2022 Year 9 (5.1/5.2/5.3) Topic Tests Information Sheet (NSW)

2022 Year 9 (5.1/5.2/5.3) Topic Tests are sets of short answer questions and their solutions. We offer the following sets:

Year 9 (5.1) set
- Computation and Financial Mathematics (3 questions)
- Indices and Numbers of Any Magnitude (3 questions)
- Linear Relationships (3 questions)
- Right-angled Triangles (3 questions)
- Properties of Geometrical Figures and Areas (4 questions)
- Probability and Single Variable Data Analysis (4 questions)
- Mid-year Test

Year 9 (5.2) set
- Financial Mathematics, Ratios and Rates (2 questions)
- Algebraic Techniques, Indices and Equations (3 questions)
- Linear and Non-Linear Relationships (3 questions)
- Area, Surface Area and Volume (3 questions)
- Right-angled Triangles, Properties of Geometrical Figures (3 questions)
- Probability and Single Variable Data Analysis (4 questions)
- Mid-year Test

Year 9 (5.3) set
- Surds, Algebraic Techniques and Equations (3 questions)
- Linear and Non-linear Relationships (3 questions)
- Surface Area and Volume (2 questions)
- Pythagoras' Theorem and Properties of Geometrical Figures (4 questions)
- Mid-year Test

The structure of each **Mid-year Test** is:
- 15 multiple choice questions
- 5 short answer questions
- 2 extended response questions

Distribution
We will email electronic copies

File format
MS Word DOCX format and PDF format

Release date
1st of March 2022

Pricing
$105 per set

2022 Year 9 (5.1) Mathematics
Computation and Financial Mathematics Test

Time allowed: 1 hour
Total marks: 30 marks

Question 1 (9 marks)

a. Write $5\frac{1}{2}$ as an improper fraction. 1 mark

_____

b. Evaluate 6.24×2. 1 mark

_____

c. Evaluate $\frac{2}{3} \div 6$. 2 marks

_____

_____

d. Evaluate $\sqrt{45}$ correct to two decimal places. 1 mark

_____

e. The value of a car, originally purchased for \$15,200, has depreciated by 12%. 2 marks
Calculate the reduced value of the car.

_____

_____

f. Students can study only one language at a school. 2 marks
Out of the 68 students at the school, one quarter study French. Of those who do not study French, one third study German and the rest study Italian.
Find the number of students who study Italian.

_____

_____

Question 2 (10 marks)
Adam's annual salary for the 2021-22 financial year is $65,650.
His taxable income is $64,450.

a. Calculate the amount of Adam's tax deductions. 2 marks

b. 3 marks

Taxable income	**Tax on this income**
$45,001 – $120,000	$5,092 plus 32.5 cents for each $1 over $45,000

Use the tax bracket shown above to calculate Adam's tax payable.

c. Calculate Adam's (2%) Medicare levy. 2 marks

d. Adam paid $13,200.50 in tax throughout the 2021-22 financial year. 3 marks
Calculate Adam's tax refund.

Question 3 (11 marks)

a. Simplify the ratio 150 mL : 0.45 L. 2 marks

b. Belinda types 42 words per minute. 2 marks
Find how many words she would type in a minute and forty seconds.

c. $12,000 is invested at 6.5% per annum simple interest for 2 years. 2 marks
Calculate the total interest earned.

d. Dean earns $45.50 per hour. 3 marks
One week he worked 38 hours at the normal rate and an additional 5 hours at double time.
Calculate Dean's total earnings for that week.

e. Suzy works at a pharmacy and earns $860 per week. 2 marks
If Suzy takes annual leave for two weeks, calculate her leave loading for these two weeks.

2022 Year 9 (5.1) Mathematics
Computation and Financial Mathematics Test
Total marks: 30 marks

Question 1 (9 marks)

a. 1 mark

$5\frac{1}{2} = \frac{11}{2}$ (A1)

b. 1 mark

$6.24 \times 2 = 12.48$ (A1)

c. 2 marks

$\frac{2}{3} \div 6 = \frac{2}{3} \times \frac{1}{6}$ (A1)

$= \frac{1}{9}$ (A1)

d. 1 mark

$\sqrt{45} \approx 6.71$ (A1)

e. 2 marks

$\$15,200 \times (1 - 0.12)$ (A1)

$= \$13,376$ (A1)

f. 2 marks

The number of students who do not study French is

$68 \times \frac{3}{4} = 51$ (A1)

The number of students who study Italian is

$51 \times \frac{2}{3} = 34$ (A1)

Question 2 (10 marks)

a. 2 marks

$\$65,650 - \$64,450$ (A1)

$= \$1,200$ (A1)

b. 3 marks

$\$5,092 + 0.325 \times (\$64,450 - \$45,000)$ (A1)×2

$= \$11,413.25$ (A1)

c. 2 marks

$\$64,450 \times \frac{2}{100}$ (A1)

$= \$1,289$ (A1)

d. 3 marks

$(\$11,413.25 + \$1,289) - \$13,200.50$ (A1)

$= -\$498.25$ (A1)

- The order of subtraction does not matter.

Adam's tax refund is \$498.25. (A1)

Question 3 (11 marks)

a. 2 marks

$150 \text{ mL}:0.45 \text{ L}$

$= 150 \text{ mL}:450 \text{ mL}$ (A1)

$= 1:3$ (A1)

● Accept 0.15 L: 0.45 L for the working.

b. 2 marks

$42 \times \left(1 + \frac{40}{60}\right)$ (A1)

$= 70 \text{ words}$ (A1)

c. 2 marks

$\$12,000 \times \frac{6.5}{100} \times 2$ (A1)

$= \$1,560$ (A1)

d. 3 marks

$\$45.50 \times 38 + \$45.50 \times 5 \times 2$ (A1)×2

$= \$2,184$ (A1)

● For the working, award 1 mark for $\$45.50 \times 38$ and another 1 mark for $\$45.50 \times 5 \times 2$.

e. 2 marks

$\$860 \times \frac{17.5}{100} \times 2$ (A1)

$= \$301$ (A1)

2022 Year 9 (5.1) Mathematics
Indices and Numbers of Any Magnitude Test

Time allowed: 1 hour
Total marks: 30 marks

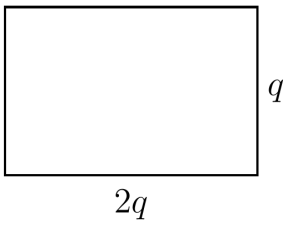
Question 1 (8 marks)

a. Write down the next consecutive integer after $n - 2$, where n is an integer. 1 mark

b. If $p = 2$ and $q = -3$, evaluate $p \times (p + q)^2$. 2 marks

c. Evaluate 10^0. 1 mark

d. 2 marks



Find the area of the rectangle above in terms of q.
Simplify your answer.

e. If k is any positive integer, write an expression in terms of k that represents an even number. 1 mark

f. Write z^3 in expanded form. 1 mark

Question 2 (14 marks)

a. Write 5^{-3} using a positive index. 2 marks

b. Simplify $x^2 \times x^4$. 2 marks

c. Simplify $ab^5 \div (ab^4)$. 2 marks

d. It is given that $(2w^3)^2 = 4w^n$ for all w.

i. Find the value of n. 2 marks
Show all working.

ii. What type of number is n? 2 marks
Circle the correct answer(s).

integer rational number real number

e. Simplify $\dfrac{48e^5f^2}{4e^2f}$. 2 marks

f. Simplify $z^2(4z^4 - 2z^4)$. 2 marks

Question 3 (8 marks)

a. Write 0.000043 in scientific notation. 1 mark

b. Determine how many times greater 3.4×10^5 is than 1.7×10^2. 2 marks

c. Sound travels at 330 m/s. 2 marks
Find how long a sound would take to travel 891 km, in seconds.
Write your answer in scientific notation.

d. A magic rectangle expands such that its area increases by a factor of 10 every minute. 3 marks
The area of the magic rectangle at 8:00 am is 18 cm^2.
If the ratio of its width to its length of the magic rectangle is always 1 : 2, find the width at 8:24 am.

2022 Year 9 (5.1) Mathematics
Indices and Numbers of Any Magnitude Test
Total marks: 30 marks

Question 1 (8 marks)

a. 1 mark

$n-1$ (A1)

b. 2 marks

$2\times(2-3)^2$ (A1)

$=2\times1$

$=2$ (A1)

c. 1 mark

$10^0=1$ (A1)

d. 2 marks

$2q\times q$ (A1)

$=2q^2$ (A1)

e. 1 mark

$2k$ (A1)

● Accept other even numbers in terms of k such as $4k$, $6k$, ….

f. 1 mark

$z\times z\times z$ (A1)

Question 2 (14 marks)

a. 2 marks

$5^{-3} = \frac{1}{5^3}$

- The numerator is 1. (A1)
- The denominator is 5^3 or 125. (A1)
- Accept $\left(\frac{1}{5}\right)^3$ as the final answer.

b. 2 marks

$x^2 \times x^4 = x^6$

- The final expression contains x. (A1)
- The power of x is 6. (A1)

c. 2 marks

$ab^5 \div (ab^4) = \frac{ab^5}{ab^4}$ (A1)

$= b$ (A1)

d.

i. 2 marks

$(2w^3)^2 = 4w^6$ (A1)

Therefore, $n = 6$. (A1)

ii. 2 marks

$n = 6$ is an integer, a rational number and a real number.

- All three options are circled. (A1)×2
- Penalise 1 mark per option not circled.

e. 2 marks

$\frac{48e^5f^2}{4e^2f} = 12e^3f$

- The coefficient of the final expression is 12. (A1)
- The final expression contains e^3f. (A1)

f. 2 marks

$z^2(4z^4 - 2z^4) = z^2(2z^4)$ (A1)

$= 2z^6$ (A1)

Question 3 (8 marks)

a. 1 mark

$0.000043 = 4.3 \times 10^{-5}$ (A1)

b. 2 marks

$\frac{3.4 \times 10^5}{1.7 \times 10^2}$ (A1)

$= 2,000$ (A1)

● Accept 2.0×10^3 as the final answer.

c. 2 marks

$\frac{891000}{330}$ (A1)

$= 2.7 \times 10^3$ seconds (A1)

d. 3 marks

The area of the magic rectangle at 8:24 am is

$18 \times 10^{24} = 1.8 \times 10^{25}$ (A1)

Let the width and length be a and $2a$ respectively.

$a \times 2a = 1.8 \times 10^{25}$ (A1)

$a^2 = 9.0 \times 10^{24}$

$a = 3.0 \times 10^{12}$ cm (A1)

2022 Year 9 (5.1) Mathematics
Linear Relationships Test

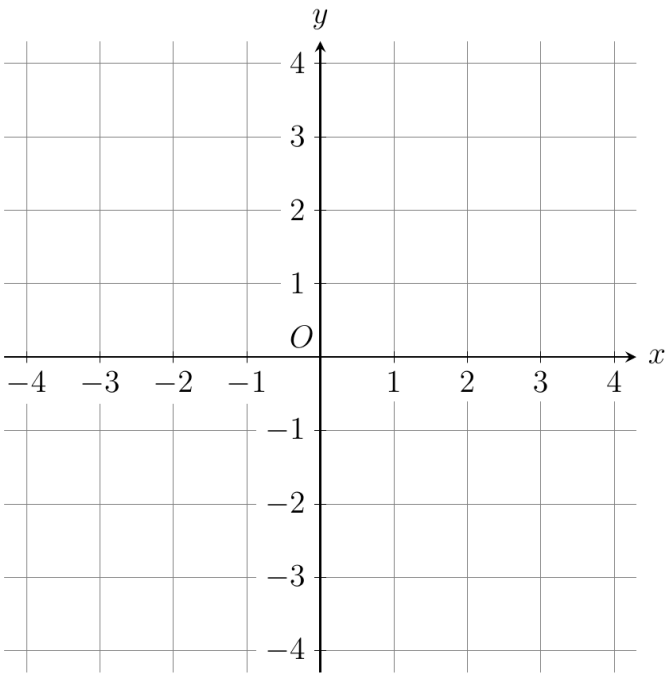
Time allowed: 1 hour
Total marks: 25 marks

Question 1 (10 marks)

a. Write down the gradient of the line with equation $y = 2x + 5$. 1 mark

_____

b.



i. Sketch the graph of $y = -2x + 1$ on the set of axes above. 2 marks

ii. For the above equation, find the value of y when $x = -4$. 2 marks

_____

_____

c. Determine whether or not the point $(2, 3)$ lies on the line $y = 4 - x$. 2 marks
Justify your answer.

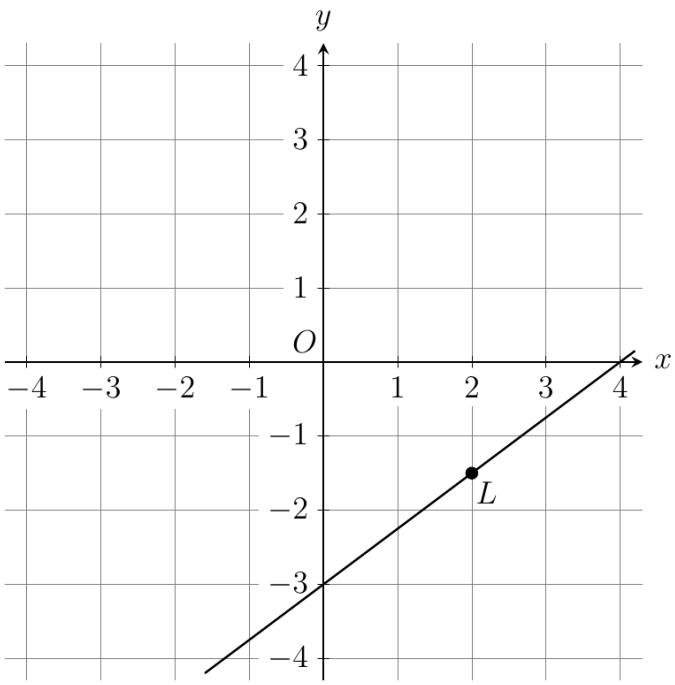
d. Which one of the following represents a horizontal line? 1 mark
Circle the correct answer(s).

