m 3 Carlo will need 6.04 m, 6 m is not enough
Page 127  1 a 10 cm b 10.82 cm 2 a 328 m b 481 m
Page 128  1 a Opp, adj, hyp b Hyp, adj, opp c Opp, adj, hyp d Opp, adj, hyp e Adj, hyp, opp f Hyp, opp,
adj 2 a \( \frac{8}{10} \) b \( \frac{6}{8} \) c \( \frac{3}{4} \) d \( \frac{3}{5} \) e \( \frac{12}{5} \) 2 \( \frac{12}{5} \) d \( \frac{x}{y} \) x \( \frac{17}{17} \) y \( \frac{a}{c} \) e \( \frac{10}{a} \) a f \( \frac{9}{b} \) b \( \frac{9}{a} \)
Page 129  1 a 0.934 b 0.342 c 0.424 d 0.122 e 0.384 f 0.966 g 1.111 h 0.588 i 0.669
2 a 3.15 b 1.97 c 0.686 d 7.87 e 0.931 f 0.414 g 0.903 h 19.9 i 0.461 3 a 0.31 b 0.04 c 22.71
d 0.08 e 0.24 f 28.84 g 0.05 h 0.15 i 65.98 4 a 26° b 38° c 57° d 60° e 59° f 56° g 72° h 63° i 71°
4 a 52° k 54° l 36° 5 a 36°52’ b 61°07’ c 67°0’ d 66°31’ e 40°53’
f 28°50’ g 52°26’ h 14°29’
Page 130  1 a 7.8 cm b 3.2 cm c 12.2 cm d 4.1 cm e 11.8 cm f 17.6 cm 2 a 3.30 cm b 16.37 cm
c 6.38 cm
Page 131  1 a 11.8 cm b 9.2 cm c 15.2 cm 2 a 4.8 m b 16.6 cm c 12.4 cm d 11.9 m e 4.7 cm f 41.6 cm
Page 132  1 a 22° b 56° c 20° d 2 a 40° b 29° c 64° 3 a 22°45’ b 21°04’ c 71°34’
d 66°53’ e 31°28’ f 61°31’
Page 133  1 d 62 m 2 a 33° b 47 m 3 45 m 4 76.5 m
Page 134  1 d 62 m 2 a 33° b 47 m 3 45 m 4 76.5 m
Pages 135–138  1 B 2 C 3 B 4 A 5 B 6 D 7 D 8 A 9 B 10 B 11 a 56 m b 41 m
12 Right-angled, \( 145^2 + 408^2 = 433^2 \) 13 a 2.61 b 0.41 c 18.30 d 29.68 14 a 65° b 29° 15 a 49°53’
b 66°30’ 16 a 6.44 cm b 15.31 cm 17 a 36° b 44° 18 80 m 19 a

Page 139  1 a Certain b Certain c Impossible d Certain e Impossible f Impossible g Even chance
h Impossible 2 a 30% b 100% c 30% d 100% e 0% f 50% g 0% h 70% 3 a Unlikely
b Impossible c Certain d Most likely e Even chance f Most likely g Unlikely h Unlikely i Most likely
j Certain k Unlikely l Most likely
Page 140  1 a 1, 2, 3, 4, 5, 6 b Head, tail c A, B, C, D, . . . Y, Z d A, E, I, O, U e 1, 2, 3, 4, 5, 6, 7, 8, 9
f 10 spades, 10 hearts, 10 diamonds, 10 clubs g Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday h Jan, Feb,
Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec 2 a 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, L, L, M, W 3 c 13 4 3 a 52 b 45
c 12 d 500
Page 141  1 a Yes b Yes c Yes d Yes e Yes f No g No h Yes 2 a A, B, I, L, O, P, R, T, Y
b white marble c X, Y, Z d No possible outcomes 3 a 4 b 12 c 26 d 13 e 2 f 1 g 8 h 0
Page 142  1 a RBW, RWB, BRW, BWR, WBR b 3 c 2 d 1 2 a 1234, 1243, 1324, 1342, 1423, 1432, 2134,
2143, 2314, 2341, 2413, 3124, 3142, 3214, 3241, 3412, 4123, 4132, 4213, 4231, 4321, 4321, 24 c 120; there
are 5 choices for the first digit, 4 choices for the second digit, 3 for the third 2 for the fourth and 1 for the final digit, 5 \times 4 \times 3 \times 2 
= 120 3 a AAA, AAB, AAC, ABA, ACA, BAA, CBB, BBA, BBC, BAB, BCB, ABB, CNN, CCA, CCB, CBC, ACC, BCC,
ABC, ACB, BCA, CBA, CBB 27 c 81 d 6561, for each selection there are 3 choices, after elections select the number of
outcomes is 3 = 6561
Page 143  1 17 576 000 2 1000 3 a 9 b 60 4 260 5 a 36 b 1 679 616 6 5040
Page 144  1 No, there is a one-in-a-hundred chance it will flood this year and all subsequent years. It does not mean there
will be 100 years between floods 2 Win and not win do not have equal probabilities, the chance of not winning would usually be
much greater than the chance of winning 3 Snow would not fall randomly throughout the year, if Ken went on his holiday in
summer it would be unlikely to snow, in winter it could snow each day of his holiday. 4 There are more consonants
than vowels therefore the probability of selecting a consonant is greater than 50-50. b The statement is false, however the chance
will be closer to 50-50 than in 4a, because vowels occur more frequently in the written language than in the alphabet.
Pages 145–146  1 B 2 B 3 C 4 C 5 A 6 B 7 D 8 C 9 a 789, 798, 879, 897, 978, 878 24 10 For healthy people, the probability of being well is far greater than the probability of being unwell 11 a 720 b The letters are unlikely to spell FACED, there is a chance in 720 of this occurring
Page 147  1 a 1 b 1 c 4 d 1 2 a 0.08, 0.16, 0.12, 0.08, 0.28, 0.12, 0.16 b 0.1, 0.2, 0.1, 0.1, 0.15, 0.15

