

CHAPTER

10

Sample Preliminary examinations

Sample Preliminary examination 1

Total time allowed: 2 hours Total marks: 85

Sample exam 1

Section 1

(Suggested time: 35 minutes)

Multiple-choice questions

25 marks

- Attempt ALL questions.
- All questions are of equal value.
- Select the alternative (A, B, C or D) that best answers the question.

1 Calculate, and give your answer correct to one

decimal place: $\frac{3}{0.63} - \frac{1}{2.25}$

- A 3.4 B 4.3
C 6.1 D 5.4

2 Write 68 530 000 in scientific notation.

- A 6.853×10^7 B 68.53×10^6
C 685.3×10^5 D 6.853×10^{-7}

3 Given that $x^3 = 6.25 \times 10^8$, find x to the nearest whole number.

- A 855 B 627
C 900 D 850

4 Mirella sold a car at \$40 000 and lost \$10 000. For what price should she have sold it to gain 5%?

- A \$50 000 B \$47 500
C \$55 000 D \$52 500

5 Find 45% of \$650 and add it to 30% of \$240.

- A \$380.60 B \$325
C \$332.50 D \$364.50

6 Pammy and Jaani invested \$6000 and \$9000 respectively in a business. If the profit was \$12 000, how much should Jaani get if they divide the profit in the ratio of their investments?

- A \$8400 B \$7000
C \$7200 D \$4800

7 In blending coffee, 56 kilograms of type A at \$3.55 per kilogram is mixed with 34 kilograms of type B at \$2.95 per kilogram. Find the cost per kilogram of this blend, correct to the nearest cent.

- A \$3.00 B \$3.32
C \$3.10 D \$3.50

8 If it takes 8 hours to complete a journey when travelling at an average speed of 80 km/h, how long will the same journey take if the average speed is increased to 100 km/h?

- A 2.3 h B 5 h
C 6.4 h D 5.8 h

9 If $x = -2$, find $\frac{1}{4}(x^3 - x^2 + 4)$.

- A -2 B 4
C -3 D -4

10 A motorbike is for sale at \$16 000. Finance is available at \$5000 deposit plus monthly repayments of \$420 for 3 years. The interest paid is:

- A \$4120 B \$5040
C \$15 120 D \$20 120

11 A phone plan charges 24 cents per MB for excess data use, in blocks of 1 MB. What is the cost of 66.4 MB of excess data?

- A \$15.94 B \$16.08
C \$1594 D \$1608

12 The maglev (magnetic levitation) train in Shanghai has a cruising speed of 340 km/h. This is equivalent to:

- A 94.4 m/s B 340 m/s
C 1224 m/s D 5666.7 m/s

13 Given that $x^3 = 200\,000$, find x rounded off to the nearest whole number.

- A 58 B 47
C 36 D 60

14 The cost price of a T-shirt is \$8.25. The selling price is \$12.50. Calculate the percentage profit on the cost price.

- A 30% B 51.5%
C 55.8% D 70.3%

15 The stamp duty payable on purchasing a new car is 2% of the market value up to \$40 000, plus 5% on the balance over \$40 000. A new car costs \$55 000. The stamp duty is closest to:

- A \$750 B \$1100
C \$1550 D \$2750

16 Find the difference between the mean and the mode of the scores: 10, 30, 60, 40, 60

- A 30 B 10
C 20 D 0

17 Which classification accurately describes the variable, 'the number of children in a family'?

- A Categorical nominal
B Categorical ordinal
C Quantitative discrete
D Quantitative continuous

18 Find the range of the set of scores: 4, 9, 5, 2, 8, 9, 2, 11, 13

- A 11 B 7
C 6 D 9

19 For a single throw of one die, what is the probability of having an odd number?

- A $\frac{1}{3}$ B $\frac{1}{6}$
C $\frac{1}{36}$ D $\frac{1}{2}$

20 A jar contains 15 Smarties: seven red, five green and three yellow. One is chosen at random. What is the probability that it is neither red nor green?

