Foundation Mathematics Units 1 & 2

Chapter 13 Practice examinations

Contents

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	$a:b=c:d \Rightarrow \frac{a}{b}=\frac{c}{d}$
Direct proportion	$a=kb$, where k is a constant
Percentage of a quantity	$\frac{\text{part}}{\text{whole}}\times 100\,\%$

Data analysis 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	$\text{IQR}=Q_3-Q_1$

Space and measurement

Description	Formula
Perimeter of a rectangle	$2(l+w)$
Area of a rectangle	lw
Area of a parallelogram	bh
Area of a triangle	$\frac{1}{2}bh$
Area of a trapezium	$\frac{1}{2}(a+b)h$
Circumference of a circle	$\pi d=2\pi r$
Area of a circle	πr^2
Pythagoras' theorem	$c^2=a^2+b^2$
Volume of a prism	area of base × height
Volume of a cylinder	$\pi r^2 h$
Volume of a pyramid	$\frac{1}{3}\times$ area of base × height
Volume of a cone	$\frac{1}{3}\pi r^2 h$
Volume of a sphere	$\frac{4}{3}\pi r^3$
Total surface area of a cylinder	$2\pi r^2+2\pi rh$
Surface area of a sphere	$4\pi r^2$

Description	Formula

Financial and consumer mathematics

Description	Formula
Simple interest	$I = \dfrac{P\,r\,t}{100}$
Goods and services tax (GST)	$10\,\%$
Medicare levy	$2\,\%$
Percentage increase	$\dfrac{\text{final} - \text{initial}}{\text{initial}} \times 100\,\%$
Percentage decrease	$\dfrac{\text{initial} - \text{final}}{\text{initial}} \times 100\,\%$
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; the Formula Sheet provided. 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 $6 + 2 \times 4$ is

A. 32

B. 20

C. 12

D. 14

Question 2

25% of 80 is

A. 55

B. 320

C. 25

D. 20

Question 3

The number 3.86 rounded to one decimal place is

A. 3.0

B. 3.8

C. 4.0

D. 3.9

Question 4

The ratio $15:20$ written in simplest form is

A. $5:4$

B. $3:5$

C. $3:4$

D. $4:3$

Question 5

The number $3\,200\,000$ written in the form $a \times 10^n$ (with $1 \leq a < 10$) is

A. 3.2×10^5

B. 3.2×10^6

C. 32×10^5

D. 3.2×10^7

Question 6

Three-fifths of 40 is

A. 24

B. 8

C. 15

D. 200

Question 7

The solution of the equation $3x - 4 = 11$ is

A. $x = 3$

B. $x = 45$

C. $x = 5$

D. $x = 7$

Question 8

The value of 2^5 is

A. 25

B. 32

C. 10

D. 16

Question 9

The mean of $5, 7, 9, 11, 13$ is

A. 11

B. 8

C. 9

D. 45

Question 10

The median of $4, 8, 10, 15, 20, 25$ is

A. 15

B. 13

C. 10

D. 12.5

Question 11

A student records the number of siblings each classmate has. This data is

A. categorical and nominal

B. categorical and ordinal

C. numerical and continuous

D. numerical and discrete

Question 12

The range of $8, 12, 19, 25, 30$ is

A. 22

B. 30

C. 8

D. 18

Question 13

The simple interest on $\$2000$ invested at 6% per annum for 2 years is

A. $\$120$

B. $\$240$

C. $\$2240$

D. $\$24$

Question 14

The GST (at 10%) on a purchase of $\$350$ is

A. $\$35$

B. $\$385$

C. $\$3.50$

D. $\$350$

Question 15

A pair of shoes marked at $\$60$ is discounted by 20%. The price paid is

A. $\$12$

B. $\$48$

C. $\$72$

D. $\$40$

Question 16

A casual worker is paid $\$25$ per hour and works 8 hours. The pay earned is

A. $\$200$

B. $\$33$

C. $\$250$

D. $\$2008$

Question 17

The area of a rectangle 7 m long and 6 m wide is

A. $13\,\text{m}^2$

B. $84\,\text{m}^2$

C. $42\,\text{m}^2$

D. $26\,\text{m}^2$

Question 18

A length of 2.4 metres is equal to

A. 24 cm

B. 240 cm

C. 2400 cm

D. 0.024 cm

Question 19

The volume of a cube with side length 3 cm is

A. $27\,\text{cm}^3$

B. $18\,\text{cm}^3$

C. $12\,\text{cm}^3$

D. $9\,\text{cm}^3$

Question 20

The angles that meet at a point add to

A. 180°

B. 270°

C. 360°

D. 90°

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 shirt is priced at $\$45$.

a. A store offers 20% off. Find the discount amount. 1 mark

b. Find the sale price of the shirt. 1 mark

c. A second store sells the same shirt for $\$50$ with 25% off. Find its sale price. 2 marks

d. State which store is cheaper. 1 mark

Question 2 (5 marks)

A fruit punch is made from juice, soda and water in the ratio $2:1:3$.

a. How many parts are there in total? 1 mark

b. A batch uses 1200 mL of punch. Find the volume of soda in the batch. 2 marks

c. Another batch uses 500 mL of juice. Find the volume of water needed. 2 marks

Question 3 (5 marks)

An electrician charges $C = 90 + 70h$ 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 $\$370$ takes 4 hours. 2 marks

c. State what the number 90 represents in this situation. 1 mark

Question 4 (5 marks)

The numbers of coffees sold at a small stall on 7 days were

$$5, 8, 8, 8, 11, 13, 17.$$

a. Find the mean number of coffees sold. 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, 50 students recorded how they travel to school, as shown below.

Travel mode	Walk	Bus	Car	Bike
Number of students	12	20	13	5

a. How many students travel by bus? 1 mark

b. What fraction of the students walk? Give your answer in simplest form. 2 marks

c. What percentage of the students travel by car? 1 mark

d. State the modal travel mode. 1 mark

Question 6 (5 marks)

A survey of 80 residents recorded whether they own a pet and whether they live in a house or an apartment. Some entries are missing.

	House	Apartment	Total
Pet: yes	30		
Pet: no		15	
Total	50		80

a. How many house residents do **not** own a pet? 1 mark

b. How many residents live in an apartment in total? 1 mark

c. How many apartment residents own a pet? 2 marks

d. What fraction of all 80 residents own a pet? Give your answer in simplest form. 1 mark

Question 7 (5 marks)

Sam invests $\$1500$ at 4% per annum simple interest for 3 years.

a. Find the simple interest earned. 2 marks

b. Find the total amount in the account after 3 years. 1 mark

c. Show that, at 5% per annum, the interest earned over 3 years would be $\$225$. 2 marks

Question 8 (5 marks)

Two gym memberships are offered. Plan A costs $\$40$ per month. Plan B costs $\$20$ per month plus $\$5$ per visit, and a member visits 6 times each month.

a. Find the yearly cost of Plan A. 1 mark

b. Find the monthly cost of Plan B for this member. 2 marks

c. Find the yearly cost of Plan B, and state which plan is cheaper over a year. 2 marks

Question 9 (5 marks)

A stall sells 60 cupcakes at $\$4$ each at a school fair.

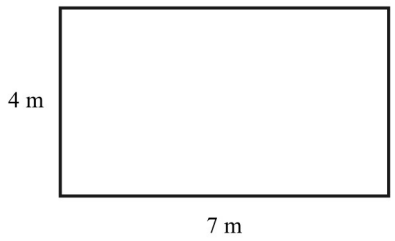
a. Find the total revenue from the cupcakes. 1 mark

b. The stall's costs for the day are $\$90$. Find the profit. 2 marks

c. GST of $10\,\%$ must be added to the $\$4$ price. Find the new GST-inclusive price of a cupcake. 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 $\$30$ per square metre. Find the cost to carpet the floor. 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 0.6 m and height 1.5 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 1700 litres. ($1\,\text{m}^3 = 1000$ litres.) 2 marks

c. State one assumption you have made in part **b**. 1 mark

Question 12 (5 marks)

a. Convert 3.2 km to metres. 1 mark

b. Two angles lie on a straight line. One angle is 125°. Find the size of the other angle. 2 marks

c. A triangle has two angles of 40° and 75°. Show that the third angle is 65°. 2 marks

End of Section B

Practice Exam 1 — Solutions

Section A

Question	Answer	Working
1	**D**	$6+2\times4=6+8=14$ (multiply before add).
2	**D**	$0.25\times80=20$.
3	**D**	The next digit is 6, so 3.8 rounds up to 3.9.
4	**C**	$15:20=3:4$ (divide both by 5).
5	**B**	$3\,200\,000=3.2\times10^{6}$.
6	**A**	$\frac{3}{5}\times40=24$.
7	**C**	$3x=15$, so $x=5$.
8	**B**	$2^{5}=32$.
9	**C**	$\frac{5+7+9+11+13}{5}=\frac{45}{5}=9$.
10	**D**	Median $=\frac{10+15}{2}=12.5$.
11	**D**	A number of siblings is a whole-number count, so numerical and discrete.
12	**A**	$30-8=22$.
13	**B**	$I=\frac{2000\times6\times2}{100}=240$.
14	**A**	$0.10\times350=35$.
15	**B**	$60\times0.80=48$.
16	**A**	$25\times8=200$.
17	**C**	$7\times6=42\text{ m}^2$.
18	**B**	$2.4\times100=240$ cm.
19	**A**	$3^{3}=27\text{ cm}^3$.
20	**C**	Angles at a point sum to 360°.

Section B

Question 1.

a. Discount $=20\%\times\$45=0.20\times45=\$9$.

b. Sale price $=\$45-\$9=\$36$.

c. Second store: 25% off $\$50$ is $0.25\times50=\$12.50$, so the sale price is $50-12.50=\$37.50$.

d. The first store ($\$36$) is cheaper than the second ($\$37.50$).

Question 2.

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

b. Soda is 1 part out of 6, so the volume of soda $=\frac{1}{6}\times1200=200$ mL.

c. Juice is 2 parts $=500$ mL, so one part $=250$ mL. Water is 3 parts, so the volume of water $=3\times 250=750$ mL.

Question 3.

a. $C=90+70\times 3=90+210=\$300$.

b. Set $C=370$:

$$90+70h=370$$

$$70h=280$$

$$h=4.$$

So a job costing $\$370$ takes 4 hours.

c. The $\$90$ is the fixed call-out fee charged before any hours are worked.

Question 4.

a. Mean $=\dfrac{5+8+8+8+11+13+17}{7}=\dfrac{70}{7}=10$ coffees.

b. With 7 values, the median is the 4th value: median $=8$ coffees.

c. The value 8 occurs most often (three times), so the mode $=8$ coffees.

d. Range $=17-5=12$ coffees.

