

ZHONGHUA SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2023
SECONDARY 1 EXPRESS

CANDIDATE NAME	CLASS	INDEX NUMBER

MATHEMATICS

4052

28 September 2023

Candidates answer on the Question Paper.

2 hours

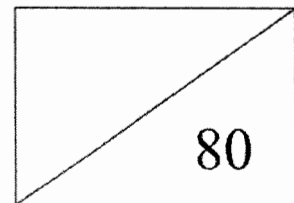
READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
 Write in dark blue or black pen.
 You may use an HB pencil for any diagrams or graphs.
 Do not use paper clips, glue or correction fluid.

Answer **all** the questions.
 If working is needed for any question it must be shown with the answer.
 Omission of essential working will result in loss of marks.
 The use of an approved scientific calculator is expected, where appropriate.
 If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
 For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is **80**.



2

Answer all the questions.

- 1 The point Q lies on the line PR .
 $PQ : QR = 5 : 2$.
 (a) Write PQ as a fraction of PR .

Answer [1]

- (b) QR is 15 cm.
 Calculate PR .

Answer cm [1]

- 2 The area of the floor of a master bedroom is 12.8 m^2 .
 State the area of the floor in square centimetres.

Answer cm^2 [1]

- 3 (a) Factorise $20pq - 4p$.

Answer [1]

3

- (b) Write as a single fraction in its simplest form $\frac{1}{4}x - \frac{7(5-x)}{12}$.

Answer [2]

- 4 A residential community club organised an outing to River Wonders. The admission fees to River Wonders are as shown:

Adult	Child
S\$42	S\$30

- (a) There are $(2w + 4)$ children who signed up for the outing. The number of adults who signed up for the outing is $(w - 1)$ fewer than the number of children. Write down a **simplified** expression for the number of adults in terms of w .

Answer [1]

- (b) The total amount for the tickets purchased for the group of adults and children who signed up for the outing was \$1452. **By forming an equation in w** , find the number of children in the group.

Answer [2]

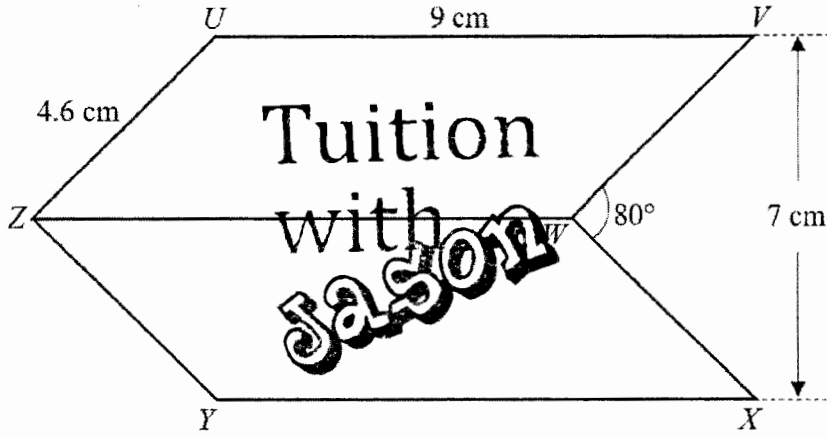
4

- 5 Using only a ruler and compasses, construct a quadrilateral $ABCD$ where $BC = 12$ cm, $AD = 9$ cm, $BD = 12$ cm and angle $ABC = 100^\circ$.
 AB is drawn below.



[3]

- 6 The figure is made up of two identical parallelograms, $UVWZ$ and $WXYZ$.
 $UV = 9$ cm, $UZ = 4.6$ cm, $VX = 7$ cm and angle $VWX = 80^\circ$.



- (a) Calculate the area of $UVWXYZ$.

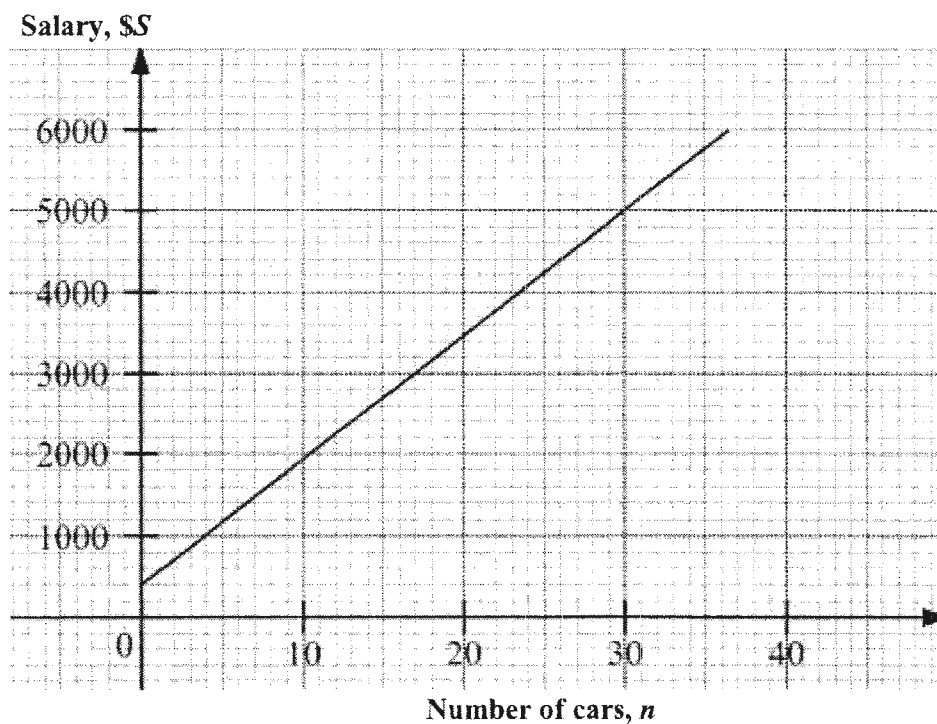
Answer cm² [2]

- (b) Calculate angle VUZ .

