

Foundation Mathematics Units 3 & 4

Chapter 14 — Practice examinations

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Formula Sheet — reference for all practice examinations

This Formula Sheet may be used in all six practice examinations in this booklet. Values shown for GST and the Medicare levy are the standard rates used throughout Foundation Mathematics.

Algebra, number and structure

Description	Formula
Distributive law	$a(b + c) = ab + ac$
Square root	$\sqrt{a^2} = a$, for $a \geq 0$
Ratios	$a : b = c : d \Rightarrow \frac{a}{b} = \frac{c}{d}$
Percentage error	$\frac{ \text{measured} - \text{actual} }{\text{actual}} \times 100\%$
Direct variation	$a = kb$, where k is a constant
Inverse variation	$a = \frac{k}{b}$, where k is a constant

Data analysis, probability and statistics

Description	Formula
Mean	$\bar{x} = \frac{\text{sum of data values}}{\text{number of data values}}$
Median position (ordered set, size n)	$\frac{n+1}{2}$
Range	maximum – minimum
Interquartile range	$\text{IQR} = Q_3 - Q_1$
Percentage relative frequency	$\frac{\text{frequency}}{\text{total number of trials}} \times 100\%$
Probability (large number of trials)	$\text{Pr}(A) \approx \frac{\text{number of times } A \text{ occurs}}{\text{total number of trials}}$

Space and measurement

Description	Formula
Pythagoras' theorem	$c^2 = a^2 + b^2$
Area of a triangle	$\frac{1}{2}bh$
Area of a trapezium	$\frac{1}{2}(a+b)h$
Circumference of a circle	$\pi d = 2\pi r$
Length of an arc	$\pi d \times \frac{\theta}{360}$
Area of a circle	πr^2
Area of a sector	$\pi r^2 \times \frac{\theta}{360}$
Volume of a sphere	$\frac{4}{3}\pi r^3$
Surface area of a sphere	$4\pi r^2$

Description	Formula
Volume of a cone	$\frac{1}{3} \pi r^2 h$
Volume of a prism	area of base $\times$ height
Volume of a pyramid	$\frac{1}{3} \times$ area of base $\times$ height

Heron's formula for the area of a triangle with sides a, b, c :

$$s = \frac{a+b+c}{2}, \text{Area} = \sqrt{s(s-a)(s-b)(s-c)}.$$

Financial and consumer mathematics

Description	Formula
Simple interest	$I = \frac{P r t}{100}$
Compound interest	$A = P R^n$, where $R = 1 + \frac{r}{100}$
Goods and services tax (GST)	10 %
Medicare levy	2 %
Percentage increase	$\frac{\text{final} - \text{initial}}{\text{initial}} \times 100 \%$
Percentage decrease	$\frac{\text{initial} - \text{final}}{\text{initial}} \times 100 \%$
Profit	income $-$ expenditure

End of Formula Sheet

Practice Exam 1

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each question is worth 1 mark.

Question 1

The value of $3 + 4 \times 5$ is

- A. 27
- B. 20
- C. 23
- D. 35

Question 2

20% of 150 is

- A. 15
- B. 30
- C. 300
- D. 45

Question 3

The number 6.47 rounded to one decimal place is

- A. 6.5
- B. 7.0
- C. 6.4
- D. 6.0

Question 4

The ratio 12:18 written in simplest form is

- A. 6:9
- B. 2:3
- C. 3:2
- D. 1:2

Question 5

The number 45 000 written in scientific notation is

- A. 4.5×10^4
- B. 4.5×10^3
- C. 45×10^3
- D. 4.5×10^5

Question 6

The variables x and y are in direct proportion, and $y=12$ when $x=3$. When $x=5$, the value of y is

- A. 24
- B. 60
- C. 15
- D. 20

Question 7

The solution of the equation $2x + 5 = 13$ is

- A. $x=3$
- B. $x=9$
- C. $x=4$
- D. $x=4.5$

Question 8

The mean of 4, 6, 8, 10, 12 is

- A. 6
- B. 10
- C. 40
- D. 8

Question 9

The median of 3, 5, 7, 9, 11, 13 is

- A. 9
- B. 6
- C. 8
- D. 7

Question 10

The range of 12, 15, 20, 25, 30 is

- A. 30
- B. 15
- C. 18
- D. 20

Question 11

A fair six-sided die is rolled once. The probability of rolling an even number is

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

Question 12

A survey records each person's eye colour. This data is

- A. categorical
- B. ordinal and numerical
- C. numerical and discrete
- D. numerical and continuous

Question 13

The simple interest on \$ 1000 invested at 5 % per annum for 2 years is

- A. \$ 1100
- B. \$ 50
- C. \$ 150
- D. \$ 100

Question 14

The GST (at 10 %) on a purchase of \$ 200 is

- A. \$ 200
- B. \$ 22
- C. \$ 2
- D. \$ 20

Question 15

A jacket marked at \$ 80 is discounted by 15 %. The price paid is

- A. \$ 12
- B. \$ 95
- C. \$ 68
- D. \$ 65

Question 16

A traveller changes \$ 100 Australian dollars to US dollars at a rate of 1 AUD = 0.65 USD. The amount received is

- A. \$ 65 USD
- B. \$ 100 USD
- C. \$ 35 USD
- D. \$ 153.85 USD

Question 17

The area of a rectangle 8 m long and 5 m wide is

- A. 13 m^2
- B. 80 m^2
- C. 40 m^2
- D. 26 m^2

Question 18

A length of 3 metres is equal to

- A. 30 cm
- B. 300 cm
- C. 3000 cm
- D. 0.03 cm

Question 19

The volume of a cube with side length 4 cm is

- A. 48 cm^3
- B. 64 cm^3
- C. 12 cm^3
- D. 16 cm^3

Question 20

Two angles lie on a straight line. Their sizes add to

- A. 45°
- B. 360°
- C. 90°
- D. 180°

End of Section A

Section B

Answer all questions in the spaces provided. In all questions where a numerical answer is required, you should only round your answer when instructed to do so. In questions where more than one mark is available, appropriate working must be shown.

Question 1 (5 marks)

A jacket is priced at \$ 120.

- a. A store offers 25 % off. Find the discount amount. 1 mark
- b. Find the sale price of the jacket. 1 mark
- c. A second store sells the same jacket for \$ 110 with 15 % off. Find its sale price. 2 marks
- d. State which store is cheaper. 1 mark

Question 2 (5 marks)

A concrete mix uses cement, sand and gravel in the ratio 1 : 2 : 3.

- a. How many parts are there in total? 1 mark
- b. A batch uses 30 kg of mix. Find the mass of sand in the batch. 2 marks
- c. Another batch uses 4 kg of cement. Find the mass of gravel needed. 2 marks

Question 3 (5 marks)

A plumber charges $C = 80 + 65h$ dollars for a job lasting h hours.

- a. Find the cost of a job that takes 3 hours. 2 marks
- b. Show that a job costing \$ 340 takes 4 hours. 2 marks
- c. State what the number 80 represents in this situation. 1 mark

Question 4 (5 marks)

The numbers of goals scored by a team in 7 matches were

1, 2, 2, 2, 3, 4, 7.

- a. Find the mean number of goals. 2 marks
- b. Find the median. 1 mark
- c. Find the mode. 1 mark
- d. Find the range. 1 mark

Question 5 (5 marks)

In a survey, 40 students chose a favourite sport, as shown below.

Sport	Football	Netball	Cricket	Basketball
Number of students	14	10	8	8

- How many students chose cricket? 1 mark
- What fraction of the students chose football? Give your answer in simplest form. 2 marks
- What percentage of the students chose netball? 1 mark
- State the modal sport. 1 mark

Question 6 (5 marks)

A bag contains 5 red, 3 blue and 2 green marbles. One marble is drawn at random.

- Find the probability that the marble is red. 1 mark
- Find the probability that the marble is **not** green. 2 marks
- The marble is returned and the draw is repeated 30 times. Find the expected number of blue marbles drawn. 2 marks

Question 7 (5 marks)

Maria invests \$2000 at 4% per annum simple interest for 3 years.

- Find the simple interest earned. 2 marks
- Find the total amount in the account after 3 years. 1 mark
- Show that, at 5% per annum, the interest earned over 3 years would be \$300. 2 marks

Question 8 (5 marks)

Two mobile phone plans are offered. Plan A costs \$30 per month. Plan B costs \$15 per month plus \$0.10 per call, and a user makes 100 calls each month.

- Find the yearly cost of Plan A. 1 mark
- Find the monthly cost of Plan B for this user. 2 marks
- Find the yearly cost of Plan B, and state which plan is cheaper over a year. 2 marks

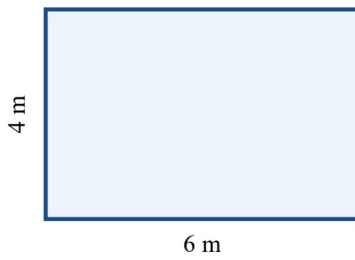
Question 9 (5 marks)

A market stall sells 40 hats at \$12 each on a Saturday.

- Find the total revenue from the hats. 1 mark
- The stall's costs for the day are \$150. Find the profit. 2 marks
- GST of 10% must be added to the \$12 price. Find the new GST-inclusive price of a hat. 2 marks

Question 10 (5 marks)

A rectangular room is shown below.



- a. Find the perimeter of the room. 2 marks
- b. Find the area of the floor. 2 marks
- c. Carpet costs \$35 per square metre. Find the cost to carpet the floor. 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 0.5 m and height 2 m. The volume of a cylinder is $V = \pi r^2 h$.

- a. Find the volume of the tank, in cubic metres, correct to two decimal places. 2 marks
- b. Show that the tank holds about 1570 litres. ($1 \text{ m}^3 = 1000 \text{ litres}$.) 2 marks
- c. State one assumption you have made in part b. 1 mark

Question 12 (5 marks)

- a. Convert 2.5 km to metres. 1 mark
- b. Two angles lie on a straight line. One angle is 110° . Find the size of the other angle. 2 marks
- c. A triangle has two angles of 50° and 60° . Show that the third angle is 70° . 2 marks

End of Section B

Practice Exam 1 — Solutions

Section A

Question	Answer	Working
1	C	$3 + 4 \times 5 = 3 + 20 = 23$ (multiply before add).
2	B	$0.20 \times 150 = 30$.
3	A	The next digit is 7, so 6.4 rounds up to 6.5.
4	B	$12 : 18 = 2 : 3$ (divide both by 6).
5	A	$45\,000 = 4.5 \times 10^4$.
6	D	$k = 12 \div 3 = 4$, so $y = 4 \times 5 = 20$.
7	C	$2x = 8$, so $x = 4$.
8	D	$\frac{4+6+8+10+12}{5} = \frac{40}{5} = 8$.
9	C	Median = $\frac{7+9}{2} = 8$.
10	C	$30 - 12 = 18$.
11	B	$\frac{3}{6} = \frac{1}{2}$ (even: 2, 4, 6).
12	A	Eye colour is a category, not a number.
13	D	$I = \frac{1000 \times 5 \times 2}{100} = 100$.
14	D	$0.10 \times 200 = 20$.
15	C	$80 \times 0.85 = 68$.
16	A	$100 \times 0.65 = 65$.
17	C	$8 \times 5 = 40 \text{ m}^2$.
18	B	$3 \times 100 = 300 \text{ cm}$.
19	B	$4^3 = 64 \text{ cm}^3$.
20	D	Angles on a straight line sum to 180° .