- A $\frac{1}{3}$ B $\frac{1}{5}$
C $\frac{2}{5}$ D $\frac{2}{3}$

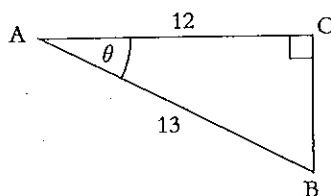
21 Expand and simplify $8 - 3(4 - 5x)$.

- A $12 - 15x$ B $-4 - 15x$
C $15x - 4$ D $-4 + 5x$

22 If 120 kg is increased by 20% it will become:

- A 140 kg B 20 kg
C 144 kg D 100 kg

- 23** In the right-angled triangle given below, find the value of $\tan \theta$.



- A $\frac{5}{12}$ B $\frac{12}{13}$
 C $\frac{13}{12}$ D $\frac{12}{5}$

- 24** A car purchased for \$29 900 is worth \$15 400 after 5 years. The annual amount of depreciation, using the straight line method, is:

- A \$2900 B \$3080
 C \$5980 D \$14 500

- 25** Which of the following expressions is equivalent to $(7a^4)^2$?

- A $49a^6$ B $49a^4$
 C $49a^8$ D $14a^6$

Sample exam 1

Section 2

(Suggested time: 85 minutes)

Objective-response questions

60 marks

- Attempt ALL questions.
- Each question is worth 15 marks.
- Show all working.

- 26** a A body is projected vertically upwards with the speed of 100 m/s. Owing to the pull of gravity, this speed decreases with time according to the relationship $V = 100 - 10t$.

The table below gives values of v for some values of t :

Time t seconds	0	2	4	6	8	10
Speed V m/s		80		40		

- i Copy the table onto your paper and complete it for remaining values of t . 2 marks
- ii Plot these points on graph paper and draw a neat curve showing the relationship between speed and time. 2 marks
- iii Use this graph to find V when $t = 5.6$. Also find t when $V = 84$. 2 marks
- b If the Centrepoint Tower lifts operate at a speed of 426 metres per minute, calculate their speed in kilometres per hour. 2 marks
- c A store advertises a box of six crystal glasses for \$6.95 and a larger box of 18 for \$20.

- i What is the cheaper way to buy 18 glasses? 2 marks
- ii How much cheaper is your choice if 18 glasses are bought? 1 mark
- d A property was bought for \$560 000 in 1997. In 2014, the property was found to have increased in value by 95%. What was its new value? 2 marks
- e Silva is looking into Youth Allowance to see if she can afford to study at university. She finds this Youth Allowance information on a government website:

Your circumstances	Your maximum fortnightly payment
Single, with no children, 18 years or more, and living at parental home	\$272.80

Based on her eligibility, Silva is entitled to \$26.40 less than the maximum fortnightly payment.

- i If her circumstances do not change, how much will Silva receive each fortnight? 1 mark

- ii If her rates of pay and circumstances do not change, how much will Silya receive over the 4 years of her planned university study? 1 mark

27 a A class of 20 students scored the following marks (out of 10) in a spelling test:
5, 0, 7, 6, 7, 2, 3, 5, 3, 5, 10,
8, 7, 6, 3, 4, 7, 10, 7, 2

- i Draw up a frequency table using the following headings: score, tally, frequency and cumulative frequency. 3 marks
- ii For this distribution, calculate:
A the mean mark
B the mode
C the range
D the median 4 marks
- b A jar contains 20 Smarties: ten red, six green and four yellow. One Smartie is chosen at random. Find the probability that the Smartie is:
i green 1 mark
ii neither green nor yellow. 1 mark

c The following formula can be used to estimate the BAC of a female:

$$\text{BAC}_{\text{female}} = \frac{10N - 7.5H}{5.5M}$$

- i What do the letters BAC stand for? 1 mark
- ii Calculate the BAC for a 75 kg woman who has had five standard drinks in 3 hours. 1 mark
- iii A formula such as this should be considered only as an approximation. Give two other factors that will have an effect on a woman's BAC. 2 marks
- d Aiyana watches the cars passing her house one day and notes the number of vehicles of particular colours:

Colour of vehicle	Frequency
Silver	18
White	12
Red	6
Other	14

- i What is the relative frequency of red cars passing by? 1 mark
- ii Based on Aiyana's experimental probability, what is the probability (as a percentage) that the next car to pass her house will be silver? 1 mark

28 a Sue owns a home unit as an investment, which she rents out for \$300 per week. She pays a managing agent's fee of 7% and the furnishings are valued at \$15 000.