$x = 4$ $x + y = 4$ $y = 4$

e. Find the gradient and the x-intercept of the line with equation $2x + 3y = 6$. 2 marks

Question 2 (10 marks)

Consider the line shown below.
L is the midpoint of the axis intercepts of the line.



a. Find the equation of the line. 2 marks

b. Find the coordinates of L. 2 marks

c. Find the equation of a line parallel to the one shown above that passes through the point $(0, 3)$. 2 marks

d. Find the area of the shape formed by the points $(0, -3)$, $(0, 0)$ and $(4, 0)$. 2 marks

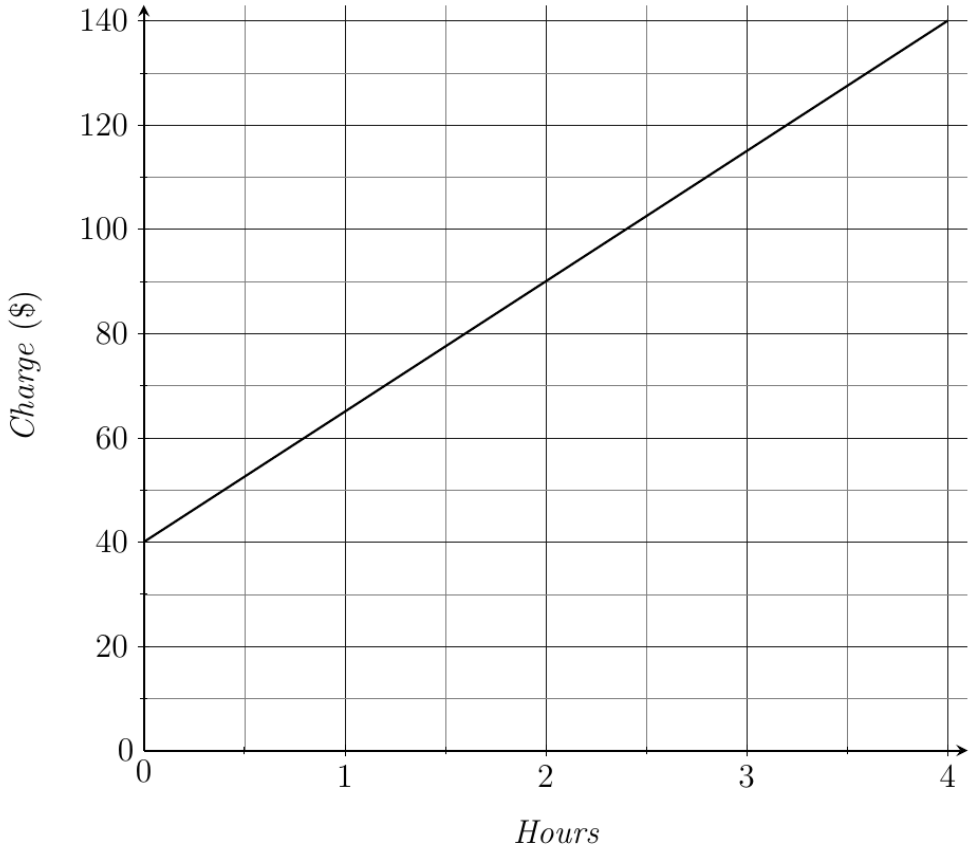
e. Find the length of the line segment connecting the axis intercepts. 2 marks

_____

_____

_____

Question 3 (5 marks)
A plumber charges an upfront fee and an hourly charge.
The graph below shows this information.



a. Complete the following sentence by writing down the appropriate words or numbers. 2 marks

The plumber charges an upfront fee of $_____ and an hourly charge of $_____.

b. Explain how you can you tell from the graph that the total charge would be higher for a greater number of hours worked by the plumber. 1 mark

_____

_____

c. Find how many hours the plumber worked if they charged a customer $100. 2 marks

_____

_____

_____

2022 Year 9 (5.1) Mathematics
Linear Relationships Test
Total marks: 25 marks

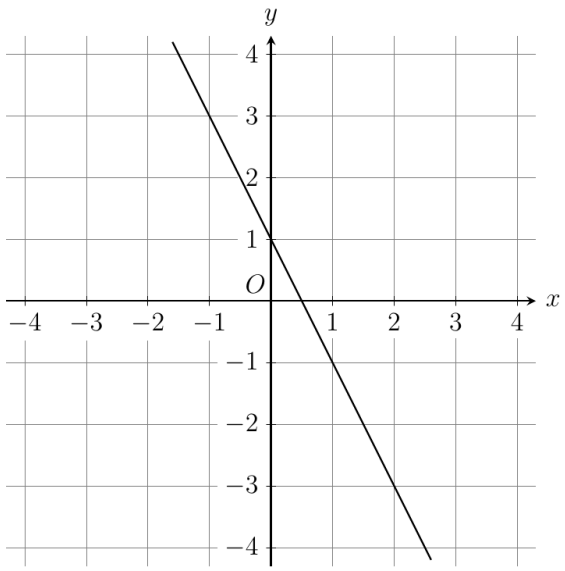
Question 1 (10 marks)

a.

2 (A1) 1 mark

b.

i. 2 marks



- A line with a negative gradient is sketched. (A1)
- The sketched line passes through all correct integer-valued points. (A1)

ii. 2 marks

$y = -2 \times (-4) + 1$ (A1)

$= 9$ (A1)

c. 2 marks

$y = 4 - 2 = 2$ (A1)

Since $2 \neq 3$, the point $(2, 3)$ does not lie on the line. (A1)

d. 1 mark

$y = 4$ (A1)

e. 2 marks

$2x + 3y = 6$ can be written as $y = -\frac{2}{3}x + 2$.

The gradient is $-\frac{2}{3}$. (A1)

The x-intercept is 3. (A1)

Question 2 (10 marks)

a. 2 marks

$y = \frac{3}{4}x - 3$

The gradient of the sketched line is $\frac{3}{4}$. (A1)

The y-intercept of the sketched line is –3. (A1)

b. 2 marks

$\left(2, -\frac{3}{2}\right)$ (A1)×2

c. 2 marks

$y = \frac{3}{4}x + 3$

The coefficient of x is $\frac{3}{4}$. (A1)

The constant term is 3. (A1)

d. 2 marks

The area of the shape is

$\frac{1}{2} \times 4 \times 3$ (A1)

$= 6 \text{ units}^2$ (A1)

e. 2 marks

The length of the line segment is

$\sqrt{4^2 + 3^2}$ (A1)

$= \sqrt{25}$

$= 5 \text{ units}$ (A1)

Question 3 (5 marks)

a. 2 marks

\$40 (A1)

\$25 (A1)

b. 1 mark

The graph shows a line with a positive slope. (A1)

c. 2 marks

$40 + 25 \times Hours = 100$ (A1)

$25 \times Hours = 60$

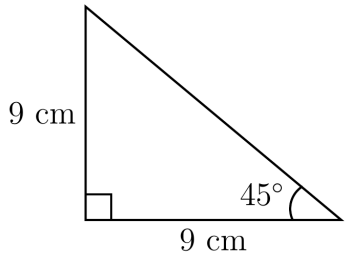
$Hours = 2.4$ (A1)

● Accept 2 hours and 24 minutes.

2022 Year 9 (5.1) Mathematics
Right-angled Triangles Test

Time allowed: 1 hour
Total marks: 20 marks

Question 1 (7 marks)
Consider the right-angled triangle shown below.



a. Write down the length of the adjacent to angle 45º. 1 mark

_____

b. Use the triangle above to find the value of $\tan(45º)$. 2 marks

_____

_____

_____

c. Use Pythagoras' theorem to show that the length of the hypotenuse is $\sqrt{162}$ cm. 2 marks

_____

_____

_____

d. Find the exact value of $\cos(45º)$. 1 mark

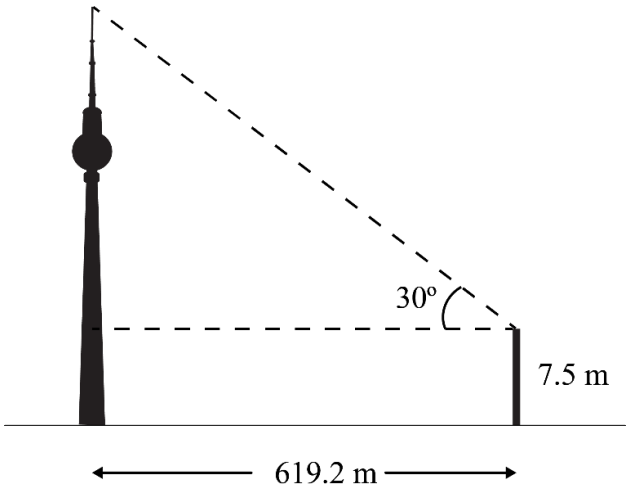
_____

_____

e. What kind of triangle is the one shown above? 1 mark
Circle the correct answer.

Equilateral triangle Isosceles triangle Scalene triangle

Question 2 (7 marks)
The height of a vertical pole is 7.5 m.
The angle of elevation from the top of the pole to the top of the Berlin TV Tower is 30º.
The Berlin TV Tower and the pole are 619.2 m apart.



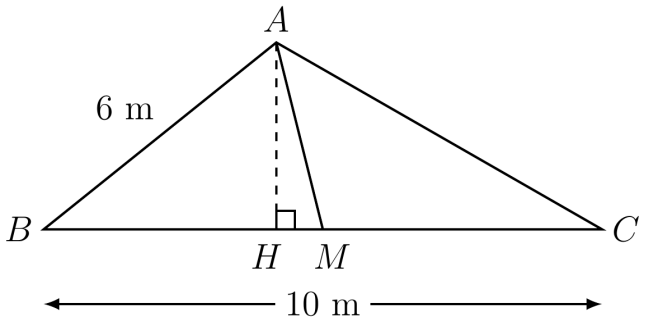
a. Find how much taller the Berlin TV Tower is than the pole. 2 marks
Round your answer to one decimal place.

b. Find the height of the Berlin TV Tower. 2 marks
Round your answer to the nearest whole number.

c. Write down the angle of depression from the top of the Berlin TV Tower to the top of the pole. 1 mark

d. Find the shortest distance between the top of the Berlin TV Tower and the bottom of the pole. 2 marks
Round your answer to the nearest whole number.

Question 3 (6 marks)
In the triangle below, $\cos(B) = 0.8$.
The midpoint of BC is M.



a. Show that the length of BH is 4.8 m. 2 marks

b. Find the length of HM. 1 mark

c. Find the length of AM. 3 marks
Round your answer to one decimal place.

2022 Year 9 (5.1) Mathematics
Right-angled Triangles Test
Total marks: 20 marks

Question 1 (7 marks)

a. 1 mark

9 cm (A1)

b. 2 marks

$\tan(45^\circ) = \frac{9}{9}$ (A1)

$= 1$ (A1)

c. 2 marks

The length of the hypotenuse is

$\sqrt{9^2 + 9^2}$ (A1)

$= \sqrt{81 + 81}$

$= \sqrt{162}$ cm (A1)

d. 1 mark

$\cos(45^\circ) = \frac{9}{\sqrt{162}}$ (A1)

- Accept $\cos(45^\circ) = \frac{1}{\sqrt{2}}$ or $\cos(45^\circ) = \frac{\sqrt{2}}{2}$.

e. 1 mark

Isosceles triangle (A1)

Question 2 (7 marks)

a. 2 marks

Let h be the height of the Berlin TV Tower above the pole.

$\frac{h}{619.2} = \tan(30^\circ)$ (A1)

$h = 619.2\tan(30^\circ)$

≈ 357.5 m (A1)

b. 2 marks

$357.5 + 7.5$ (A1)

≈ 365 m (A1)

c. 1 mark

30º (A1)

d. 2 marks

By Pythagoras' theorem

$\sqrt{619.2^2 + \left(619.2\tan(30^\circ) + 7.5\right)^2}$ (A1)

≈ 719 m (A1)

Question 3 (6 marks)

a. 2 marks

$BH = 6 \times \cos(B)$

$= 6 \times 0.8$

≈ 4.8 m

● Correct working is shown to obtain the correct answer. (A1)×2

b. 1 mark

$HM = 5 - 4.8 = 0.2$ m (A1)

c. 3 marks

$AH = \sqrt{6^2 - 4.8^2}$

$= \sqrt{12.96}$

$= 3.6$ m

● Correct length of AH. (A1)

$AM = \sqrt{3.6^2 + 0.2^2}$ (A1)

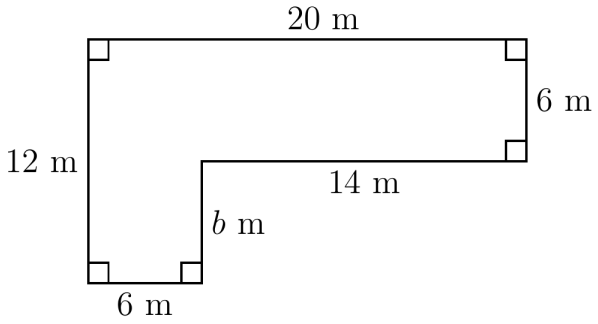
$= \sqrt{13}$

≈ 3.6 m (A1)

2022 Year 9 (5.1) Mathematics
Properties of Geometrical Figures and Areas Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (10 marks)
Consider the following composite shape.



a. Complete the following sentence by writing down the appropriate word. 1 mark

The composite shape is made by removing a smaller _____ from a larger rectangle.

b. Show that $b = 6$. 2 marks

_____

_____

c. Find the area of the composite shape. 2 marks

_____

_____

d. Find the perimeter of the composite shape. 2 marks

_____

_____

e. The area of a square is the same as that of the composite shape. 3 marks
Find the side length of the square.
Round your answer to one decimal place.

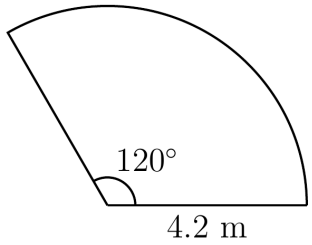
_____

_____

Question 2 (8 marks)

a. Find the circumference of a circle with radius 4.5 cm. 2 marks
Round your answer to one decimal place.

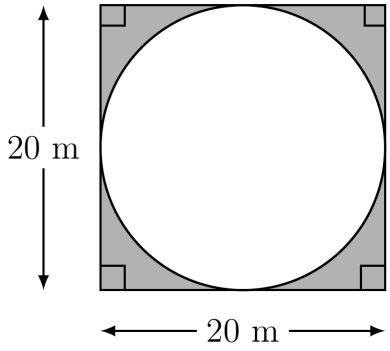
b. The following diagram shows a sector.



i. Find the perimeter of the sector. 2 marks
Round your answer to one decimal place.

ii. Find the area of the sector. 2 marks
Round your answer to one decimal place.

c. The diagram below shows a circle inside a square. 2 marks



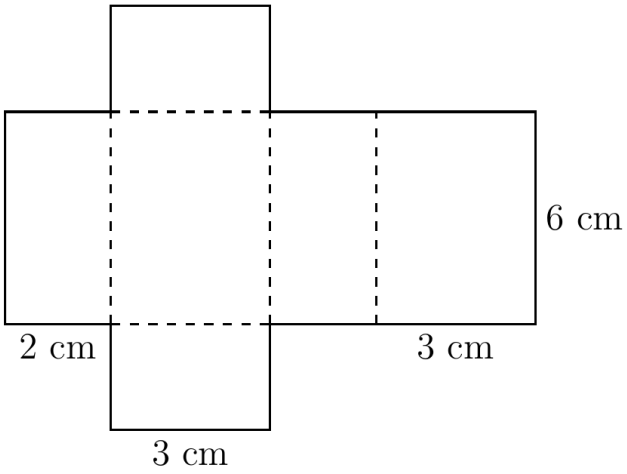
Find the area of the shaded part in the diagram.
Round your answer to one decimal place.

_____

_____

_____

Question 3 (7 marks)
Consider the net of a solid shown below.



a. Write down the name of the solid. 1 mark

b. Find the surface area of the solid. 2 marks

c. Find the volume of the solid. 2 marks

d. Find the capacity of the solid in litres. 2 marks
Hint: 1 cm^3 = 1 mL.

2022 Year 9 (5.1) Mathematics
Properties of Geometrical Figures and Areas Test
Total marks: 25 marks

Question 1 (10 marks)

a. 1 mark

rectangle (A1)

b. 2 marks

$b+6=12$ (A1)

$b=6$ (A1)

c. 2 marks

The area of the composite shape is

$12\times20-14\times6$ (A1)

$=156\ \text{m}^2$ (A1)

d. 2 marks

The perimeter of the composite shape is

$2\times12+2\times20$ (A1)

$=64\ \text{m}$ (A1)

e. 3 marks

Let the side length of the square be s.