Answer [2]

6

- 7 The graph shows the salary scheme of a car sales representative between his salary, $\$S$, and the number of cars, n , he has sold.



- (a) Use the graph to find
 (i) his salary when he sold 30 cars,

Answer \$ [1]

- (ii) the number of cars sold if his salary was \$3000.

Answer cars [1]

- (b) His salary package, $\$S$ is made up of a fixed component $\$x$ and a commission which is based on a flat rate of $\$y$ for each car he has sold. Use the graph to find the value of x and of y .

Answer $x =$
 $y =$ [2]

7

- 8 In a sequence, the same number is subtracted each time to obtain the next term. The first five terms of the sequence are

74, x , y , z , 46, ...

- (a) Find the values of x , y and z .

Answer $x =$
 $y =$
 $z =$ [2]

- (b) Write down a simplified expression for the n^{th} term in terms of n .

Answer [2]

- (c) Explain why -40 is a not term of this sequence. Justify your answer.

Answer -40 a term of this sequence because
 [1]

8

9 The number 240, written as the product of its prime factors, is

$$240 = 2^4 \times 3 \times 5.$$

(a) (i) Express 500 as a product of its prime factors in index notation.

Answer [1]

(ii) Hence, find the LCM of 240 and 500.
Give your answer as a product of its prime factors in index notation.

Answer [1]

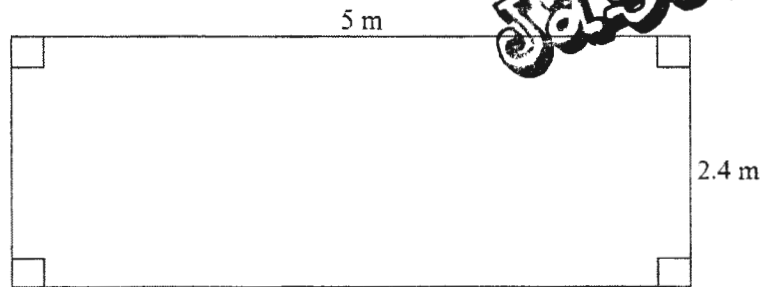
(iii) Find the smallest integer p , such that $240p$ is a perfect square.

Answer $p =$ [1]

9

Tuition
with
Jason

- 9 (b) The diagram shows the plan of a floor.
The dimensions of the floor are 5 m by 2.4 m.



The floor is to be tiled using identical square tiles.
Find

- (i) the largest possible length in cm of the side of each tile,

Answer cm [1]

- (ii) the number of tiles required to fully lay the whole floor.

Answer tiles [1]

10

10 (a) Solve the equation $\frac{2+3k}{7-2k} = \frac{1}{4}$.

Answer $k =$ [2]

(b) Solve the equation $\frac{4x-1}{2} - 2 = \frac{2-3x}{5}$.

$x =$ [3]

11

- 11** A laptop is priced at \$2300 inclusive of Goods and Services Tax (GST) of 8%.
(a) Calculate the marked price of the laptop.

Answer \$ [2]

- (b)** Michelle buys the laptop on hire purchase which includes a 25% downpayment and the remaining amount to be paid on monthly instalments over 2 years at a simple interest of 5% per annum. Find

- (i)** the total amount of interest to be paid over the 2 years,

Answer \$ [2]

- (ii)** her monthly instalment.

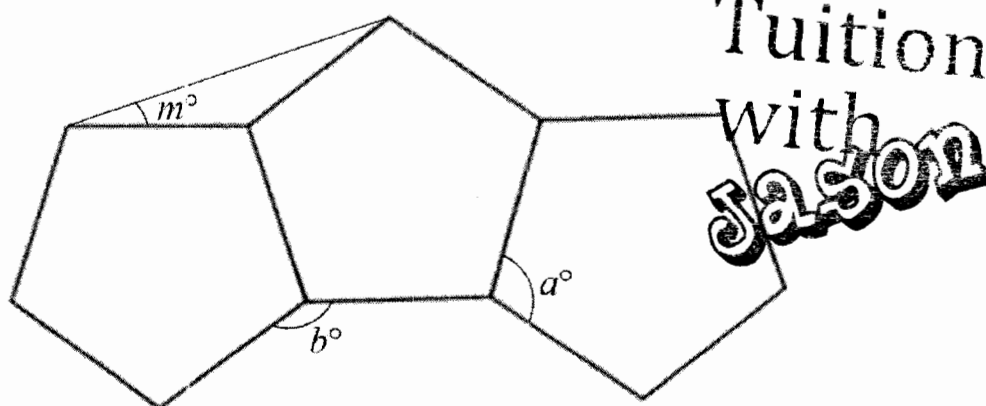
Answer \$ [1]

12

- 12 (a) Find the exterior angle of a regular octagon.

Answer [2]

- (b) The diagram shows three regular pentagons.