- i What is the gross income received by Sue from her unit over the year? 1 mark
- ii The managing agent's fee and depreciation of 25% of the cost of furnishings are allowable tax deductions. What is the total amount of tax deductions Sue can claim for her unit over the year? 1 mark
- iii Sue's other income from her job as a teacher is \$3000 per fortnight and her other deductions total \$890. What is Sue's total taxable income? 2 marks
- iv Using the tax table below, how much tax does Sue owe, including the Medicare levy (1.5% of taxable income)? 2 marks

Taxable income	Tax on this income
\$0-\$18 200	Nil
\$18 201-\$37 000	19¢ for each \$1 over \$18 200
\$37 001-\$80 000	\$3572 plus 32.5¢ for each \$1 over \$37 000
\$80 001-\$180 000	\$17 547 plus 37¢ for each \$1 over \$80 000
\$180 001 and over	\$54 547 plus 45¢ for each \$1 over \$180 000

- v If Sue pays \$810 per fortnight in tax instalments, how much will she owe/receive as a refund at the end of the financial year? 2 marks

b Neena works for a company and her basic rate of pay is \$20.50 per hour for a 35-hour week. She gets time-and-a-half pay for the first 2 hours overtime worked on weekdays and double time on Sundays. On a particular job, she worked a normal 35-hour week plus 1 hour overtime on Tuesday and $1\frac{1}{2}$ hours on Sunday. What was her wage for the week? 2 marks

c Simon is planning on moving out of home and is preparing a budget to see if he will be able to afford it. He notes down the following average weekly earning and spending patterns:
Weekly salary \$750, food \$105, phone and internet \$20.50, travel \$55, music tuition income \$90, miscellaneous expenses \$115

i Arrange Simon's expenses and income into the budget below. 2 marks

Income	Expenditure
Total	Total

- ii What amount is Simon able to save each week, based on this budget? 1 mark
- iii If Simon anticipates rent to be \$250 per week, and wants to save \$250 a week to pay for university fees and save up for a car, will he be able to afford living out of home? 2 marks

29 a Tina, Tanya and Teaser are the three members of a rock band called the Three Sisters. They employ a manager and, in the contract, they agree that all band earnings will be split in the ratio of 5 : 5 : 5 : 2. (Tina : Tanya : Teaser : Manager).

i What fraction of band earnings will the manager receive? 1 mark

ii The band performs at a club one night and the manager received \$2800 of the band's earnings.
How much did Teaser receive? 2 marks

b If $P = M(1 - r)^n$, evaluate P when $M = 3000$, $r = 0.08$ and $n = 3$. 1 mark

c Find the length of the third side of a right-angled triangle if its hypotenuse is 39 cm and another side is 36 cm. 2 marks

d A motorcycle travels 522 km on a tank of 26 L of fuel.

i Express this fuel consumption in L/100 km. 1 mark

ii This motorcycle will be used for a 974 km trip. If petrol costs 159.9¢/L, calculate the cost of fuel for the journey. 2 marks

e The table shows the conversion of download speeds into different units:

Bits per second (bps):	<input type="text" value="10 000"/>
Kilobits per second (kbps):	<input type="text" value="10"/>
Megabits per second (Mbps):	<input type="text" value="0.01"/>
Bytes per second (Bps):	<input type="text" value="P"/>
Kilobytes per second (kBps):	<input type="text" value="Q"/>
Kilobytes per minute (kBpmin):	<input type="text" value="75"/>
Megabytes per minute (MBpmin):	<input type="text" value="R"/>

Complete the table by calculating the values of P, Q and R. 3 marks

f Natalie is choosing between two jobs with the following details:

- Job A: Salary of \$75 000 p.a. for a 40-hour working week
- Job B: Salary of \$74 100 p.a. for a 38-hour working week