Question 5.

a. 20 students travel by bus.

b. Fraction who walk $=\dfrac{12}{50}=\dfrac{6}{25}$.

c. Percentage by car $=\dfrac{13}{50}\times 100\,\%=26\,\%$.

d. Bus was chosen most often (20 students), so it is the modal travel mode.

Question 6.

a. House residents without a pet $=50-30=20$.

b. Apartment residents in total $=80-50=30$.

c. Apartment residents who own a pet $=30-15=15$.

d. Pet owners in total $=30+15=45$, so the fraction $=\dfrac{45}{80}=\dfrac{9}{16}$.

Question 7.

a. $I=\dfrac{Prt}{100}=\dfrac{1500\times 4\times 3}{100}=\$180$.

b. Total amount $=\$1500+\$180=\$1680$.

c. At $5\,\%$: $I=\dfrac{1500\times 5\times 3}{100}=\dfrac{22\,500}{100}=\$225$, as required.

Question 8.

a. Plan A per year $= 40 \times 12 = \$480$.

b. Plan B per month $= 20 + 5 \times 6 = 20 + 30 = \$50$.

c. Plan B per year $= 50 \times 12 = \$600$. Since $\$480 < \$600$, Plan A is cheaper over a year.

Question 9.

a. Revenue $= 60 \times \$4 = \$240$.

b. Profit $= \text{revenue} - \text{costs} = 240 - 90 = \$150$.

c. GST-inclusive price $= \$4 \times 1.10 = \$4.40$.

Question 10.

a. Perimeter $= 2 \times (7 + 4) = 2 \times 11 = 22$ m.

b. Area $= 7 \times 4 = 28\,\text{m}^2$.

c. Cost $= 28 \times \$30 = \$840$.

Question 11.

a. $V = \pi r^2 h = \pi \times 0.6^2 \times 1.5 = \pi \times 0.36 \times 1.5 = 0.54\pi \approx 1.70\,\text{m}^3$.

b. In litres, $V \approx 1.6965 \times 1000 = 1696.5 \approx 1700$ litres.

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

Question 12.

a. 3.2 km $= 3.2 \times 1000 = 3200$ m.

b. Angles on a straight line sum to 180°, so the other angle $= 180^\circ - 125^\circ = 55^\circ$.

c. The angles of a triangle sum to 180°, so the third angle $= 180^\circ - 40^\circ - 75^\circ = 65^\circ$, as required.

Practice Exam 2

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated; the Formula Sheet provided. 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 5.762 rounded to one decimal place is

A. 5.8

B. 5.76

C. 6.0

D. 5.7

Question 2

20% of $\$45$ is

A. $\$20$

B. $\$25$

C. $\$65$

D. $\$9$

Question 3

The ratio $18:12$ written in simplest form is

A. $6:4$

B. $9:6$

C. $3:2$

D. $2:3$

Question 4

The value of $20 - 6 \times 2$ is

A. 8

B. 20

C. 12

D. 28

Question 5

The value of 4^3 is

A. 64

B. 12

C. 16

D. 43

Question 6

The area of a rectangle is $A = l\,w$. When $l = 7$ and $w = 4$, the value of A is

A. 11

B. 22

C. 28

D. 74

Question 7

The solution of $4x + 6 = 30$ is

A. $x = 7.5$

B. $x = 24$

C. $x = 6$

D. $x = 9$

Question 8

The mean of $5, 8, 11$ is

A. 8

B. 24

C. 6

D. 11

Question 9

The median of $4, 7, 9, 12, 15$ is

A. 7

B. 9

C. 12

D. 47

Question 10

The range of the data $14, 9, 22, 18, 6$ is

A. 6

B. 28

C. 16

D. 22

Question 11

The mode of $3, 5, 5, 7, 8, 5, 9$ is

A. 5

B. 6

C. 3

D. 9

Question 12

Using $I = \dfrac{Prt}{100}$, the simple interest on $\$600$ at 5% per year for 2 years is

A. $\$30$

B. $\$60$

C. $\$600$

D. $\$66$

Question 13

The GST (at 10%) on an item costing $\$80$ is

A. $\$72$

B. $\$8$

C. $\$10$

D. $\$88$

Question 14

A pair of shoes costing $\$60$ is discounted by 25%. The sale price is

A. $\$35$

B. $\$48$

C. $\$15$

D. $\$45$

Question 15

A business has an income of $\$950$ and expenditure of $\$780$. Its profit is

A. $\$1730$

B. $\$170$

C. $\$780$

D. $\$950$

Question 16

A casual worker is paid $\$24$ per hour and works 30 hours in a week. Her pay for the week is

A. $\$54$

B. $\$744$

C. $\$600$

D. $\$720$

Question 17

The perimeter of a rectangle that is 9 m long and 6 m wide is

A. 54 m

B. 15 m

C. 30 m

D. 21 m

Question 18

The area of a triangle with base 10 cm and height 6 cm is

A. 16 cm^2

B. 32 cm^2

C. 60 cm^2

D. 30 cm^2

Question 19

The volume of a rectangular box measuring 2 cm by 5 cm by 4 cm is

A. 11 cm^3

B. 20 cm^3

C. 80 cm^3

D. 40 cm^3

Question 20

A length of 3.2 m is equal to

A. 0.032 cm

B. 320 cm

C. 32 cm

D. 3200 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 shop is having a sale.

a. Find 30% of $\$70$. 1 mark

b. A coat marked $\$70$ is reduced by 30%. Find the sale price. 1 mark

c. GST of 10% is added to an item costing $\$45$. Find the total price paid. 1 mark

d. Show that an item costing $\$150$ reduced by 12% has a sale price of $\$132$. 2 marks

Question 2 (5 marks)

a. Simplify $7y + 2y - 4y$. 1 mark

b. The cost of hiring a carpet cleaner is $C = 30 + 18h$ dollars for a hire lasting h hours. Find the cost of a 4-hour hire. 2 marks

c. Solve $5x + 7 = 42$. 2 marks

Question 3 (5 marks)

a. Divide $\$72$ between two people in the ratio $3:5$. 2 marks

b. A recipe uses 250 g of sugar to make 10 muffins. How much sugar is needed to make 16 muffins? 2 marks

c. Show that the ratio $15:25$ simplifies to $3:5$. 1 mark

Question 4 (5 marks)

The numbers of customers at a shop over seven days were

$$18, 22, 22, 25, 27, 30, 34.$$

a. Find the mean number of customers, correct to one decimal place. 2 marks

b. Find the median. 1 mark

c. Find the range. 1 mark

d. Write down the mode. 1 mark

Question 5 (5 marks)

A survey of 50 people recorded whether they own a bicycle, by age group. Some entries are missing.

	Owns bike	No bike	Total
Under 18	16		28
18 and over		8	22
Total			50

a. Copy and complete the table. 2 marks

b. How many of the people surveyed own a bicycle? 1 mark

c. What percentage of the under-18 group own a bicycle? Give your answer correct to one decimal place. 2 marks

Question 6 (5 marks)

A survey of 60 workers recorded how each travels to work: car 27, train 15, bus 12, walk 6.

a. What percentage of the workers travel by car? 2 marks

b. Write down the modal (most common) method of travel. 1 mark

c. What fraction of the workers walk? Give your answer in simplest form. 1 mark

d. If the data is displayed in a pie chart, find the angle of the sector representing "train". 1 mark

Question 7 (5 marks)

$\$3000$ is invested at 6% per year simple interest. Use $I = \dfrac{Prt}{100}$.

a. Find the interest earned in 4 years. 2 marks

b. Find the total amount in the account after 4 years. 1 mark

c. At the same rate, how many years would it take to earn $\$900$ in interest? 2 marks

Question 8 (5 marks)

Sam works 36 hours per week and is paid $\$28$ per hour.

a. Find his weekly pay. 1 mark

b. Find his annual pay, assuming he works 52 weeks. 1 mark

c. The Medicare levy is 2% of annual income. Find the levy Sam pays. 1 mark

d. Superannuation of 11.5% of annual pay is paid into Sam's fund. Show that his superannuation is $\$6027.84$. 2 marks

Question 9 (5 marks)

a. A 2 L bottle of juice costs $\$4.80$ and a 1.5 L bottle costs $\$3.90$. Find the cost per litre of each, and state which bottle is better value. 3 marks

b. A phone plan costs $\$35$ per month. Find the total cost over a 24-month contract. 1 mark

c. The same plan can be prepaid for a year for $\$360$. Find the saving compared with paying $\$35$ each month for 12 months. 1 mark

Question 10 (5 marks)

A rectangular courtyard is 16 m long and 9 m wide.

a. Find the perimeter of the courtyard. 1 mark

b. Find the area of the courtyard. 1 mark

c. Paving costs $\$48$ per square metre. Find the cost of paving the courtyard. 2 marks

d. Show that an area of 144 m² is equal to $1\,440\,000$ cm². 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 1.5 m and height 4 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 m³ $= 1000$ L, find the capacity of the tank in litres, to the nearest litre. 2 marks

c. If 500 L is used each day, for how many complete days will a full tank last? 1 mark

Question 12 (5 marks)

a. On a map with scale $1:25\,000$, two landmarks are 8 cm apart. Find the real distance between them, in kilometres. 2 marks

b. Two angles of a triangle are 42° and 73°. Find the third angle. 1 mark

c. An L-shaped garden is made from two rectangles, one 6 m by 4 m and the other 3 m by 2 m. Find the total area of the garden. 2 marks

End of Section B

Practice Exam 2 — Solutions

Section A — answer key

Question	Answer	Working
1	**A**	The next digit is $6 \geq 5$, so $5.762 \to 5.8$.
2	**D**	$0.20 \times 45 = 9$.
3	**C**	Divide both parts by 6: $18:12 = 3:2$.
4	**A**	Multiply first: $20 - 6 \times 2 = 20 - 12 = 8$.
5	**A**	$4^3 = 4 \times 4 \times 4 = 64$.
6	**C**	$A = l\,w = 7 \times 4 = 28$.
7	**C**	$4x = 24$, so $x = 6$.
8	**A**	$\frac{5+8+11}{3} = \frac{24}{3} = 8$.
9	**B**	The middle (3rd) value is 9.
10	**C**	$22 - 6 = 16$.
11	**A**	5 occurs three times, more than any other value.
12	**B**	$\frac{600 \times 5 \times 2}{100} = 60$.
13	**B**	$0.10 \times 80 = 8$.
14	**D**	$60 \times 0.75 = 45$.
15	**B**	$950 - 780 = 170$.
16	**D**	$30 \times 24 = 720$.
17	**C**	$2(9+6) = 30$ m.
18	**D**	$\frac{1}{2} \times 10 \times 6 = 30$ cm².
19	**D**	$2 \times 5 \times 4 = 40$ cm³.
20	**B**	$3.2 \times 100 = 320$ cm.