Find the value of

- (i) (a) a ,

Answer $a =$ [2]

- (b) b ,

Answer $b =$ [1]

13

(c) m .

Answer $m =$ [1]

- (ii) Additional pentagons are added to the three pentagons to form a closed ring which is in the shape of a regular polygon.
Find the number of additional pentagons needed to form the closed ring.

Answer [2]

- 13 (a)** Shinkansen bullet trains in Japan reach a top speed of 320 km/h. Express this speed in m/s, giving your answer correct to 2 significant figures.

Answer m/s [1]

- (b)** A MRT train travels 5 km at 50 km/h between Station *K* to Station *Y*.

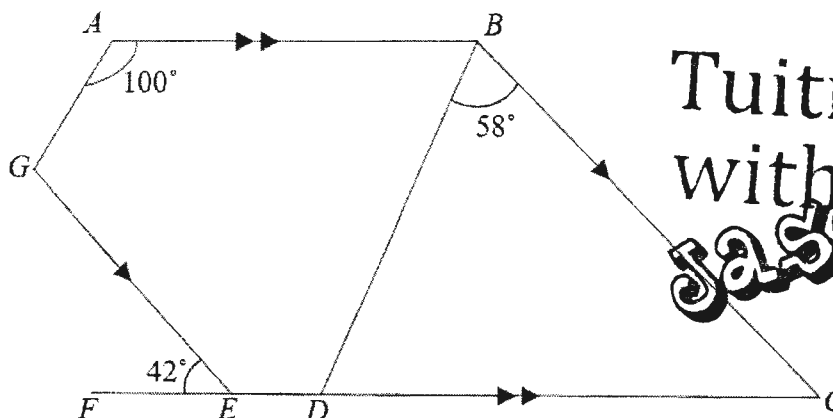
- (i)** Find the time taken for the train to travel from Station *K* to Station *Y* in minutes.

Answer minutes [2]

- (ii)** If the same train travels at 30 km/h from Station *Y* to Station *A* in 2 minutes, find its average speed, in km/h, for its journey from Station *K* to *A*.

Answer km/h [3]

- 14 In the diagram, $CDEF$ is a straight line.
 AB is parallel to CF and BC is parallel to EG .
 Angle $BAG = 100^\circ$, angle $FEG = 42^\circ$ and angle $CBD = 58^\circ$.



- (a) Find angle BCD , giving a reason for your answer.

angle $BCD =$ because

..... [2]

- (b) Find angle BDE , giving a reason for your answer.

angle $BDE =$ because

..... [2]

- (c) Find angle AGE .

Answer [3]

- (d) Is AG parallel to BD ?
 Explain your answer.

Answer because

..... [2]

15 Answer the whole of this question on the sheet of graph paper on page 17.

- (a) The table below shows some of the points of the line $y = mx + c$.

x	-3	-1	1	3
y	3	2	1	0

Using a scale of 2 cm to 1 unit, draw a horizontal x -axis for $-3 \leq x \leq 3$.

Using a scale of 4 cm to 1 unit, draw a vertical y -axis for $0 \leq y \leq 4$.
On your axes, plot the points given in the table and join them with a straight line.

[3]

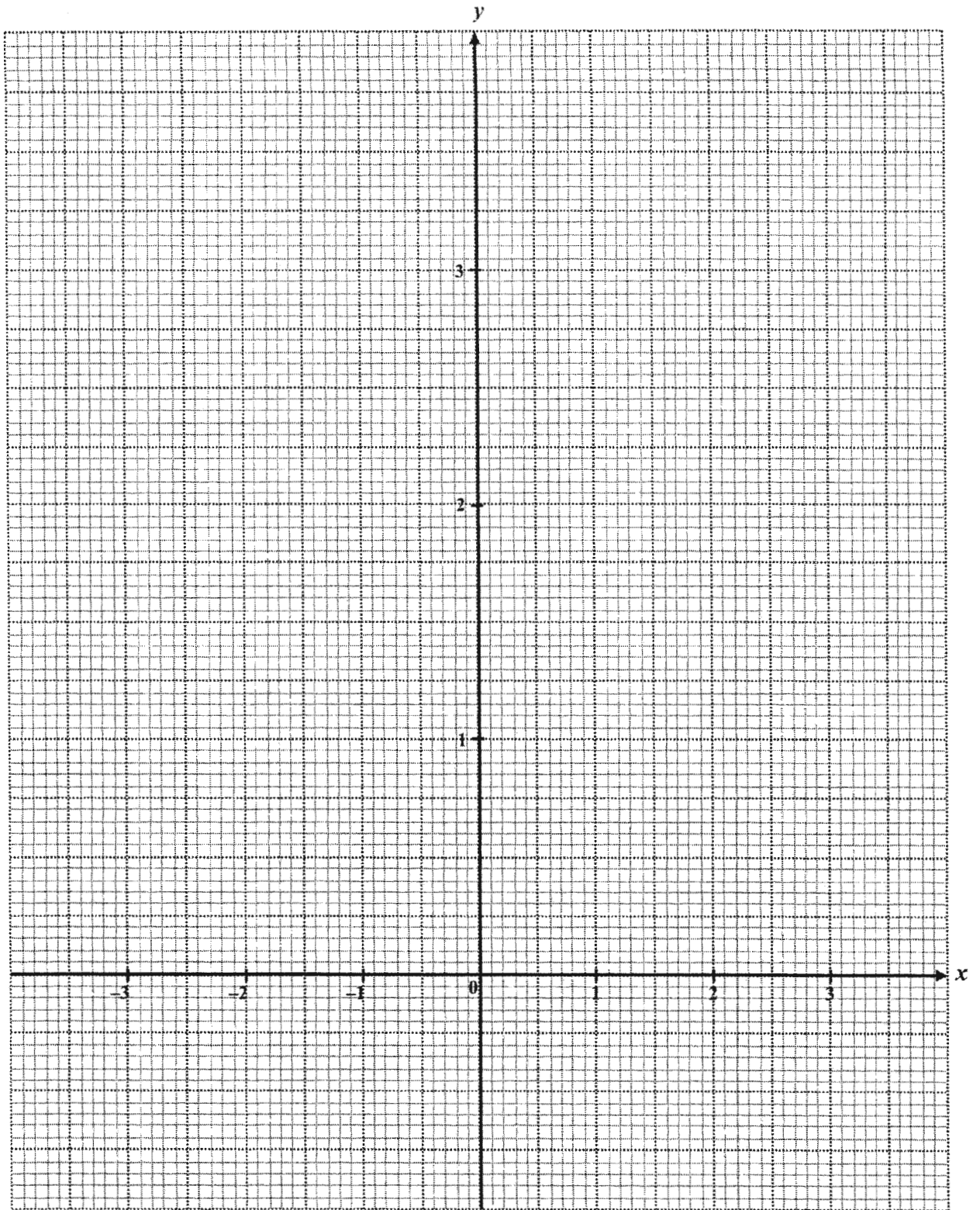
- (b) Use your graph to find the value of m and of c .