If Natalie wants the job with the highest per-hour pay rate, which job should she choose? 3 marks

Go to p. 244 for **Quick Answers**
or to pp. 265–268 for **Worked Solutions**.

$$\frac{3}{0.63} - \frac{1}{2.25} = 4.3174603... \text{ [Cal.]}$$

$$= 4.3 \text{ [1 d.p.] } \checkmark$$

$$68\,530\,000 = 6.853 \times 10^7 \checkmark$$

$$x^3 = 6.25 \times 10^8$$

$$x = \sqrt[3]{6.25 \times 10^8}$$

$$x = 854.987... \text{ [Cal.]}$$

$$x = 855 \text{ [to nearest whole number]} \checkmark$$

Selling price of the car = \$40 000
 Loss = \$10 000
 Cost price = \$40 000 + \$10 000
 = \$50 000

To gain 5% on it, Mirella's selling price should have been
 105% of \$50 000 = 105% × \$50 000 = \$52 500 \checkmark

$$45\% \text{ of } \$650 + 30\% \text{ of } \$240 = \$292.50 + \$72$$

$$= \$364.50 \checkmark$$

Pammy: Jaani
 6000:9000
 2:3
 Total parts = 2 + 3 = 5
 Profit = \$12 000
 5 parts = \$12 000
 1 part = $\frac{\$12\,000}{5} = \2400
 3 parts = \$2400 × 3 = \$7200
 Jaani's share = \$7200 \checkmark

$$\text{Total cost} = 56 \times \$3.55 + 34 \times \$2.95$$

$$= \$198.80 + \$100.30$$

$$= \$299.10$$

$$\text{Cost per kg} = \frac{\$299.10}{90}$$

$$= \$3.3233... \text{ [Cal.]}$$

$$= \$3.32 \text{ [to nearest cent]} \checkmark$$

$$\text{Total distance covered} = 8 \times 80$$

$$= 640 \text{ km}$$

$$t = 64 \div 100$$

$$t = 6.4 \text{ hours } \checkmark$$

$$\frac{1}{4}(x^3 - x^2 + 4), x = -2$$

$$\frac{1}{4}([(-2)^3 - (-2)^2 + 4])$$

$$\frac{1}{4}(-8 - 4 + 4) = -2 \checkmark$$

$$\text{Total paid} = \$5000 + \$420 \times 12 \times 3$$

$$= \$20\,120$$

$$\text{Interest} = \$20\,120 - \$16\,000$$

$$= \$4120 \checkmark$$

This person will pay for 67 MB of excess data,
 i.e. $67 \times \$0.24 = \16.08 . \checkmark

$$340 \text{ km/h} \times 1000 \text{ m/1 km} \times 1 \text{ h/60 min} \times 1 \text{ min/60 s}$$

$$= 94.4 \text{ m/s. Or, simply convert by dividing by 3.6. } \checkmark$$

$$x^3 = 200\,000$$

$$x = 58.4803... \text{ [Cal.]}$$

$$x = 58 \text{ [to nearest whole number]} \checkmark$$

Cost price = \$8.25
 Selling price = \$12.50
 Profit = \$12.50 - \$8.25
 = \$4.25

$$\text{Percentage profit on cost price} = \frac{4.25}{8.25} \times 100$$

$$= 51.5\% \text{ [1 d.p.] } \checkmark$$

$$\text{Stamp duty} = 0.02 \times \$40\,000 + 0.05 \times (\$55\,000 - \$40\,000)$$

$$= \$1550 \checkmark$$

$$\text{Mean} = \frac{10 + 30 + 60 + 40 + 60}{5}$$

$$= 40$$

Mode = 60
 Difference = 60 - 40
 = 20 \checkmark

A quantitative discrete variable measures exact values and is often the result of counting. \checkmark

$$\text{Range} = 13 - 2$$

$$= 11 \checkmark$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2} \checkmark \quad \left[\begin{array}{l} n(E) = 3 \\ n(S) = 6 \end{array} \right]$$

$$P(E) = \frac{n(E)}{n(S)}$$

$$P(E) = \frac{3}{15} = \frac{1}{5} \checkmark \quad \left[\begin{array}{l} n(E) = 3 \\ n(S) = 15 \end{array} \right]$$