Section B — worked solutions

Question 1. a. 30% of $\$70 = 0.30 \times 70 = \$21$. **b.** Sale price $= 70 - 21 = \$49$ (or $70 \times 0.70 = \$49$). **c.** GST $= 0.10 \times 45 = \$4.50$, so the total $= 45 + 4.50 = \$49.50$. **d.** A reduction of 12% leaves 88% of the price:

$$150 \times 0.88 = 132.$$

$\therefore$ the sale price is $\$132$.

Question 2. a. $7y + 2y - 4y = 5y$. **b.** $C = 30 + 18 \times 4 = 30 + 72 = \$102$. **c.** $5x + 7 = 42 \Rightarrow 5x = 35 \Rightarrow x = 7$.

Question 3. a. Total parts $= 3 + 5 = 8$. One part $= \frac{72}{8} = \$9$, so the shares are $3 \times 9 = \$27$ and $5 \times 9 = \$45$. **b.** One muffin uses $\frac{250}{10} = 25$ g, so 16 muffins use $16 \times 25 = 400$ g. **c.** Dividing both parts by 5: $15:25 = 3:5$.

Question 4. a. Mean $= \dfrac{18+22+22+25+27+30+34}{7} = \dfrac{178}{7} = 25.4$ (to 1 d.p.). **b.** With $n = 7$, the median is the 4th value: 25. **c.** Range $= 34 - 18 = 16$. **d.** The mode is 22 (it occurs twice).

Question 5. a. Under-18 with no bike $= 28 - 16 = 12$; 18-and-over who own a bike $= 22 - 8 = 14$. So the "owns bike" total $= 16 + 14 = 30$ and the "no bike" total $= 12 + 8 = 20$ (check $30 + 20 = 50$).

	Owns bike	No bike	Total
Under 18	16	12	28
18 and over	14	8	22
Total	30	20	50

b. 30 people own a bicycle. **c.** $\dfrac{16}{28} \times 100\,\% = 57.1\,\%$ (to 1 d.p.).

Question 6. a. $\dfrac{27}{60} \times 100\,\% = 45\,\%$. **b.** Car was chosen most often (27), so the modal method is **car**. **c.** $\dfrac{6}{60} = \dfrac{1}{10}$. **d.** Train angle $= \dfrac{15}{60} \times 360^\circ = 90^\circ$.

Question 7. a. $I = \dfrac{Prt}{100} = \dfrac{3000 \times 6 \times 4}{100} = \$720$. **b.** Total $= 3000 + 720 = \$3720$. **c.** Interest per year $= \dfrac{3000 \times 6}{100} = \$180$. To earn $\$900$: $t = \dfrac{900}{180} = 5$ years.

Question 8. a. Weekly pay $= 36 \times 28 = \$1008$. **b.** Annual pay $= 1008 \times 52 = \$52\,416$. **c.** Medicare levy $= 0.02 \times 52\,416 = \$1048.32$. **d.** Superannuation $= 0.115 \times 52\,416 = 6027.84$. $\therefore$ Sam's superannuation is $\$6027.84$.

Question 9. a. 2 L bottle: $\dfrac{4.80}{2} = \$2.40$ per litre. 1.5 L bottle: $\dfrac{3.90}{1.5} = \$2.60$ per litre. The 2 L bottle is better value (lower cost per litre). **b.** Total cost $= 35 \times 24 = \$840$. **c.** Paying monthly for a year costs $12 \times 35 = \$420$, so the saving is $420 - 360 = \$60$.

Question 10. a. Perimeter $= 2(16 + 9) = 50$ m. **b.** Area $= 16 \times 9 = 144$ m². **c.** Cost $= 144 \times 48 = \$6912$. **d.** 1 m² $= 100 \times 100 = 10\,000$ cm², so 144 m² $= 144 \times 10\,000 = 1\,440\,000$ cm².

Question 11. a. $V = \pi \times 1.5^2 \times 4 = 9\pi = 28.274\ldots \approx 28.27$ m³. **b.** Capacity $= 28.274 \times 1000 = 28\,274$ L (to the nearest litre). **c.** $\dfrac{28\,274}{500} = 56.5$, so a full tank lasts 56 complete days.

Question 12. a. Real distance $= 8 \times 25\,000 = 200\,000$ cm $= 2000$ m $= 2$ km. **b.** Third angle $= 180^\circ - 42^\circ - 73^\circ = 65^\circ$. **c.** Split the garden into two rectangles: $6 \times 4 = 24$ m² and $3 \times 2 = 6$ m². Total area $= 24 + 6 = 30$ m².

Practice Exam 3

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated; the Formula Sheet provided. 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 $30 - 4 \times 5 + 8$ is

A. 2

B. 18

C. 22

D. 138

Question 2

Written in scientific notation, $4\,800\,000$ is

A. 4.8×10^{7}

B. 4.8×10^{5}

C. 48×10^{5}

D. 4.8×10^{6}

Question 3

A coat priced at $\$140$ is discounted by 15%. The sale price is

A. $\$21$

B. $\$161$

C. $\$125$

D. $\$119$

Question 4

An amount of $\$96$ is shared in the ratio $3:5$. The larger share is

A. $\$60$

B. $\$12$

C. $\$40$

D. $\$36$

Question 5

The price of an item rises from $\$50$ to $\$58$. The percentage increase is

A. 58%

B. 8%

C. 16%

D. 14%

Question 6

The solution of the equation $3(x+2)=27$ is

A. $x=9$

B. $x=7.5$

C. $x=25$

D. $x=7$

Question 7

The mean of $6, 8, 11, 14, 16$ is

A. 11

B. 55

C. 12

D. 14

Question 8

The median of $4, 6, 9, 9, 12, 17, 21$ is

A. 12

B. 9

C. 9.71

D. 11

Question 9

The five-number summary of a data set is $6, 10, 15, 21, 30$. The interquartile range is

A. 24

B. 11

C. 15

D. 6

Question 10

The number of pets a family owns is an example of data that is

A. numerical and discrete

B. numerical and continuous

C. categorical and nominal

D. categorical and ordinal

Question 11

The range of the data $12, 7, 19, 4, 15$ is

A. 19

B. 11.4

C. 15

D. 4

Question 12

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

A. $\$600$

B. $\$3600$

C. $\$150$

D. $\$60$

Question 13

A price of $\$99$ includes 10% GST. The amount of GST included is

A. $\$90$

B. $\$10$

C. $\$9.90$

D. $\$9$

Question 14

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

A. the two options cost the same per kilogram

B. 1.2 kg for $\$6.60$

C. it cannot be determined

D. 750 g for $\$4.50$

Question 15

A casual worker is paid $\$24.80$ per hour and works 7.5 hours. The pay for the shift is

A. $\$180.00$

B. $\$178.50$

C. $\$186.00$

D. $\$32.30$

Question 16

When 10% GST is added to a price of $\$250$, the new price is

A. $\$25$

B. $\$227.27$

C. $\$260$

D. $\$275$

Question 17

The area of a triangle with base 12 cm and height 5 cm is

A. $30\,\text{cm}^2$

B. $17\,\text{cm}^2$

C. $34\,\text{cm}^2$

D. $60\,\text{cm}^2$

Question 18

The volume of a cylinder with radius 4 cm and height 10 cm, to the nearest cubic centimetre, is

A. $126\,\text{cm}^3$

B. $251\,\text{cm}^3$

C. $503\,\text{cm}^3$

D. $1257\,\text{cm}^3$

Question 19

An area of $3.5\,\text{m}^2$ is equal to

A. $350\,000\,\text{cm}^2$

B. $35\,000\,\text{cm}^2$

C. $350\,\text{cm}^2$

D. $3500\,\text{cm}^2$

Question 20

A right-angled triangle has the two shorter sides 9 cm and 12 cm. The length of the hypotenuse is

A. 108 cm

B. 21 cm

C. 15 cm

D. 225 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 smoothie mixes fruit and yoghurt in the ratio 400 g $:250$ g.

a. Write the ratio $400:250$ in its simplest form. 1 mark

b. The recipe is scaled up to a total mix of 3.25 kg in the same ratio. Find the mass of fruit and the mass of yoghurt. 2 marks

c. In one 650 g batch (400 g fruit and 250 g yoghurt), what percentage is yoghurt? Give your answer to one decimal place. 2 marks

Question 2 (5 marks)

An electrician charges a $\$60$ call-out fee plus $\$1.40$ per minute. The cost $\$C$ of a job lasting n minutes is $C = 60 + 1.40n$.

a. Find the cost of a job lasting 90 minutes. 1 mark

b. A job cost $\$130$. Find how many minutes it lasted. 2 marks

c. Show that a job lasting 75 minutes costs $\$165$. 2 marks

Question 3 (5 marks)

A stall sells jars of jam for $\$9$ each. The costs are a fixed $\$240$ plus $\$3$ for each jar made.

a. Write an expression for the revenue R and an expression for the total cost C when n jars are made and sold. 1 mark

b. Find the number of jars the stall must sell to break even. 2 marks

c. Show that selling 70 jars gives a profit of $\$180$. 2 marks

Question 4 (5 marks)

The numbers of bikes hired each day over 11 days were

$$8, 11, 11, 14, 16, 19, 22, 25, 28, 31, 58.$$

a. Find the median number of bikes hired. 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 58 is an outlier. 2 marks

Question 5 (5 marks)

250 commuters were surveyed about their preferred transport. The results are shown below.

	Train	Bus	Total
Female	85	40	125
Male	65	60	125
Total	150	100	250

a. How many commuters preferred the bus? 1 mark

b. What percentage of the train commuters were female? Give your answer to one decimal place. 2 marks

c. What percentage of all commuters preferred the train? 2 marks

Question 6 (5 marks)

The number of goals scored by a netball team in each of 20 games is summarised in the frequency table below.

Goals	0	1	2	3	4
Frequency	3	6	5	4	2

a. State the mode of the number of goals. 1 mark

b. Find the mean number of goals per game. 2 marks

c. Find the median number of goals per game. 2 marks

Question 7 (5 marks)

Ravi invests $\$5000$ at 4% per annum simple interest.

a. Find the simple interest earned in 3 years, and the total value of the investment after 3 years. 2 marks

b. Show that, at the same rate, the interest earned in 5 years is $\$1000$. 1 mark

c. Find the interest rate that would be needed for the $\$5000$ to earn $\$900$ of simple interest in 3 years. 2 marks

Question 8 (5 marks)

In one quarter, a business had sales of $\$27\,500$ (including GST) and purchases of $\$13\,200$ (including GST).

a. Find the GST included in the sales. 1 mark

b. Find the GST included in the purchases. 2 marks

c. The net GST payable is the GST on sales minus the GST on purchases. Show that the business must pay $\$1300$. 2 marks

Question 9 (5 marks)

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 $\$52\,000$ in a year.