$s^2=156$ (A1)

$s=\sqrt{156}$ (A1)

$\approx12.5\ \text{m}$ (A1)

Question 2 (8 marks)

a. 2 marks

$2 \times \pi \times 4.5$ (A1)

≈ 28.3 cm (A1)

b.

i. 2 marks

$2 \times 4.2 + \frac{120^\circ}{360^\circ} \times 2 \times \pi \times 4.2$ (A1)

≈ 17.2 m (A1)

ii. 2 marks

$\frac{120^\circ}{360^\circ} \times \pi \times 4.2^2$ (A1)

≈ 18.5 m^2 (A1)

c. 2 marks

$20^2 - \pi \times 10^2$ (A1)

≈ 85.8 m^2 (A1)

Question 3 (7 marks)

a. 1 mark

Rectangular prism (A1)

b. 2 marks

Surface area $= 2 \times 3 \times 6 + 2 \times 3 \times 2 + 2 \times 2 \times 6$ (A1)

$= 72$ cm^2 (A1)

c. 2 marks

Volume $= 3 \times 6 \times 2$ (A1)

$= 36$ cm^3 (A1)

d. 2 marks

36 cm$^3 = 36$ mL (A1)

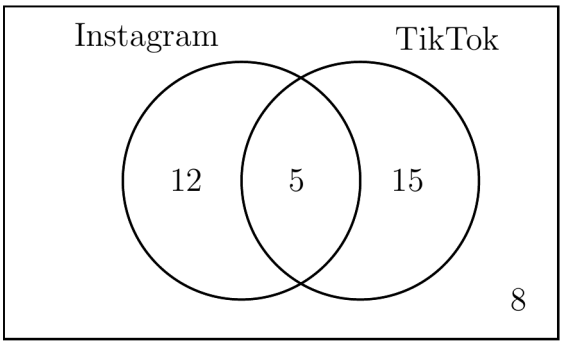
$= 0.036$ L (A1)

- Award full marks for the correct answer.

2022 Year 9 (5.1) Mathematics
Probability and Single Variable Data Analysis Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (6 marks)
A survey was conducted on a group of teenagers. The teenagers were asked whether or not they use Instagram (I) or TikTok (T).
The following Venn diagram shows the results.



a. Find how many teenagers were surveyed. 1 mark

_____

_____

b. Write down the number of teenagers who use neither Instagram nor TikTok. 1 mark

_____

c. A teenager from this group is randomly selected.

i. Find the probability that the teenager uses Instagram but not TikTok. 2 marks
Write your answer as a decimal.

_____

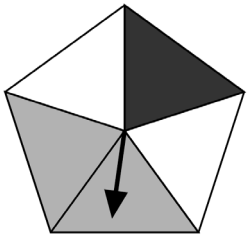
_____

ii. Find the probability that the teenager uses Instagram or TikTok. 2 marks
Write your answer as a decimal.

_____

_____

Question 2 (7 marks)
The spinner shown below was spun 100 times.



The colour of the region where the spinner landed was recorded each time.

Colour	white	grey	black
Frequency	37	42	21

a. Find the experimental probability that the spinner lands on a grey region. 2 marks
Write your answer as a fraction in simplest form.

_____

_____

b. Find the theoretical probability that the spinner lands on a grey region. 1 mark
Write your answer as a fraction in simplest form.

_____

_____

c. Complete the following sentence by writing the appropriate word or number. 1 mark

Since the number of trials is fairly large, it is expected that the _____ probability is close to the theoretical probability.

d. If the spinner is spun 300 times, find the expected number of times that the spinner lands on a black region. 2 marks

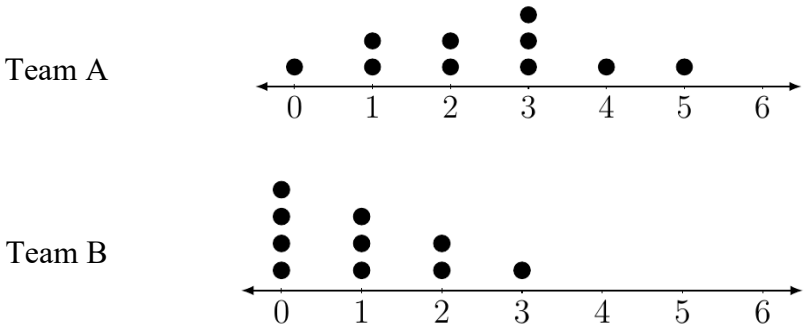
_____

_____

e. If the experiment above was repeated, would you expect to obtain the same frequencies? 1 mark
Circle the correct answer.

Yes No

Question 3 (8 marks)
The following dot plots show the scores earned by two soccer teams (Team A and Team B) in their games this year.



a. Find the range of scores for Team A. 1 mark

_____

b. Write down the most common score for Team B. 1 mark

_____

c. Find the mean score of Team B. 2 marks

_____

_____

d. Complete the sentence below by writing the appropriate words or numbers. 2 marks

The distribution of scores for Team A is roughly _____, whereas the distribution for Team B is _____.

e. In general, which team earned higher scores? 2 marks
Justify your answer by referring to the dot plots.

_____

_____

Question 4 (4 marks)
The following excerpt is from a news article.

> A survey was conducted on a total of 601 Victorians, including 208 from Melbourne. Respondents, recruited via Facebook and Instagram between the 20th of February and the 21st of February in 2021, opted to participate in the survey themselves.
>
> 83% said that they supported the continued "closed border" policy, whereas 16.8% opposed the decision to close the border to everyone but Victorians.

a. Is the group of 601 surveyed Victorians best referred to as a sample or the population? 1 mark
Circle the correct answer.

Sample Population

b. The percentages of the responses mentioned in the article only add to 99.8%. 1 mark
State what could have happened to the remaining 0.2% of responses.

_____

_____

c. Can it be concluded that the majority of Victorians support the closed border policy? 2 marks
Justify your answer.

_____

_____

_____

2022 Year 9 (5.1) Mathematics
Probability and Single Variable Data Analysis Test
Total marks: 25 marks

Question 1 (6 marks)

a. 1 mark

$12 + 5 + 15 + 8 = 40$ (A1)

b. 1 mark

8 (A1)

c.

i. 2 marks

$\frac{12}{40}$ (A1)

$= 0.3$ (A1)

ii. 2 marks

$\frac{12+5+15}{40}$ (A1)

$= 0.8$ (A1)

Question 2 (7 marks)

a. 2 marks

$\frac{42}{100}$ (A1)

$= \frac{21}{50}$ (A1)

b. 1 mark

$\frac{2}{5}$ (A1)

c. 1 mark

experimental (A1)

d. 2 marks

$\frac{1}{5} \times 300$ (A1)

$= 60$ (A1)

e. 1 mark

No (A1)

Question 3 (8 marks)

a. 1 mark

$5 - 0 = 5$ (A1)

b. 1 mark

0 (A1)

c. 2 marks

$\frac{4\times0+3\times1+2\times2+1\times3}{10}$ (A1)

$=1$ (A1)

d. 2 marks

symmetric (A1)

(positively-)skewed (A1)

e. 2 marks

Team A (A1)

Possible justifications are:

- Half of Team A's scores are equal or higher than the scores of Team B.
- The centre of Team A is positioned higher than that of Team B.

● A valid justification. (A1)

Question 4 (4 marks)

a. 1 mark

Sample (A1)

b. 1 mark

The 0.2% could consist of no responses/invalid responses. (A1)

c. 2 marks

Possible justification for yes:

● 83% is greater than 50%.
● 601 is a reasonable number of people.

Possible justification for no:

● 601 may not be enough to be representative of Victoria.
● The survey recruited only those who use Facebook or Instagram.
● The survey was done over only a 2-day period.

● Correct decision supported with a reasonable statement. (A1)×2
● Do not award any marks for stating just yes or no.

2022 YEAR 9 (5.1) MATHEMATICS

MIDYEAR TEST

Reading time: 15 minutes
Writing time: 2 hours

QUESTION BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	15	15	15
B	5	5	25
C	2	2	20
			Total 60

SECTION A

Instructions for Section A

Answer **all** questions.
Choose the response that is **correct** for the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1

The smallest positive integer from the list below is

A. -1
B. 0
C. 0.5
D. 1
E. 2

Question 2

$4b^2 \div (2b)$ simplifies to

A. $2b$
B. 2
C. $2b^3$
D. b^3
E. $8b$

Question 3

$\frac{11}{24}$ is equal to

A. $0.45\dot{3}$
B. 0.4583333
C. 0.458
D. 0.4583
E. $0.458\dot{3}$

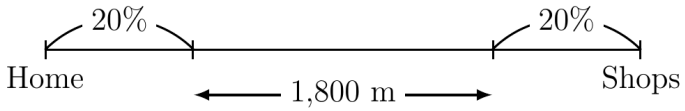
Question 4

Taxable income	Tax on this income
$120,001 – $180,000	$29,467 plus 37 cents for each $1 over $120,000

Melissa's taxable income is $150,250.
Based on the tax rate shown in the table, Melissa's tax payable is
A. $29,467
B. $73,867
C. $40,659.50
D. $44,689.71
E. $55,592.50

Question 5
Deena's annual salary is $75,231.
The amount of money she earns each fortnight is closest to
A. $1,446.75
B. $2,883.52
C. $4,340.25
D. $6,269.25
E. $37,615.50

Question 6

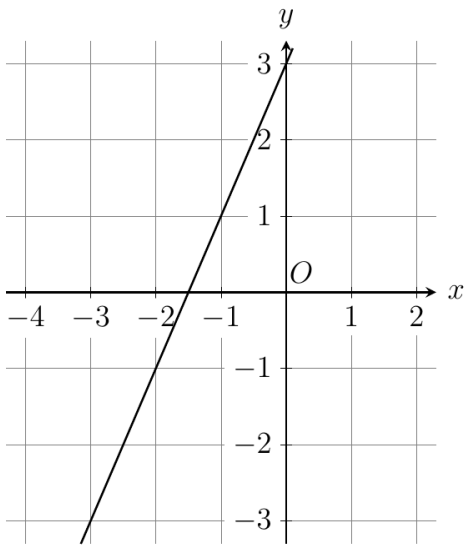


When Lisa has walked 20% of the way to the shops from home, she has 1,800 metres more to walk than when she has 20% of the walk remaining.
The distance between Lisa's home and the shops is
A. 720 metres
B. 800 metres
C. 1,640 metres
D. 3,000 metres
E. 8,000 metres

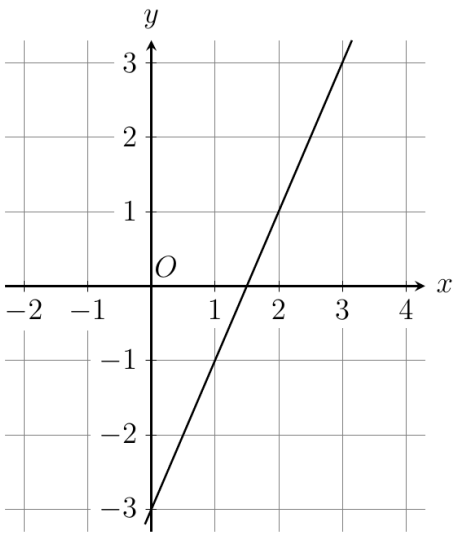
Question 7

The graph of $y = 3 - 2x$ is best represented by

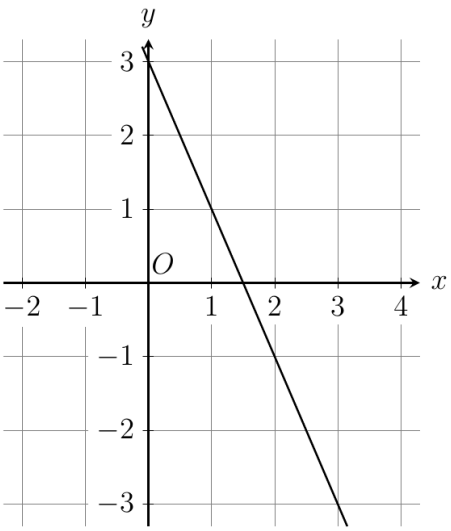
A.



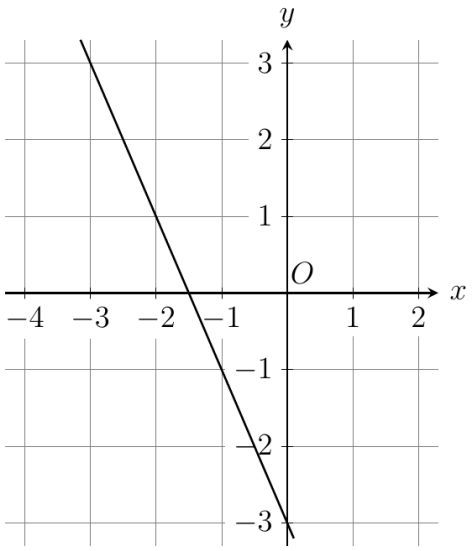
B.



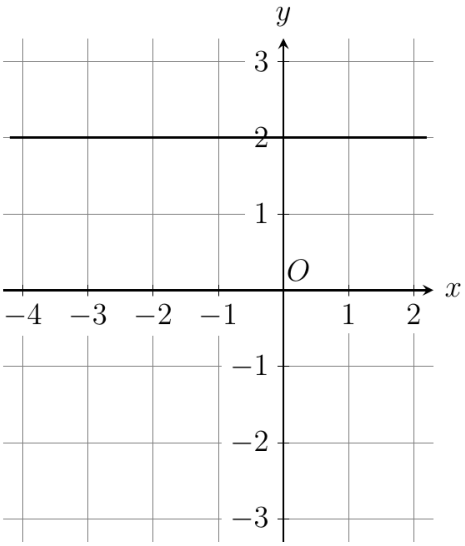
C.



D.



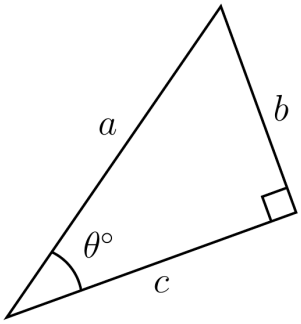
E.



Question 8
The coordinates of the midpoint of the line segment joining $(-8, 5)$ and $(p, 17)$ are $(4, 11)$.
The value of p is
A. -2
B. -1
C. 2
D. 8
E. 16

Question 9
Which one of the following lines is parallel to the line $x + 2y = 6$?
A. $x - 2y = 1$
B. $-x - 2y = 1$
C. $y = 0$
D. $2x + y = 3$
E. $-2x + y = 6$

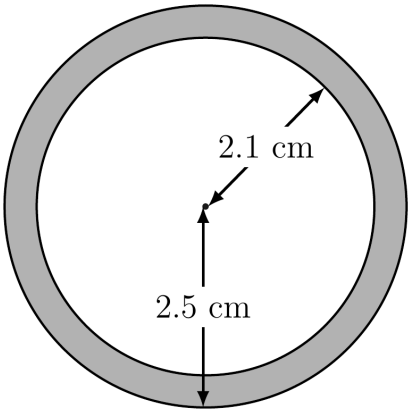
The following information relates to Questions 10 – 11.



Question 10
Which one of the following statements is **true**?
A. $a^2 - b^2 = c^2$
B. $a^2 + b^2 = c^2$
C. $a^2 + c^2 = b^2$
D. $2c^2 - a^2 = b^2$
E. $a^2 + b^2 + c^2 = 0$

Question 11
If $a = 65$ and $b = 56$, the value of θ is closest to
A. 30.5
B. 40.7
C. 49.3
D. 59.5
E. 85.8

Question 12



The area of the shaded region in the diagram above is closest to

A. 2.51 cm^2

B. 5.78 cm^2

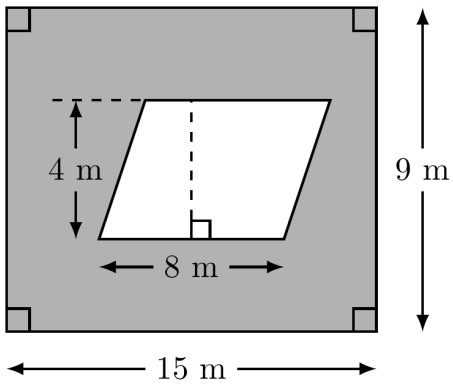
C. 13.85 cm^2

D. 28.90 cm^2

E. 33.49 cm^2

Question 13

The following composite shape is made by cutting a parallelogram out from a rectangle.