Answer $m =$ [2]

$c =$ [1]

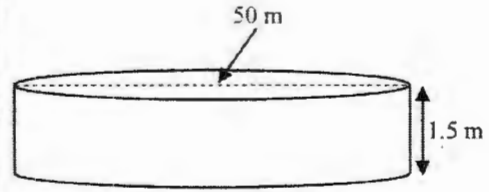
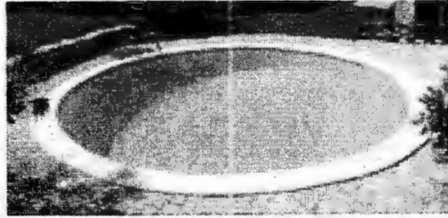
- (c) Write down the equation of the horizontal line that passes through c in (b).

Answer [1]



16 A swimming pool, which is a man-made structure designed to hold water for water-related activities such as swimming and water polo, can come in various sizes.

- (a) A swimming pool can be modelled as a cylinder.
The cylindrical swimming pool has a diameter of 50 m and a height of 1.5 m.



- (i) The swimming pool contains water to a depth of 1.4 m.
Calculate the volume of the water in the swimming pool, giving your answer correct to 3 significant figures.

Answer m³ [2]

- (ii) Calculate the total inner surface area of the swimming pool, giving your answer in terms of π .

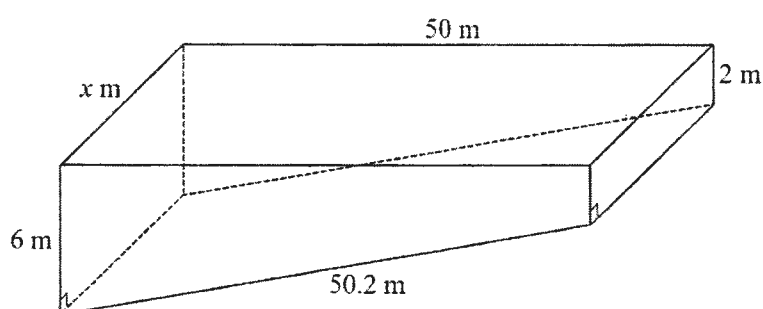
Answer m² [2]

- (b) Another swimming pool is built and it can be modelled as a trapezium prism.

Tuition
with
Jason

Useful information

- It is 50 m long and can hold 5 000 000 litres of water when fully filled.
- It is 2 m deep at one end and slopes uniformly down to 6 m at the other end.



- (i) The breadth of this swimming pool is x m.
Find the value of x .

Answer $x =$ [2]

- (ii) Bob is tasked to paint the inner surface of this swimming pool.
1 litre of paint can cover 5 m^2 .
Given that paint is sold in 15-litre containers, Bob claims that he needs to buy 25 such tins altogether.
Justify whether his claim is true or false.
Show your working clearly.

Answer His claim is because

.....
..... [4]



ZHONGHUA SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2023
SECONDARY 1 EXPRESS

CANDIDATE NAME	CLASS	INDEX NUMBER
Marking Scheme		

MATHEMATICS

4052

28 September 2023

Candidates answer on the Question Paper.

2 hours

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use paper clips, glue or correction fluid.

Answer **all** the questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

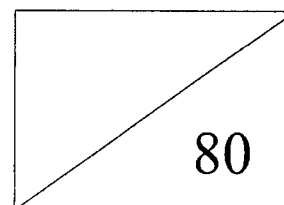
The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is **80**.



Set by: Ms Lee Sock Kee

Vetted by: Ms June Yeo & Mr Francis Tan

This document consists of **20** printed pages.

2

Answer all the questions.

- 1 The point Q lies on the line PR .
 $PQ : QR = 5 : 2$.
 (a) Write PQ as a fraction of PR .