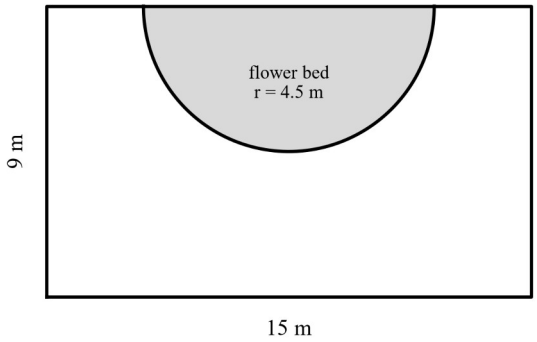
a. Find the income tax payable. 2 marks

b. Find the Medicare levy. 1 mark

c. Find the worker's net income after the tax and the levy have been paid. 2 marks

Question 10 (5 marks)

A rectangular courtyard measures 15 m by 9 m. A semicircular flower bed of radius 4.5 m is cut from the middle of one long side, as shown.



a. Find the perimeter of the 15 m by 9 m rectangle. 1 mark

b. Find the area of paving remaining after the flower bed is removed, correct to two decimal places. 2 marks

c. Paving costs $\$16$ per square metre. Show that paving the remaining area costs about $\$1651$. 2 marks

Question 11 (5 marks)

A cylindrical rainwater tank has radius 1.0 m and height 2.4 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. ($1\text{ m}^3 = 1000$ L.) 1 mark

c. Water has a mass of 1000 kg per cubic metre. Find the mass of water in the full tank, to the nearest kilogram. 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 6 cm by 4.5 cm.

a. Find the real length of the 6 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**	$30 - 20 + 8 = 18$ (multiply before add/subtract).
2	**D**	The leading digit is in the millions column: 4.8×10^6.
3	**D**	$140 \times 0.85 = \$119$.
4	**A**	$96 \times 5/8 = \$60$.
5	**C**	$58 - 50/50 \times 100\% = 16\%$.
6	**D**	$x + 2 = 9$, so $x = 7$.
7	**A**	$55/5 = 11$.
8	**B**	7 values; the 4th is 9.
9	**B**	$\text{IQR} = 21 - 10 = 11$.
10	**A**	A count of pets gives whole numbers, so numerical and discrete.
11	**C**	$19 - 4 = 15$.
12	**A**	$3000 \times 5 \times 4/100 = \$600$.
13	**D**	$99 \div 11 = \$9$.
14	**B**	$4.50 \div 0.75 = \$6$/kg vs $6.60 \div 1.2 = \$5.50$/kg.
15	**C**	$24.80 \times 7.5 = \$186$.
16	**D**	$250 \times 1.1 = \$275$.
17	**A**	$1/2 \times 12 \times 5 = 30\,\text{cm}^2$.
18	**C**	$\pi \times 4^2 \times 10 = 160\pi \approx 503\,\text{cm}^3$.
19	**B**	$3.5 \times 10\,000 = 35\,000\,\text{cm}^2$.
20	**C**	$\sqrt{9^2 + 12^2} = \sqrt{225} = 15$ cm.

Section B

Question 1. a. Dividing both parts by 50: $400 : 250 = 8 : 5$. **b.** The mix has $8 + 5 = 13$ parts, so one part is $3250 \div 13 = 250$ g. Fruit $= 8 \times 250 = 2000$ g; yoghurt $= 5 \times 250 = 1250$ g. **c.** $\dfrac{250}{650} \times 100\% = 38.5\%$ (to 1 d.p.).

Question 2. a. $C = 60 + 1.40 \times 90 = 60 + 126 = \$186$. **b.** $60 + 1.40n = 130$, so $1.40n = 70$ and $n = \dfrac{70}{1.40} = 50$ minutes. **c.** $C = 60 + 1.40 \times 75$. Now $1.40 \times 75 = 105$, so $C = 60 + 105 = \$165$, as required.

Question 3. a. $R = 9n$ and $C = 240 + 3n$. **b.** Break-even is where $R = C$: $9n = 240 + 3n$, so $6n = 240$ and $n = 40$ jars. **c.** For 70 jars: $R = 9 \times 70 = 630$ and $C = 240 + 3 \times 70 = 450$. Profit $= 630 - 450 = \$180$, as required.

Question 4. a. With $n = 11$ values, the median is the 6th value: 19. **b.** Lower half $8, 11, 11, 14, 16$ gives $Q_1 = 11$; upper half $22, 25, 28, 31, 58$ gives $Q_3 = 28$; so $\text{IQR} = 28 - 11 = 17$. **c.** The upper fence is $Q_3 + 1.5 \times \text{IQR} = 28 + 1.5 \times 17 = 28 + 25.5 = 53.5$. Since $58 > 53.5$, the value 58 lies beyond the upper fence and is an outlier.

Question 5. a. 100 commuters preferred the bus. **b.** $\dfrac{85}{150} \times 100\% = 56.7\%$ (to 1 d.p.). **c.** $\dfrac{150}{250} \times 100\% = 60\%$.

Question 6. a. The highest frequency is 6, at 1 goal, so the mode is 1. **b.** Total goals $= 0 \times 3 + 1 \times 6 + 2 \times 5 + 3 \times 4 + 4 \times 2 = 0 + 6 + 10 + 12 + 8 = 36$. Mean $= \dfrac{36}{20} = 1.8$ goals. **c.** With 20 games the median is the average of the 10th and 11th values. The cumulative frequencies are $3, 9, 14$, so both the 10th and 11th values are 2. Median $= 2$ goals.

Question 7. a. $I = \dfrac{5000 \times 4 \times 3}{100} = \$600$; total value $= 5000 + 600 = \$5600$. **b.** $I = \dfrac{5000 \times 4 \times 5}{100} = \$1000$, as required. **c.** $900 = \dfrac{5000 \times r \times 3}{100} = 150r$, so $r = \dfrac{900}{150} = 6\%$ per annum.

Question 8. a. GST on sales $= \dfrac{27\,500}{11} = \$2500$. **b.** GST on purchases $= \dfrac{13\,200}{11} = \$1200$. **c.** Net GST $= 2500 - 1200 = \$1300$, so the business must pay $\$1300$, as required.

Question 9. a. Tax $= 0.19 \times (52\,000 - 18\,200) = 0.19 \times 33\,800 = \$6422$. **b.** Medicare levy $= 0.02 \times 52\,000 = \$1040$. **c.** Net income $= 52\,000 - 6422 - 1040 = \$44\,538$.

Question 10. a. Perimeter $= 2(15 + 9) = 48$ m. **b.** Area of rectangle $= 15 \times 9 = 135\,\text{m}^2$. Area of semicircle $= 1/2\,\pi \times 4.5^2 = 10.125\,\pi \approx 31.81\,\text{m}^2$. Remaining paving $= 135 - 10.125\,\pi \approx 103.19\,\text{m}^2$. **c.** Cost $= 103.19 \times 16 = \$1651.04 \approx \$1651$, as required.

Question 11. a. $V = \pi r^2 h = \pi \times 1.0^2 \times 2.4 = 2.4\,\pi \approx 7.5398\,\text{m}^3$. **b.** Capacity $= 2.4\,\pi \times 1000 \approx 7540$ L. **c.** Mass $= 1000 \times 2.4\,\pi \approx 7540$ kg (to the nearest kilogram).

Question 12. a. Real length $= 6 \times 100 = 600$ cm $= 6$ m. **b.** The other side is $4.5 \times 100 = 450$ cm $= 4.5$ m, so the floor area $= 6 \times 4.5 = 27\,\text{m}^2$. **c.** Diagonal $= \sqrt{6^2 + 4.5^2} = \sqrt{56.25} = 7.5$ m.

Practice Exam 4

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated; the Formula Sheet provided. 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 $(7-3)^2 \div 8 + 6$ is

A. 10

B. 14

C. 8

D. 4

Question 2

Written as an ordinary number, 6.3×10^4 is

A. $63\,000$

B. 0.00063

C. $630\,000$

D. 6300

Question 3

$\$540$ is divided between two people in the ratio $4:5$. The larger share is

A. $\$60$

B. $\$300$

C. $\$240$

D. $\$270$

Question 4

A price increases from $\$75$ to $\$90$. The percentage increase is

A. 15%

B. 25%

C. 17%

D. 20%

Question 5

Six identical textbooks cost $\$84$. At the same rate, the cost of 10 textbooks is

A. $\$140$

B. $\$840$

C. $\$50.40$

D. $\$126$

Question 6

$\frac{2}{3}+\frac{1}{4}$ equals

A. $\frac{3}{7}$

B. $\frac{3}{12}$

C. $\frac{11}{12}$

D. $\frac{2}{12}$

Question 7

The solution of $5x-4=3x+10$ is

A. $x=0.75$

B. $x=7$

C. $x=3$

D. $x=-7$

Question 8

The value of $\sqrt{81}+3^3$ is

A. 18

B. 36

C. 108

D. 30

Question 9

The mean of $7, 9, 10, 11, 13$ is

A. 50

B. 9

C. 10

D. 11

Question 10

The median of $5, 8, 11, 14, 16, 19$ is

A. 12.5

B. 12

C. 11

D. 14

Question 11

A data set has the five-number summary $8, 14, 19, 26, 35$. The interquartile range is

A. 19

B. 27

C. 12

D. 21

Question 12

The colour of each car in a car park is recorded. This data is best described as

A. numerical and discrete

B. numerical and continuous

C. none of these

D. categorical

Question 13

The simple interest on $\$3200$ at 5% per annum for 3 years is

A. $\$384$

B. $\$9600$

C. $\$460$

D. $\$480$

Question 14

A price of $\$143$ includes 10% GST. The amount of GST included is

A. $\$13$

B. $\$14.30$

C. $\$11$

D. $\$130$

Question 15

A 400 g pack of oats costs $\$3.20$ and a 600 g pack costs $\$4.20$. Better value is

A. it cannot be determined

B. the 600 g pack

C. the 400 g pack

D. they are equal value

Question 16

A worker is paid $\$24.50$ per hour and works 38 hours in a week. The gross weekly pay is