Page 148  1 a 100 b 59 100 c 1 2 d 41 100 e 1 2 f 1 g 50 tails 2 a 1 8 b 5 24 c 1 4 d 1 6 e 1 9 f 5 136
b i 1 4 ii 35 72 iii 1 4 iv 7 12 v 16.67% vi 51.39% vii 0.11 viii 0.14
Page 149  1 a 1 4 b 1 2 c 1 3 d 3 4 e 1 26 f 2 13 g 4 11 h 2 a 1 11 b 7 c 2 11 d 2 11 e 4 11
f 1 11 3 a 1 6 b 1 6 c 0 d 1 2 e 1 2 f 1 3 g 4 1 a 1 10 b 2 3 c 1 2 d 9 10 e 0 f 3 5 g 1 3
b 2 3 c 2 3 d 1 3 e 0 f 0 a 3 5 b 0 c 2 5 d 1 5 e 1 5 f 3 5
Page 150  1 a 0.2 b 0.8 c 0 2 a 10% b 9% c 90% d 20% e 10% f 19% 3 a 20%
b 60% 4 a 1000 b 0.1 c 1 a 1 2 b 1 3 c 1 6 d 5 6 e 0 f 1 6 0, 1
Page 151  1 a 63 b All answers 4 7 c i 8 63 ii 11 63 iii 5 63 iv 12 63 v 9 63 vi 7 63 vii 11 63 d The
spinner does not seem fair, the score of 3 occurs fewer times than expected but this could happen by chance. Lara should make
another 63 spins to check her results 2 a 0.019 b i 0.019 ii 0.097 iii 0.058 c Trevor was correct for the queen
of hearts and the jack of clubs, the experimental probabilities are far higher than expected.
Page 152  1 a a b Scores of 5, 6, 7 and 8 are far more likely than the
other possible scores 2 a 150 b 7 150
Page 153  1 a 5 6 b 5 6 c 2 3 d 1 2 2 3 4 3 499 500 4 a 1 2 b 0 c 1 5 13 32 6 4 5 7 0
Page 154-156  1 D 2 A 3 C 4 D 5 C 6 B 7 A 8 C 9 B 10 A 11 a 1 6 b 1 3 c 0
d 1 2 e 4 14 24 3 4 5 7 11 13 15 a 3 10 b 1 4 c 9 20 d 0 e 11 10 f 7 10 g 1
Page 155  1 a 4; 24, 28, 32 b 7; 38, 45, 52 c 15; 75, 90, 105 d 5; 31, 36, 41 e 0.5; 5.5, 6.6 5 2 a 2;
Page 156  1 a 0.2 b 0.8 c 0 2 a 10% b 9% c 90% d 20% e 10% f 19% 3 a 20%
b 60% 4 a 1000 b 0.1 c 1 a 1 2 b 1 3 c 1 6 d 5 6 e 0 f 1 6 0, 1
Page 157  1 a 4; 24, 28, 32 b 7; 38, 45, 52 c 15; 75, 90, 105 d 5; 31, 36, 41 e 0.5; 5.5, 6.6 5 2 a 2;
Page 158  1 a 6, 7, 8, 9, 10 b 3, 5, 7, 9, 11 c –2, –1, 0, 1, 2 d 2, 5, 8, 11, 14 e 1, 4, 9, 16, 25 f 5, 10,
Page 159  1 a 1 m, 2b 3, 4, 5x c 8a, a 2xy d 8 e 5 y, e 2xy a, 3a
Page 160  1 x 2 4 8 10 y 2 x 3 z 4 a 5 b 6 c 7 d 8 e 9 f 10 g 11 h 12 i 13 j 14 k 15 l 16 m 17 n 18 o 19 p 20 q 21 r 22 s 23 t 24 u 25 v 26 w 27 x 28 y 29 z 30 a 31 b 32 c 33 d 34 e 35 f 36 g 37 h 38 i 39 j 40 k 41 l 42 m 43 n 44 o 45 p 46 q 47 r 48 s 49 t 50 u 51
Answers