Answer $\frac{5}{7}$ [B1] [1]

- (b) QR is 15 cm.
 Calculate PR .

$$\begin{aligned} \text{Length } PR \\ &= \frac{15}{2} \times 7 \\ &= 52.5 \end{aligned}$$

Answer 52.5 [B1] cm [1]

- 2 The area of the floor of a master bedroom is 12.8 m^2 .
 State the area of the floor in square centimetres.

$$\begin{aligned} 12.8 \text{ m}^2 \\ &= 12.8 \times 100^2 \\ &= 128000 \text{ cm}^2 \end{aligned}$$

Answer 128 000 [B1] cm^2 [1]

- 3 (a) Factorise $20pq - 4p$.
 $20pq - 4p = 4p(5q - 1)$

Answer $4p(5q - 1)$ [B1] [1]

(b) Write as a single fraction in its simplest form $\frac{1}{4}x - \frac{7(5-x)}{12}$.

$$\begin{aligned} & \frac{1}{4}x - \frac{7(5-x)}{12} \\ &= \frac{3x - 7(5-x)}{12} \quad \text{[M1] can be } \frac{3x}{12} \\ &= \frac{3x - 35 + 7x}{12} \\ &= \frac{10x - 35}{12} \end{aligned}$$

Answer $\frac{10x-35}{12}$ [A1] [2]

4 A residential community club organised an outing to River Wonders. The admission fees to River Wonders are as shown:

Adult	Child
S\$42	S\$30

(a) There are $(2w + 4)$ children who signed up for the outing. The number of adults who signed up for the outing is $(w - 1)$ fewer than the number of children. Write down a **simplified** expression for the number of adults in terms of w .

$$\begin{aligned} \text{Number of adults} &= (2w + 4) - (w - 1) \\ &= 2w + 4 - w + 1 \\ &= w + 5 \end{aligned}$$

Answer $w+5$ [B1] [1]

(b) The total amount for the tickets purchased for the group of adults and children who signed up for the outing was \$1452. **By forming an equation in w** , find the number of children in the group.

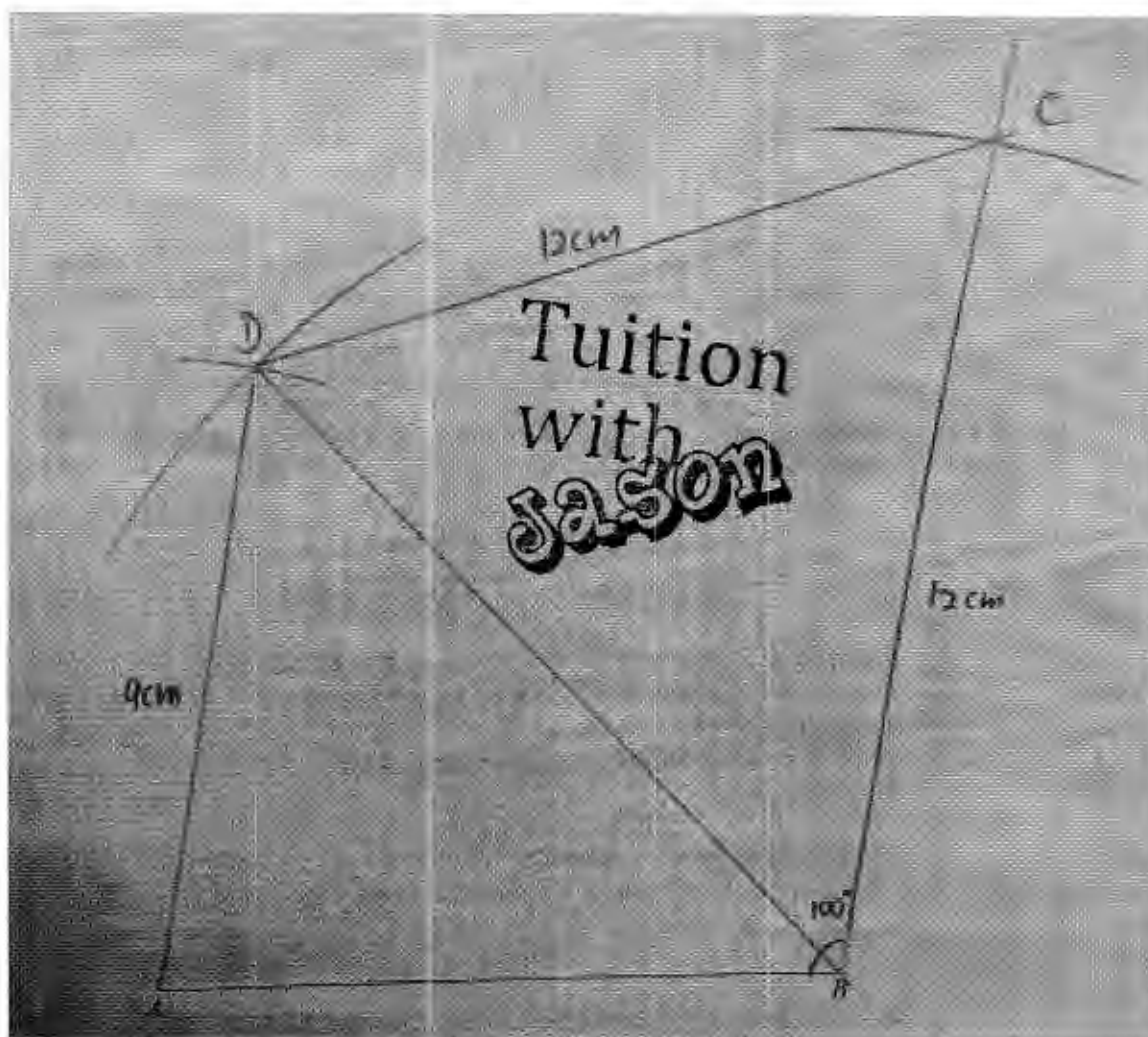
$$\begin{aligned} 30(2w + 4) + 42(w + 5) &= 1452 \quad \text{[M1] } \sqrt{\text{with 30 and 42 multiplied to } (2w+4) \text{ and } (w+5)} \\ 60w + 120 + 42w + 210 &= 1452 && \text{number of children} \\ 102w &= 1122 && = 2(11) + 4 \\ w &= 11 && = 26 \end{aligned}$$