A. $\$93.10$

B. $\$62.50$

C. $\$980$

D. $\$931$

Question 17

The area of a circle of radius 5 cm, correct to one decimal place, is

A. 25 cm²

B. 31.4 cm²

C. 78.5 cm²

D. 15.7 cm²

Question 18

The volume of a cylinder of radius 2 cm and height 5 cm, correct to one decimal place, is

A. 125.7 cm³

B. 20 cm³

C. 31.4 cm³

D. 62.8 cm³

Question 19

6.2 m² expressed in square centimetres is

A. 62 000 cm²

B. 620 cm²

C. 6200 cm²

D. 620 000 cm²

Question 20

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

A. 169 cm

B. 13 cm

C. 17 cm

D. 8.5 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 food van has fixed costs of $\$150$ per day. Each meal costs $\$4$ to make and sells for $\$9$. The van sells n meals in a day.

a. Write an expression for the daily profit P dollars in terms of n. 1 mark

b. Show that the van breaks even when $n = 30$. 2 marks

c. Find the profit when 80 meals are sold. 1 mark

d. How many meals must be sold for a profit of $\$400$? 1 mark

Question 2 (5 marks)

A smoothie recipe for 4 serves uses 600 g of fruit and 500 mL of yoghurt.

a. How much fruit is needed for 10 serves? 2 marks

b. The amount of yoghurt is increased by 15%. Find the new amount of yoghurt. 1 mark

c. Write the ratio of fruit to yoghurt, $600:500$, in simplest form. 1 mark

d. Fruit costs $\$8$ per kilogram. Find the cost of the fruit needed for 10 serves. 1 mark

Question 3 (5 marks)

A council estimates that a park has $18\,000$ trees. A survey then counts $19\,500$ trees.

a. Find the absolute error in the estimate. 1 mark

b. Find the percentage error, correct to one decimal place. 2 marks

c. Round $19\,500$ to two significant figures. 1 mark

d. Write $19\,500$ in scientific notation. 1 mark

Question 4 (5 marks)

The times (in minutes) taken for 9 commutes were

$$22, 25, 28, 30, 33, 36, 38, 41, 65.$$

a. Find the median commute 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 65-minute commute is an outlier. 2 marks

Question 5 (5 marks)

A survey of 250 students recorded whether each walks or rides to school, by year level. Some entries are missing.

	Walk	Ride	Total
Junior	80		140
Senior		70	110
Total			250

a. Complete the table by finding the four missing values. 2 marks

b. What percentage of all students walk to school? 1 mark

c. What percentage of junior students ride to school, correct to one decimal place? 1 mark

d. If 500 students were surveyed with the same proportions, how many would be expected to walk? 1 mark

Question 6 (5 marks)

The numbers of books read in a month by the members of two book clubs were

- Club P: $3, 5, 5, 6, 8, 9, 12$
- Club Q: $4, 4, 5, 7, 7, 8, 20$

a. Find the median for each club. 2 marks

b. Find the range for each club. 1 mark

c. One member of Club Q read 20 books. State whether this value affects the mean or the median more, and explain why. 2 marks

Question 7 (5 marks)

Marcus has $\$5000$ to invest.

a. Option 1 pays 5% per annum simple interest. Find the interest earned over 3 years. 2 marks

b. Option 2 pays 4% per annum simple interest. Find the interest earned over 4 years. 2 marks

c. State which option earns more interest, 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 $\$18\,000$ before GST. Find the GST to be added to the sales. 1 mark

b. The business paid $\$6600$ (GST-inclusive) for stock. Find the GST included in this amount. 1 mark

c. Show that the net GST owed on the Business Activity Statement is $\$1200$. 2 marks

d. State the GST rate used throughout. 1 mark

Question 9 (5 marks)

Ava earns a salary of $\$72\,000$ per year.

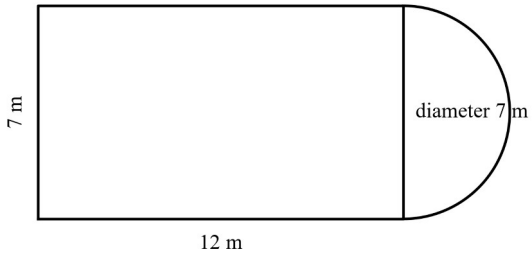
a. Ava receives a 3% pay rise. Find the new salary. 1 mark

b. Inflation that year was 4%. State whether Ava's buying power increased or decreased, and explain briefly. 2 marks

c. Ava compares two internet plans: Plan A costs $\$65$ per month; Plan B costs $\$720$ per year prepaid. State which is cheaper over a year and by how much. 2 marks

Question 10 (5 marks)

A courtyard is a rectangle 12 m by 7 m with a semicircle of diameter 7 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 courtyard, correct to one decimal place. 1 mark

d. Paving costs $\$45$ per square metre. Find the cost of paving the whole courtyard, to the nearest dollar. 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 0.8 m and height 1.5 m.

a. Show that the volume of the tank is about 3.02 m³. 2 marks

b. Find the capacity of the tank in litres (1 m³ $= 1000$ L), to the nearest litre. 1 mark

c. Water flows in at 20 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 $1:25\,000$, two lookouts are 6 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 6 cm by 3.5 cm on the plan. Find the real area of the room, in square metres. 2 marks

c. A length is measured as 18.4 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 — answer key

Question	Answer	Working
1	**C**	$(7-3)^2 \div 8 + 6 = 16 \div 8 + 6 = 2 + 6 = 8$.
2	**A**	$6.3 \times 10^4 = 6.3 \times 10\,000 = 63\,000$.
3	**B**	$4 + 5 = 9$ parts; larger $= \frac{5}{9} \times 540 = \$300$.
4	**D**	$\frac{90-75}{75} \times 100\,\% = \frac{15}{75} \times 100\,\% = 20\,\%$.
5	**A**	One book $= 84 \div 6 = \$14$; ten books $= 14 \times 10 = \$140$.
6	**C**	$\frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$.
7	**B**	$5x - 4 = 3x + 10 \Rightarrow 2x = 14 \Rightarrow x = 7$.
8	**B**	$\sqrt{81} + 3^3 = 9 + 27 = 36$.
9	**C**	$\frac{7+9+10+11+13}{5} = \frac{50}{5} = 10$.
10	**A**	$n = 6$; median $= \frac{11+14}{2} = 12.5$.
11	**C**	$\text{IQR} = Q_3 - Q_1 = 26 - 14 = 12$.
12	**D**	Colour is a label, not a number, so the data is categorical.
13	**D**	$I = \frac{3200 \times 5 \times 3}{100} = \$480$.
14	**A**	GST included $= \frac{143}{11} = \$13$.
15	**B**	$\$3.20 \div 400 = 0.8$ c/g; $\$4.20 \div 600 = 0.7$ c/g — the 600 g pack is cheaper per gram.
16	**D**	$24.50 \times 38 = \$931$.
17	**C**	$\pi \times 5^2 = 78.53\ldots \approx 78.5$ cm².
18	**D**	$\pi \times 2^2 \times 5 = 62.83\ldots \approx 62.8$ cm³.
19	**A**	$6.2 \times 100^2 = 6.2 \times 10\,000 = 62\,000$ cm².
20	**B**	$\sqrt{5^2 + 12^2} = \sqrt{169} = 13$ cm.

Section B — solutions

Question 1.

a. Revenue is $9n$ and total cost is $150 + 4n$, so $P = 9n - (150 + 4n) = 5n - 150$.

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

$$5n - 150 = 0$$

$$5n = 150$$

$$n = 30.$$

So the van breaks even at $n = 30$ meals.

c. $P = 5(80) - 150 = 400 - 150 = \$250.$

d. $5n - 150 = 400 \Rightarrow 5n = 550 \Rightarrow n = 110$ meals.

Question 2.

a. For 1 serve, fruit $= 600 \div 4 = 150$ g, so for 10 serves, fruit $= 150 \times 10 = 1500$ g.

b. New yoghurt $= 500 \times 1.15 = 575$ mL.

c. $600 : 500 = 6 : 5$ (dividing both parts by 100).

d. 1500 g $= 1.5$ kg, so cost $= 1.5 \times \$8 = \$12.00.$

Question 3.

a. Absolute error $= |18\,000 - 19\,500| = 1500.$

b. Percentage error $= \dfrac{1500}{19\,500} \times 100\,\% = 7.69\ldots\,\% \approx 7.7\,\%.$

c. $19\,500$ to two significant figures is $20\,000.$

d. $19\,500 = 1.95 \times 10^4.$

Question 4.

a. With $n = 9$ ordered values, the median is the 5th value, 33 minutes.

b. Lower half $22, 25, 28, 30$ gives $Q_1 = \dfrac{25 + 28}{2} = 26.5$; upper half $36, 38, 41, 65$ gives $Q_3 = \dfrac{38 + 41}{2} = 39.5$. So IQR $= 39.5 - 26.5 = 13$ minutes.

c. The upper fence is

$$Q_3 + 1.5 \times \text{IQR} = 39.5 + 1.5 \times 13 = 39.5 + 19.5 = 59 \text{ minutes}.$$

Since $65 > 59$, the 65-minute commute lies beyond the upper fence and is an outlier.

Question 5.

a. Junior ride $= 140 - 80 = 60$; Senior walk $= 110 - 70 = 40$; Walk total $= 80 + 40 = 120$; Ride total $= 60 + 70 = 130$ (check $120 + 130 = 250$).

b. Walk $= \dfrac{120}{250} \times 100\,\% = 48\,\%.$

c. Junior ride $= \dfrac{60}{140} \times 100\,\% = 42.85\ldots\,\% \approx 42.9\,\%.$

d. Expected walkers $= 48\,\% \times 500 = 240.$

Question 6.

a. Each club has 7 values, so the median is the 4th. Club P: 6 books; Club Q: 7 books.

b. Club P range $= 12 - 3 = 9$; Club Q range $= 20 - 4 = 16$.

c. The value 20 affects the **mean** more. The mean adds every value, so one unusually large value pulls it upward; the median depends only on the middle position and is barely changed by the extreme value.

Question 7.

a. $I = \dfrac{P\,r\,t}{100} = \dfrac{5000 \times 5 \times 3}{100} = \$750.$

b. $I = \dfrac{5000 \times 4 \times 4}{100} = \$800.$

c. Option 2 earns more interest, by $800 - 750 = \$50$.

Question 8.

a. GST to add $= 10\% \times 18\,000 = \$1800$.

b. GST included $= \dfrac{6600}{11} = \$600.$

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

$$1800 - 600 = \$1200.$$

So the net GST owed on the BAS is $\$1200$.

d. The GST rate is 10%.