$$8 - 3(4 - 5x) = 8 - 12 + 15x$$

$$= -4 + 15x$$

$$= 15x - 4 \checkmark$$

$$20\% \text{ of } 120 \text{ kg} = 20\% \times 120 \text{ kg}$$

$$= 24 \text{ kg}$$

$$\text{Total} = 120 + 24$$

$$= 144 \text{ kg } \checkmark$$

Use Pythagoras' Theorem.
 $BC^2 + 12^2 = 13^2$
 $BC^2 + 144 = 169$
 $BC^2 = 169 - 144$
 $BC^2 = 25$
 $BC = 25$
 $BC = 5$

$$\therefore \tan \theta = \frac{\text{Opp}}{\text{Adj}}$$

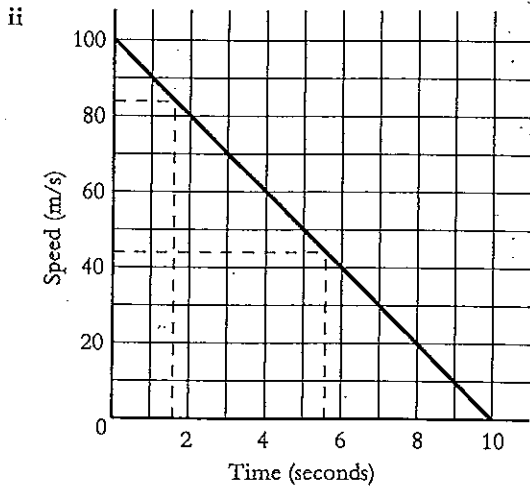
$$= \frac{5}{12} \checkmark$$

24 The value of the car declined by \$29 900 - \$15 400
 = \$14 500 over 5 years. This is $\frac{\$14\,500}{5} = \2900 p.a. ✓

25 $(7a^4)^2 = 49a^8$ ✓

26 a i $v = 100 - 10t$

Time t seconds	0	2	4	6	8	10
Speed v m/s	100	80	60	40	20	0



iii When $t = 5.6$, $v = 44$ m/s
 When $v = 84$ m/s, $t = 1.6$ s ✓✓

b Speed = 426 m/minute
 = (426×60) m/h

Speed = $\frac{426 \times 60}{1000}$ km/h
 = 25.56 km/h ✓✓

c i Larger box of 18 = \$20

In a small box:

6 crystal glasses = \$6.95

18 crystal glasses = $\$6.95 \times 3$
 = \$20.85 ✓

The cheapest way is to buy the larger box of 18 for \$20. ✓

ii $\$20.85 - \$20 = 85$ cents

It is cheaper by 85 cents. ✓

d 195% of \$560 000 = $195\% \times 560\,000$
 = \$1 092 000 ✓

e i Youth Allowance Payment = $\$272.80 - \26.40
 = \$246.40 ✓

ii Payments over 4 years = $\$246.40 \times 26 \times 4$
 = \$25 625.60 ✓

27 a i

Score	Tally	Frequency	Cumulative frequency
0		1	1
1		0	1
2		2	3
3		3	6
4		1	7
5		3	10
6		2	12
7		5	17
8		1	18
9		0	18
10		2	20

ii A Mean = $\frac{\text{Sum of (Score} \times \text{Frequency)}}{\text{Total frequency}}$

= $\frac{107}{20}$
 = 5.35 ✓

B Mode = 7 ✓

C Range = $10 - 0 = 10$ ✓

D Median = 5.5 ✓

b i $P(E) = \frac{n(E)}{n(S)} = \frac{6}{20} = \frac{3}{10}$ ✓

ii $P(E) = \frac{n(E)}{n(S)} = \frac{10}{20} = \frac{1}{2}$ ✓

c i Blood alcohol content (or concentration). ✓

ii BAC = $\frac{10 \times 5 - 7.5 \times 3}{5.5 \times 75} = 0.067$ ✓

iii Factors that affect BAC include fitness, liver function, how much food is in the person's stomach, and overall health. ✓✓