Answer 26 [A1] [2]



4

- 5 Using only a ruler and compasses, construct a quadrilateral $ABCD$ where $BC = 12$ cm, $AD = 9$ cm, $BD = 12$ cm and angle $ABC = 100^\circ$. AB is drawn below.

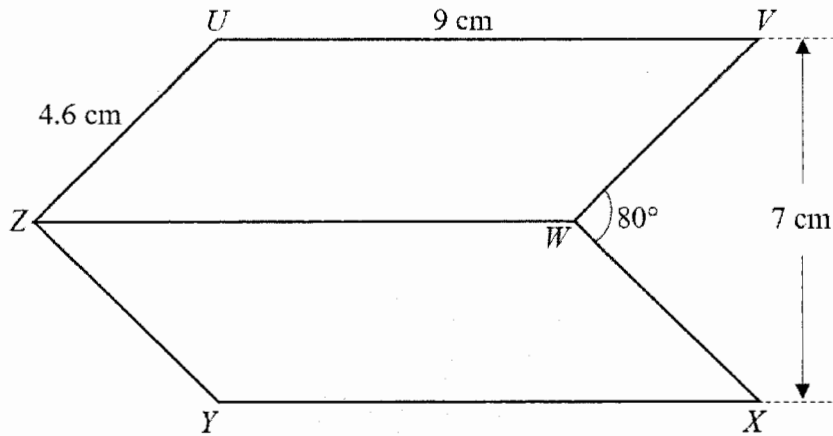


- [C1] $AD = 9$ cm (arc to be seen)
 [C1] $BD = 12$ cm (arc to be seen)
 [C1] angle $ABC = 100^\circ$, $BC = 12$ cm

Minus one mark if not quadrilateral or never label vertices

[3]

- 6 The figure is made up of two identical parallelograms, $UVWZ$ and $WXYZ$.
 $UV = 9$ cm, $UZ = 4.6$ cm, $VX = 7$ cm and angle $VWX = 80^\circ$.



- (a) Calculate the area of $UVWXYZ$.

Area
 $= 2(9 \times 3.5)$ [M1] area = base x height or 9×7
 $= 63$

Answer 63 [A1] cm^2 [2]

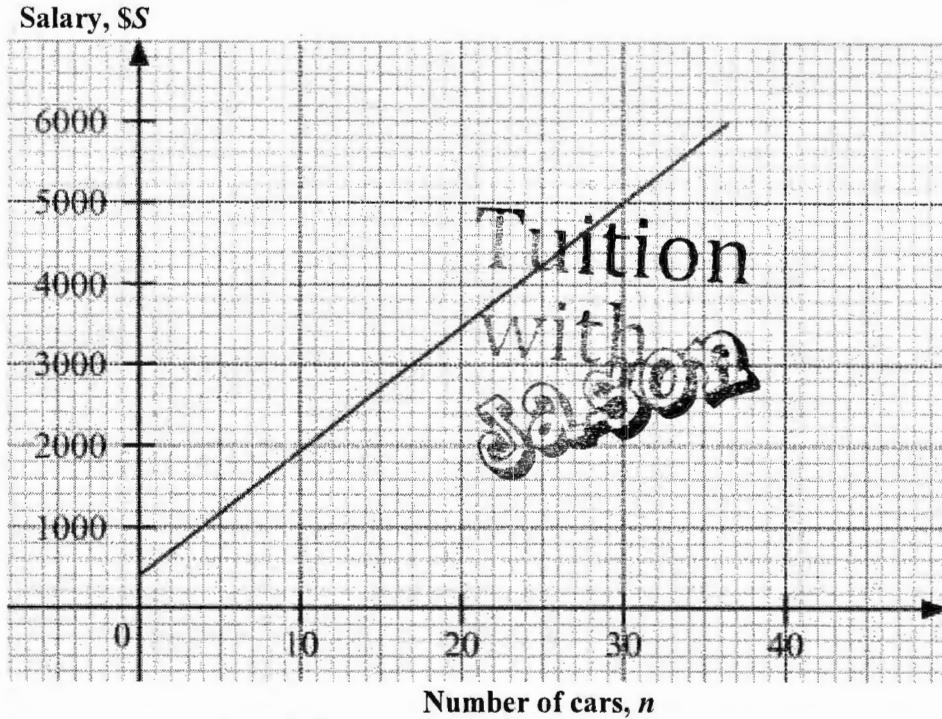
- (b) Calculate angle VUZ .