Question 9.

a. New salary $= 72\,000 \times 1.03 = \$74\,160$.

b. The pay rise (3%) is less than inflation (4%), so prices rise faster than the salary and the real value falls by about 1% — Ava's buying power **decreased**.

c. Plan A costs $65 \times 12 = \$780$ per year; Plan B costs $\$720$ per year. Plan B is cheaper, by $780 - 720 = \$60$.

Question 10.

a. Rectangle area $= 12 \times 7 = 84$ m².

b. The semicircle has diameter 7 m, so radius 3.5 m. Area $= \dfrac{1}{2}\pi r^2 = \dfrac{1}{2}\pi(3.5)^2 = 19.24\ldots \approx 19.2$ m².

c. Total area $= 84 + 19.24 = 103.24 \approx 103.2$ m².

d. Cost $= \left(84 + \dfrac{1}{2}\pi(3.5)^2\right) \times \$45 = \$4645.9\ldots \approx \$4646.$

Question 11.

a. $V = \pi r^2 h = \pi \times (0.8)^2 \times 1.5 = \pi \times 0.64 \times 1.5 = 3.0159\ldots \approx 3.02$ m³.

b. Capacity $= 3.0159 \times 1000 = 3015.9 \approx 3016$ L.

c. Time $= \dfrac{3015.9}{20} = 150.8\ldots \approx 151$ minutes.

d. Mass $= 3016 \times 1 = 3016$ kg (using 1 kg per litre).

Question 12.

a. Real distance $= 6 \times 25\,000 = 150\,000$ cm $= 1500$ m $= 1.5$ km.

b. Real length $= 6 \times 100 = 600$ cm $= 6$ m; real width $= 3.5 \times 100 = 350$ cm $= 3.5$ m. Real area $= 6 \times 3.5 = 21$ m².

c. "Nearest millimetre" means ± 0.05 cm, so the true value lies between 18.35 cm and 18.45 cm.

Practice Exam 5

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated; the Formula Sheet provided. 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 $48\,637$ rounded to two significant figures is

A. $50\,000$

B. $48\,600$

C. $48\,000$

D. $49\,000$

Question 2

The number 0.00072 written in the form $a \times 10^{n}$, where $1 \le a < 10$, is

A. 7.2×10^{-4}

B. 7.2×10^{4}

C. 72×10^{-5}

D. 7.2×10^{-3}

Question 3

\$5400 is shared between three people in the ratio $2:3:7$. The smallest share is

A. \$2100

B. \$450

C. \$900

D. \$1800

Question 4

A \$60 jacket is discounted by 20%, and then a further 10% is taken off the discounted price at the register. The final price is

A. \$42.00

B. \$40.80

C. \$43.20

D. \$45.00

Question 5

The formula $P=2(l+w)$ is transposed to make w the subject. When $P=34$ and $l=12$, the value of w is

A. 5

B. 11

C. 10

D. 22

Question 6

A car uses 6.4 litres of fuel per 100 km. The fuel used on a 250 km trip is

A. 12.8 L

B. 16 L

C. 9.6 L

D. 25.6 L

Question 7

For the data set $8, 11, 13, 14, 16, 19, 21, 25$, the interquartile range is

A. 8.5

B. 8

C. 9

D. 6

Question 8

The number of goals scored in 20 games is summarised below.

Goals	0	1	2	3
Frequency	4	6	7	3

The mean number of goals per game is

A. 1.55

B. 2

C. 1.5

D. 1.45

Question 9

The median of $5, 9, 12, 12, 15, 20, 22, 28$ is

A. 15

B. 12.5

C. 12

D. 13.5

Question 10

In a sample of 80 light globes, 12 were faulty. At the same rate, the number of faulty globes expected in a batch of 500 is

A. 150

B. 75

C. 60

D. 96

Question 11

The simple interest earned on \$4500 at 4% per annum for 2 years is

A. \$360

B. \$720

C. \$180

D. \$450

Question 12

A restaurant bill of \$209 includes GST at 10%. The amount of GST included in the bill is

A. \$19.90

B. \$19.00

C. \$20.90

D. \$18.00

Question 13

A worker earning \$1200 per week receives a 3% pay rise. The new weekly pay is

A. \$1203

B. \$1260

C. \$1236

D. \$1230

Question 14

A 750 g pack of rice costs \$6.00. The unit price is

A. \$1.25 per 100 g

B. \$0.60 per 100 g

C. \$0.80 per 100 g

D. \$0.75 per 100 g

Question 15

On a plan drawn to a scale of $1:200$, a region has an area of 18 cm². The real area of the region is

A. 3.6 m²

B. 7200 cm²

C. 36 m²

D. 72 m²

Question 16

A cylinder has radius 5 cm and height 14 cm. Its volume, to the nearest cm³, is

A. 1100 cm³

B. 1099 cm³

C. 2199 cm³

D. 220 cm³

Question 17

A right-angled triangle has the two shorter sides 7 cm and 24 cm. The length of the hypotenuse is

A. 31 cm

B. 625 cm

C. 23 cm

D. 25 cm

Question 18

Three angles lie on a straight line. Their sizes are x, $2x$ and 30°. The value of x is

A. 50°

B. 75°

C. 60°

D. 45°

Question 19

A rectangular tank measures 80 cm by 50 cm by 40 cm. Its capacity is

A. 1600 L

B. $160\,000$ L

C. 160 L

D. 16 L

Question 20

A train travels 210 km in 2 hours and 30 minutes. Its average speed is

A. 88 km/h

B. 84 km/h

C. 105 km/h

D. 70 km/h

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 community garden has vegetable beds and flower beds in the ratio $5:3$. There are 64 beds in total.

a. Find the number of vegetable beds and the number of flower beds. 2 marks

b. Show that the flower beds make up 37.5% of the garden. 1 mark

c. The gardeners want the ratio of vegetable beds to flower beds to become $5:4$, keeping all 40 vegetable beds. Find how many flower beds must be added. 2 marks

Question 2 (5 marks)

A plumber charges $C = 90 + 75h$ dollars for a job that takes h hours.

a. Find the charge for a 3.5-hour job. 1 mark

b. By solving an equation, find the length of a job that costs \$465. 2 marks

c. Transpose the formula $C = 90 + 75h$ to make h the subject. 2 marks

Question 3 (5 marks)

a. Evaluate $\dfrac{48 - 3 \times 4}{2^2 + 5}$. 2 marks

b. A shopper estimates 6.1×39.5 by rounding each number to one significant figure, getting $6 \times 40 = 240$. Find the exact value and its difference from the estimate. 2 marks

c. Explain why the estimate in part **b.** is reasonable. 1 mark

Question 4 (5 marks)

The masses (in kilograms) of 11 parcels were

$$3, 5, 6, 6, 8, 9, 11, 12, 14, 16, 40.$$

a. Find the median and the interquartile range. 2 marks

b. Show that the 40 kg parcel is an outlier. 2 marks

c. State whether the median or the mean better represents a typical parcel mass, and give a reason. 1 mark

Question 5 (5 marks)

The number of days absent last term was recorded for 25 students.

Days absent (x)	0	1	2	3	4
Frequency (f)	6	8	5	4	2

a. Find the mean number of days absent, correct to two decimal places. 2 marks

b. Find the median and the mode. 2 marks

c. Find the percentage of students absent for 3 or more days. 1 mark

Question 6 (5 marks)

A survey of 150 residents recorded their main transport to work, by area.

	Public transport	Car	Total
City	48		90
Suburbs			60
Total		78	150

a. Complete the two-way table. 2 marks

b. Find the percentage of city residents who use public transport, correct to one decimal place. 1 mark

c. Determine which area has the greater proportion of residents using public transport, justifying your answer with calculations. 2 marks

Question 7 (5 marks)

A person invests \$6000 at 5% per annum simple interest.

a. Show that the interest earned in 4 years is \$1200. 2 marks

b. Find the total value of the investment after 4 years. 1 mark

c. Find how many years it would take to earn \$1800 in interest at the same rate. 2 marks

Question 8 (5 marks)

For a certain year, income tax is \$4200 plus 30 cents for each \$1 of taxable income over \$40,000. A worker has a taxable income of \$58,000.

a. Show that the income tax payable is \$9600. 2 marks

b. The Medicare levy is 2% of taxable 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)

A worker earns \$1400 gross per week. Weekly deductions are \$322 in PAYG tax and a \$12 union fee.

a. Find the worker's net (take-home) pay. 2 marks

b. The employer also pays superannuation at 11.5% of gross pay. Find the weekly superannuation contribution. 1 mark

c. The worker budgets 30% of net pay for rent. Find the weekly rent budget and the amount left after paying rent. 2 marks

Question 10 (5 marks)

A rectangular lawn measures 15 m by 9 m. A semicircular garden bed of diameter 6 m is removed from one side, and the rest is turfed.

a. Show that the area of the semicircular garden bed is 4.5π m². 2 marks

b. Find the area to be turfed, correct to two decimal places. 2 marks

c. Turf costs \$18 per square metre. Find the cost of turfing, to the nearest dollar. 1 mark

Question 11 (5 marks)

A cylindrical water tank has radius 1.5 m and height 1.2 m.

a. Show that the volume of the tank is 2.7π m³. 2 marks

b. Find the volume correct to two decimal places, and hence the capacity in litres (1 m³ $= 1000$ L), to the nearest litre. 2 marks

c. The tank is filled at 40 litres per minute. Find the time to fill it, to the nearest minute. 1 mark

Question 12 (5 marks)

On a map with a scale of $1:50\,000$, two towns are 12 cm apart.

a. Find the real distance between the towns, in kilometres. 1 mark

b. A cyclist rides between the towns at an average speed of 18 km/h. Find the time taken, in minutes. 2 marks

c. The cyclist leaves at $9:50$ am and rests for 15 minutes along the way. Find the arrival time. 2 marks