Section B

Question 1.

a. Discount = $25\% \times \$120 = 0.25 \times 120 = \30 .

b. Sale price = $\$120 - \$30 = \$90$.

c. Second store: 15% off \$110 is $0.15 \times 110 = \$16.50$, so the sale price is $110 - 16.50 = \$93.50$.

d. The first store (\$90) is cheaper than the second (\$93.50).

Question 2.

a. $1 + 2 + 3 = 6$ parts.

b. Sand is 2 parts out of 6, so mass of sand $= \frac{2}{6} \times 30 = 10$ kg.

c. One part = 4 kg (the cement). Gravel is 3 parts, so mass of gravel $= 3 \times 4 = 12$ kg.

Question 3.

a. $C = 80 + 65 \times 3 = 80 + 195 = \275 .

b. Set $C = 340$:

$$80 + 65h = 340$$

$$65h = 260$$

$$h = 4.$$

So a job costing \$340 takes 4 hours.

c. The \$80 is the fixed call-out fee charged before any hours are worked.

Question 4.

a. Mean $= \frac{1+2+2+2+3+4+7}{7} = \frac{21}{7} = 3$ goals.

b. With 7 values, the median is the 4th value: median = 2 goals.

c. The value 2 occurs most often (three times), so the mode = 2 goals.

d. Range $= 7 - 1 = 6$ goals.

Question 5.

a. 8 students chose cricket.

b. Fraction for football $= \frac{14}{40} = \frac{7}{20}$.

c. Percentage for netball $= \frac{10}{40} \times 100\% = 25\%$.

d. Football was chosen most often (14 students), so it is the modal sport.

Question 6.

a. There are 10 marbles, 5 red, so $\Pr(\text{red}) = \frac{5}{10} = \frac{1}{2}$.

b. There are 2 green, so 8 are not green: $\Pr(\text{not green}) = \frac{8}{10} = \frac{4}{5}$.

c. $\Pr(\text{blue}) = \frac{3}{10}$, so the expected number in 30 draws $= \frac{3}{10} \times 30 = 9$.

Question 7.

a. $I = \frac{Prt}{100} = \frac{2000 \times 4 \times 3}{100} = \240 .

b. Total amount $= \$2000 + \$240 = \$2240$.

c. At 5 %: $I = \frac{2000 \times 5 \times 3}{100} = \frac{30\,000}{100} = \300 , as required.

Question 8.

a. Plan A per year $= 30 \times 12 = \$360$.

b. Plan B per month $= 15 + 0.10 \times 100 = 15 + 10 = \25 .

c. Plan B per year $= 25 \times 12 = \$300$. Since $\$300 < \360 , Plan B is cheaper over a year.

Question 9.

a. Revenue $= 40 \times \$12 = \480 .

b. Profit $= \text{revenue} - \text{costs} = 480 - 150 = \330 .

c. GST-inclusive price $= \$12 \times 1.10 = \13.20 .

Question 10.

a. Perimeter $= 2 \times (6 + 4) = 2 \times 10 = 20 \text{ m}$.

b. Area $= 6 \times 4 = 24 \text{ m}^2$.

c. Cost $= 24 \times \$35 = \840 .

Question 11.

a. $V = \pi r^2 h = \pi \times 0.5^2 \times 2 = \pi \times 0.25 \times 2 = 0.5\pi \approx 1.57 \text{ m}^3$.

b. In litres, $V \approx 1.5708 \times 1000 = 1570.8 \approx 1570$ litres.

c. It is assumed the tank is filled completely to the top (and is an exact cylinder).

Question 12.

a. $2.5 \text{ km} = 2.5 \times 1000 = 2500 \text{ m}$.

b. Angles on a straight line sum to 180° , so the other angle $= 180^\circ - 110^\circ = 70^\circ$.

c. The angles of a triangle sum to 180° , so the third angle $= 180^\circ - 50^\circ - 60^\circ = 70^\circ$, as required.

Practice Exam 2

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round your answer only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each correct answer is worth 1 mark.

Question 1

The number 3.847 rounded to two decimal places is

- A. 3.8
- B. 3.85
- C. 3.9
- D. 3.84

Question 2

15 % of \$ 80 is

- A. \$ 8
- B. \$ 20
- C. \$ 12
- D. \$ 15

Question 3

The ratio 16 : 24 written in simplest form is

- A. 4 : 5
- B. 3 : 2
- C. 2 : 3
- D. 6 : 9

Question 4

Written in scientific notation, 45 000 is

- A. 4.5×10^4
- B. 4.5×10^3
- C. 45×10^3
- D. 4.5×10^5

Question 5

The value of $3 + 4 \times 2$ is

- A. 11
- B. 14
- C. 10
- D. 24

Question 6

The perimeter of a rectangle is $P = 2l + 2w$. When $l = 5$ and $w = 3$, the value of P is

- A. 30
- B. 16
- C. 8
- D. 13

Question 7

The solution of $2x + 3 = 11$ is

- A. $x = 5.5$
- B. $x = 3$
- C. $x = 7$
- D. $x = 4$

Question 8

The mean of 4, 6, 8, 10 is

- A. 28
- B. 7
- C. 6
- D. 8

Question 9

The median of 3, 5, 7, 9, 11 is

- A. 6
- B. 7
- C. 5
- D. 9

Question 10

The range of the data 12, 15, 20, 8, 25 is

- A. 12
- B. 25
- C. 17
- D. 20

Question 11

A fair six-sided die is rolled once. The probability of rolling a number greater than 3 is

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

Question 12

Using $I = \frac{Prt}{100}$, the simple interest on \$500 at 4% per year for 2 years is

- A. \$80
- B. \$400
- C. \$40
- D. \$20

Question 13

The GST (at 10%) on an item costing \$60 is

- A. \$66
- B. \$54
- C. \$6
- D. \$10

Question 14

A jacket costing \$50 is discounted by 20%. The sale price is

- A. \$45
- B. \$30
- C. \$10
- D. \$40

Question 15

A business has an income of \$ 800 and expenditure of \$ 650. Its profit is

- A. \$ 1450
- B. \$ 150
- C. \$ 650
- D. \$ 800

Question 16

The perimeter of a rectangle that is 6 m long and 4 m wide is

- A. 24 m
- B. 10 m
- C. 12 m
- D. 20 m

Question 17

The area of a triangle with base 8 cm and height 5 cm is

- A. 40 cm^2
- B. 13 cm^2
- C. 26 cm^2
- D. 20 cm^2

Question 18

The volume of a rectangular box measuring 3 cm by 4 cm by 5 cm is

- A. 60 cm^3
- B. 20 cm^3
- C. 12 cm^3
- D. 47 cm^3

Question 19

A length of 2.5 m is equal to

- A. 0.025 cm
- B. 25 cm
- C. 250 cm
- D. 2500 cm

Question 20

Using $C = 2\pi r$, the circumference of a circle of radius 7 cm, correct to the nearest whole number, is

- A. 44 cm
- B. 22 cm
- C. 14 cm
- D. 154 cm

End of Section A

Section B

Answer all questions in the spaces provided. In all questions where more than one mark is available, appropriate working must be shown. Round only when instructed.

Question 1 (5 marks)

A store is having a sale.

- a. Find 25 % of \$ 80. 1 mark
- b. A jacket marked \$ 80 is reduced by 25 %. Find the sale price. 1 mark
- c. GST of 10 % is added to an item costing \$ 90. Find the total price paid. 1 mark
- d. Show that an item costing \$ 120 reduced by 15 % has a sale price of \$ 102. 2 marks

Question 2 (5 marks)

- a. Simplify $3a + 5a - 2a$. 1 mark
- b. The cost of hiring a plumber is $C = 40 + 25h$ dollars for a job lasting h hours. Find the cost of a 3-hour job. 2 marks
- c. Solve $4x - 5 = 19$. 2 marks

Question 3 (5 marks)

- a. Divide \$ 60 between two workers in the ratio 2 : 3. 2 marks
- b. A recipe uses 300 g of flour to make 12 biscuits. How much flour is needed to make 20 biscuits? 2 marks
- c. Show that the ratio 8 : 12 simplifies to 2 : 3. 1 mark

Question 4 (5 marks)

The masses (in kg) of six parcels are

6, 8, 8, 10, 12, 16.

- a. Find the mean mass. 2 marks
- b. Find the median mass. 1 mark
- c. Find the range. 1 mark
- d. Write down the mode. 1 mark

Question 5 (5 marks)

A bag contains 3 red, 5 blue and 2 green marbles.

- a. Find the probability of drawing a red marble. 1 mark
- b. Find the probability of drawing a marble that is **not** green. 2 marks
- c. A marble is drawn and then replaced, 50 times in all. How many red marbles would you expect? 2 marks

Question 6 (5 marks)

A survey of 30 people recorded each person's favourite colour: blue 12, red 8, green 6, yellow 4.

- a. What percentage of people chose blue? 2 marks
- b. Write down the modal (most common) colour. 1 mark
- c. What fraction of people chose green? Give your answer in simplest form. 1 mark
- d. State the most appropriate type of graph for displaying this data. 1 mark

Question 7 (5 marks)

\$2000 is invested for 3 years.

- a. At 5 % per year simple interest, use $I = \frac{Prt}{100}$ to find the interest earned. 2 marks
- b. Find the total amount in the account after 3 years. 1 mark
- c. If 5 % per year **compound** interest is paid instead, use $A = PR^n$ to show that the amount after 3 years is \$2315.25 (to the nearest cent). 2 marks

Question 8 (5 marks)

Priya works 38 hours per week and is paid \$25 per hour.

- a. Find her weekly pay. 1 mark
- b. Find her annual pay, assuming she works 52 weeks. 1 mark
- c. The Medicare levy is 2 % of annual income. Find the levy Priya pays. 1 mark
- d. Income tax is \$4288 plus 30 % of income above \$45 000. Show that Priya's tax is \$5608. 2 marks

Question 9 (5 marks)

A stall sells 200 drink bottles at \$12 each. Fixed costs are \$500 and each bottle costs \$4 to make.

- a. Find the total revenue. 1 mark
- b. Find the total cost (fixed costs plus the cost of making 200 bottles). 2 marks
- c. Find the profit. 1 mark
- d. Find the break-even number of bottles, rounded up to a whole bottle. 1 mark

Question 10 (5 marks)

A rectangular room is 8 m long and 5 m wide.