\[ j \]

\[ x = 6 \]

\[ y = 6 \]

\[ z = 6 \]

\[ a = 6 \]

\[ b = 6 \]

\[ c = 6 \]

\[ d = 6 \]

\[ e = 6 \]

\[ f = 6 \]

\[ g = 6 \]

\[ h = 6 \]

\[ i = 6 \]

\[ j = 6 \]

\[ k = 6 \]

\[ l = 6 \]

\[ m = 6 \]

\[ n = 6 \]

\[ o = 6 \]

\[ p = 6 \]

\[ q = 6 \]

\[ r = 6 \]

\[ s = 6 \]

\[ t = 6 \]

\[ u = 6 \]

\[ v = 6 \]

\[ w = 6 \]

\[ x = 6 \]

\[ y = 6 \]

\[ z = 6 \]

\[ a = 6 \]

\[ b = 6 \]

\[ c = 6 \]

\[ d = 6 \]

\[ e = 6 \]

\[ f = 6 \]

\[ g = 6 \]

\[ h = 6 \]

\[ i = 6 \]

\[ j = 6 \]

\[ k = 6 \]

\[ l = 6 \]

\[ m = 6 \]

\[ n = 6 \]

\[ o = 6 \]

\[ p = 6 \]

\[ q = 6 \]

\[ r = 6 \]

\[ s = 6 \]

\[ t = 6 \]

\[ u = 6 \]

\[ v = 6 \]

\[ w = 6 \]

\[ x = 6 \]

\[ y = 6 \]

\[ z = 6 \]

\[ a = 6 \]

\[ b = 6 \]

\[ c = 6 \]

\[ d = 6 \]

\[ e = 6 \]

\[ f = 6 \]

\[ g = 6 \]

\[ h = 6 \]

\[ i = 6 \]

\[ j = 6 \]

\[ k = 6 \]

\[ l = 6 \]

\[ m = 6 \]

\[ n = 6 \]

\[ o = 6 \]

\[ p = 6 \]

\[ q = 6 \]

\[ r = 6 \]

\[ s = 6 \]

\[ t = 6 \]

\[ u = 6 \]

\[ v = 6 \]

\[ w = 6 \]

\[ x = 6 \]

\[ y = 6 \]

\[ z = 6 \]

\[ a = 6 \]

\[ b = 6 \]

\[ c = 6 \]

\[ d = 6 \]

\[ e = 6 \]

\[ f = 6 \]

\[ g = 6 \]

\[ h = 6 \]

\[ i = 6 \]

\[ j = 6 \]

\[ k = 6 \]

\[ l = 6 \]

\[ m = 6 \]

\[ n = 6 \]

\[ o = 6 \]

\[ p = 6 \]

\[ q = 6 \]

\[ r = 6 \]

\[ s = 6 \]

\[ t = 6 \]

\[ u = 6 \]

\[ v = 6 \]

\[ w = 6 \]
Answers

Page 175  
1 a (0, -1), (1, 0), (2, 1), (3, 2)  
b (0, 0), (1, 3), (2, 6), (3, 9)  
c (0, 2), (1, 4), (2, 6), (3, 8)  

2 a (2, 0), (2, 1), (2, 2), (2, 3)  
b (0, 3), (1, 3), (2, 3), (3, 3)  
c (0, 0), (1, 1), (2, 2), (3, 3)  

3 a (0, -3), (1, -2), (2, -1), (3, 0); (0, 3), (1, 2), (2, 1), (3, 0)  
b (3, 0)  

c (0, 2), (1, 4), (2, 6), (3, 8)  

Page 176  
1 a n  
b n  
c Dependent variable  
d C  
e

<table>
<thead>
<tr>
<th>n</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>3</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>23</td>
<td>28</td>
</tr>
</tbody>
</table>
Answers

234

1 a $30  
b 550 km  
c $10  
d Registration and insurance are fixed costs and need to be paid even if no travel was undertaken.