End of Section B

Practice Exam 5 — Solutions

Section A — Multiple-choice answers

Question	Answer	Working
1	**D**	First two significant figures $4, 8$; the next digit is $6 \geq 5$, so round up: $49\,000$.
2	**A**	Move the point four places right: $0.00072 = 7.2 \times 10^{-4}$.
3	**C**	Total parts $2 + 3 + 7 = 12$; one part $= \frac{5400}{12} = 450$; smallest $= 2 \times 450 = \$900$.
4	**C**	$60 \times 0.80 = 48$, then $48 \times 0.90 = \$43.20$ (the two discounts do not add to 30%).
5	**A**	$w = \frac{P}{2} - l = \frac{34}{2} - 12 = 17 - 12 = 5$.
6	**B**	$\frac{6.4}{100} \times 250 = 16$ L.
7	**B**	Lower half $8, 11, 13, 14 \Rightarrow Q_1 = 12$; upper half $16, 19, 21, 25 \Rightarrow Q_3 = 20$; IQR $= 20 - 12 = 8$.
8	**D**	$\sum f = 20$, $\sum xf = 0 + 6 + 14 + 9 = 29$; mean $= \frac{29}{20} = 1.45$.
9	**D**	Middle two values are 12 and 15; median $= \frac{12 + 15}{2} = 13.5$.
10	**B**	$\frac{12}{80} \times 500 = 75$.
11	**A**	$I = \frac{Prt}{100} = \frac{4500 \times 4 \times 2}{100} = \$360$.
12	**B**	GST $= \frac{209}{11} = \$19.00$.
13	**C**	$1200 \times 1.03 = \$1236$.
14	**C**	$\frac{6.00}{750} \times 100 = \$0.80$ per 100 g.
15	**D**	Area factor $= 200^2 = 40\,000$; $18 \times 40\,000 = 720\,000$ cm² $= 72$ m².
16	**A**	$V = \pi \times 5^2 \times 14 = 350\pi \approx 1099.56 \approx 1$ cm³.
17	**D**	$c = \sqrt{7^2 + 24^2} = \sqrt{625} = 25$ cm.
18	**A**	$x + 2x + 30 = 180 \Rightarrow 3x = 150 \Rightarrow x = 5$.
19	**C**	$80 \times 50 \times 40 = 160\,000$ cm³ $= 160$

Question	Answer	Working
		L.
20	**B**	2 h 30 min $= 2.5$ h; average speed $= \frac{210}{2.5} = 84$ km/h.

Section B — worked solutions

Question 1. a. Total parts $= 5 + 3 = 8$, so one part $= \frac{64}{8} = 8$. Vegetable beds $= 5 \times 8 = 40$; flower beds $= 3 \times 8 = 24$. **b.** Flower beds are $\frac{24}{64} = 0.375 = 37.5\,\%$ of the garden. **c.** For a $5:4$ ratio keeping 40 vegetable beds, one part $= \frac{40}{5} = 8$, so flower beds must total $4 \times 8 = 32$. Since there are already 24, the gardeners must add $32 - 24 = 8$ flower beds.

Question 2. a. $C = 90 + 75 \times 3.5 = 90 + 262.50 = \$352.50$. **b.** Solve $90 + 75h = 465$: $75h = 375$, so $h = \frac{375}{75} = 5$ hours. **c.** $C - 90 = 75h$, so $h = \frac{C - 90}{75}$.

Question 3. a. Numerator $= 48 - 3 \times 4 = 48 - 12 = 36$; denominator $= 2^2 + 5 = 4 + 5 = 9$; so $\frac{36}{9} = 4$. **b.** Exact value $= 6.1 \times 39.5 = 240.95$; difference from the estimate $= 240.95 - 240 = 0.95$. **c.** Rounding each number to one significant figure changes each only slightly, so the estimate 240 has the same order of magnitude as the exact value and confirms it is reasonable.

Question 4. a. With $n = 11$, the median is the 6th value, 9 kg. Lower half $3, 5, 6, 6, 8 \Rightarrow Q_1 = 6$; upper half $11, 12, 14, 16, 40 \Rightarrow Q_3 = 14$; so IQR $= 14 - 6 = 8$ kg. **b.** Upper fence $= Q_3 + 1.5 \times \text{IQR} = 14 + 1.5 \times 8 = 14 + 12 = 26$ kg. Since $40 > 26$, the 40 kg parcel is an outlier. **c.** The **median** better represents a typical parcel, because the 40 kg outlier inflates the mean above most of the data.

Question 5. a. $\sum f = 6 + 8 + 5 + 4 + 2 = 25$; $\sum xf = 0(6) + 1(8) + 2(5) + 3(4) + 4(2) = 0 + 8 + 10 + 12 + 8 = 38$; mean $= \frac{38}{25} = 1.52$ days. **b.** The median is the 13th value; the cumulative frequencies $6, 14$ place the 13th value at $x = 1$, so the median $= 1$. The largest frequency is 8, at $x = 1$, so the mode $= 1$. **c.** Students absent 3 or more days $= 4 + 2 = 6$, so $\frac{6}{25} \times 100\,\% = 24\,\%$.

Question 6. a. City car $= 90 - 48 = 42$. Total public transport $= 150 - 78 = 72$, so suburbs public transport $= 72 - 48 = 24$ and suburbs car $= 60 - 24 = 36$ (check: $42 + 36 = 78$). ✓

	Public transport	Car	Total
City	48	42	90
Suburbs	24	36	60
Total	72	78	150

b. City public-transport users $= \frac{48}{90} \times 100\,\% = 53.3\,\%$ (1 d.p.). **c.** City: $\frac{48}{90} \times 100\,\% = 53.3\,\%$; suburbs: $\frac{24}{60} \times 100\,\% = 40\,\%$. The **city** has the greater proportion using public transport ($53.3\,\% > 40\,\%$).

Question 7. a. $I = \frac{Prt}{100} = \frac{6000 \times 5 \times 4}{100} = \$1200$. **b.** Total value $= 6000 + 1200 = \$7200$. **c.** Set $\frac{6000 \times 5 \times t}{100} = 1800$, i.e. $300t = 1800$, so $t = 6$ years.

Question 8. a. Tax $= 4200 + 0.30 \times (58\,000 - 40\,000) = 4200 + 0.30 \times 18\,000 = 4200 + 5400 = \$9600$. **b.** Medicare levy $= 0.02 \times 58\,000 = \$1160$. **c.** Net income $= 58\,000 - 9600 - 1160 = \$47\,240$.

Question 9. a. Net pay $= 1400 - 322 - 12 = \$1066$. **b.** Superannuation $= 0.115 \times 1400 = \$161$. **c.** Rent budget $= 0.30 \times 1066 = \$319.80$; amount left $= 1066 - 319.80 = \$746.20$.

Question 10. a. The diameter is 6 m, so the radius is 3 m. Area $= \frac{1}{2}\pi r^2 = \frac{1}{2}\pi \times 3^2 = \frac{1}{2}\pi \times 9 = 4.5\pi$ m². **b.** Lawn area $= 15 \times 9 = 135$ m². Turfed area $= 135 - 4.5\pi \approx 135 - 14.14 = 120.86$ m². **c.** Cost $= 120.8628\ldots \times 18 \approx \$2176$ (to the nearest dollar).

Question 11. a. $V = \pi r^2 h = \pi \times 1.5^2 \times 1.2 = \pi \times 2.25 \times 1.2 = 2.7\pi$ m³. **b.** $V = 2.7\pi \approx 8.48$ m³; capacity $= 8.4823\ldots \times 1000 \approx 8482$ L. **c.** Time $= \frac{8482.3}{40} \approx 212$ min (to the nearest minute).

Question 12. a. Real distance $= 12 \times 50\,000 = 600\,000$ cm $= 6$ km. **b.** Time $= \frac{6}{18}$ h $= \frac{1}{3}$ h $= 20$ minutes. **c.** Riding time 20 min plus a 15 min rest $= 35$ min. Leaving at $9:50$ am, the arrival time is $10:25$ am.

Practice Exam 6

Reading time: 15 minutes. Writing time: 2 hours. Materials: one scientific calculator; one bound reference that may be annotated; the Formula Sheet provided. 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 0.048271 rounded to two significant figures is

A. 0.0482

B. 0.048

C. 0.05

D. 0.0483

Question 2

An amount of \$720 is divided in the ratio $2:3:4$. The largest share is

A. \$320

B. \$240

C. \$80

D. \$160

Question 3

A \$250 jacket is increased in price by 20%, then the new price is reduced by 15% in a sale. The sale price is

A. \$253

B. \$262.50

C. \$250

D. \$255

Question 4

A car uses 42 litres of fuel to travel 600 km. Its fuel consumption, in litres per 100 km, is

A. 0.07

B. 25.2

C. 7

D. 14.3

Question 5

The cost of a job is given by $C = 45 + 30h$, where h is the number of hours. When $C = 195$, the value of h is

A. 8

B. 4

C. 6.5

D. 5

Question 6

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

A. 200

B. 56

C. 35

D. 41

Question 7

The mean of $12, 15, 15, 18, 20$ is

A. 15

B. 15.5

C. 16

D. 80

Question 8

The median of $13, 18, 23, 27, 29, 34$ is

A. 25

B. 23

C. 27

D. 24

Question 9

A data set has the five-number summary $7, 15, 22, 31, 50$. Its interquartile range is

A. 16

B. 43

C. 22

D. 35

Question 10

In a survey, 40 people named their favourite season and 10 chose summer. On a pie chart of the results, the angle of the summer sector is

A. 90°

B. 100°

C. 45°

D. 36°

Question 11

The simple interest on \$4000 at 6% per annum for 3 years is

A. \$4720

B. \$720

C. \$72

D. \$240

Question 12

A price of \$253 includes GST at 10%. The amount of GST included in this price is

A. \$23.30

B. \$25.30

C. \$23

D. \$22

Question 13

A wage of \$880 per week is increased by 5%. The new weekly wage is

A. \$885

B. \$44

C. \$968

D. \$924

Question 14

Rice is sold as a 2 kg pack for \$6.40 or a 3 kg pack for \$8.85. The lower unit price, per kilogram, is

A. \$2.95

B. \$3.08

C. \$2.45

D. \$3.20

Question 15

Simple interest of \$360 is earned on \$3000 invested for 2 years. The annual interest rate is

A. 3%

B. 6%

C. 0.06%

D. 12%

Question 16

A trapezium has parallel sides 8 m and 14 m and a height of 5 m. Its area is

A. 27.5 m^2

B. 55 m^2

C. 110 m^2

D. 60 m^2

Question 17

A cylinder has radius 3 cm and height 10 cm. Its volume, to the nearest cm^3, is

A. 94 cm^3

B. 188 cm^3

C. 90 cm^3

D. 283 cm^3

Question 18

An area of 2.5 hectares is equal to

A. 250 000 m^2

B. 250 m^2

C. 25 000 m^2

D. 2500 m^2

Question 19

A circular pond has a diameter of 7 m. Its circumference, correct to two decimal places, is

A. 11.00 m

B. 43.98 m

C. 153.94 m

D. 21.99 m

Question 20

A bus travels 180 km in 2 hours and 15 minutes. Its average speed is

A. 90 km/h

B. 80 km/h

C. 75 km/h

D. 72 km/h

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 garden-bed mix is made from sand, soil and compost in the ratio $2:3:5$.