- a. Find the perimeter of the room. 1 mark
- b. Find the area of the floor. 1 mark
- c. Carpet costs \$30 per square metre. Find the cost of carpeting the room. 2 marks
- d. Show that an area of 40 m² is equal to 400 000 cm². 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 2 m and height 3 m. Use $V = \pi r^2 h$.

a. Find the volume of the tank, correct to two decimal places. 2 marks

b. Given that $1 \text{ m}^3 = 1000 \text{ L}$, find the capacity of the tank in litres, to the nearest litre. 2 marks

c. Water is removed using 1000 L containers. How many containers are needed to empty a full tank? 1 mark

Question 12 (5 marks)

a. On a map with scale 1 : 50 000, two towns are 6 cm apart. Find the real distance between the towns, in kilometres. 2 marks

b. Two angles of a triangle are 50° and 60° . Find the third angle. 1 mark

c. A triangle has sides 3 cm, 4 cm and 5 cm. Using Pythagoras' theorem, show that the triangle is right-angled. 2 marks

End of Section B

Practice Exam 2 — Solutions

Section A — answer key

Question	Answer	Working
1	B	The next digit is $7 \geq 5$, so $3.847 \rightarrow 3.85$.
2	C	$0.15 \times 80 = 12$.
3	C	Divide both parts by 8: $16:24 = 2:3$.
4	A	$45\,000 = 4.5 \times 10^4$.
5	A	Multiply first: $3 + 4 \times 2 = 3 + 8 = 11$.
6	B	$2 \times 5 + 2 \times 3 = 10 + 6 = 16$.
7	D	$2x = 8$, so $x = 4$.
8	B	$\frac{4+6+8+10}{4} = \frac{28}{4} = 7$.
9	B	The middle (3rd) value is 7.
10	C	$25 - 8 = 17$.
11	A	3 outcomes (4, 5, 6) out of 6: $\frac{3}{6} = \frac{1}{2}$.
12	C	$\frac{500 \times 4 \times 2}{100} = 40$.
13	C	$0.10 \times 60 = 6$.
14	D	$50 \times 0.80 = 40$.
15	B	$800 - 650 = 150$.
16	D	$2(6 + 4) = 20$ m.
17	D	$\frac{1}{2} \times 8 \times 5 = 20$ cm ² .
18	A	$3 \times 4 \times 5 = 60$ cm ³ .
19	C	$2.5 \times 100 = 250$ cm.
20	A	$2\pi \times 7 = 43.98 \dots \approx 44$ cm.

Section B — worked solutions

Question 1. **a.** 25% of $\$80 = 0.25 \times 80 = \20 . **b.** Sale price $= 80 - 20 = \$60$ (or $80 \times 0.75 = \$60$). **c.** GST $= 0.10 \times 90 = \$9$, so the total $= 90 + 9 = \$99$. **d.** A reduction of 15% leaves 85% of the price:

$$120 \times 0.85 = 102.$$

$\therefore$ the sale price is $\$102$.

Question 2. **a.** $3a + 5a - 2a = 6a$. **b.** $C = 40 + 25 \times 3 = 40 + 75 = \115 . **c.** $4x - 5 = 19 \Rightarrow 4x = 24 \Rightarrow x = 6$.

Question 3. **a.** Total parts $= 2 + 3 = 5$. One part $= \frac{60}{5} = \$12$, so the shares are $2 \times 12 = \$24$ and $3 \times 12 = \$36$. **b.** One biscuit uses $\frac{300}{12} = 25$ g, so 20 biscuits use $20 \times 25 = 500$ g. **c.** Dividing both parts by 4: $8:12 = 2:3$.

Question 4. **a.** $\text{Mean} = \frac{6+8+8+10+12+16}{6} = \frac{60}{6} = 10$ kg. **b.** With $n=6$, the median is the average of the 3rd and 4th values: $\frac{8+10}{2} = 9$ kg. **c.** Range = $16 - 6 = 10$ kg. **d.** The mode is 8 kg (it occurs twice).

Question 5. **a.** There are 10 marbles, so $\text{Pr}(\text{red}) = \frac{3}{10}$. **b.** There are $10 - 2 = 8$ marbles that are not green, so $\text{Pr}(\text{not green}) = \frac{8}{10} = \frac{4}{5}$. **c.** Expected reds = $\frac{3}{10} \times 50 = 15$.

Question 6. **a.** $\frac{12}{30} \times 100\% = 40\%$. **b.** Blue was chosen most often (12), so the modal colour is **blue**. **c.** $\frac{6}{30} = \frac{1}{5}$. **d.** A bar (column) chart is most appropriate for this categorical data (a pie chart is also acceptable).

Question 7. **a.** $I = \frac{Prt}{100} = \frac{2000 \times 5 \times 3}{100} = \300 . **b.** Total = $2000 + 300 = \$2300$. **c.** With $R = 1 + \frac{5}{100} = 1.05$ and $n = 3$,

$$A = 2000 \times 1.05^3 = 2000 \times 1.157625 = 2315.25.$$

$\therefore$ the amount is \$2315.25.

Question 8. **a.** Weekly pay = $38 \times 25 = \$950$. **b.** Annual pay = $950 \times 52 = \$49\,400$. **c.** Medicare levy = $0.02 \times 49\,400 = \$988$. **d.** Income above \$45 000 is $49\,400 - 45\,000 = \$4400$. Then

$$\text{tax} = 4288 + 0.30 \times 4400 = 4288 + 1320 = 5608.$$

$\therefore$ Priya's tax is \$5608.

Question 9. **a.** Revenue = $200 \times 12 = \$2400$. **b.** Total cost = $500 + 4 \times 200 = 500 + 800 = \1300 . **c.** Profit = $2400 - 1300 = \$1100$. **d.** Break-even: $500 + 4n = 12n \Rightarrow 500 = 8n \Rightarrow n = 62.5$, so 63 bottles must be sold.

Question 10. **a.** Perimeter = $2(8 + 5) = 26$ m. **b.** Area = $8 \times 5 = 40$ m². **c.** Cost = $40 \times 30 = \$1200$. **d.** $1 \text{ m}^2 = 100 \times 100 = 10\,000 \text{ cm}^2$, so $40 \text{ m}^2 = 40 \times 10\,000 = 400\,000 \text{ cm}^2$.

Question 11. **a.** $V = \pi \times 2^2 \times 3 = 12\pi = 37.699 \dots \approx 37.70 \text{ m}^3$. **b.** Capacity = $37.699 \times 1000 = 37\,699 \text{ L}$ (to the nearest litre). **c.** $\frac{37\,699}{1000} = 37.699$, so 38 containers are needed (one extra for the remainder).

Question 12. **a.** Real distance = $6 \times 50\,000 = 300\,000 \text{ cm} = 3000 \text{ m} = 3 \text{ km}$. **b.** Third angle = $180^\circ - 50^\circ - 60^\circ = 70^\circ$. **c.** $3^2 + 4^2 = 9 + 16 = 25 = 5^2$. Since the sum of the squares of the two shorter sides equals the square of the longest side, the triangle is right-angled.

Practice Exam 3

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each question is worth 1 mark.

Question 1

The value of $20 - 3 \times 4 + 6$ is

- A. 2
- B. 14
- C. 26
- D. 62

Question 2

Which one of the following numbers is **irrational**?

- A. $\sqrt{16}$
- B. 0.75
- C. $\sqrt{20}$
- D. $\frac{3}{8}$

Question 3

Written in scientific notation, 3 200 000 is

- A. 3.2×10^4
- B. 32×10^5
- C. 3.2×10^5
- D. 3.2×10^6

Question 4

A jacket priced at \$120 is discounted by 25 %. The sale price is

- A. \$90
- B. \$95
- C. \$30
- D. \$145

Question 5

An amount of \$ 72 is shared between two people in the ratio 3:5. The larger share is

- A. \$ 27
- B. \$ 45
- C. \$ 9
- D. \$ 40

Question 6

The price of an item rises from \$ 40 to \$ 46. The percentage increase is

- A. 6 %
- B. 13 %
- C. 15 %
- D. 46 %

Question 7

The solution of the equation $2(x + 3) = 20$ is

- A. $x = 5.5$
- B. $x = 8.5$
- C. $x = 13$
- D. $x = 7$

Question 8

A quantity y varies directly with x , and $y = 15$ when $x = 3$. When $x = 8$, the value of y is

- A. 40
- B. 24
- C. 45
- D. 120

Question 9

The mean of 4, 7, 9, 12, 13 is

- A. 11
- B. 9
- C. 12
- D. 45

Question 10

The median of 3, 5, 8, 8, 10, 15, 20 is

- A. 10
- B. 8.5
- C. 8
- D. 9.86

Question 11

The five-number summary of a data set is 5, 9, 14, 19, 28. The interquartile range is

- A. 10
- B. 23
- C. 14
- D. 5

Question 12

A bag contains 12 balls, of which 3 are red. The probability of drawing a red ball at random is

- A. 3
- B. $\frac{1}{3}$
- C. 0.3
- D. 0.25

Question 13

The simple interest earned on \$ 2000 at 4 % per annum for 3 years is

- A. \$ 2240
- B. \$ 240
- C. \$ 80
- D. \$ 2400

Question 14

A price of \$ 88 includes 10 % GST. The amount of GST included is

- A. \$ 8
- B. \$ 8.80
- C. \$ 80
- D. \$ 9.78

Question 15

An amount of \$ 500 is invested at 6 % per annum compound interest for 2 years. The amount in the account is

- A. \$ 560
- B. \$ 530
- C. \$ 572
- D. \$ 561.80

Question 16

Which of the following is the **best value** for money?

- A. 1.5 L for \$ 2.85
- B. the two options cost the same per litre
- C. 2 L for \$ 3.60
- D. it cannot be determined

Question 17

The area of a triangle with base 14 cm and height 6 cm is

- A. 42 cm^2
- B. 84 cm^2
- C. 20 cm^2
- D. 40 cm^2

Question 18

The volume of a cylinder with radius 3 cm and height 10 cm, to the nearest cubic centimetre, is

- A. 188 cm^3
- B. 283 cm^3
- C. 90 cm^3
- D. 942 cm^3

Question 19

An area of 3.6 m^2 is equal to

- A. 360 cm^2
- B. 3600 cm^2
- C. $360\,000 \text{ cm}^2$
- D. $36\,000 \text{ cm}^2$

Question 20

A right-angled triangle has the two shorter sides 5 cm and 12 cm. The length of the hypotenuse is

- A. 17 cm
- B. 60 cm
- C. 13 cm
- D. 169 cm

End of Section A

Section B

Answer all questions in the spaces provided. In questions where more than one mark is available, appropriate working must be shown. Round only when instructed.

Question 1 (5 marks)

A bakery mixes flour and sugar in the ratio 350 g : 150 g.

- a. Write the ratio 350 : 150 in its simplest form. 1 mark
- b. The recipe is scaled up to a total mix of 2.5 kg in the same ratio. Find the mass of flour and the mass of sugar. 2 marks
- c. In one 500 g batch (350 g flour and 150 g sugar), what percentage is sugar? 2 marks

Question 2 (5 marks)

A plumber charges a \$45 call-out fee plus \$1.20 per minute. The cost \$ C of a job lasting n minutes is $C = 45 + 1.20n$.

- a. Find the cost of a job lasting 80 minutes. 1 mark
- b. A job cost \$93. Find how many minutes it lasted. 2 marks
- c. Show that a job lasting 50 minutes costs \$105. 2 marks

Question 3 (5 marks)

A stall sells scented candles for \$12 each. The costs are a fixed \$300 plus \$4 for each candle made.

- a. Write an expression for the revenue R and an expression for the total cost C when n candles are made and sold. 1 mark
- b. Find the number of candles the stall must sell to break even. 2 marks
- c. Show that selling 60 candles gives a profit of \$180. 2 marks

Question 4 (5 marks)

The numbers of parcels delivered by a courier over 11 days were

12, 15, 15, 18, 20, 22, 24, 27, 30, 33, 55.

- a. Find the median number of parcels. 1 mark
- b. Find the lower quartile Q_1 , the upper quartile Q_3 and the interquartile range. 2 marks
- c. Show that the value 55 is an outlier. 2 marks

Question 5 (5 marks)

200 customers were surveyed about their preferred store. The results are shown below.

	Store A	Store B	Total
Female	70	30	100
Male	50	50	100
Total	120	80	200

- How many customers preferred Store B? 1 mark
- What percentage of the Store A customers were female? Give your answer to one decimal place. 2 marks
- What percentage of all customers preferred Store A? 2 marks

Question 6 (5 marks)

A spinner has 8 equal sectors, of which 3 are blue.