2 a

<table>
<thead>
<tr>
<th>Amount of fuel (L)</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost ($)</td>
<td>675</td>
<td>1250</td>
<td>1825</td>
<td>2400</td>
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</table>

3 a

<table>
<thead>
<tr>
<th>Amount of petrol (L)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (km)</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The graph could not pass 960 km if the car was not refilled, that is the limit for 60 litres of petrol.
Answers

Page 178  
1 a Positive  b Negative  c Positive  d Positive  
2 a $\frac{5}{3}$  b $-\frac{7}{3}$  c $2$  d $-\frac{1}{2}$  e $1$  f $2$  
g $-1$  h $1$  i $-2$

Page 179  
1 a $5$  b The fixed amount of the pocket money per week, $5$  c $2$  d Liam’s mother pays him $2$ per hour when he helps her  
e $d = -15t + 90$

Page 180  
1 a $2, 7$  b $3, 1$  c $7, 0$  d $4, -3$  e $\frac{1}{2}$  f $1, 4$  g $-3, 8$  h $-1, -5$  i $-2, 11$

2 a $2, 3$  b $-1, 2$  c $-5, 3$

Page 181  
1 a 

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

b $m = 6$  c $y = 6x$

2 a 

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (m)</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

b $48$  c $7.5$
Answers

Page 182  1  a $2.50  b 3 hours  c $7.50  d $10  e $10

2  a
Distance (km)  0  50  100  150  200  250  300  350  400
Total cost ($)  55  55  55  55  55  70  85  100  115

b

c  550 km

3  a  i 60c  ii $1.05  iii $1.05

Page 183  1  a  80%  b 75 marks  c 120 marks  d 20%

2  a

$ US  $ AUD

Answers

3  a  360
b  162° C  c  95° F

Page 184  1  a  16 people  b  $440  c  Company A, it is cheaper by $35  d  $1.67 per person
2  a

<table>
<thead>
<tr>
<th>Number of items</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost ($)</td>
<td>100</td>
<td>250</td>
<td>400</td>
<td>550</td>
</tr>
<tr>
<td>Return from sales ($)</td>
<td>0</td>
<td>175</td>
<td>350</td>
<td>525</td>
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</table>

b  c  20 items  d  The maximum profit will be made when 30 items are produced, provided they are all sold

Page 185  1  a  and b

<table>
<thead>
<tr>
<th>Length of elastic (cm)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass (g)</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
</tr>
</tbody>
</table>

Page 185  1  a and b

c  i  21 cm  ii  47 cm  iii  56 cm  d  22 g
Answers

2 a and $b$  

3 a and $b$

Pages 186–189

1 B  2  B  3  C  4  A  5  C  6  C  7  B  8  C  9  C  10  D  11  a  1, 5, 9, 13

b

y

25

20

15

10

5

0

1  2  3  4  5  6

x

b and $g$

Cost

Return on sales

Number of jugs

Sample Preliminary Examination 1

Pages 190–198

1  C  2  A  3  B  4  D  5  A  6  A  7  B  8  A  9  B  10  B  11  D  12  B  13  D  14  D  15  D

16  C  17  D  18  D  19  D  20  C  21  A  22  A  23  D  24  C  25  B

26 a  3.7921 × 10$^7$  b  23.88  c  1500 people  d  i  40  ii $\frac{50}{2}$  e  $x = 8$  f  25.56 km/h  g  $9573.44$

27 a  i  $852$  ii  $1075.65$  iii  $4004.40$  b  i  $m = \frac{1}{2}$  ii  $b = 2$  iii  $y = \frac{1}{2}x + 2$  iv  $y = 11$  c  i  4.32 L  ii  $19.44$

28 a  i  $\frac{1}{2}$  ii  $\frac{1}{2}$  iii  $\frac{1}{3}$  iv  0  b  i  $\frac{1}{4}$  ii  $\frac{1}{11}$  c  i  $55185$  ii  $13109.70$  iii  $827.78$

iv & v  Joanne must pay an additional $1061.08

EXCEL ESSENTIAL SKILLS: PRELIMINARY GENERAL MATHEMATICS REVISION AND EXAM WORKBOOK

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Excel Essential Skills Preliminary General Mathematics Revision and Exam Workbook Year 11
Answers