This composite shape is enlarged by a scale factor of 2.5.
The area of the larger composite shape is closest to

A. 80 m^2

B. 103 m^2

C. 257.5 m^2

D. 643.8 m^2

E. 843.8 m^2

Question 14

It is given that $m \times n = 8$, where m and n are positive integers.
The number of pairs (m, n) that satisfy this rule is

A. 1
B. 2
C. 4
D. 6
E. 8

Question 15

M and N are three-digit integers that each consist of unique digits from 0 to 9.
The least possible difference between M and N is

A. 1
B. 2
C. 3
D. 4
E. 5

END OF SECTION A

SECTION B

Instructions for Section B

Answer **all** questions.
In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.
In questions where more than one mark is available, appropriate working **must** be shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (5 marks)
Scott's salary for the 2021-22 financial year is $97,500.
The total amount of his work-related expenses is $5,500.
Scott did not have any other allowable deductions.

Resident tax rates 2021–22

Taxable income	Tax on this income
0 – $18,200	Nil
$18,201 – $45,000	19 cents for each $1 over $18,200
$45,001 – $120,000	$5,092 plus 32.5 cents for each $1 over $45,000
$120,001 – $180,000	$29,467 plus 37 cents for each $1 over $120,000
$180,001 and over	$51,667 plus 45 cents for each $1 over $180,000

Source: ATO website

a. Show that Scott's taxable income for the 2021-22 financial year is $92,000. 1 mark

b. Use the tax table above to calculate Scott's income tax. 2 marks

c. Scott's tax liability is $22,207. 2 marks
Find the amount of his Medicare levy.

Question 2 (5 marks)
The distance between Earth and the Sun is 1496×10^5 km.
This distance is called one astronomical unit.

a. Write 1496×10^5 km in scientific notation. 1 mark

b. Pluto is 5.913×10^9 km from Earth. 2 marks
Convert this distance to astronomical units.
Round your answer to the nearest whole number.

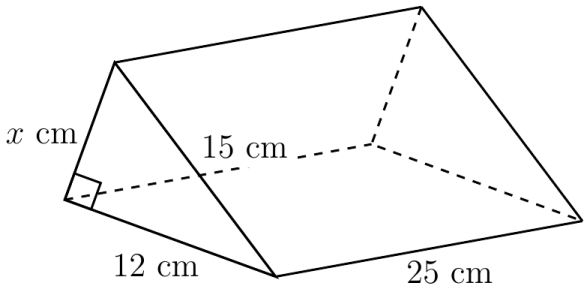
c. Convert 1.496×10^{18} m to astronomical units. 2 marks

Question 3 (5 marks)
Terry works as a waiter and earns $1,121 per week.

a. Calculate how much Terry would earn in a year. 2 marks

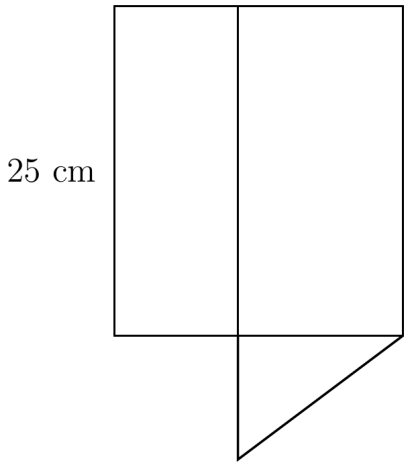
b. Terry will take annual leave for the next month and then return to work for the subsequent 2 months. Assume each month is 4 weeks. 3 marks
Calculate his earnings for the next 3 months, including his leave loading.

Question 4 (5 marks)
Consider the following triangular prism.

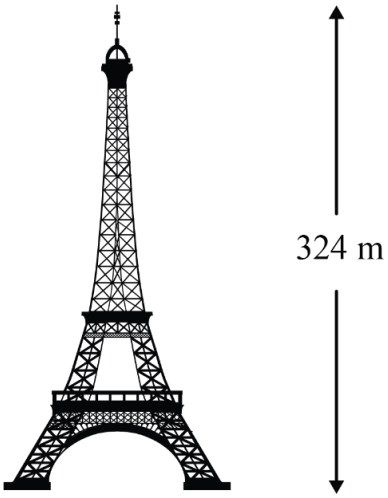


a. Find the value of x in the diagram above. 2 marks

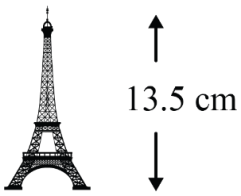
b. Complete the net of the triangular prism. 3 marks
Include any relevant measurements.



Question 5 (5 marks)
The Eiffel Tower in Paris stands at 324 metres tall. A smaller model of the Eiffel Tower, built to scale, is 13.5 cm tall.



Actual Eiffel Tower



Model Eiffel Tower

a. Convert 13.5 cm to m. 1 mark

_____

_____

b. Calculate the scale factor used to enlarge the model Eiffel Tower into the actual Eiffel Tower. 2 marks

_____

_____

c. Are the model Eiffel Tower and actual Eiffel Tower congruent? 2 marks
Justify your answer.

_____

_____

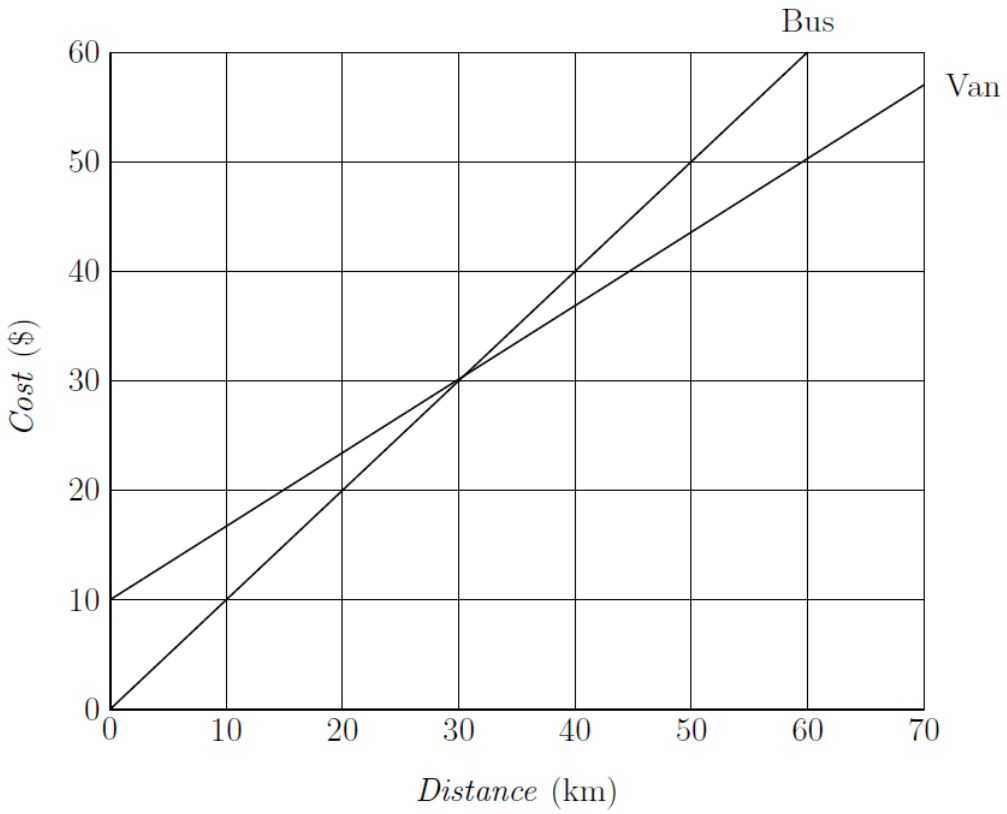
END OF SECTION B

SECTION C

Instructions for Section C

Answer **all** questions.
In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.
In questions where more than one mark is available, appropriate working **must** be shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (10 marks)
A school wants to hire a vehicle for their upcoming excursion.
The following two lines show the costs of hiring either a bus or a van.



a. Explain how the graphs show that the cost of hire is greater for longer distances travelled. 1 mark

b. For what distance travelled is the cost of hiring a bus the same as the cost of hiring a van? 1 mark

c. How was your answer to part **b** found? 1 mark

_____

d. Write down the fixed cost of hiring a van. 1 mark

_____

e. Write down the equation for the cost of hiring a van. 2 marks

$$Cost = \square + \square \times Distance$$

f. A client who hired a van was charged $48. 2 marks
Find the distance that this client travelled with the van.

_____

_____

_____

g. Compare the cost of hiring of a bus and the cost of hiring a van when the distance travelled is at least 30 km. 2 marks

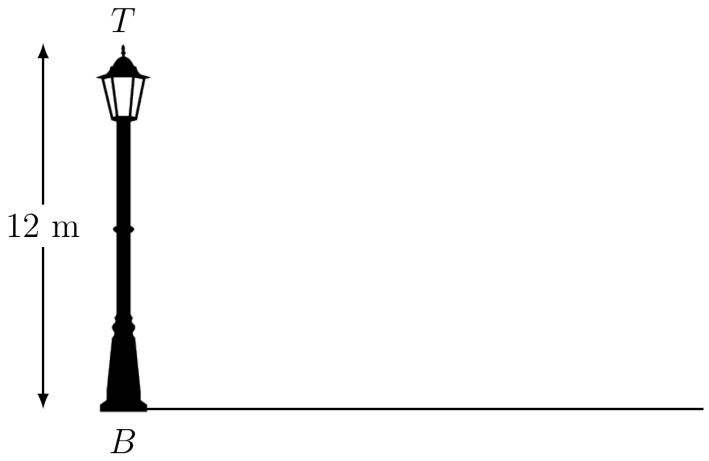
_____

_____

_____

Question 2 (10 marks)
A lamp post stands 12 m tall above flat ground.
Lisa walks away from the base of the lamp post (B) until she comes to point C on the ground, from which the angle of elevation to the top of the lamp post (T) is 60º. She then walks a further distance to reach point D on the ground, from which the angle of elevation to the top of the lamp post is 40º.

a. Complete the following diagram representing the information given by drawing the relevant lines and labelling the appropriate angles. 3 marks



b. In the shape formed by points B, C and T, what is the mathematical name of CT? 1 mark

_____

c. Find an expression for the length BC. 2 marks
Do not evaluate your answer.

_____

_____

d. Find the distance between point C and point D. 2 marks
Round your answer to two decimal places.

_____

_____

_____

_____

e. Find the distance between point D and point T. 2 marks
Round your answer to one decimal place.

_____

_____

_____

END OF QUESTION AND ANSWER BOOK

2022 YEAR 9 (5.1) MATHEMATICS MIDYEAR TEST

SOLUTIONS

SECTION A

Question	Answer
1	D
2	A
3	E
4	C
5	B
6	D
7	C
8	E
9	B
10	A
11	D
12	B
13	D
14	C
15	C

Question 1
1 is the smallest positive integer.

Answer is **D**.

Question 2
$4b^2 \div (2b) = 2b$

Answer is **A**.

Question 3
$\frac{11}{24} = 0.458\dot{3}$

Answer is **E**.

Question 4
$\$29{,}467 + 0.37 \times (\$150{,}250 - \$120{,}000) = \$40{,}659.50$

Answer is **C**.

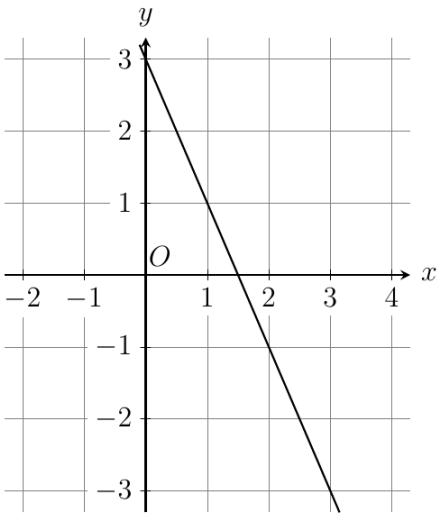
Question 5
$\$75{,}231 / (52.18 \div 2) \approx \$2{,}883.52$

Answer is **B**.

Question 6
60% of the distance between Lisa's home and the shops is 1,800 metres.
Therefore, the full distance is 1,800/0.6 = 3,000 metres.

Answer is **D**.

Question 7
The following is the correct graph for the equation $y = 3 - 2x$.



Answer is **C**.

Question 8

$$\frac{-8+p}{2} = 4$$
$$-8 + p = 8$$
$$p = 16$$

Answer is **E**.

Question 9

$x + 2y = 6$ can be written as $y = 3 - \frac{x}{2}$.

Therefore, the gradient of this line is $-\frac{1}{2}$.

The equation $-x - 2y = 1$ can be written as $y = -\frac{1}{2} - \frac{x}{2}$.

The gradient of this line is also $-\frac{1}{2}$.

Answer is **B**.

Question 10

By Pythagoras' theorem

$b^2 + c^2 = a^2$, which can be written as $c^2 = a^2 - b^2$.

Answer is **A**.

Question 11

$$\sin(\theta) = \frac{56}{65}$$

$$\theta = \sin^{-1}\left(\frac{56}{65}\right)$$

$$\approx 59.5^\circ$$

Answer is **D**.

Question 12

The area of the shaded region is

$\pi \times 2.5^2 - \pi \times 2.1^2 \approx 5.78$ cm^2

Answer is **B**.

Question 13

The area of the new composite shape is

$(15 \times 2.5) \times (9 \times 2.5) - (8 \times 2.5) \times (4 \times 2.5) \approx 643.8$ m^2

Answer is **D**.

Question 14

m	*n*
1	8
8	1
2	4
4	2

Answer is **C**.

Question 15

Assume $M > N$. The least difference will occur when M has the form …01 and N has the form …98, given that all the digits are unique. Likewise, the least difference must occur when the hundreds digits are 1 apart.

$M = 501$
$N = 498$

Therefore, $M - N = 501 - 498 = 3$.

Note that pairs such as $M = 301$ and $N = 298$ are also valid.

Answer is **C**.

SECTION B

Question 1 (5 marks)

a. 1 mark

$\$97{,}500 - \$5{,}500 = \$92{,}000$ (A1)

b. 2 marks

$\$5{,}092 + 0.325 \times (\$92{,}000 - \$45{,}000)$ (A1)

$= \$20{,}367$ (A1)

c. 2 marks

$\$22{,}207 - \$20{,}367$ (A1)

$= \$1{,}840$ (A1)

Question 2 (5 marks)

a. 1 mark

$1496 \times 10^5 \text{ km} = 1.496 \times 10^8 \text{ km}$ (A1)

b. 2 marks

$\dfrac{5.913 \times 10^9}{1.496 \times 10^8}$ (A1)

≈ 40 (A1)

c. 2 marks

$1.496 \times 10^{18} \text{ m} = 1.496 \times 10^{15} \text{ km}$ (A1)

$\dfrac{1.496 \times 10^{15}}{1.496 \times 10^8} = 1.0 \times 10^7$ (A1)

Question 3 (5 marks)

a. 2 marks

$\$1{,}121 \times 52$ (A1)

$= \$58{,}292$ (A1)

b. 3 marks

$\$1{,}121 \times 4 \times 1.175 + \$1{,}121 \times 4 \times 2 = \$14{,}236.70$

- Correct holiday pay ($\$1{,}121 \times 4 \times 1.175$). (A1)
- Correct normal pay ($\$1{,}121 \times 4 \times 2$). (A1)
- Correct answer. (A1)

Question 4 (5 marks)

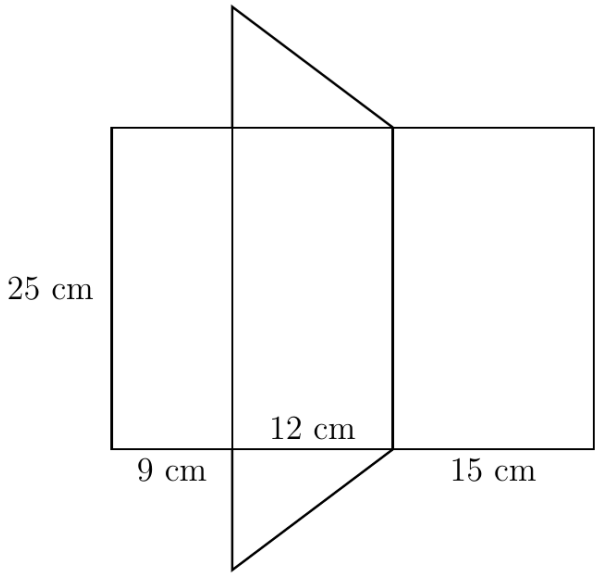
a. 2 marks

$x = \sqrt{15^2 - 12^2}$ (A1)

$= \sqrt{81}$

$= 9$ (A1)

b. 3 marks



- Correct triangular face is drawn. (A1)
- Correct rectangular face is drawn. (A1)
- Appropriate edges are correctly labelled. (A1)

Question 5 (5 marks)

a. 1 mark

13.5 cm = 0.135 m (A1)

b. 2 marks

$\frac{324}{0.135}$ (A1)

$= 2400$ (A1)

c. 2 marks

No (A1)

The heights of the towers are different. (A1)

- Similarity does not necessarily imply congruence.