- Find the probability of spinning blue. 1 mark
- The spinner is spun 160 times. How many blue results would you expect? 2 marks
- In an experiment, blue came up 54 times in 160 spins. Find the relative frequency of blue and compare it with the theoretical probability. 2 marks

Question 7 (5 marks)

Maria invests \$ 4000 at 5 % per annum.

- Find the simple interest earned in 3 years. 1 mark
- If instead the interest is compounded annually, find the amount in the account after 3 years. 2 marks
- Find how much more interest is earned by compounding rather than by simple interest over the 3 years. 2 marks

Question 8 (5 marks)

In one quarter, a business had sales of \$ 22 000 (including GST) and purchases of \$ 9900 (including GST).

- Find the GST included in the sales. 1 mark
- Find the GST included in the purchases. 2 marks
- The net GST payable on the Business Activity Statement is the GST on sales minus the GST on purchases. Show that the business must pay \$ 1100. 2 marks

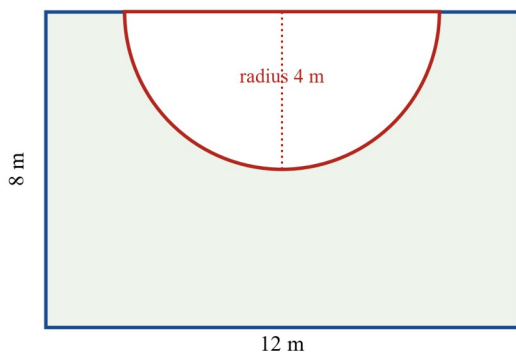
Question 9 (5 marks)

For a certain year, income tax is calculated as: no tax on the first \$ 18 200; then 19 cents for each \$ 1 over \$ 18 200. In addition, a Medicare levy of 2 % of total income is payable. A worker earns \$ 45 000 in a year.

- Find the income tax payable. 2 marks
- Find the Medicare levy. 1 mark
- Find the worker's net income after the tax and the levy have been paid. 2 marks

Question 10 (5 marks)

A rectangular lawn measures 12 m by 8 m. A semicircular garden bed of radius 4 m is cut from the middle of one long side, as shown.



- a. Find the perimeter of the 12 m by 8 m rectangle. 1 mark
- b. Find the area of lawn remaining after the garden bed is removed, correct to two decimal places. 2 marks
- c. Turf costs \$ 18 per square metre. Show that turfing the remaining lawn costs about \$ 1276. 2 marks

Question 11 (5 marks)

A cylindrical water tank has radius 0.5 m and height 1.2 m.

- a. Find the volume of the tank in cubic metres, correct to four decimal places. 2 marks
- b. Find the capacity of the tank in litres, to the nearest litre. ($1 \text{ m}^3 = 1000 \text{ L.}$) 1 mark
- c. Water has a density of 1000 kg/m^3 . Find the mass of water in the full tank. 2 marks

Question 12 (5 marks)

A room is drawn on a plan with a scale of 1 : 100. On the plan the room measures 7 cm by 3 cm.

- a. Find the real length of the 7 cm side, in metres. 1 mark
- b. Find the real floor area of the room. 2 marks
- c. Find the length of the diagonal of the room floor, correct to two decimal places. 2 marks

End of Section B

Practice Exam 3 — Solutions

Section A

Question	Answer	Working
1	B	$20 - 12 + 6 = 14$ (multiply before add/subtract).
2	C	$\sqrt{16} = 4$ and $3/8, 0.75$ are rational; $\sqrt{20} = 2\sqrt{5}$ is irrational.
3	D	The point moves 6 places: 3.2×10^6 .
4	A	$120 \times 0.75 = \$90$.
5	B	$72 \times 5/8 = \$45$.
6	C	$46 - 40/40 \times 100\% = 15\%$.
7	D	$x + 3 = 10$, so $x = 7$.
8	A	$k = 15 \div 3 = 5$, so $y = 5 \times 8 = 40$.
9	B	$45/5 = 9$.
10	C	7 values; the 4th is 8.
11	A	$IQR = 19 - 9 = 10$.
12	D	$3/12 = 0.25$.
13	B	$2000 \times 4 \times 3/100 = \240 .
14	A	$88 \div 11 = \$8$.
15	D	$500 \times 1.06^2 = \$561.80$.
16	C	$3.60 \div 2 = \$1.80/L$ vs $2.85 \div 1.5 = \$1.90/L$.
17	A	$1/2 \times 14 \times 6 = 42 \text{ cm}^2$.
18	B	$\pi \times 3^2 \times 10 = 90\pi \approx 283 \text{ cm}^3$.
19	D	$3.6 \times 10\,000 = 36\,000 \text{ cm}^2$.
20	C	$\sqrt{5^2 + 12^2} = \sqrt{169} = 13 \text{ cm}$.

Section B

Question 1. **a.** Dividing both parts by 50: $350 : 150 = 7 : 3$. **b.** The mix has $7 + 3 = 10$ parts, so one part is

$2500 \div 10 = 250 \text{ g}$. Flour $= 7 \times 250 = 1750 \text{ g}$; sugar $= 3 \times 250 = 750 \text{ g}$. **c.** $\frac{150}{500} \times 100\% = 30\%$.

Question 2. **a.** $C = 45 + 1.20 \times 80 = 45 + 96 = \141 . **b.** $45 + 1.20n = 93$, so $1.20n = 48$ and $n = \frac{48}{1.20} = 40$ minutes. **c.**

$C = 45 + 1.20 \times 50$. Now $1.20 \times 50 = 60$, so $C = 45 + 60 = \$105$, as required.

Question 3. **a.** $R = 12n$ and $C = 300 + 4n$. **b.** Break-even is where $R = C$: $12n = 300 + 4n$, so $8n = 300$ and $n = 37.5$. Since only whole candles can be sold, the stall must sell 38 candles to break even. **c.** For 60 candles: $R = 12 \times 60 = 720$ and $C = 300 + 4 \times 60 = 540$. Profit $= 720 - 540 = \$180$, as required.

Question 4. **a.** With $n = 11$ values, the median is the 6th value: 22. **b.** Lower half 12, 15, 15, 18, 20 gives $Q_1 = 15$; upper half 24, 27, 30, 33, 55 gives $Q_3 = 30$; so $IQR = 30 - 15 = 15$. **c.** The upper fence is $Q_3 + 1.5 \times IQR = 30 + 1.5 \times 15 = 30 + 22.5 = 52.5$. Since $55 > 52.5$, the value 55 lies beyond the upper fence and is an outlier.

Question 5. a. 80 customers preferred Store B. b. $\frac{70}{120} \times 100\% = 58.3\%$ (to 1 d.p.). c. $\frac{120}{200} \times 100\% = 60\%$.

Question 6. a. $Pr(\text{blue}) = \frac{3}{8} = 0.375$. b. Expected blue $= 160 \times \frac{3}{8} = 60$. c. Relative frequency $= \frac{54}{160} = 0.3375 \approx 0.338$. This is slightly less than the theoretical probability of 0.375, but close to it.

Question 7. a. $I = \frac{4000 \times 5 \times 3}{100} = \600 . b. $A = 4000 \times 1.05^3 = \4630.50 . c. Compound interest $= 4630.50 - 4000 = \$630.50$; simple interest $= \$600$; so compounding earns $630.50 - 600 = \$30.50$ more.

Question 8. a. GST on sales $= \frac{22\,000}{11} = \$2000$. b. GST on purchases $= \frac{9900}{11} = \$900$. c. Net GST $= 2000 - 900 = \$1100$, so the business must pay \$1100, as required.

Question 9. a. Tax $= 0.19 \times (45\,000 - 18\,200) = 0.19 \times 26\,800 = \5092 . b. Medicare levy $= 0.02 \times 45\,000 = \900 . c. Net income $= 45\,000 - 5092 - 900 = \$39\,008$.

Question 10. a. Perimeter $= 2(12 + 8) = 40$ m. b. Area of rectangle $= 12 \times 8 = 96 \text{ m}^2$. Area of semicircle $= \frac{1}{2} \pi \times 4^2 = 8\pi \approx 25.13 \text{ m}^2$. Remaining lawn $= 96 - 8\pi \approx 70.87 \text{ m}^2$. c. Cost $= 18 \times (96 - 8\pi) = 1275.61 \dots \approx \1276 , as required.

Question 11. a. $V = \pi r^2 h = \pi \times 0.5^2 \times 1.2 = 0.3\pi \approx 0.9425 \text{ m}^3$. b. Capacity $= 0.3\pi \times 1000 = 942.47 \dots \approx 942$ L. c. Mass $= \text{density} \times \text{volume} = 1000 \times 0.9425 = 942.5$ kg.

Question 12. a. Real length $= 7 \times 100 = 700$ cm $= 7$ m. b. The other side is $3 \times 100 = 300$ cm $= 3$ m, so the floor area $= 7 \times 3 = 21 \text{ m}^2$. c. Diagonal $= \sqrt{7^2 + 3^2} = \sqrt{58} \approx 7.62$ m.

Practice Exam 4

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each question is worth 1 mark.

Question 1

The value of $(6 + 2)^2 \div 4 - 3$ is

- A. 61
- B. 19
- C. 16
- D. 13

Question 2

Written as an ordinary number, 3.2×10^5 is

- A. 3 200 000
- B. 0.000032
- C. 32 000
- D. 320 000

Question 3

\$450 is divided between three people in the ratio 2:3:4. The largest share is

- A. \$250
- B. \$100
- C. \$150
- D. \$200

Question 4

y is directly proportional to x , and $y = 20$ when $x = 5$. When $x = 8$, the value of y is

- A. 32
- B. 12.5
- C. 40
- D. 25

Question 5

A price increases from \$80 to \$92. The percentage increase is

- A. 15 %
- B. 12 %
- C. 13 %
- D. 87 %

Question 6

A crowd is estimated at 250 people, but the actual number is 240. The percentage error is closest to

- A. 4.2 %
- B. 10 %
- C. 96 %
- D. 4 %

Question 7

The solution of $3x - 7 = 2x + 5$ is

- A. $x = 12$
- B. $x = 0.4$
- C. $x = 2.4$
- D. $x = -12$

Question 8

The median of 3, 7, 8, 10, 12, 15, 15 is

- A. 15
- B. 10
- C. 8
- D. 12

Question 9

A data set has the five-number summary 5, 10, 14, 20, 28. The interquartile range is

- A. 23
- B. 10
- C. 14
- D. 18

Question 10

The mean of 4, 6, 8, 10, 12 is

- A. 6
- B. 8
- C. 10
- D. 40

Question 11

A bag holds 5 red, 3 blue and 2 green marbles. One marble is drawn at random. The probability that it is **not** red is

- A. 0.3
- B. 0.5
- C. 0.7
- D. 0.2

Question 12

The simple interest on \$ 2000 at 5 % per annum for 3 years is

- A. \$ 2300
- B. \$ 315
- C. \$ 300
- D. \$ 100

Question 13

A price of \$ 66 includes 10 % GST. The amount of GST included is

- A. \$ 60
- B. \$ 9.68
- C. \$ 6
- D. \$ 6.60

Question 14

\$ 1000 is invested at 10 % per annum, compounding annually. After 2 years the amount is

- A. \$ 1102
- B. \$ 1200
- C. \$ 1210
- D. \$ 1100

Question 15

A 500 g pack of rice costs \$ 4.00 and a 750 g pack costs \$ 5.40. Better value is

- A. the 500 g pack
- B. they are equal value
- C. the 750 g pack
- D. it cannot be determined

Question 16

A triangle has base 12 cm and height 5 cm. Its area is

- A. 60 cm²
- B. 17 cm²
- C. 30 cm
- D. 30 cm²

Question 17

The volume of a cube of edge length 4 cm is

- A. 16 cm³
- B. 48 cm³
- C. 12 cm³
- D. 64 cm³

Question 18

2.5 m² expressed in square centimetres is

- A. 2500 cm²
- B. 250 000 cm²
- C. 250 cm²
- D. 25 000 cm²

Question 19

A right-angled triangle has the two shorter sides 6 cm and 8 cm. The hypotenuse is

- A. 100 cm
- B. 14 cm
- C. 48 cm
- D. 10 cm

Question 20

The circumference of a circle of radius 7 cm, correct to one decimal place, is

- A. 44.0 cm
- B. 22.0 cm
- C. 153.9 cm
- D. 14 cm

End of Section A

Section B

Answer all questions in the spaces provided. Appropriate working must be shown where more than one mark is available. Round only when instructed.