Angle VWZ
 $= \frac{360^\circ - 80^\circ}{2}$ (angles at a point) [M1] find one angle that leads to angle VUZ
 $= 140^\circ$

Angle VUZ
 $= 140^\circ$ (opposite angles of parallelogram)

Answer 140° [A1] [2]

- 7 The graph shows the salary scheme of a car sales representative between his salary, \$S, and the number of cars, n , he has sold.



(a) Use the graph to find
 (i) his salary when he sold 30 cars,
 Answer \$ 5000 [B1] [1]

(ii) the number of cars sold if his salary was \$3000.
 17 [B1]
 Answer cars [1]

- (b) His salary package, \$S is made up of a fixed component \$x and a commission which is based on a flat rate of \$y for each car he has sold. Use the graph to find the value of x and of y.

$y = \frac{5000 - 400}{30} = 153$ [Using two points on the straight line]
 Answer $x = 400$ [B1]
 $y = 153$ or 150 or 160 [B1] [2]

7

- 8 In a sequence, the same number is subtracted each time to obtain the next term.
The first five terms of the sequence are

74, x , y , z , 46, ...

- (a) Find the values of x , y and z .

Answer $x =$ 67
 $y =$ 60
 $z =$ 53 [2]

[B2] if all correct

[B1] for 2 correct

- (b) Write down a simplified expression for the n^{th} term in terms of n .

$$\begin{aligned} \text{nth term} &= 74 - 7(n-1) \quad [\text{M1}] \\ &= 74 - 7n + 7 \\ &= 81 - 7n \end{aligned}$$

Answer $81 - 7n$ [A1] or [B2] [2]

- (c) Explain why -40 is not a term of this sequence.
Justify your answer.

$$\begin{aligned} 81 - 7n &= -40 \\ -7n &= -121 \\ n &= \frac{121}{7} \\ n &= 17\frac{2}{7} \end{aligned}$$

Answer -40 is not a term of this sequence because
 n is not a whole number / positive integer [B1]

[1]

8

- 9 The number 240, written as the product of its prime factors, is
 $240 = 2^4 \times 3 \times 5$.

- (a) (i) Express 500 as a product of its prime factors in index notation.

Answer $2^2 \times 5^3$ [B1] [1]

- (ii) Hence, find the LCM of 240 and 500.
 Give your answer as a product of its prime factors in index notation.

Answer $2^4 \times 3 \times 5^3$ [B1] [1]

- (iii) Find the smallest integer p , such that $240p$ is a perfect square.

$$240p = 2^4 \times 3 \times 5 \times p$$

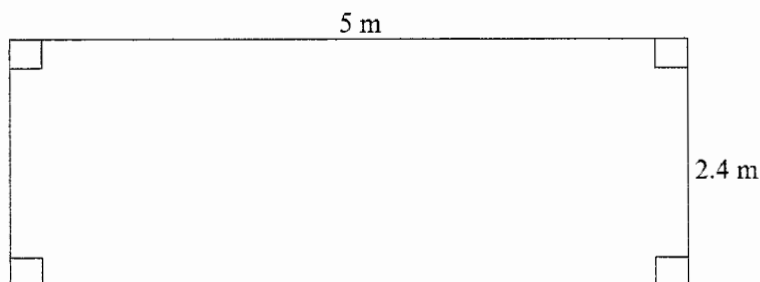
$$p = 3 \times 5$$

$$p = 15$$

Answer $p = 15$ [B1] [1]

9

- 9 (b) The diagram shows the plan of a floor.
The dimensions of the floor are 5 m by 2.4 m.



The floor is to be tiled using identical square tiles.

Find

- (i) the largest possible length in cm of the side of each tile,

$$\begin{array}{r|l}
 2 & 500, 240 \\
 2 & 250, 120 \\
 5 & 125, 60 \\
 \hline
 & 25, 12
 \end{array}$$

Tuition
with
Jason

$$\text{HCF} = 2 \times 2 \times 5 = 20$$

20 [B1]

Answer cm [1]

- (ii) the number of tiles required to fully lay the whole floor.

Number of tiles

$$\begin{aligned}
 &= \frac{500}{20} \times \frac{240}{20} \\
 &= 25 \times 12 \\
 &= 300
 \end{aligned}$$

300 [B1]

Answer tiles [1]

10

- 10 (a) Solve the equation $\frac{2+3k}{7-2k} = \frac{1}{4}$.

$$\frac{2+3k}{7-2k} = \frac{1}{4}$$

$$4(2+3k) = 7-2k \quad [\text{M1}] \text{ multiply away denominator}$$

$$8+12k = 7-2k$$

$$14k = -1$$

$$k = -\frac{1}{14}$$

Answer $k = -\frac{1}{14}$ [A1] [2]
.....

- (b) Solve the equation $\frac{4x-1}{2} - 2 = \frac{2-3x}{5}$.