a. One batch uses 40 kg of compost. Find the mass of soil in this batch. 2 marks

b. Show that one batch has a total mass of 80 kg. 1 mark

c. A landscaper needs 200 kg of the mix. Find the mass of sand required. 2 marks

Question 2 (5 marks)

The cost to hire a marquee is $C = 120 + 18d$, where C is the cost in dollars and d is the number of days.

a. Find the cost of a 5-day hire. 1 mark

b. Transpose the formula to make d the subject. 2 marks

c. A hire cost \$354. Find the number of days. 2 marks

Question 3 (5 marks)

A gym offers two membership options. Option A charges a \$30 joining fee plus \$12 per week. Option B charges \$18 per week with no joining fee.

a. Find the total cost of Option A for 8 weeks. 1 mark

b. Show that the two options cost the same for 5 weeks. 2 marks

c. For a 10-week membership, state which option is cheaper and by how much. 2 marks

Question 4 (5 marks)

The numbers of goals a netball team scored in 15 games, in order, were

$$12, 15, 15, 18, 20, 22, 24, 25, 27, 28, 30, 33, 35, 38, 41.$$

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 one unusually high-scoring game. 2 marks

c. Find the mean number of goals, correct to two decimal places. 1 mark

Question 5 (5 marks)

Two workers recorded their daily sales (units) over five days:

$$\text{Worker P: } 20, 24, 28, 30, 33; \text{ Worker Q: } 14, 22, 28, 34, 37.$$

a. Find the median daily sales of each worker. 2 marks

b. Show that both workers have the same mean of 27. 2 marks

c. Using the range, state which worker's daily sales are more consistent. 1 mark

Question 6 (5 marks)

A survey of 200 commuters recorded their transport mode and whether they hold a concession card.

	Concession	Full fare	Total
Train	48		130
Bus		44	70
Total	74		200

a. Complete the table by finding the three missing values. 2 marks

b. Find the percentage of train commuters who hold a concession card, correct to one decimal place. 2 marks

c. A column graph of the concession numbers is drawn with its vertical axis starting at 20 rather than 0. Explain briefly why this could be misleading. 1 mark

Question 7 (5 marks)

\$8000 is invested at simple interest.

a. Find the interest earned at 4.5% per annum over 2 years. 2 marks

b. At a rate of 4% per annum, show that it earns \$960 in interest over 3 years. 2 marks

c. Find the total amount (principal plus interest) for the investment in part **a.** 1 mark

Question 8 (5 marks)

A worker has a taxable income of \$68,000. Using the tax table, their income tax for the year is \$12,567.

a. The employer must pay superannuation of 11.5% 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 take-home pay after income tax and the Medicare levy. 2 marks

Question 9 (5 marks)

In one quarter a business had sales of \$63,800 (GST-inclusive) and purchases of \$28,600 (GST-inclusive). GST is charged at 10%.

a. Find the GST collected on the sales. 2 marks

b. Find the GST paid on the purchases. 1 mark

c. Find the net GST the business must pay to the ATO. 2 marks

Question 10 (5 marks)

A cylindrical water tank has radius 2 m and height 3 m.

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

b. Find the capacity of the tank in litres ($1\ \text{m}^3 = 1000$ L), to the nearest litre. 1 mark

c. Water flows in at 40 litres per minute. Show that the tank takes about 15.7 hours to fill from empty. 2 marks

Question 11 (5 marks)

A closed rectangular carton measures 40 cm by 30 cm by 25 cm.

a. Show that the total surface area of the carton is 5900 cm². 2 marks

b. The carton is made from cardboard costing \$0.015 per cm². Find the cost of the cardboard. 2 marks

c. State the number of faces, edges and vertices of the carton. 1 mark

Question 12 (5 marks)

On a map with a scale of $1:100\,000$, the road between two towns measures 18 cm.

a. Find the real distance between the towns, in kilometres. 2 marks

b. A cyclist rides this route at an average speed of 12 km/h. Find the time taken, in hours and minutes. 2 marks

c. The cyclist leaves at $10:05$ am. State the arrival time. 1 mark

End of Section B

Practice Exam 6 — Solutions

Section A — Multiple-choice answers

Question	Answer	Working
1	**B**	First two significant figures $4, 8$; next digit $2 < 5$, so 0.048.
2	**A**	Total 9 parts; largest $= \frac{4}{9} \times 720 = \$320$.
3	**D**	$250 \times 1.20 = 300$, then $300 \times 0.85 = \$255$.
4	**C**	$\frac{42}{600} \times 100 = 7$ L/100 km.
5	**D**	$195 - 45 = 150$, then $150 \div 30 = 5$.
6	**C**	$2^3 = 8$, $4 \times 8 = 32$, $32 + 3 = 35$.
7	**C**	$\frac{12+15+15+18+20}{5} = \frac{80}{5} = 16$.
8	**A**	Middle two values $23, 27$: $\frac{23+27}{2} = 25$.
9	**A**	$\text{IQR} = Q_3 - Q_1 = 31 - 15 = 16$.
10	**A**	$\frac{10}{40} \times 360^\circ = 90^\circ$.
11	**B**	$I = \frac{4000 \times 6 \times 3}{100} = \$720$.
12	**C**	$\text{GST} = \frac{253}{11} = \$23$.
13	**D**	$880 \times 1.05 = \$924$.
14	**A**	$\frac{6.40}{2} = \$3.20$/kg; $\frac{8.85}{3} = \$2.95$/kg; lower is \$2.95.
15	**B**	$360 = \frac{3000 \times r \times 2}{100} = 60r$, so $r = 6\%$.
16	**B**	$\frac{1}{2}(8 + 14) \times 5 = \frac{1}{2} \times 22 \times 5 = 55$ m².
17	**D**	$V = \pi \times 3^2 \times 10 = 90\pi \approx 283$ cm³.
18	**C**	$2.5 \times 10\,000 = 25\,000$ m².
19	**D**	$C = \pi d = 7\pi \approx 21.99$ m.
20	**B**	2 h 15 min $= 2.25$ h; $\frac{180}{2.25} = 80$ km/h.

Section B — worked solutions

Question 1. a. Compost is 5 parts $= 40$ kg, so one part $= \frac{40}{5} = 8$ kg. Soil is 3 parts $= 3 \times 8 = 24$ kg. **b.** The mix is $2 + 3 + 5 = 10$ parts, so one batch $= 10 \times 8 = 80$ kg. **c.** Sand is 2 parts out of 10, so $\frac{2}{10} \times 200 = 40$ kg.

Question 2. a. $C = 120 + 18 \times 5 = 120 + 90 = \$210$. **b.** $C - 120 = 18d$, so $d = \frac{C - 120}{18}$. **c.** $d = \frac{354 - 120}{18} = \frac{234}{18} = 13$ days.

Question 3. a. Option A $= 30 + 12 \times 8 = 30 + 96 = \$126$. **b.** Option A $= 30 + 12 \times 5 = \$90$; Option B $= 18 \times 5 = \$90$. The two options both cost \$90, so they are equal at 5 weeks. **c.** At 10 weeks: Option A $= 30 + 12 \times 10 = \$150$; Option B $= 18 \times 10 = \$180$. Option A is cheaper, by \$30.

Question 4. a. With $n = 15$, the median is the 8th value, 25. Leaving it out, the lower half $12, 15, 15, 18, 20, 22, 24$ gives $Q_1 = 18$ and the upper half $27, 28, 30, 33, 35, 38, 41$ gives $Q_3 = 33$, so IQR $= 33 - 18 = 15$. **b.** Range $= 41 - 12 = 29$. The **range** is more affected by one unusually high-scoring game, because it uses only the extreme values, whereas the IQR uses only the middle 50% of the data. **c.** Mean $= \frac{383}{15} \approx 25.53$ goals.

Question 5. a. Worker P median $= 28$ (the 3rd of 5 values); Worker Q median $= 28$. **b.** P sum $= 20 + 24 + 28 + 30 + 33 = 135$, mean $= \frac{135}{5} = 27$. Q sum $= 14 + 22 + 28 + 34 + 37 = 135$, mean $= \frac{135}{5} = 27$. The means are equal. **c.** P has range $33 - 20 = 13$; Q has range $37 - 14 = 23$. Worker P's daily sales are more consistent (smaller range).

Question 6. a. Train full fare $= 130 - 48 = 82$. Bus concession $= 74 - 48 = 26$ (check: $26 + 44 = 70$ ✓). Full-fare total $= 82 + 44 = 126$ (check: $74 + 126 = 200$ ✓).

	Concession	Full fare	Total
Train	48	82	130
Bus	26	44	70
Total	74	126	200

b. $\frac{48}{130} \times 100\% = 36.9\%$ (1 d.p.). **c.** Starting the axis at 20 instead of 0 cuts the bottom off both bars, so the visible heights are 28 (train) and 6 (bus): the train bar looks almost 5 times the bus bar even though 48 is less than double 26 — the graph exaggerates the difference.

Question 7. a. $I = \frac{8000 \times 4.5 \times 2}{100} = \$720$. **b.** $I = \frac{Prt}{100} = \frac{8000 \times 4 \times 3}{100} = \$960$, as required. **c.** Total $= 8000 + 720 = \$8720$.

Question 8. a. Superannuation $= 0.115 \times 68\,000 = \$7820$. **b.** Medicare levy $= 0.02 \times 68\,000 = \$1360$. **c.** Take-home pay $= 68\,000 - 12\,567 - 1360 = \$54\,073$.

Question 9. a. GST collected $= \frac{63\,800}{11} = \$5800$. **b.** GST paid $= \frac{28\,600}{11} = \$2600$. **c.** Net GST to the ATO $= 5800 - 2600 = \$3200$.

Question 10. a. $V = \pi r^2 h = \pi \times 2^2 \times 3 = 12\pi \approx 37.70$ m³. **b.** Capacity $= 37.70\ldots \times 1000 \approx 37\,699$ L. **c.** Time $= \frac{37\,699}{40} = 942.5$ minutes $= \frac{942.5}{60} \approx 15.7$ hours.

Question 11. a. Surface area $= 2(40 \times 30 + 40 \times 25 + 30 \times 25) = 2(1200 + 1000 + 750) = 2 \times 2950 = 5900$ cm². **b.** Cost $= 5900 \times 0.015 = \$88.50$. **c.** A rectangular carton has 6 faces, 12 edges and 8 vertices.

Question 12. a. Real distance $= 18 \times 100\,000 = 1\,800\,000$ cm $= 18\,000$ m $= 18$ km. **b.** Time $= \dfrac{18}{12} = 1.5$ h $= 1$ hour 30 minutes. **c.** $10:05$ am $+ 1$ h 30 min $= 11:35$ am.