Question 1 (5 marks)

A market stall has fixed costs of \$120 per day. Each item costs \$2 to make and sells for \$5. The stall sells n items in a day.

- a. Write an expression for the daily profit P dollars in terms of n . 1 mark
- b. Show that the stall breaks even when $n = 40$. 2 marks
- c. Find the profit when 100 items are sold. 1 mark
- d. How many items must be sold for a profit of \$300? 1 mark

Question 2 (5 marks)

A muffin recipe for 4 people uses 500 g of flour and 300 mL of milk.

- a. How much flour is needed for 10 people? 2 marks
- b. The amount of milk is increased by 20%. Find the new amount of milk. 1 mark
- c. Write the ratio of flour to milk, 500 : 300, in simplest form. 1 mark
- d. Flour costs \$2.40 per kilogram. Find the cost of the flour needed for 10 people. 1 mark

Question 3 (5 marks)

A steward estimates the crowd at a local match as 2000 people. Ticket sales show the actual attendance was 2150.

- a. Find the absolute error in the estimate. 1 mark
- b. Find the percentage error, correct to one decimal place. 2 marks
- c. Round 2150 to two significant figures. 1 mark
- d. Write 2150 in scientific notation. 1 mark

Question 4 (5 marks)

The times (in minutes) taken to deliver 9 parcels were

12, 15, 18, 20, 22, 25, 28, 30, 50.

- a. Find the median delivery time. 1 mark
- b. Find the lower quartile Q_1 , the upper quartile Q_3 and the interquartile range. 2 marks

c. Show that the 50-minute delivery is an outlier.

2 marks

Question 5 (5 marks)

A survey asked 200 commuters how they usually travel to work. The results are shown below.

Mode	Car	Train	Bus	Walk
Number	90	50	30	30

a. What percentage of commuters travel by car?

1 mark

b. One commuter is chosen at random. Find the probability that they travel by train.

1 mark

c. Find the probability that a randomly chosen commuter travels by bus or walks.

1 mark

d. If 500 commuters were surveyed with the same proportions, how many would be expected to travel by car?

2 marks

Question 6 (5 marks)

A spinner has 5 equal sectors, of which 2 are red. The spinner is spun 80 times and lands on red 32 times.

a. Find the relative frequency of red from the 80 spins.

1 mark

b. Find the theoretical probability of red.

1 mark

c. Comment on how the relative frequency compares with the theoretical probability.

1 mark

d. Using the theoretical probability, estimate the number of reds in 400 spins.

2 marks

Question 7 (5 marks)

Priya has \$ 4000 to invest for 4 years.

a. Option 1 pays 6 % per annum simple interest. Find the interest earned over 4 years.

2 marks

b. Option 2 pays 5 % per annum compound interest. Find the amount after 4 years, correct to the nearest cent.

2 marks

c. State which option gives Priya more money, and by how much.

1 mark

Question 8 (5 marks)

A small business reports its figures for one quarter. GST is 10 %.

a. Sales were \$ 22 000 before GST. Find the GST to be added to the sales.

1 mark

b. The business paid \$ 8800 (GST-inclusive) for supplies. Find the GST included in this amount.

1 mark

c. Show that the net GST owed on the Business Activity Statement is \$ 1400.

2 marks

d. State the fraction of a GST-inclusive price that is GST.

1 mark

Question 9 (5 marks)

Sam earns a salary of \$ 60 000 per year.

a. Sam receives a 4 % pay rise. Find the new salary.

1 mark

b. Inflation that year was 5 %. State whether Sam's buying power increased or decreased, and explain briefly.

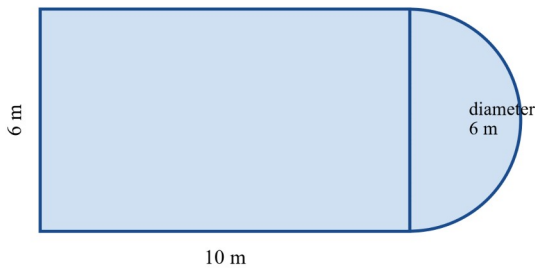
2 marks

c. Sam compares two phone plans: Plan A costs \$ 45 per month; Plan B costs \$ 500 per year. State which is cheaper over a year and by how much.

2 marks

Question 10 (5 marks)

A garden bed is a rectangle 10 m by 6 m with a semicircle of diameter 6 m attached to one short end, as shown.



- a. Find the area of the rectangular part. 1 mark
- b. Find the area of the semicircular part, correct to one decimal place. 2 marks
- c. Find the total area of the garden bed, correct to one decimal place. 1 mark
- d. Turf costs \$12 per square metre. Find the cost of turfing the whole bed, to the nearest dollar. 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 0.7 m and height 2.0 m.

- a. Show that the volume of the tank is about 3.08 m^3 . 2 marks
- b. Find the capacity of the tank in litres ($1 \text{ m}^3 = 1000 \text{ L}$), to the nearest litre. 1 mark
- c. Water flows in at 15 litres per minute. Find the time to fill the tank, to the nearest minute. 1 mark
- d. Water has a density of 1 kg per litre. Find the mass of water in the full tank. 1 mark

Question 12 (5 marks)

- a. On a map with scale 1:50 000, two towns are 8 cm apart. Find the real distance between them, in kilometres. 2 marks
- b. A floor plan is drawn to a scale of 1:100. A room measures 5 cm by 4 cm on the plan. Find the real area of the room, in square metres. 2 marks
- c. A length is measured as 24.6 cm, correct to the nearest millimetre. Write down the range of possible true values. 1 mark

End of Section B

Practice Exam 4 — Solutions

Section A

Question	Answer	Working
1	D	$(6+2)^2 \div 4 - 3 = 64 \div 4 - 3 = 16 - 3 = 13$.
2	D	$3.2 \times 10^5 = 3.2 \times 100\,000 = 320\,000$.
3	D	$2+3+4=9$ parts; largest $= \frac{4}{9} \times 450 = \200 .
4	A	$k = 20 \div 5 = 4$, so $y = 4 \times 8 = 32$.
5	A	$\frac{92-80}{80} \times 100\% = \frac{12}{80} \times 100\% = 15\%$.
6	A	$\frac{ 250-240 }{240} \times 100\% = \frac{10}{240} \times 100\%$.
7	A	$3x - 7 = 2x + 5 \Rightarrow x = 12$.
8	B	$n=7$; median is the 4th value, 10.
9	B	$\text{IQR} = Q_3 - Q_1 = 20 - 10 = 10$.
10	B	$\frac{4+6+8+10+12}{5} = \frac{40}{5} = 8$.
11	B	$\text{Pr}(\text{not red}) = \frac{3+2}{10} = \frac{5}{10} = 0.5$.
12	C	$I = \frac{2000 \times 5 \times 3}{100} = \300 .
13	C	$\text{GST included} = \frac{66}{11} = \6 .
14	C	$A = 1000 \times 1.10^2 = \1210 .
15	C	$\$4.00 = 400$ c, so $400 \div 500 = 0.80$ c/g; $\$5.40 = 540$ c, so $540 \div 750 = 0.72$ c/g — the 750 g pack is cheaper per gram.
16	D	$\frac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2$.
17	D	$4^3 = 64 \text{ cm}^3$.
18	D	$2.5 \times 100^2 = 2.5 \times 10\,000 = 25\,000 \text{ cm}^2$.
19	D	$\sqrt{6^2 + 8^2} = \sqrt{100} = 10 \text{ cm}$.
20	A	$2\pi \times 7 = 43.98 \dots \approx 44.0 \text{ cm}$.

Section B

Question 1.

a. Revenue is $5n$ and total cost is $120 + 2n$, so $P = 5n - (120 + 2n) = 3n - 120$.

b. Break-even is where $P=0$:

$$3n - 120 = 0$$

$$3n = 120$$

$$n = 40.$$

So the stall breaks even at $n=40$ items.

c. $P = 3(100) - 120 = 300 - 120 = \$180.$

d. $3n - 120 = 300 \Rightarrow 3n = 420 \Rightarrow n = 140$ items.

Question 2.

a. For 1 person, flour $= 500 \div 4 = 125$ g, so for 10 people, flour $= 125 \times 10 = 1250$ g.

b. New milk $= 300 \times 1.20 = 360$ mL.

c. $500 : 300 = 5 : 3$ (dividing both parts by 100).

d. $1250 \text{ g} = 1.25 \text{ kg}$, so cost $= 1.25 \times \$2.40 = \$3.00.$

Question 3.

a. Absolute error $= |2000 - 2150| = 150.$

b. Percentage error $= \frac{150}{2150} \times 100\% = 6.97\ldots\% \approx 7.0\%.$

c. 2150 to two significant figures is 2200.

d. $2150 = 2.15 \times 10^3.$

Question 4.

a. With $n=9$ ordered values, the median is the 5th value, 22 minutes.

b. Lower half 12, 15, 18, 20 gives $Q_1 = \frac{15+18}{2} = 16.5$; upper half 25, 28, 30, 50 gives $Q_3 = \frac{28+30}{2} = 29$. So IQR $= 29 - 16.5 = 12.5$ minutes.

c. The upper fence is

$$Q_3 + 1.5 \times \text{IQR} = 29 + 1.5 \times 12.5 = 29 + 18.75 = 47.75 \text{ minutes}.$$

Since $50 > 47.75$, the 50-minute delivery lies beyond the upper fence and is an outlier.

Question 5.

a. Car: $\frac{90}{200} \times 100\% = 45\%.$

b. $\text{Pr}(\text{train}) = \frac{50}{200} = 0.25.$

c. $\text{Pr}(\text{bus or walk}) = \frac{30+30}{200} = \frac{60}{200} = 0.3.$

d. Expected car travellers $= 0.45 \times 500 = 225.$

Question 6.

a. Relative frequency $= \frac{32}{80} = 0.4$.

b. Theoretical probability $= \frac{2}{5} = 0.4$.

c. The relative frequency (0.4) equals the theoretical probability (0.4) here, showing good agreement between the experiment and theory.

d. Expected reds $= 0.4 \times 400 = 160$.

Question 7.

a. $I = \frac{Prt}{100} = \frac{4000 \times 6 \times 4}{100} = \960 .

b. $A = PR^n = 4000 \times 1.05^4 = \4862.03 (to the nearest cent).

c. Option 1 gives $4000 + 960 = \$4960$; Option 2 gives $\$4862.03$. Option 1 gives more, by $4960 - 4862.03 = \$97.97$.