SECTION C

Question 1 (10 marks)

a. 1 mark

Both lines have positive gradients. (A1)

b. 1 mark

30 km (A1)

c. 1 mark

The straight lines intersect when distance travelled is 30 km. (A1)

d. 1 mark

\$10 (A1)

e. 2 marks

$$Cost = \boxed{10 \text{ (A1)}} + \boxed{\frac{2}{3} \text{ (A1)}} \times Distance$$

f. 2 marks

$$10 + \frac{2}{3} \times \text{Distance} = 48 \quad \text{(A1)}$$

$$\frac{2}{3} \times \text{Distance} = 38$$

$$\text{Distance} = 57 \text{ km} \quad \text{(A1)}$$

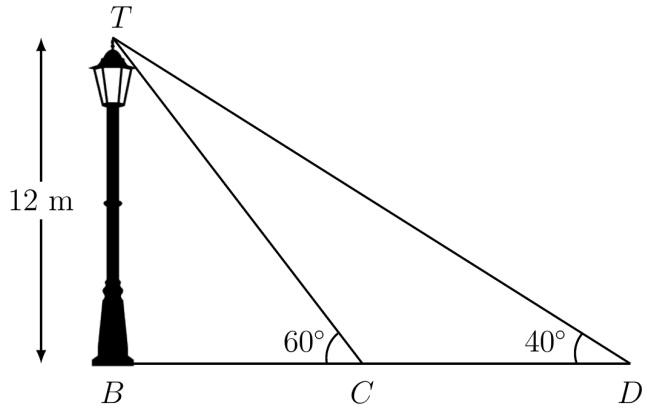
g. 2 marks

The cost of hiring of a bus and the cost of hiring a van is the same for 30 km. (A1)

Beyond 30 km, the cost of hire is greater for a bus (\$1 per km) than that for a van (\$2/3 per km). (A1)

Question 2 (10 marks)

a. 3 marks



- Both triangles are sketched. (A1)
- Points C and D are labelled correctly. (A1)
- Both angles are labelled correctly. (A1)

b. 1 mark

Hypotenuse (A1)

c. 2 marks

$$\frac{12}{BC} = \tan(60^\circ) \quad \text{(A1)}$$

$$BC = \frac{12}{\tan(60^\circ)} \quad \text{(A1)}$$

d. 2 marks

$$CD = BD - BC$$

$$= \frac{12}{\tan(40^\circ)} - \frac{12}{\tan(60^\circ)} \quad \text{(A1)}$$

$$\approx 7.37 \text{ m} \quad \text{(A1)}$$

e. 2 marks

$$\frac{12}{DT} = \sin(40^\circ) \quad \text{(A1)}$$

$$DT = \frac{12}{\sin(40^\circ)}$$

$$\approx 18.7 \text{ m} \quad \text{(A1)}$$

2022 Year 9 (5.2) Mathematics
Financial Mathematics, Ratios and Rates Test

Time allowed: 1 hour
Total marks: 20 marks

Question 1 (11 marks)

a. Calculate the total interest earned when \$3,720 is invested at 4.5% simple interest for three years. 2 marks

b. Alan borrowed \$9,500 from his bank on simplest interest.
The following table shows the value of Alan's loan for the first two years.

Year	Starting Balance	Interest	Ending Balance
1	\$9,500	\$570	\$10,070
2	\$10,070	\$570	

i. What is the ending balance of the loan after two years? 1 mark

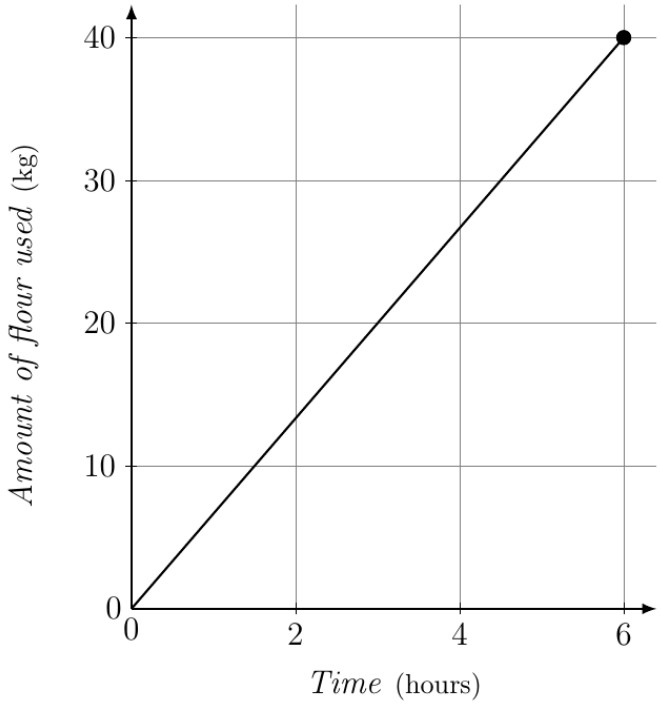
ii. Find the interest rate on the loan. 2 marks
Express your answer as a percentage.

iii. Alan's friend Des also borrows \$9,250 from the bank on simple interest of r% per annum. 3 marks
After two years, the value of Alan's loan shown above and Des' loan are equal.
Find the value of r, rounding your answer to two decimal places.

Question 2 (9 marks)

a. If 6 lollies are needed for 2 children, calculate how many lollies are needed for 100 children. 2 marks

b. The following graph shows the *Amount of flour used* by a bakery over a period of 6 hours.



i. Describe the proportionality between the *Amount of flour used* and *Time*. 1 mark

ii. Write down the equation relating *Amount of flour used* and *Time*. 1 mark

iii. Find the *Amount of flour used* after 4 hours and 12 minutes. 2 marks

2022 Year 9 (5.2) Mathematics
Financial Mathematics, Ratios and Rates Test
Total marks: 20 marks

Question 1 (11 marks)

a. 2 marks

$\$3,720 \times \frac{4.5}{100} \times 3$ (A1)

$= \$502.20$ (A1)

b.

i. 1 mark

$\$10{,}070 + \$570 = \$10{,}640$ (A1)

ii. 2 marks

$r = \frac{\$570}{\$9{,}500} \times 100$ (A1)

$= 6\%$ (A1)

iii. 3 marks

$\$9{,}250 + \$9{,}250 \times \frac{r}{100} \times 2 = \$10{,}640$ (A1)

$r = \frac{(\$10{,}640 - \$9{,}250) \times 100}{\$9{,}250 \times 2}$ (A1)

≈ 7.51 (A1)

c. 3 marks

Let the value of Riley's initial investment be $\$P$.

$P + P \times \frac{4}{100} \times 3 = \$6{,}186.75$ (A1)

$P = \frac{\$6{,}186.75}{1 + \frac{4}{100} \times 3}$

$\approx \$5{,}523.8839$ (A1)

Therefore, the initial value of the investment grew by

$\frac{\$6{,}186.75 - \$5{,}523.8839...}{\$5{,}523.8839...} \times 100 \approx 12\%$ (A1)

2022 Year 9 (5.2) Mathematics
Algebraic Techniques, Indices and Equations Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (10 marks)

a. Simplify $(2b)^{-2}$. 2 marks

Write your answer using positive indices only.

b. Simplify $9xy \div (3xy)^3$. 2 marks

Write your answer using positive indices only.

c. Simplify $3s - 2s + 3s^2 - 6s^2$. 2 marks

d. Factorise $2pq - 12p^2q$. 2 marks

e. Expand and simplify $(-2 + x)(x + 2)$. 2 marks

Question 3 (7 marks)

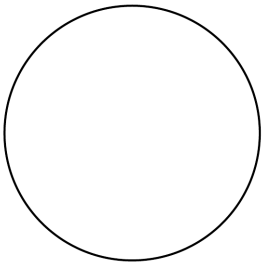
a. A bakery sells croissants for \$5 each and doughnuts for \$3 each.
Elly bought some croissants and doughnuts for \$46.
She bought 10 items in total.

Let c be the number of croissants bought and d be the number of doughnuts bought.
One equation that can be formed using the above information is $c + d = 10$.

i. Write the other equation in terms of c and d. 1 mark

ii. Solve the set of simultaneous equations to find how many croissants Elly bought. 3 marks

b. 3 marks



The circumference of the circle above is $\frac{\pi a}{4}$.

Find a simplified expression for the area of the circle in terms of π and a.

2022 Year 9 (5.2) Mathematics
Algebraic Techniques, Indices and Equations Test
Total marks: 25 marks

Question 1 (10 marks)

a. 2 marks

$(2b)^{-2} = \dfrac{1}{4b^2}$

- The numerator is 1. (A1)
- The denominator is $4b^2$. (A1)

b. 2 marks

$9xy \div (3xy)^3 = 9xy \times \dfrac{1}{27x^3y^3}$ (A1)

$= \dfrac{1}{3x^2y^2}$ (A1)

c. 2 marks

$3s - 2s + 3s^2 - 6s^2 = s - 3s^2$

- The first term is correct (s). (A1)
- The second term is correct ($-3s^2$). (A1)

d. 2 marks

$2pq - 12p^2q = 2pq(1 - 6p)$

- The final expression is factored by $2pq$. (A1)
- The expression inside the bracket is $(1 - 6p)$. (A1)

e. 2 marks

$(-2 + x)(x + 2) = -2x - 4 + x^2 + 2x$ (A1)

$= x^2 - 4$ (A1)

2022 Year 9 (5.2) Mathematics
Linear and Non-linear Relationships Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (9 marks)

a. Write down the equation of the line with a gradient of –3 and a y-intercept of 4. 1 mark

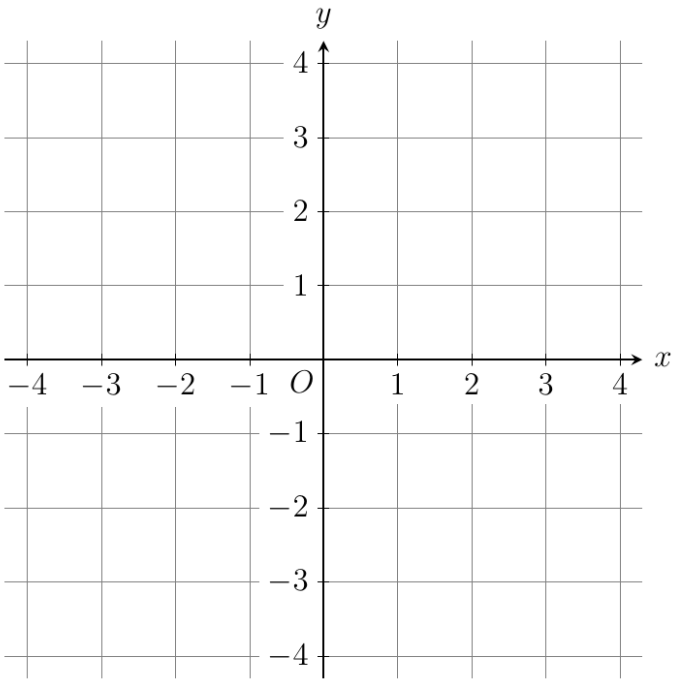
_____

b. i. Write the equation $x - 2y = 4$ in the form $y = mx + c$. 2 marks

_____

_____

ii. Sketch the graph of $x - 2y = 4$ on the set of axes provided below. 2 marks



c. Write down the equation of a line that is parallel to the line with equation $y = 5x - 2$. 1 mark

_____

d. Describe one similarity between the graphs of $y = -4x + 1$ and $y = -2x + 1$. 1 mark

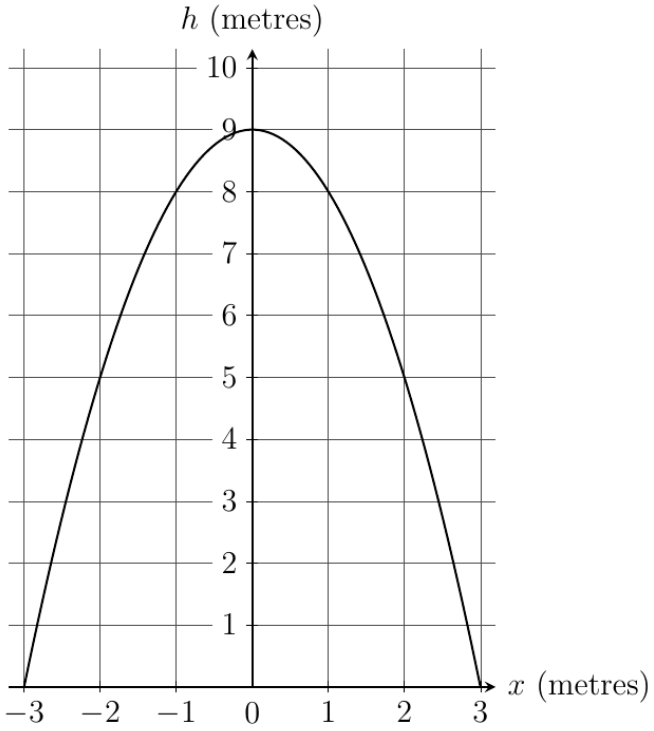
_____

_____

Question 3 (5 marks)
The entrance of a theme park is a tunnel that can be modelled by the following quadratic equation

$$h = 9 - x^2$$

where h is the height of the tunnel in metres and x is the horizontal distance from the centre of the tunnel.
A graph representing the tunnel is shown below.



a. State the maximum width of the tunnel. 1 mark

_____

b. State the maximum height of the tunnel. 1 mark

_____

c. Consider a large shipping container with a rectangular cross-section measuring 4 metres wide and 6 metres tall. 3 marks
Determine whether or not this container can be pushed through the tunnel.