d i Relative frequency = $\frac{\text{Number of red cars}}{\text{Total cars}}$

= $\frac{6}{50}$

= $\frac{3}{25}$ ✓

ii $P(\text{next car being silver}) = \frac{18}{50} \times 100\%$

= 36% ✓

28 a i Gross income per year = $\$300 \times 52$

= \$15 600 ✓

ii Managing agent's fee = 7% of \$15 600
 $= 7\% \times \$15\,600 = \1092
 Depreciation of furnishings = 25% of \$15 000
 $= \$3750$
 Total amount of deductions = \$1092 + \$3750
 $= \$4842 \quad \checkmark$

iii Total taxable income
 $= \text{Gross income from job} + \text{Gross income from unit} - \text{Deductions}$
 $= \$3000 \times 26 + \$300 \times 52 - (\$4842 + \$890) \quad \checkmark$
 $= \$87\,868 \quad \checkmark$

iv Tax owed
 $= \$17\,547 + \frac{37}{100} \times (87\,868 - 80\,000) + 1.5\%$
 $\times 87\,868 \quad \checkmark$
 $= \$21\,776.18 \quad \checkmark$

v Tax paid = \$810 × 26
 $= \$21\,060 \quad \checkmark$

Since the tax paid is less than the tax due, Sue still owes \$716.18 (\$21 776.18 - \$21 060). \checkmark

b Neena's normal pay = 35 × \$20.50
 $= \$717.50$

Overtime on Tuesday = 1 × \$20.50 × 1.5
 $= \$30.75$

Overtime on Sunday = 1.5 × \$20.50 × 2
 $= \$61.50 \quad \checkmark$

Neena's wage for the week
 $= \$717.50 + \$30.75 + \$61.50$
 $= \$809.75 \quad \checkmark$

c i

Income (\$)		Expenditure (\$)	
Weekly salary	750.00	Food	105.00
Music tuition	90.00	Phone and internet	20.50
		Travel	55.00
		Misc. expenses	115.00
Total	840.00	Total	295.50 $\checkmark\checkmark$

ii Savings = Income - Expenses
 $= \$840 - \295.50
 $= \$544.50 \quad \checkmark$

iii Simon's anticipated rent and money set aside for savings totals \$500, leaving him \$44.50 extra. \checkmark
 Based on this he will be able to afford living out of home. \checkmark

29 a i Total = 5 + 5 + 5 + 2 = 17

Manager's share = $\frac{2}{17} \quad \checkmark$

ii 2 parts = \$2800

1 part = $\frac{\$2800}{2} = \$1400 \quad \checkmark$

5 parts = 5 × \$1400 = \$7000

∴ Teaser's share = \$7000 \checkmark

b $P = M(1 - r)^n$

$P = 3000(1 - 0.08)^3$

$P = 3000 \times 0.778\,688 = 2336.064 \quad \checkmark$

c $a^2 + b^2 = c^2$

$a^2 + 36^2 = 39^2$

$a^2 + 1296 = 1521$

$a^2 = 1521 - 1296$

$a^2 = 225$

$a = \sqrt{225}$

$= 15 \text{ cm} \quad \checkmark\checkmark$

d i Fuel consumption = $\frac{26}{5.22} = 4.98 \text{ L} \quad \checkmark$

ii Amount of fuel required

$= 4.98 \text{ L}/100 \text{ km} \times 974 \text{ km}$

$= 48.5 \text{ L} \quad \checkmark$

Cost for journey = 48.5 × 159.9

$= 7755.15 \text{ cents}$

$= \$77.55 \quad \checkmark$

e $P = \frac{10000}{8} = 1250$ (there are 8 bits in each byte). \checkmark

$Q = 1250 \div 1000 = 1.25 \quad \checkmark$

$R = 1250 \div 1\,000\,000 \times 60 = 0.075 \quad \checkmark$

f Job A pays \$75 000 ÷ 52 ÷ 40 = \$36.06 per hour \checkmark

Job B pays \$74 100 ÷ 52 ÷ 38 = \$37.50 per hour \checkmark

Therefore, Natalie should choose Job B. \checkmark