Question 8.

a. GST to add $= 10\% \times 22\,000 = \2200 .

b. GST included $= \frac{8800}{11} = \$800$.

c. Net GST = GST collected on sales – GST paid on purchases:

$$2200 - 800 = \$1400.$$

So the net GST owed on the BAS is $\$1400$.

d. GST is 10% of the GST-exclusive price, so the GST-inclusive price is 110%. The fraction that is GST is $\frac{10}{110} = \frac{1}{11}$.

Question 9.

a. New salary $= 60\,000 \times 1.04 = \$62\,400$.

b. The pay rise (4%) is less than inflation (5%), so the real value of the salary falls by about 1% — Sam's buying power **decreased**.

c. Plan A costs $45 \times 12 = \$540$ per year; Plan B costs $\$500$ per year. Plan B is cheaper, by $540 - 500 = \$40$.

Question 10.

a. Rectangle area $= 10 \times 6 = 60 \text{ m}^2$.

b. The semicircle has diameter 6 m, so radius 3 m. Area $= \frac{1}{2} \pi r^2 = \frac{1}{2} \pi (3)^2 = 14.14 \dots \approx 14.1 \text{ m}^2$.

c. Total area $= 60 + 14.14 = 74.14 \approx 74.1 \text{ m}^2$.

d. Cost $= 74.14 \times \$12 = \$889.6 \dots \approx \$890$.

Question 11.

a. $V = \pi r^2 h = \pi \times (0.7)^2 \times 2.0 = \pi \times 0.49 \times 2.0 = 3.0788 \dots \approx 3.08 \text{ m}^3$.

b. Capacity = $3.0788 \times 1000 = 3078.8 \approx 3079$ L.

c. Time = $\frac{3078.8}{15} = 205.3 \dots \approx 205$ minutes.

d. Mass = $3079 \times 1 = 3079$ kg (using 1 kg per litre).

Question 12.

a. Real distance = $8 \times 50\,000 = 400\,000$ cm = 4000 m = 4 km.

b. Real length = $5 \times 100 = 500$ cm = 5 m; real width = $4 \times 100 = 400$ cm = 4 m. Real area = $5 \times 4 = 20$ m².

c. “Nearest millimetre” means ± 0.05 cm, so the true value lies between 24.55 cm and 24.65 cm.

Practice Exam 5

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each question is worth 1 mark.

Question 1

A length is measured as 2.35 m, but its true length is 2.40 m. The percentage error of this measurement, correct to two decimal places, is

- A. 2.04 %
- B. 2.08 %
- C. 2.13 %
- D. 5.00 %

Question 2

Written in scientific notation, 0.00046 is

- A. 4.6×10^4
- B. 46×10^{-5}
- C. 4.6×10^{-4}
- D. 4.6×10^{-3}

Question 3

Three people share \$900 in the ratio 3 : 4 : 5. The smallest share is

- A. \$75
- B. \$375
- C. \$300
- D. \$225

Question 4

A price is increased by 5 %, and then the new price is increased by 5 % again. The overall percentage increase is

- A. 10.25 %
- B. 10 %
- C. 25 %
- D. 5 %

Question 5

The formula $v = u + at$ is transposed to make a the subject. When $u = 8$, $v = 23$ and $t = 3$, the value of a is

- A. 4
- B. 5
- C. 6
- D. 15

Question 6

y is inversely proportional to x . When $x = 3$, $y = 18$. When $x = 9$, the value of y is

- A. 2
- B. 6
- C. 27
- D. 54

Question 7

For the data set 26, 32, 34, 36, 37, 38, 42, 45, the upper quartile Q_3 is

- A. 36
- B. 38
- C. 40
- D. 42

Question 8

The standard deviation of 3, 5, 8, 11, 13, 20, correct to two decimal places, is

- A. 4.67
- B. 5.60
- C. 37.60
- D. 6.13

Question 9

The probability that an event A occurs is $\frac{7}{20}$. The probability that A does **not** occur is

- A. $\frac{7}{13}$
- B. $\frac{20}{7}$
- C. $\frac{13}{20}$
- D. $\frac{7}{20}$

Question 10

In a sample of 80 items, 12 were faulty. Based on this relative frequency, the expected number of faulty items in a batch of 500 is

- A. 75
- B. 60
- C. 96
- D. 150

Question 11

A simple-interest investment earns \$300 on a principal of \$2500 over 3 years. The annual interest rate is

- A. 3 %
- B. 4 %
- C. 5 %
- D. 12 %

Question 12

A bill of \$275 includes GST at 10 %. The GST component of the bill is

- A. \$25.00
- B. \$27.50
- C. \$30.00
- D. \$247.50

Question 13

\$3000 is invested at 4 % per annum, compounded annually. Its value after 3 years is

- A. \$3244.80
- B. \$3360.00
- C. \$3374.59
- D. \$3120.00

Question 14

The exchange rate is 1 AUD = 0.66 USD. An amount of \$850 AUD is worth

- A. \$1288 USD
- B. \$1300 USD
- C. \$561 USD
- D. \$56.10 USD

Question 15

A scale drawing uses the scale 1 : 40. A region on the drawing has an area of 25 cm². The real area of the region is

- A. 0.1 m²
- B. 1 m²
- C. 4 m²
- D. 40 m²

Question 16

A cylinder has a radius of 7 cm and a height of 12 cm. Its volume, correct to the nearest cm³, is

- A. 264 cm³
- B. 528 cm³
- C. 588 cm³
- D. 1847 cm³

Question 17

The two shorter sides of a right-angled triangle measure 7 cm and 24 cm. Find the length of the hypotenuse.

- A. 17 cm
- B. 25 cm
- C. 31 cm
- D. 625 cm

Question 18

Two parallel lines are crossed by a transversal. One co-interior angle is 118°. The other co-interior angle is

- A. 118°
- B. 72°
- C. 242°
- D. 62°

Question 19

The volume of a tank is 2.5 m³. Its capacity, in litres, is

- A. 250 L
- B. 2500 L
- C. 25 000 L
- D. 2.5 L

Question 20

A metal block has a volume of 250 cm^3 and a density of 2.7 g/cm^3 . Its mass is

- A. 92.6 g
- B. 252.7 g
- C. 675 g
- D. 6750 g

End of Section A

Section B

Answer all questions in the spaces provided. In all questions where a numerical answer is required, round only when instructed. Where more than one mark is available, appropriate working must be shown.

Question 1 (5 marks)

A market box contains apples and oranges in the ratio 2:3. There are 45 pieces of fruit in the box.

- a. Find the number of apples and the number of oranges in the box. 2 marks
- b. Show that the oranges make up 60% of the box. 1 mark
- c. The box normally sells for \$20. During a shortage the price is increased by 15%. Find the new price. 2 marks

Question 2 (5 marks)

A caterer charges $C = 25 + 18h$ dollars for a booking of h hours.

- a. Find the charge for a booking of 4 hours. 1 mark
- b. By solving an equation, find the number of hours for a booking that costs \$160. 2 marks
- c. Transpose the formula $C = 25 + 18h$ to make h the subject. 2 marks

Question 3 (5 marks)

At the school fete, bags of popcorn are sold for \$7 each. When n bags are sold, the revenue is $R = 7n$ dollars and the total cost is $C = 320 + 3n$ dollars.

- a. Show that the break-even point is $n = 80$. 2 marks
- b. Find the profit made when 130 bags are sold. 2 marks
- c. State whether selling 60 bags results in a profit or a loss, and give the amount. 1 mark

Question 4 (5 marks)

The hourly sales of cups of coffee at a café, over 11 hours, were

5, 5, 9, 9, 11, 11, 14, 14, 17, 19, 47.

- a. For these sales, find the median and then the interquartile range (IQR). 2 marks
- b. Show that the hour in which 47 cups were sold is an outlier. 2 marks
- c. State whether the mean or the median better represents a typical hour of sales, and give a reason. 1 mark

Question 5 (5 marks)

The number of patients seen per hour at a medical clinic was recorded over 30 hours.

Patients per hour (x)	0	1	2	3	4
Frequency (f)	4	7	11	5	3

- Calculate the mean number of patients seen per hour, correct to two decimal places. 2 marks
- Find the median and the mode. 2 marks
- Find the percentage of hours in which fewer than 2 patients were seen. 1 mark

Question 6 (5 marks)

In 150 spins of a prize wheel, the outcome “win” occurred 21 times.

- Find the relative frequency of a win, as a decimal. 1 mark
- Use this relative frequency to estimate the number of wins in 400 spins. 2 marks
- A fair prize wheel has 8 equal sections, of which 2 are “win”. Find the theoretical probability of a win, and comment on whether this wheel appears to be fair. 2 marks

Question 7 (5 marks)

\$5000 is invested at 4.5 % per annum, compounded annually, for 3 years.

- Show that the value of the investment after 3 years is \$5705.83. 2 marks
- Find the compound interest earned. 1 mark
- At the end of the 3 years, a further \$2000 is deposited. Find the value of the investment one year later, correct to two decimal places. 2 marks

Question 8 (5 marks)

For the current tax year, Mira earns a taxable income of \$62,000. Her income tax is \$5092 plus 32.5 cents for each dollar of taxable income above \$45,000, and a Medicare levy of 2 % of taxable income is also charged.

- Show that Mira’s income tax is \$10,617. 2 marks
- Find the Medicare levy that Mira must pay. 1 mark
- Hence calculate Mira’s net income after the income tax and the Medicare levy are deducted. 2 marks

Question 9 (5 marks)

A business sells an item for \$15. Each item costs \$7 to make (a variable cost), and the business has fixed costs of \$2000 per month.

- In one month the business had a revenue of \$9000 and total expenses of \$6200. Find the profit and the profit margin (as a percentage of revenue, to one decimal place). 2 marks
- Show that the business must sell 250 items in a month to break even. 2 marks
- Find the profit in a month when 320 items are sold. 1 mark

Question 10 (5 marks)

A rectangular wall measures 8 m by 3 m. It contains one door, 2 m by 0.9 m, and two square windows, each 1.5 m by 1.5 m. The rest of the wall is painted.