_____

_____

_____

_____

2022 Year 9 (5.2) Mathematics
Linear and Non-linear Relationships Test
Total marks: 25 marks

Question 1 (9 marks)

a. 1 mark

$y = -3x + 4$ (A1)

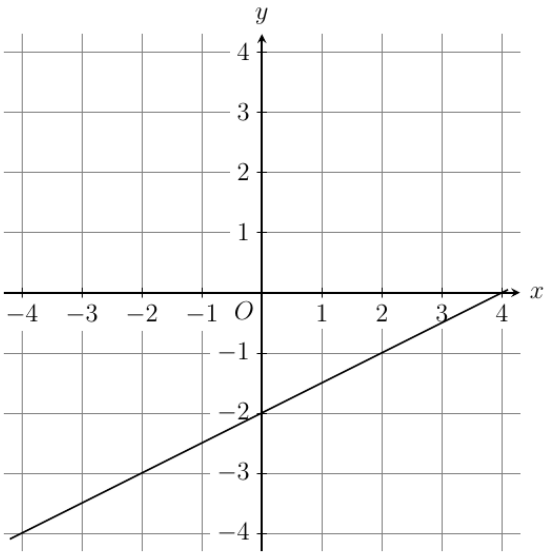
b.

i. 2 marks

$$x - 2y = 4$$
$$-2y = -x + 4$$
$$y = \frac{x}{2} - 2$$

● Correct working and final expression. (A1)×2

ii. 2 marks



● A line with a positive gradient is sketched. (A1)
● The sketched graph passes through $(0, -2)$ and $(4, 0)$. (A1)

c. 1 mark

Any equation in the form $y = 5x + k$, where k is any real number. (A1)

d. 1 mark

The lines share the same y-intercept (of 1). (A1)

e. 2 marks

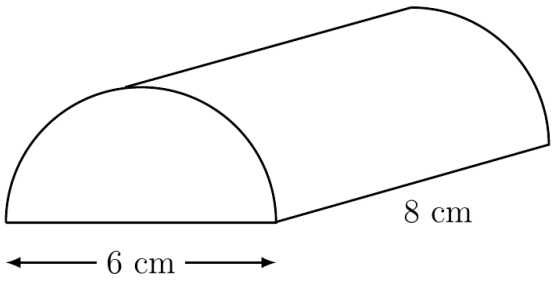
The gradient of the given line is -2. (A1)

Therefore, the gradient of a line perpendicular to the given line is $\frac{1}{2}$. (A1)

2022 Year 9 (5.2) Mathematics
Area, Surface Area and Volume Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (11 marks)
Consider the prism shown below.



a. Show that the cross-sectional area of the prism is 4.5π cm^2. 1 mark

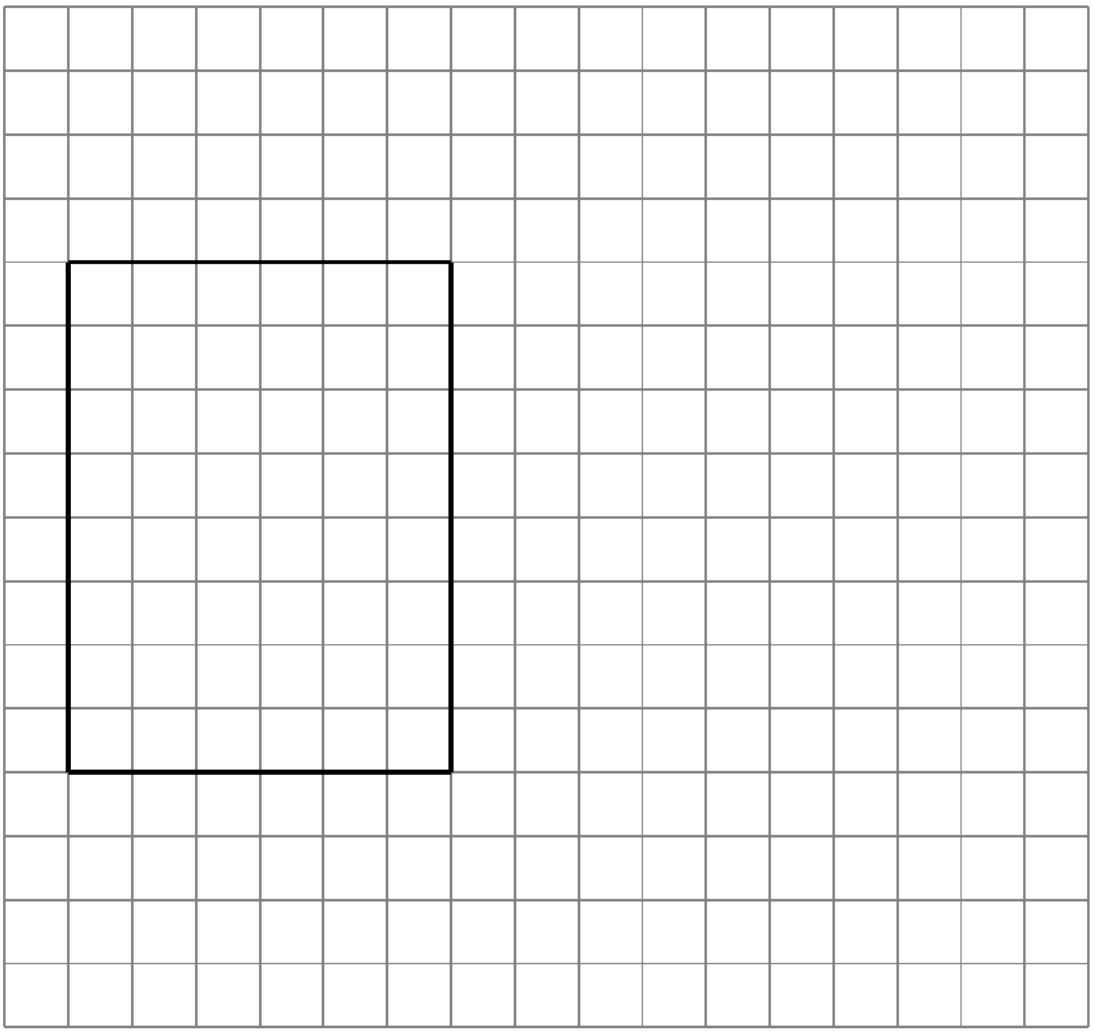
b. Find the volume of the prism. 2 marks
Round your answer to one decimal place.

c. Complete the following sentence by writing down the appropriate number or word. 1 mark

The curved side of the prism can be treated as a _____ when calculating the surface area.

d. Find the surface area of the prism, excluding the base face. 2 marks

e. On the grid of centimetre squares below, complete the net of the prism. 3 marks
The base face has been drawn for you.



f. Suppose that the net of the prism is cut out from a thin rectangular sheet measuring 16 cm by 17 cm. 2 marks
Find the area of the remaining part of the rectangular sheet.
Round your answer to the nearest whole number.

_____

_____

_____

Question 2 (8 marks)

a.

i. 1 mark

Trapezium (A1)

ii. 2 marks

The area of the cross-section of the swimming pool is

$\frac{1}{2}\times(6+2)\times 30$ (A1)

$=120\ \text{m}^2$ (A1)

b. 2 marks

The volume of the swimming pool is

120×20 (A1)

$=2400\ \text{m}^3$ (A1)

c. 3 marks

The volume of the swimming pool in litres is 2,400,000 L. (A1)

The number of hours it takes to completely drain the swimming pool is

$\frac{2,400,000}{800}\times\frac{1}{60}$ (A1)

$=50$ hours (A1)

Question 3 (6 marks)

a. 1 mark

10 faces (A1)

b. 3 marks

The surface area of the concrete block is

$2\times(15\times 13-2\times 3.5\times 6)+(15+8)\times 27+2\times(7+3.5+6)\times 27$ (A1)×2

$=1818\ \text{m}^2$ (A1)

c. 2 marks

Let the side length of the cubic concrete block be x.

$x^3=(15\times 13-2\times 3.5\times 6)\times 27$ (A1)

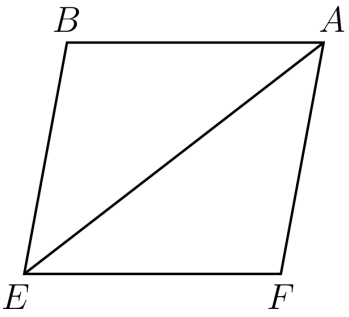
$x=\sqrt[3]{4131}$

≈ 16 m (A1)

2022 Year 9 (5.2) Mathematics
Right-angled Triangles, Properties of Geometrical Figures Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (9 marks)
$ABEF$ is a rhombus.



a. Complete the following sentence by writing down the appropriate word. 1 mark

All sides of a rhombus are _____.

b. The working below is an incomplete proof that triangle ABE and triangle AFE are congruent. 4 marks

$AB = AF$
_____ = _____
_____ is common to both triangles.
By the _____ test, triangle ABE and triangle AFE are congruent.

Complete the working by writing down the missing words or numbers.

c. Determine whether or not the diagonal AE bisects the angle BAF. 2 marks
Justify your answer.

_____

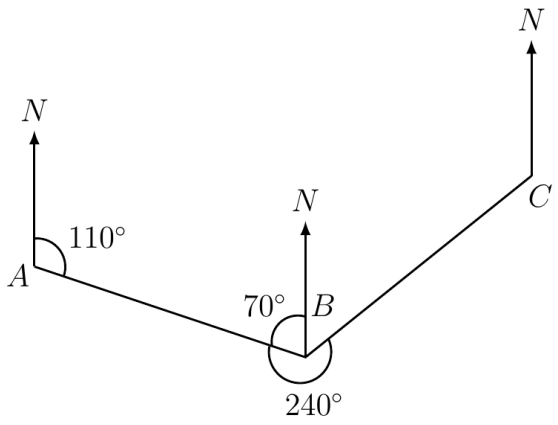
_____

d. Find the sum of the interior angles of $ABEF$. 2 marks
Show all working.

_____

_____

Question 3 (8 marks)
Consider the following diagram.



a. In the diagram, what are the angles 110º and 70º called? 1 mark
Circle the correct answer.

Alternate angles Co-interior angles Corresponding angles

b. Write down the bearing of *B* from *A*. 1 mark

_____

c. Show that the unknown angle at point *B* is 50º. 2 marks
Justify your answer.

_____

_____

d. Find the bearing of *A* from *B*. 1 mark

_____

_____

e. Find the bearing of *B* from *C*. 3 marks
Show all working.

_____

_____

_____

Question 2 (8 marks)

a. 2 marks

The length of MN is

$\sqrt{180^2-(45-30)^2}$ (A1)

$=\sqrt{32175}$

≈ 179.37 cm (A1)

b. 3 marks

$\sin(\theta)=\frac{15}{180}$ (A1)

$\theta=\sin^{-1}\left(\frac{15}{180}\right)$

$\approx 4.78^\circ$ (A1)

Therefore, the value of θ is less than 5º. (A1)

c. 1 mark

$180º - 90º - 4.78º \approx 85º$ (A1)

d. 2 marks

Let the size of angle MNP be x.

$\tan(x)=\frac{45}{\sqrt{32175}}$

$x=\tan^{-1}\left(\frac{45}{\sqrt{32175}}\right)$

$\approx 14.1^\circ$

● Correct working is shown. (A1)

the angle of elevation from N to P is 14.1º. (A1)

2022 Year 9 (5.2) Mathematics
Probability and Single Variable Data Analysis Test

Time allowed: 1 hour
Total marks: 30 marks

Question 1 (6 marks)
The following is part of the 2021 census conducted by the Australian Bureau of Statistics.
The respondents were given 5 minutes to complete the entire survey.

What is your ancestry? • Tick box, like this: ☑	☐ English ☐ Irish ☐ Scottish ☐ Chinese ☐ Italian ☐ German ☐ Aboriginal ☐ Torres Strait Islander ☐ Australian

a. Circle the type of data collected from this survey. 1 mark

Numerical Categorical

b. A particular respondent is of both English and Italian ancestry. 1 mark
State additional instructions that could be added to the survey to accommodate for this respondent.

_____

_____

c. State two disadvantages of conducting this survey using an interviewer. 2 marks

_____

_____

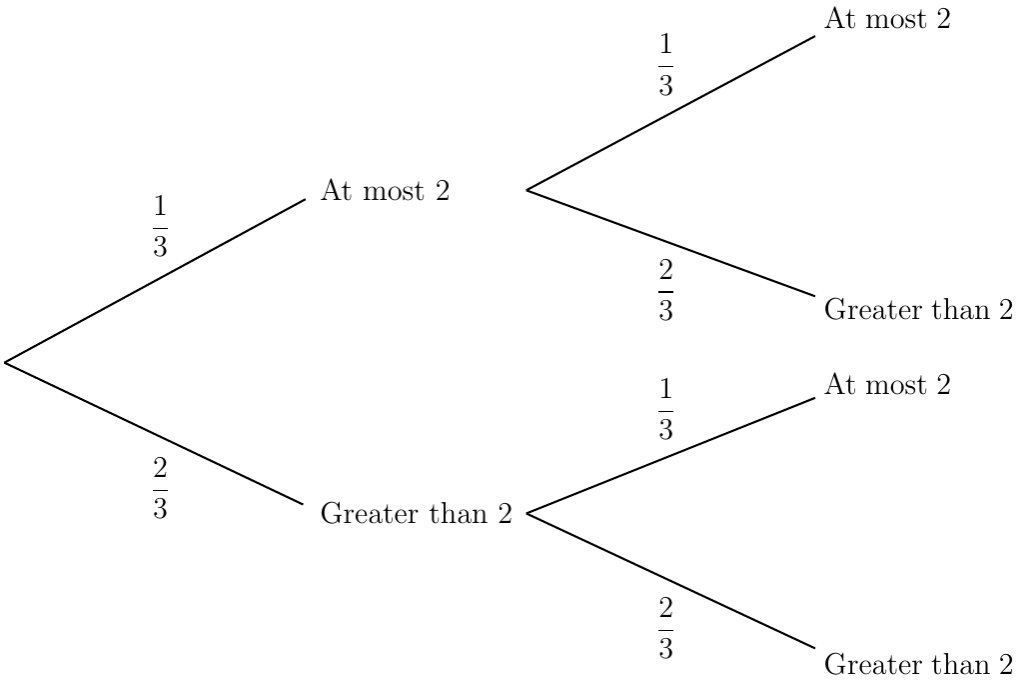
d. State two potential reasons why a respondent may not answer this question accurately. 2 marks

_____

_____

Question 4 (9 marks)
A fair die is thrown twice.

Each time, it was noted whether the number shown on the top face was at most 2 or greater than 2.
The following tree diagram shows all outcomes.



a. Does throwing the die represent selection with or without replacement? 1 mark
Circle the correct answer.

With replacement Without replacement

b. Write down the total number of outcomes. 1 mark

_____

c. Show how the probability $\frac{1}{3}$ is obtained for the event "obtaining at most 2" on the top face. 1 mark

_____

_____

2022 Year 9 (5.2) Mathematics
Probability and Single Variable Data Analysis
Total marks: 30 marks

Question 1 (6 marks)

a. 1 mark

Categorical (A1)

b. 1 mark

"Provide up to two ancestries" or similar. (A1)

c. 2 marks

Possible answers are:
- Cost
- Interviewer bias
- Manual data entry is required
- Limits sample size

● Award one mark for each reasonable statement. (A1)×2

d. 2 marks

Possible answers are:

- Not everyone knows their ancestry
- Some people may not understand the question
- Some people may not want to reveal their ancestry

● Award one mark for each reasonable statement. (A1)×2

Question 2 (10 marks)

a. 1 mark

10 minutes (A1)

b. 1 mark

minimum (A1)

c. 2 marks

$580 \times 75\%$ (A1)

$= 435$ (A1)

d. 4 marks

longer (A1)
3 (A1)
50 (A1)
right OR positive (A1)

e. 2 marks

When a numerical variable (A1) is to be compared with a categorical variable (with 2 or more levels). (A1)

2022 YEAR 9 (5.2) MATHEMATICS

MIDYEAR TEST

Reading time: 15 minutes
Writing time: 2 hours

QUESTION BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	15	15	15
B	5	5	25
C	2	2	20
			Total 60

SECTION A

Instructions for Section A

Answer **all** questions.
Choose the response that is **correct** for the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1

$(36ab) \div (6ab^{-1})$ simplifies to

A. 6

B. $6b$

C. $6b^2$

D. b^2

E. $\frac{6}{b}$

Question 2

Factorising $3x^2 - 9x$ gives

A. $3x(x - 3)$

B. $3(x^2 - 9)$

C. $3x(x - 1)$

D. $x(3x - 9x)$

E. $3x(1 - 3)$

Question 3

\$8,550 is invested at 4.4% simple interest per annum for three years.
The total value of the investment after three years is

A. \$376.20

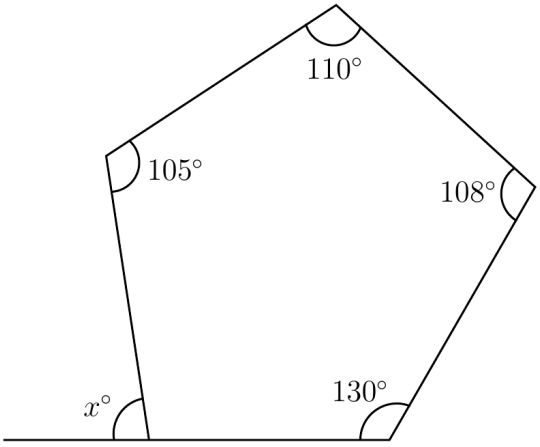
B. \$752.40

C. \$1,128.60

D. \$8,926.20

E. \$9,678.60

Question 15



In the diagram above, the value of x is

A. 75

B. 87

C. 93

D. 108

E. 180

END OF SECTION A

Question 3 (5 marks)
Consider the equation $y = x^2 - 1$.