29 a

<table>
<thead>
<tr>
<th>Score (x)</th>
<th>Tally</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
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<td></td>
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<tr>
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<tr>
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<tr>
<td>6</td>
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<td>7</td>
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<tr>
<td>8</td>
<td></td>
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</table>

b i 45 cm ii 2520 cm³ iii 6480 cm³

c

30 a

b 38.5 m c $42 000 and $30 000 d i $2.72 ii 16% e 15.1°C f 320 fish

Sample Preliminary Examination 2

Pages 199–207 1 B 2 C 3 B 4 A 5 D 6 A 7 D 8 C 9 A 10 D 11 B 12 A 13 B 14 D 15 A
16 B 17 B 18 A 19 C 20 C 21 C 22 C 23 C 24 B 25 D
26 a i 9a² + 9a ii −15a²b² b i x = 8 ii a = 3 c i 387 m ii 5.17 min d i $30 ii The price should be less than $40 because the 50% reduction is calculated on a larger amount.

27 a

<table>
<thead>
<tr>
<th>Earnings ($100)</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
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<tbody>
<tr>
<td>4</td>
<td>8</td>
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<tr>
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<td>10</td>
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<td>48</td>
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<tr>
<td>11</td>
<td>2</td>
<td>50</td>
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</table>

b i $692 ii $700 iii $700 iv $700 v $700

28 a i 100, 60, 20, 0 ii

iii 45 m/s iv 1.6 s b i 6 cm ii 301.59 cm³

iii 8 times greater c 17.9 km 29 a i 7 ii 6

iii 7.5
Answers

**SAMPLE PRELIMINARY EXAMINATION 3**

**Pages 208–217**


26. a. i. \(-10x - 1\)  
   ii. \(6a^2\)  
   b. \(2.4\)  
   c. \(x = 8\)  
   d. \(t = 10\)  
   e. \(357, 375, 537, 573, 735\)  
   f. \(0\)  
   g. \(1\)  
   h. \(\frac{1}{3}\)  
   i. \(\frac{1}{3}\)  
   j. \(\frac{1}{3}\)

27. a. i. \(11.3\) m³  
   ii. \(11310\) L  
   iii. 16 days

28. a. i. \(f \times x\)

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Class centre (x)</th>
<th>Frequency (f)</th>
<th>Cumulative frequency</th>
<th>(f \times x)</th>
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<tbody>
<tr>
<td>125–127</td>
<td>126</td>
<td>3</td>
<td>3</td>
<td>378</td>
</tr>
<tr>
<td>128–130</td>
<td>129</td>
<td>14</td>
<td>17</td>
<td>1806</td>
</tr>
<tr>
<td>131–133</td>
<td>132</td>
<td>23</td>
<td>40</td>
<td>3036</td>
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<tr>
<td>134–136</td>
<td>135</td>
<td>38</td>
<td>78</td>
<td>5130</td>
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<td>137–139</td>
<td>138</td>
<td>17</td>
<td>95</td>
<td>2346</td>
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<tr>
<td>140–142</td>
<td>141</td>
<td>5</td>
<td>100</td>
<td>705</td>
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</tbody>
</table>

   b. iv and v

   c. \(E = 80 - 0.34n\)

   v. 70 years

   c. i. \(400\) km  
   ii. 10.9 min

29. a. i. \$19.80/h  
   ii. \$207.90  
   iii. \$237.60  
   iv. \$37 500  
   v. \$7422  
   b. i. \(32°\)  
   ii. \(3774\) mm

   iii. \(61.894\) m²  
   iv. 3 cans

   30. a. \$75.35  
   b. \$1080  
   c. i. It is not a random sample, younger students would be more likely to be driven by their parents, older students may drive themselves to school

   ii. \(\frac{7}{45}\)  
   iii. 14.6 years  
   iv. 1.8 years  
   d. \$4584.89
yearly exams. Comprehensive revision in Year 11 will enable students to confidently progress into the HSC General Mathematics course in Year 12.

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About the author
AS Kalra, MA, MEd, BSc, BEd, has over thirty years experience teaching Mathematics in NSW High Schools. He is also the author of the HSC General Mathematics Study Guide and the Excel Essential Skills Years 7–10 Mathematics Revision & Exam Workbooks.

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