- Find the total area of the door and the two windows, correct to two decimal places. 2 marks
- Show that the area that will be painted is 17.7 m². 2 marks

c. Paint costs \$15 per square metre. What is the total cost of painting the wall, to the nearest dollar? 1 mark

Question 11 (5 marks)

An ice-cream cone has a radius of 4 cm and a height of 9 cm. (Volume of a cone = $\frac{1}{3}\pi r^2 h$.)

a. Show that the cone's volume is $48\pi \text{ cm}^3$. 2 marks

b. Find this volume correct to two decimal places, and hence state the capacity in millilitres ($1 \text{ cm}^3 = 1 \text{ mL}$). 2 marks

c. How many full cones can be filled from a 2-litre tub of ice-cream? 1 mark

Question 12 (5 marks)

A rectangular sports court measures 4.8 cm by 3.2 cm on a drawing with a scale of 1:250.

a. Find the actual length and width of the court, in metres. 1 mark

b. Show that the court's area is 96 m^2 . 2 marks

c. A groundskeeper measures the length of the court as 12.3 m instead of the true 12 m. Find the percentage error in this measurement, correct to two decimal places. 2 marks

End of Section B

Practice Exam 5 — Solutions

Section A — Multiple-choice answers

Question	Answer	Working
1	B	$\frac{ 2.35 - 2.40 }{2.40} \times 100\% = \frac{0.05}{2.40} \times 100\%$
2	C	Move the point 4 places right: $0.00046 = 4.6 \times 10^{-4}$.
3	D	Total parts $3 + 4 + 5 = 12$; one part $= \frac{900}{12} = \$75$; smallest $= 3 \times 75 = \$225$.
4	A	$1.05 \times 1.05 = 1.1025$, an increase of 10.25 % (not 10 %).
5	B	$a = \frac{v - u}{t} = \frac{23 - 8}{3} = 5$.
6	B	$k = x \ y = 3 \times 18 = 54$; at $x = 9$, $y = \frac{54}{9} = 6$.
7	C	Upper half 37, 38, 42, 45; $Q_3 = \frac{38 + 42}{2} = 40$.
8	D	1-variable statistics gives the sample standard deviation $s_x = 6.13$ (divisor $n - 1$).
9	C	$1 - \frac{7}{20} = \frac{13}{20}$.
10	A	$\frac{12}{80} \times 500 = 75$.
11	B	$r = \frac{100 I}{P t} = \frac{100 \times 300}{2500 \times 3} = 4\%$.
12	A	$\text{GST} = \frac{275}{11} = \25 .
13	C	$3000 \times 1.04^3 = \$3374.59$.
14	C	$850 \times 0.66 = \$561 \text{ USD}$.
15	C	Area factor $40^2 = 1600$; $25 \times 1600 = 40\,000 \text{ cm}^2 = 4 \text{ m}^2$.
16	D	$V = \pi \times 7^2 \times 12 = 588 \pi \approx 1847 \text{ cm}^3$.
17	B	$c = \sqrt{7^2 + 24^2} = \sqrt{625} = 25 \text{ cm}$.
18	D	Co-interior angles are supplementary: $180^\circ - 118^\circ = 62^\circ$.
19	B	$2.5 \text{ m}^3 = 2.5 \times 1000 = 2500 \text{ L}$.
20	C	mass = density $\times$ volume $= 2.7 \times 250 = 675 \text{ g}$.

Section B — worked solutions



Question 1. a. Total parts = $2 + 3 = 5$, so one part = $\frac{45}{5} = 9$. Apples = $2 \times 9 = 18$, oranges = $3 \times 9 = 27$. **b.** The oranges are $\frac{27}{45} = 0.6 = 60\%$ of the box. **c.** New price = $20 \times 1.15 = \$23$.

Question 2. a. $C = 25 + 18 \times 4 = 25 + 72 = \97 . **b.** Solve $25 + 18h = 160$: $18h = 135$, so $h = \frac{135}{18} = 7.5$ hours. **c.** $C - 25 = 18h$, so $h = \frac{C - 25}{18}$.

Question 3. a. Break-even is where $R = C$:

$$7n = 320 + 3n$$

$$4n = 320$$

$$n = 80.$$

b. At $n = 130$: $R = 7 \times 130 = \$910$ and $C = 320 + 3 \times 130 = \710 , so profit = $910 - 710 = \$200$. **c.** At $n = 60$: $R = 7 \times 60 = \$420$ and $C = 320 + 3 \times 60 = \500 , so there is a **loss of \$80**.

Question 4. a. With $n = 11$, the median is the 6th value, 11 cups. Lower half 5, 5, 9, 9, 11 gives $Q_1 = 9$; upper half 14, 14, 17, 19, 47 gives $Q_3 = 17$; so $IQR = 17 - 9 = 8$ cups. **b.** The upper fence is $Q_3 + 1.5 \times IQR = 17 + 1.5 \times 8 = 17 + 12 = 29$ cups. Since $47 > 29$, the hour in which 47 cups were sold is an outlier. **c.** The **median** better represents a typical hour of sales, because the 47-cup outlier inflates the mean (about 14.6 cups) above most of the data.

Question 5. a. $\sum f = 4 + 7 + 11 + 5 + 3 = 30$. $\sum (x \times f) = 0(4) + 1(7) + 2(11) + 3(5) + 4(3) = 0 + 7 + 22 + 15 + 12 = 56$, so the mean = $\frac{56}{30} \approx 1.87$ patients. **b.** The middle is between the 15th and 16th values; the cumulative frequencies 4, 11, 22 place both in $x = 2$, so the median = 2. The largest frequency is 11, at $x = 2$, so the mode = 2. **c.** Hours with fewer than 2 patients: $4 + 7 = 11$, so $\frac{11}{30} \times 100\% = 36.7\%$.

Question 6. a. Relative frequency = $\frac{21}{150} = 0.14$. **b.** Estimated wins in 400 spins = $0.14 \times 400 = 56$. **c.** Theoretical probability = $\frac{2}{8} = 0.25$. The experimental relative frequency 0.14 is well below 0.25, so the wheel does **not** appear fair — it produced fewer wins than a fair wheel would be expected to.

Question 7. a. With $R = 1 + \frac{4.5}{100} = 1.045$ and $n = 3$,

$$A = 5000 \times 1.045^3 = \$5705.83.$$

b. Interest = $5705.83 - 5000 = \$705.83$. **c.** New principal = $5705.83 + 2000 = \$7705.83$. After one more year, $A = 7705.83 \times 1.045 = \8052.59 .

Question 8. a. Tax = $5092 + 0.325 \times (62\,000 - 45\,000) = 5092 + 0.325 \times 17\,000 = 5092 + 5525 = \$10\,617$. **b.** Medicare levy = $0.02 \times 62\,000 = \$1\,240$. **c.** Net income = $62\,000 - 10\,617 - 1\,240 = \$50\,143$.

Question 9. a. Profit = $9000 - 6200 = \$2800$; profit margin = $\frac{2800}{9000} \times 100\% = 31.1\%$. **b.** Each item contributes $15 - 7 = \$8$ towards the fixed costs, so the break-even number is $\frac{2000}{8} = 250$ items. **c.** Profit = $320 \times (15 - 7) - 2000 = 320 \times 8 - 2000 = 2560 - 2000 = \560 .

Question 10. a. Door area $= 2 \times 0.9 = 1.8 \text{ m}^2$; two windows $= 2 \times (1.5 \times 1.5) = 2 \times 2.25 = 4.5 \text{ m}^2$. Total $= 1.8 + 4.5 = 6.30 \text{ m}^2$. **b.** Wall area $= 8 \times 3 = 24 \text{ m}^2$. Area that will be painted $= 24 - 6.3 = 17.7 \text{ m}^2$. **c.** Cost $= 17.7 \times 15 = \$265.50$, so \$266 to the nearest dollar.

Question 11. a. $V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times 4^2 \times 9 = \frac{1}{3} \pi \times 144 = 48 \pi \text{ cm}^3$. **b.** $V = 48 \pi \approx 150.80 \text{ cm}^3$, so the capacity is 150.80 mL. **c.** A 2-litre tub is 2000 mL. $\frac{2000}{150.80} \approx 13.26$, so 13 full cones can be filled.

Question 12. a. Actual length $= 4.8 \times 250 = 1200 \text{ cm} = 12 \text{ m}$; actual width $= 3.2 \times 250 = 800 \text{ cm} = 8 \text{ m}$. **b.** Area $= 12 \times 8 = 96 \text{ m}^2$. **c.** Percentage error $= \frac{|12.3 - 12|}{12} \times 100\% = \frac{0.3}{12} \times 100\% = 2.50\%$.

Practice Exam 6

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated. Section A: 20 multiple-choice questions (20 marks). Section B: 12 questions (60 marks). Total 80 marks. Unless otherwise indicated, diagrams are not drawn to scale; round only when instructed.

Section A — Multiple-choice questions

Choose the response that is correct for the question. Each question is worth 1 mark.

Question 1

The number 0.04871 rounded to two significant figures is

- A. 0.048
- B. 0.05
- C. 0.049
- D. 0.0487

Question 2

The product $(4 \times 10^3) \times (5 \times 10^6)$, written in scientific notation, is

- A. 20×10^9
- B. 2×10^{10}
- C. 2×10^9
- D. 9×10^9

Question 3

Two numbers are in the ratio 2:7 and their sum is 63. The smaller number is

- A. 49
- B. 31.5
- C. 14
- D. 9

Question 4

A shirt is discounted by 20% to a sale price of \$48. Its original price was

- A. \$60
- B. \$57.60
- C. \$68
- D. \$240

Question 5

The solution of $3(x - 4) = 18$ is

- A. $x = 10$
- B. $x = 6$
- C. $x = 2$
- D. $x = 22$

Question 6

Apples cost \$4.50 per kilogram. Assuming direct proportion, the change from \$50 after buying 7 kg is

- A. \$31.50
- B. \$19.50
- C. \$18.50
- D. \$21.50

Question 7

The mean of five numbers is 12. Four of the numbers are 9, 11, 13 and 14. The fifth number is

- A. 13
- B. 12
- C. 15
- D. 11

Question 8

The median of 2, 5, 5, 6, 8, 9, 12, 15 is

- A. 6.5
- B. 7
- C. 6
- D. 8

Question 9

A data set has the five-number summary 5, 11, 15, 22, 40. Its interquartile range is

- A. 22
- B. 11
- C. 15
- D. 35

Question 10

A whole number is chosen at random from 1 to 20. The probability that it is a multiple of 3 is

- A. $\frac{1}{5}$
- B. $\frac{7}{20}$
- C. $\frac{1}{3}$
- D. $\frac{3}{10}$

Question 11

The simple interest on \$3000 at 5 % per annum for 4 years is

- A. \$3600
- B. \$600
- C. \$60
- D. \$150

Question 12

GST of 10 % is added to a price of \$180. The total price is

- A. \$162
- B. \$1980
- C. \$198
- D. \$18

Question 13

A salary of \$60,000 is increased by 15 %. The new salary is

- A. \$75,000
- B. \$9000
- C. \$69,000
- D. \$61,500

Question 14

The exchange rate is 1 AUD = 0.65 USD. An amount of \$500 USD is worth, in Australian dollars,

- A. \$76.92 AUD
- B. \$325 AUD
- C. \$769.23 AUD
- D. \$500 AUD

Question 15

A trapezium has parallel sides 6 cm and 10 cm and a height of 4 cm. Its area is

- A. 40 cm^2
- B. 24 cm^2
- C. 32 cm^2
- D. 60 cm^2

Question 16

A rectangular prism has a volume of 360 cm^3 and a rectangular base measuring 8 cm by 5 cm. Its height is

- A. 45 cm
- B. 13 cm
- C. 320 cm
- D. 9 cm

Question 17

A 3 L jug of juice is poured into 400 mL cups. The number of complete cups that can be poured is

- A. 7.5
- B. 7
- C. 8
- D. 75

Question 18

A circle has a radius of 5 cm. Its circumference, correct to two decimal places, is

- A. 78.54 cm
- B. 10 cm
- C. 15.71 cm
- D. 31.42 cm

Question 19

The angles of a triangle are in the ratio 1:3:5. The largest angle is

- A. 20°
- B. 60°
- C. 100°
- D. 120°

Question 20

On a map with a scale of 1 : 200, a distance measures 3.5 cm. The real distance is

- A. 7 m
- B. 700 m
- C. 70 m
- D. 0.7 m

End of Section A

Section B

Answer all questions in the spaces provided. In all questions where a numerical answer is required, round only when instructed. Where more than one mark is available, appropriate working must be shown.

Question 1 (5 marks)

A smoothie is made by blending banana, yoghurt and berries in the ratio 2 : 3 : 1 by mass.