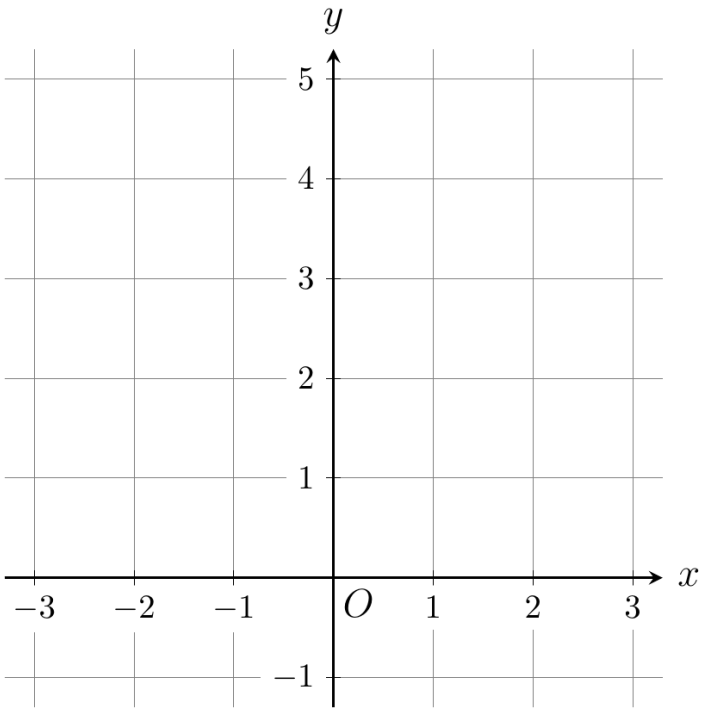
a. Complete the following table of values for the equation. 2 marks

x	–2	–1		1	2
y	3	0	–1	0	

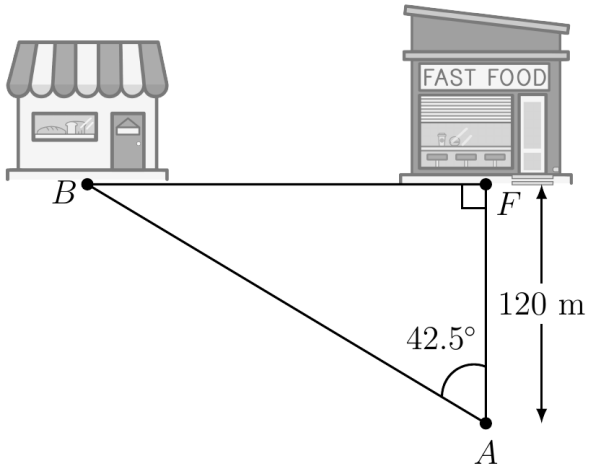
b. Write down the coordinates of the y-intercept of the graph of $y = x^2 - 1$. 1 mark

---

c. Sketch the graph of $y = x^2 - 1$ on the set of axes below. 2 marks



Question 4 (5 marks)
The diagram below shows two shops (labelled *B* and *F*) on a straight road.
The distance between *A* and *F* is 120 m and the size of angle *BAF* is 42.5º.



a. Convert 42.5º to degrees and minutes. 1 mark

b. Find the distance between *B* and *F*. 2 marks
Round your answer to one decimal place.

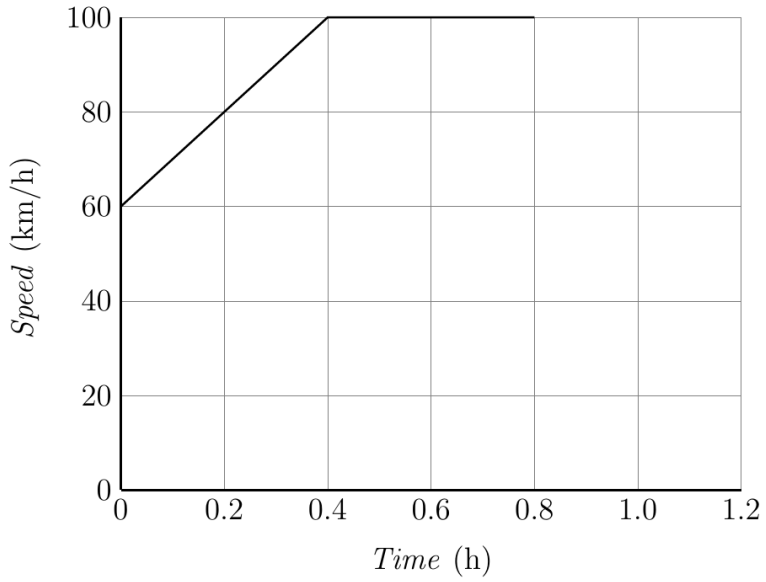
c. Jesse leaves shop *F* to travel to shop *B* via point *A.* He then returns to shop *F* via point *A*. 2 marks
Find the total distance that Jesse travelled.
Round your answer to one decimal place.

SECTION C

Instructions for Section C

Answer **all** questions.
In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.
In questions where more than one mark is available, appropriate working **must** be shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

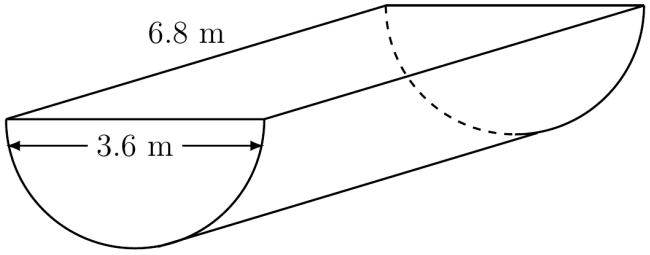
Question 1 (10 marks)
Kenny is driving a truck to his client's home.
The following graph shows Kenny's speed over a period of 0.8 hours.
Kenny travelled 32 km in the first 0.4 hours.



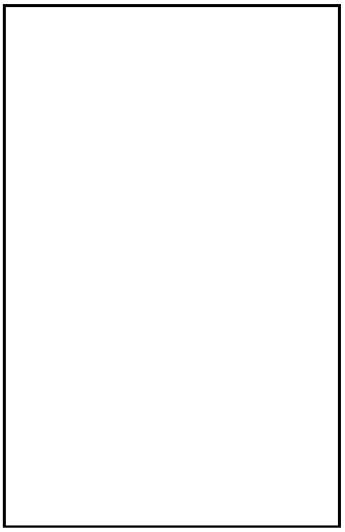
a. Convert 60 km/h to m/min. 2 marks

b. Show that the total distance that Kenny travelled between 0.4 hours and 0.8 hours is 40 km. 1 mark

Question 2 (10 marks)
An aquarium is in the shape of a closed half-cylinder.



a. Complete the diagram below for the net of the aquarium. 3 marks
Include any relevant measurements.



b. Find an expression for the cross-sectional area of the aquarium in terms of π. 2 marks
Fully simplify your answer.

2022 YEAR 9 (5.2) MATHEMATICS MIDYEAR TEST

SOLUTIONS

SECTION A

Question	Answer
1	C
2	A
3	E
4	E
5	D
6	B
7	A
8	D
9	D
10	E
11	B
12	A
13	B
14	D
15	C

Question 1

$(36ab \div 6ab^{-1}) = 6b^2$

Answer is **C**.

Question 2

$3x^2 - 9x = 3x(x - 3)$

Answer is **A**.

Question 3

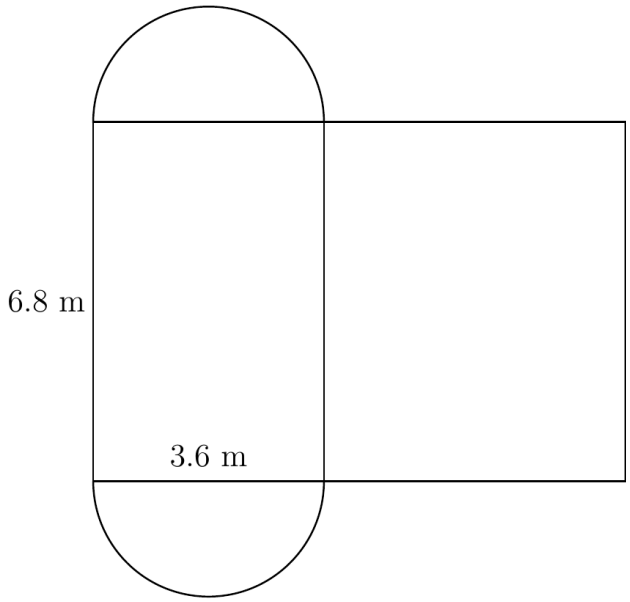
The value of the investment after three years is

$$\$8,550 + \$8,550 \times \frac{4.4}{100} \times 3 = \$9,678.60$$

Answer is **E**.

Question 2 (10 marks)

a. 3 marks



- Two semi-circular faces are drawn. (A1)
- Second rectangular face (larger than the given one) is drawn. (A1)
- Correct measurements are added. (A1)
- Accept alternative net diagram, with the rectangle already drawn as the curved surface.

b. 2 marks

$\frac{1}{2}\times\pi\times\left(\frac{3.6}{2}\right)^2$ (A1)

$=1.62\pi \text{ m}^2$ (A1)

c. 2 marks

$\left(2\times1.62\pi+3.6\times6.8+\pi\times1.8\times6.8\right)\times2.20$ (A1)

$\approx \$161$ (A1)

d. 3 marks

The volume of the aquarium is
$1.62\pi\times6.8\approx34.60778\ldots \text{ m}^3$

or 34,607.78… L. (A1)

Therefore

$\frac{34607.78\ldots}{8.5}\times\frac{1}{60}$ (A1)

≈ 68 minutes (A1)

2022 Year 9 (5.3) Mathematics
Surds, Algebraic Techniques and Equations Test

Time allowed: 1 hour
Total marks: 30 marks

Question 1 (11 marks)
a. Consider the following numbers.

$0.\dot{5}$	$\sqrt{3}$	$\frac{4}{7}$	-2	$\sqrt{27}$

i. Write down the smallest number. 1 mark

_____

ii. Simplify $\sqrt{27}$ as much as possible. 1 mark
Write your answer in surd form.

_____

_____

iii. How many of these numbers are irrational numbers? 1 mark
Circle the correct answer.

One Two Three

iv. Show that $0.\dot{5} = \frac{5}{9}$. 3 marks

_____

_____

_____

_____

b. Simplify $\sqrt{28} - \sqrt{63}$. 2 marks

_____

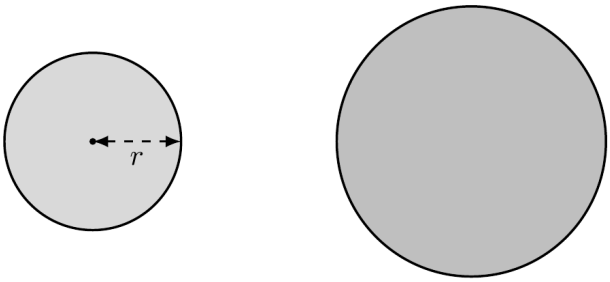
_____

_____

Question 3 (9 marks)

a. Solve the equation $x^2 + 6x + 5 = 0$. 2 marks

b. Two circles are shown in the diagram below. 3 marks



The radius of the smaller circle is r.
The combined area of the smaller circle and the larger circle is $26\pi r^2$.
Find the radius of the larger circle in terms of r.

c. Consider three consecutive natural numbers $x - 1$, x and $x + 1$. 4 marks
If the square of the middle number is equal to the difference of the squares of the other two numbers, find the largest number of the three.

2022 Year 9 (5.3) Mathematics
Surds, Algebraic Techniques and Equations Test
Total marks: 30 marks

Question 1 (11 marks)

a

i. 1 mark

–2 (A1)

ii. 1 mark

$\sqrt{27} = 3\sqrt{3}$ (A1)

iii. 1 mark

Two (A1)

$\sqrt{3}$ and $\sqrt{27}$ are irrational numbers.

iv. 3 marks

Let $x = 0.\dot{5}$ (A1)

Multiplying this equation by 10 gives $10x = 5.\dot{5}$

Subtracting the first equation from the second one gives

$10x - x = 5.\dot{5} - 0.\dot{5}$ (A1)

$$9x = 5$$

$$x = \frac{5}{9}$$ (A1)

b. 2 marks

$\sqrt{28} - \sqrt{63} = 2\sqrt{7} - 3\sqrt{7}$ (A1)

$= -\sqrt{7}$ (A1)

c. 3 marks

Let the side length of the square be s cm.

Using Pythagoras' theorem

$\sqrt{s^2 + s^2} = 5\sqrt{2}$ (A1)

$\sqrt{2s^2} = 5\sqrt{2}$

$s\sqrt{2} = 5\sqrt{2}$ (A1)

$s = 5$ (A1)

2022 Year 9 (5.3) Mathematics
Linear and Non-linear Relationships Test

Time allowed: 1 hour
Total marks: 30 marks

Question 1 (12 marks)

a. Consider the line with equation $y - 4 = 2(x - 3)$.

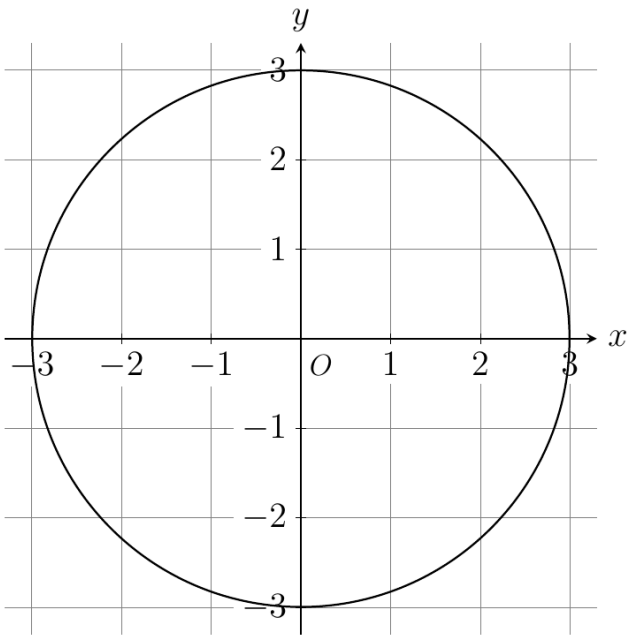
i. State the gradient of the line. 1 mark

ii. Consider a point on the line. 2 marks
Find the y-coordinate of this point if its x-coordinate is $x = a + 3$, where a is a constant.

b. A line has a gradient of -3 and passes through the point $(2, 4)$. 2 marks
Write down the equation of this line in general form ($ax + by + c = 0$).

c. The gradient of the line segment joining $(-1, 2)$ and $(3, k)$ is 1. 2 marks
Find the value of the constant k.

b. 2 marks



Find the equation of the circle shown above.