- a. Find the mass of berries in a 900 g smoothie. 2 marks
- b. Show that a 600 g smoothie contains 200 g of banana. 1 mark
- c. Yoghurt is sold in 200 g tubs. Find the number of tubs needed to make 10 smoothies of 600 g each. 2 marks

Question 2 (5 marks)

The perimeter of a rectangle is given by $P = 2(l + w)$, where l is the length and w is the width.

- a. Find P when $l = 7$ cm and $w = 4$ cm. 1 mark
- b. Transpose the formula to make w the subject. 2 marks
- c. Find w when $P = 34$ cm and $l = 9$ cm. 2 marks

Question 3 (5 marks)

Two phone plans are available. Plan A costs \$30 per month plus \$0.10 per minute of calls. Plan B costs a flat \$50 per month.

- a. Find the cost of Plan A for a month with 150 minutes of calls. 1 mark
- b. Show that the two plans cost the same for 200 minutes of calls. 2 marks
- c. For 300 minutes of calls, state which plan is cheaper and by how much. 2 marks

Question 4 (5 marks)

The numbers of customers served by a food truck over 15 lunch periods were

34, 38, 41, 44, 45, 47, 49, 52, 55, 58, 60, 63, 67, 71, 78.

- a. Find the median and the interquartile range. 2 marks
- b. Find the range, and state whether the range or the IQR is more affected by an unusually busy or quiet lunch period. 2 marks
- c. Find the mean number of customers served, correct to two decimal places. 1 mark

Question 5 (5 marks)

Two tennis players recorded the number of aces they served in six matches:

Player A: 2, 4, 6, 8, 10, 12; Player B: 0, 6, 6, 7, 8, 15.

- a. Find the median number of aces for each player. 2 marks
- b. Show that both players have the same mean of 7 aces per match. 2 marks
- c. Using the medians, state which player served slightly more aces per match. 1 mark

Question 6 (5 marks)

A bag contains 7 red, 5 blue and 3 green counters.

- a. A counter is drawn at random. Find the probability that it is red. 1 mark
- b. Find the probability that the counter is **not** green. 1 mark
- c. A counter is drawn and replaced 90 times. Find the expected number of blue counters drawn. 2 marks
- d. Find the probability that a single draw is red or green. 1 mark

Question 7 (5 marks)

\$8000 is invested at 3 % per annum for 5 years.

- a. Find the simple interest earned over the 5 years. 2 marks
- b. If instead the interest is compounded annually, show that the investment is worth \$9274.19 after 5 years. 2 marks
- c. Find how much more interest the compound investment earns than the simple-interest investment. 1 mark

Question 8 (5 marks)

A worker has a taxable income of \$75,000. Their income tax for the year is \$13,288.

- a. The employer must pay superannuation of 12 % of the income. Find the superannuation contribution. 2 marks
- b. The Medicare levy is 2 % of the income. Find the Medicare levy. 1 mark
- c. Find the worker's net income after income tax and the Medicare levy. 2 marks

Question 9 (5 marks)

In one quarter, a small business had sales of \$47,300 (GST-inclusive) and purchases of \$20,900 (GST-inclusive). GST is charged at 10 %.

- a. Find the GST collected on the sales. 2 marks
- b. Hence find the value of the sales before GST was added. 1 mark
- c. Find the net GST the business must pay to the ATO on its Business Activity Statement. 2 marks

Question 10 (5 marks)

A grain silo is a cylinder of radius 2 m and height 6 m, topped by a cone of radius 2 m and height 1.5 m.

- a. Find the volume of the cylinder, correct to two decimal places. 2 marks
- b. Find the volume of the cone, correct to two decimal places. 1 mark
- c. Show that the total volume is about 81.68 m^3 , and hence find the silo's capacity in litres ($1 \text{ m}^3 = 1000 \text{ L}$). 2 marks

Question 11 (5 marks)

A closed rectangular box measures 8 cm by 5 cm by 3 cm.

- a. Show that the total surface area of the box is 158 cm^2 . 2 marks
- b. The box is made from card costing \$0.02 per cm^2 . Find the cost of the card. 2 marks
- c. The box is cut along its edges and opened out flat. State the name given to the flat shape formed. 1 mark

Question 12 (5 marks)

A steel rod is specified to have a diameter of 25.00 mm with a tolerance of $\pm 0.10 \text{ mm}$.

- a. State the smallest and largest acceptable diameters. 1 mark
- b. A rod is measured at 25.14 mm. Show that it is outside the tolerance, and state by how much. 2 marks
- c. Another rod is measured at 24.86 mm. Find the percentage error of this measurement relative to the nominal 25.00 mm, correct to two decimal places. 2 marks

End of Section B

Practice Exam 6 — Solutions

Section A — Multiple-choice answers

Question	Answer	Working
1	C	First two significant figures 4, 8; next digit 7 rounds up: 0.049.
2	B	$4 \times 5 = 20$ and $10^3 \times 10^6 = 10^9$, so $20 \times 10^9 = 2 \times 10^{10}$.
3	C	Total parts $2 + 7 = 9$; one part $= \frac{63}{9} = 7$; smaller number $= 2 \times 7 = 14$.
4	A	80 % of the price is \$48, so the price $= \frac{48}{0.8} = \$60$.
5	A	$x - 4 = 6$, so $x = 10$.
6	C	Cost $= 4.50 \times 7 = \$31.50$; change $= 50 - 31.50 = \$18.50$.
7	A	Total $= 5 \times 12 = 60$; the four numbers sum to 47; fifth number $= 60 - 47 = 13$.
8	B	With $n = 8$, median $= \frac{6+8}{2} = 7$.
9	B	$IQR = Q_3 - Q_1 = 22 - 11 = 11$.
10	D	Favourable outcomes 3, 6, 9, 12, 15, 18: $\frac{6}{20} = \frac{3}{10}$.
11	B	$I = \frac{3000 \times 5 \times 4}{100} = \600 .
12	C	$180 \times 1.10 = \$198$.
13	C	$60\,000 \times 1.15 = \$69\,000$.
14	C	$\frac{500}{0.65} = \$769.23$ AUD.
15	C	$\frac{1}{2}(6+10) \times 4 = \frac{1}{2} \times 16 \times 4 = 32$ cm ² .
16	D	Base area $= 8 \times 5 = 40$ cm ² ; height $= \frac{360}{40} = 9$ cm.
17	B	3 L = 3000 mL; $3000 \div 400 = 7.5$, so 7 complete cups.
18	D	$C = 2\pi \times 5 = 10\pi \approx 31.42$ cm.
19	C	$x + 3x + 5x = 180^\circ$, so $9x = 180^\circ$ and $x = 20^\circ$; largest $= 5 \times 20^\circ = 100^\circ$.
20	A	$3.5 \times 200 = 700$ cm = 7 m.

Section B — worked solutions

Question 1. **a.** Total parts = $2 + 3 + 1 = 6$, so one part = $\frac{900}{6} = 150$ g. Berries are 1 part = 150 g. **b.** One part = $\frac{600}{6} = 100$ g; banana is 2 parts, so $2 \times 100 = 200$ g. **c.** Yoghurt per smoothie = $3 \times 100 = 300$ g, so 10 smoothies need 3000 g. Number of tubs = $\frac{3000}{200} = 15$.

Question 2. **a.** $P = 2(7 + 4) = 2 \times 11 = 22$ cm. **b.** $\frac{P}{2} = l + w$, so $w = \frac{P}{2} - l$ (equivalently $w = \frac{P - 2l}{2}$). **c.** $w = \frac{34}{2} - 9 = 17 - 9 = 8$ cm.

Question 3. **a.** Plan A = $30 + 0.10 \times 150 = 30 + 15 = \45 . **b.** Setting the costs equal: $30 + 0.10m = 50$, so $0.10m = 20$ and $m = 200$ minutes. **c.** At 300 minutes: Plan A = $30 + 0.10 \times 300 = \$60$; Plan B = $\$50$. Plan B is cheaper by $\$10$.

Question 4. **a.** With $n = 15$, the median is the 8th value, 52. Leaving it out, the lower half (34, 38, 41, 44, 45, 47, 49) gives $Q_1 = 44$ and the upper half (55, 58, 60, 63, 67, 71, 78) gives $Q_3 = 63$, so $IQR = 63 - 44 = 19$. **b.** Range = $78 - 34 = 44$. The **range** is more affected by an unusually busy or quiet lunch period, because it depends only on the extreme values, whereas the IQR uses only the middle 50%. **c.** Mean = $\frac{802}{15} \approx 53.47$ customers.

Question 5. **a.** Player A median = $\frac{6+8}{2} = 7$; Player B median = $\frac{6+7}{2} = 6.5$. **b.** Player A sum = $2 + 4 + 6 + 8 + 10 + 12 = 42$, mean = $\frac{42}{6} = 7$. Player B sum = $0 + 6 + 6 + 7 + 8 + 15 = 42$, mean = $\frac{42}{6} = 7$. The means are equal. **c.** Player A served slightly more aces per match (median 7 versus 6.5).

Question 6. **a.** $\Pr(\text{red}) = \frac{7}{15}$. **b.** $\Pr(\text{not green}) = 1 - \frac{3}{15} = \frac{12}{15} = \frac{4}{5}$. **c.** Expected blue = $\frac{5}{15} \times 90 = 30$. **d.** $\Pr(\text{red or green}) = \frac{7+3}{15} = \frac{10}{15} = \frac{2}{3}$.

Question 7. **a.** $I = \frac{8000 \times 3 \times 5}{100} = \1200 . **b.** With $R = 1.03$ and $n = 5$: $A = 8000 \times 1.03^5 = \9274.19 . **c.** Compound interest = $9274.19 - 8000 = \$1274.19$, which exceeds the simple interest by $1274.19 - 1200 = \$74.19$.

Question 8. **a.** Superannuation = $0.12 \times 75\,000 = \$9000$. **b.** Medicare levy = $0.02 \times 75\,000 = \$1500$. **c.** Net income = $75\,000 - 13\,288 - 1500 = \$60\,212$.

Question 9. **a.** GST collected = $\frac{47\,300}{11} = \$4300$. **b.** Sales before GST = $47\,300 - 4300 = \$43\,000$. **c.** GST paid on purchases = $\frac{20\,900}{11} = \$1900$, so net GST to the ATO = $4300 - 1900 = \$2400$.

Question 10. **a.** Cylinder volume = $\pi r^2 h = \pi \times 2^2 \times 6 = 24\pi \approx 75.40$ m³. **b.** Cone volume = $\frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times 2^2 \times 1.5 = 2\pi \approx 6.28$ m³. **c.** Total = $24\pi + 2\pi = 26\pi \approx 81.68$ m³. Capacity = $81.68 \times 1000 = 81\,680$ L.

Question 11. **a.** Surface area = $2(8 \times 5 + 8 \times 3 + 5 \times 3) = 2(40 + 24 + 15) = 2 \times 79 = 158$ cm². **b.** Cost = $158 \times 0.02 = \$3.16$. **c.** The flat shape formed is called a **net**.

Question 12. **a.** Smallest = $25.00 - 0.10 = 24.90$ mm; largest = $25.00 + 0.10 = 25.10$ mm. **b.** Since $25.14 > 25.10$, the rod is outside the tolerance, by $25.14 - 25.10 = 0.04$ mm. **c.** Percentage error = $\frac{|24.86 - 25.00|}{25.00} \times 100\% = \frac{0.14}{25.00} \times 100\% = 0.56\%$.