_____

_____

_____

Question 3 (7 marks)

a. 2 marks

The area of the garden is

$x \times (12 - 2x)$ (A1)

$= 12x - 2x^2$ (A1)

b. 1 mark

Concave down (A1)

c. 3 marks

$x \times (12 - 2x) = 18$ (A1)

$12x - 2x^2 = 18$

$x^2 - 6x + 9 = 0$ (A1)

$(x - 3)^2 = 0$

$x = 3$ (A1)

d. 1 mark

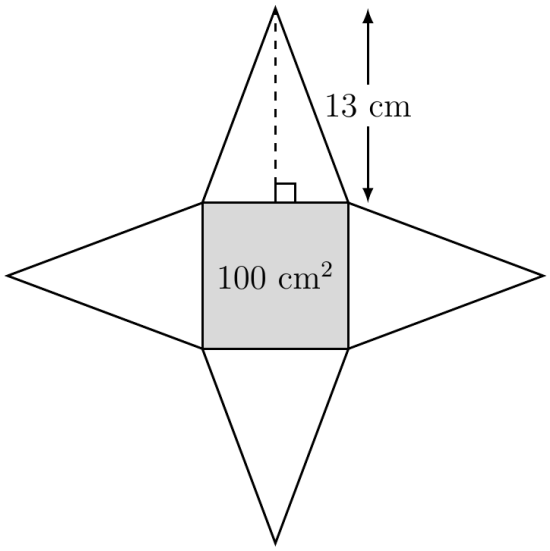
$x = 3$ is half-way between the points $x = 0$ and $x = 6$. (A1)

- Accept a valid answer.

2022 Year 9 (5.3) Mathematics
Surface Area and Volume Test

Time allowed: 1 hour
Total marks: 20 marks

Question 1 (10 marks)
a. The diagram below shows the net diagram of a square pyramid.



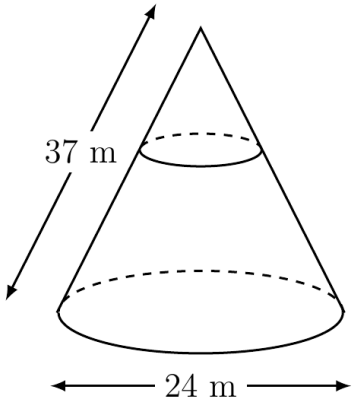
i. Find the side length of the square base. 1 mark

ii. Find the vertical height of the square pyramid. 2 marks

iii. Find the capacity of the square pyramid, in litres. 3 marks
Hint: 1 cm^3 = 0.001 L.

c. Consider a cylinder with the same base diameter and height as the cone. 2 marks
Find the ratio of the volume of the cylinder to the volume of the cone.

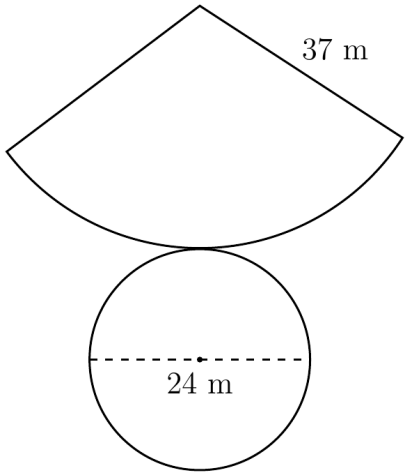
d. The given cone is sliced into two parts by a plane parallel to the base as shown below. 3 marks
The base diameter of the smaller part, which is also a cone, is 8 m.
The two cones are similar with diameters in the ratio 1:3.



Find the volume of the larger part.
Express your answer as an improper fraction in terms of π.

Question 2 (10 marks)

a. 3 marks



- A circle is drawn. (A1)
- A sector is drawn. (A1)
- Correct measurements are indicated. (A1)

b. 2 marks

The surface area of the cone is

$\pi \times 12 \times (12+37)$ (A1)

$\approx 1{,}847.3 \text{ m}^2$ (A1)

c. 2 marks

Let h be the vertical height of the cone and the cylinder.

$\pi \times 12^2 \times h : \frac{1}{3} \times \pi \times 12^2 \times h$ (A1)

$= 1 : \frac{1}{3}$

$= 3 : 1$ (A1)

d. 3 marks

The vertical height of the cone is $\sqrt{37^2 - 12^2} = 35 \text{ m}$ (A1)

The volume of the small part is

$\frac{1}{3} \times \pi \times 4^2 \times \frac{35}{3} = \frac{560}{9}\pi \text{ m}^3$ (A1)

Therefore, the volume of the larger part is

$\frac{1}{3} \times \pi \times 12^2 \times 35 - \frac{560}{9}\pi$

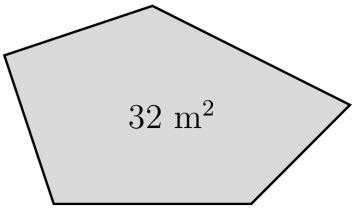
$= \frac{14560}{9}\pi \text{ m}^3$ (A1)

2022 Year 9 (5.3) Mathematics
Pythagoras' Theorem and Properties of Geometrical Figures Test

Time allowed: 1 hour
Total marks: 25 marks

Question 1 (5 marks)

a. A pentagon has an area of 32 m^2. 2 marks

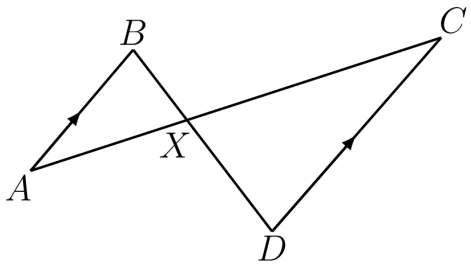


If the pentagon is enlarged by a scale factor of 1.5, find the area of the larger pentagon.

b. Two similar rectangles have areas in the ratio 49 : 144. If the length of the larger rectangle is 108 cm, find the length of the smaller rectangle. 3 marks

e. Use the results in parts **c** and **d** to show that $a^2 + b^2 = c^2$. 3 marks

Question 4 (5 marks)
The diagram below is drawn to scale.
AB is parallel to *DC*.



a. Prove that triangle *ABX* and triangle *CDX* are similar. 4 marks

b. Are triangle *ABX* and triangle *CDX* congruent? 1 mark
Circle the correct answer.

Yes No

2022 Year 9 (5.3) Mathematics
Pythagoras' Theorem and Properties of Geometrical Figures Test
Total marks: 25 marks

Question 1 (5 marks)

a. 2 marks

32×1.5^2 (A1)

$= 72 \text{ m}^2$ (A1)

b. 3 marks

The two similar rectangles have matching sides in the ratio $7:12$. (A1)

The length of the smaller rectangle is

$108 \times \frac{7}{12}$ (A1)

$= 63 \text{ cm}$ (A1)

Question 2 (5 marks)

a. 2 marks

$2\pi R : 2\pi(3R)$ (A1)

$= 1:3$ (A1)

b. 3 marks

The ratio of the area of these three circles is $1:2^2:3^2 = 1:4:9$. (A1)

Therefore, the ratio of the area of part A to the area of part C is

$1:(9-4)$ (A1)

$= 1:5$ (A1)

● Accept any other valid method.

2022 YEAR 9 (5.3) MATHEMATICS
MIDYEAR TEST

Reading time: 15 minutes
Writing time: 2 hours

QUESTION BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	15	15	15
B	5	5	25
C	2	2	20
			Total 60

Question 3

Which one of the following statements is **true** about the equation $4x = 4k$, where k is a constant?

A. The equation is not linear

B. If $k = 0$, there is no solution to the equation

C. The solution to the equation is $x = 4$

D. The equation always has a solution regardless of what the value of k is

E. The solution to the equation is $x = \frac{1}{k}$

Question 4

Two printers can print the required daily target in an hour.

In two hours, four of these printers can print

A. twice the daily target

B. three times the daily target

C. four times the daily target

D. six times the daily target

E. eight times the daily target

Question 5

$(a + b)^2 = 2ab + c^2$ simplifies to

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

B. $a^2 + b^2 = 2ab + c^2$

C. $a^2 - 2ab + b^2 = 2ab + c^2$

D. $a^2 + b^2 + c^2 = 0$

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

Question 12

$0.\dot{3}+0.0\dot{6}$ simplifies to

A. $0.3\dot{6}$

B. 0.4

C. 0.39

D. 0.63

E. $0.\dot{3}\dot{6}$

Question 13

Two similar shapes have matching sides lengths in the ratio $2:9$.

If the area of the smaller shape is 48 m^2, the area of the larger shape is

A. 10 m^2

B. 48 m^2

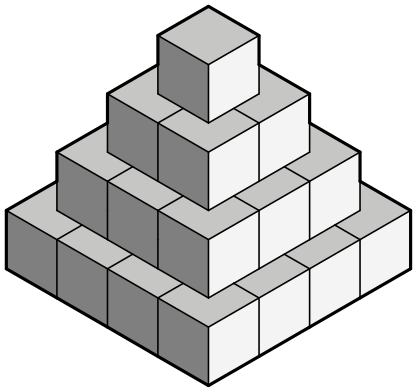
C. 81 m^2

D. 216 m^2

E. 972 m^2

Question 14

The diagram shows a solid made up of 30 cubes, each measuring $1\text{ cm}\times 1\text{ cm}\times 1\text{ cm}$.



The total surface area of the solid (including its base) is

A. 30 cm^2

B. 40 cm^2

C. 56 cm^2

D. 72 cm^2

E. 84 cm^2

SECTION B

Instructions for Section B

Answer **all** questions.
In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.
In questions where more than one mark is available, appropriate working **must** be shown.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

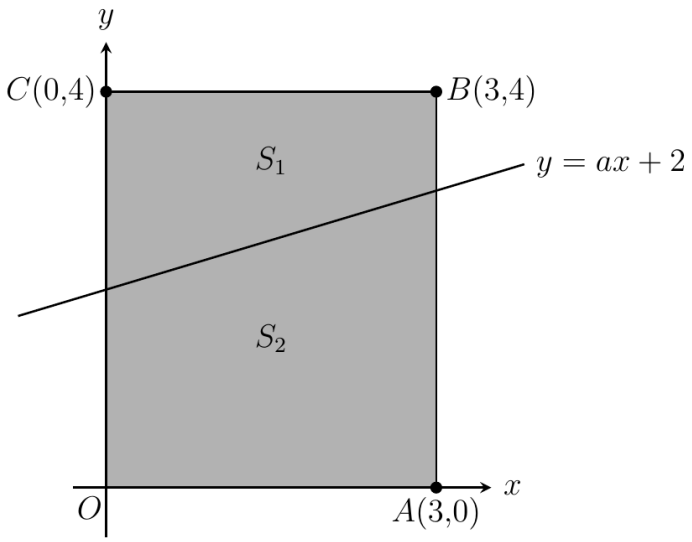
Question 1 (5 marks)

a. Simplify $\sqrt{3} \times \sqrt{12} \times \sqrt{27}$. 2 marks

Write your answer in surd form.

b. Simplify $\dfrac{y^2 - 25}{y^2 + 4y - 5}$. 3 marks

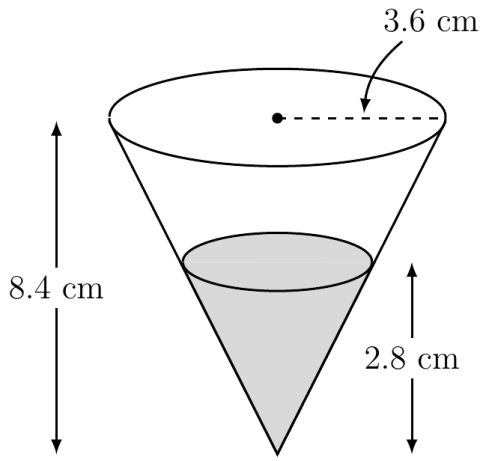
Question 3 (5 marks)
In the following diagram, *OABC* is a rectangle.
The graph of $y = ax + 2$ is shown.



a. Find the coordinates where the graph $y = ax + 2$ intersects the line segment *AB*. 1 mark
Write your answer in terms of *a*.

b. The graph of $y = ax + 2$ splits the area of rectangle *OABC* in the ratio of 3 : 5. 4 marks
S_1 is the area of the smaller region and S_2 is the area of the larger region.
Find the value of *a*.

Question 2 (10 marks)
The height of water in a conical container is 2.8 cm.



a. Find the area of the top face of the container. 2 marks
Express your answer in exact form in terms of π.

b. Show that the volume of the container is 114 cm^3, rounded to the nearest whole number. 1 mark

c. Find the diameter of the top surface of the water. 3 marks

2022 YEAR 9 (5.3) MATHEMATICS MIDYEAR TEST

SOLUTIONS

SECTION A

Question	Answer
1	B
2	A
3	D
4	C
5	E
6	C
7	B
8	A
9	C
10	D
11	B
12	B
13	E
14	D
15	A

Question 1

$$\left(\frac{25}{4}\right)^{-\frac{1}{2}} = \left(\frac{4}{25}\right)^{\frac{1}{2}}$$
$$= \frac{2}{5}$$

Answer is **B**.

Question 2

$$\sqrt{45} - \sqrt{20} = 3\sqrt{5} - 2\sqrt{5}$$
$$= \sqrt{5}$$

Answer is **A**.

Question 3

"The equation always has a solution regardless of what the value of k is" is the only true statement.

Answer is **D**.

SECTION C

Question 1 (10 marks)

a. 1 mark

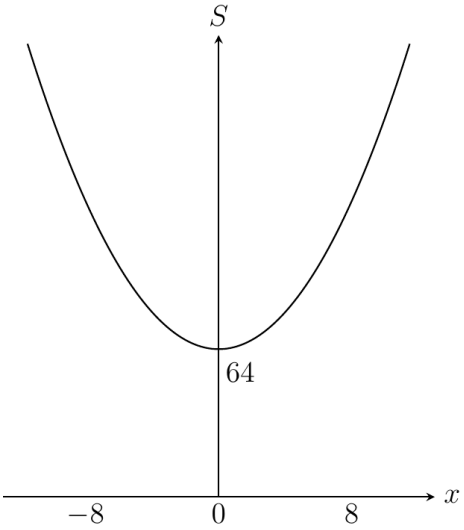
BE (A1)

b. 1 mark

$BE = \sqrt{x^2 + 64}$ (A1)

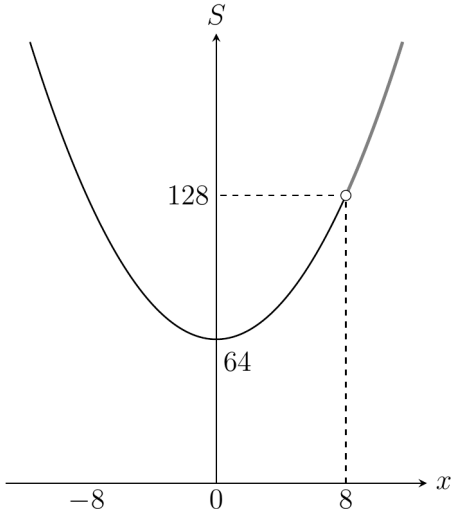
c. 2 marks

The area of square $BCDE$ is given by $S = x^2 + 64$.



- A positive parabola whose y-intercept is greater than 0. (A1)
- y-intercept is correctly labelled as 64. (A1)
- Accept sketching the graph for only $x > 0$ or $x > 8$.

d. 1 mark



- Correct part of the graph ($x > 8$) is shaded. (A1)