Multiply by 10 throughout,

$$10\left(\frac{4x-1}{2}\right) - 2(10) = 10\left(\frac{2-3x}{5}\right) \quad [\text{M1}] \text{ multiply away denominator /}$$

expressing as the same denominator

$$5(4x-1) - 20 = 2(2-3x)$$

$$20x - 5 - 20 = 4 - 6x$$

[M1] ✓ simplification

$$26x = 4 + 25$$

$$26x = 29$$

$$x = \frac{29}{26} \text{ or } 1\frac{3}{26}$$

$x = \frac{29}{26} \text{ or } 1\frac{3}{26}$ [3]
..... [A1]

Decimal not accepted

- 11 A laptop is priced at \$2300 inclusive of Goods and Services Tax (GST) of 8%.
 (a) Calculate the marked price of the laptop.


$$\begin{aligned} &\text{Marked price} \\ &= \frac{2300}{108} \times 100 \quad [\text{M1}] \text{ divide by 108, multiply by 100} \\ &= 2129.63 \end{aligned}$$

Answer \$ 2129.63 [A1] [2]

- (b) Michelle buys the laptop on hire purchase which includes a 25% downpayment and the remaining amount to be paid on monthly instalments over 2 years at a simple interest of 5% per annum.
 Find

- (i) the total amount of interest to be paid over the 2 years,

Remaining amount

$$\begin{aligned} &= \frac{75}{100} \times 2300 \\ &= 1725 \\ &\text{interest} \\ &= \frac{PRT}{100} \\ &= \frac{1725 \times 5 \times 2}{100} \quad [\text{M1}] \text{ using } \frac{PRT}{100} \text{ with correct } P = 1725 \\ &= 172.50 \end{aligned}$$


Answer \$ 172.50 [A1] [2]

- (ii) her monthly instalment.

$$\begin{aligned} &\text{Monthly instalment} \\ &= \frac{1725 + 172.50}{24} \\ &= 79.0625 \\ &= 79.06 \end{aligned}$$

Answer \$ 79.06 [B1] [1]

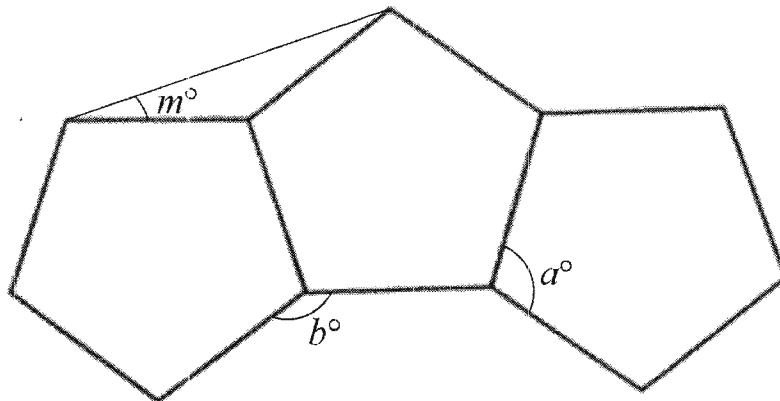
- 12 (a) Find the exterior angle of a regular **octagon**.

$$\begin{aligned} \text{Exterior angle} &= \frac{360^\circ}{8} && \text{[M1]} \\ &= 45^\circ \end{aligned}$$

$$\begin{aligned} \text{Or interior angle} &= \frac{(8-2) \times 180^\circ}{8} && \text{[M1]} \\ &= 135^\circ \\ \text{Exterior angle} &= 180^\circ - 135^\circ \\ &= 45^\circ \end{aligned}$$

Answer 45° [A1] [2]

- (b) The diagram shows three regular pentagons.



Find the value of

- (i) (a) a ,

$$a^\circ = \frac{(5-2) \times 180^\circ}{5} \quad \text{[M1]}$$

$$a^\circ = 108^\circ$$

Answer $a = 108$ [A1] [2]

- (b) b ,

$$b^\circ = 360^\circ - 108^\circ - 108^\circ \quad (\text{angles at a point})$$

$$b^\circ = 144^\circ$$

Answer $b = 144$ [B1] [1]

13

(c) m .

$$m^\circ = \frac{180^\circ - 144^\circ}{2} \quad (\text{base angles of isosceles triangle})$$

$$m^\circ = 18^\circ$$

Answer $m =$ 18 [1]

- (ii) Additional pentagons are added to the three pentagons to form a closed ring which is in the shape of a regular polygon.
Find the number of additional pentagons needed to form the closed ring.

$$\frac{(n-2) \times 180^\circ}{n} = 144^\circ \quad [\text{M1}] \text{ finding interior angle or exterior angle}$$

$$180^\circ n - 360^\circ = 144^\circ n$$

$$180^\circ n - 144^\circ n = 360^\circ$$

$$36^\circ n = 360^\circ$$

$$n = 10$$

Or exterior angle

$$= 180^\circ - 144^\circ$$

$$= 36^\circ$$

$$n = \frac{360^\circ}{36}$$

$$n = 10$$

Number of additional pentagons

$$= 10 - 3$$

$$= 7$$

Answer 7 [A1] [2]

- 13 (a) Shinkansen bullet trains in Japan reach a top speed of 320 km/h.
Express this speed in m/s, giving your answer correct to 2 significant figures.

$$\begin{aligned} & 320 \text{ km/h} \\ &= \frac{320 \times 1000 \text{ m}}{1 \times 60 \times 60 \text{ s}} \\ &= 89 \text{ m/s (2 s. f.)} \end{aligned}$$

Answer 89 [B1] m/s [1]

- (b) A MRT train travels 5 km at 50 km/h between Station K to Station Y.

- (i) Find the time taken for the train to travel from Station K to Station Y in minutes.

$$\begin{aligned} & \text{Time taken} \\ &= \frac{\text{Distance}}{\text{Speed}} \\ &= \frac{5}{50} \text{ h} \quad [\text{M1}] \\ &= \frac{1}{10} \times 60 \\ &= 6 \text{ min} \end{aligned}$$

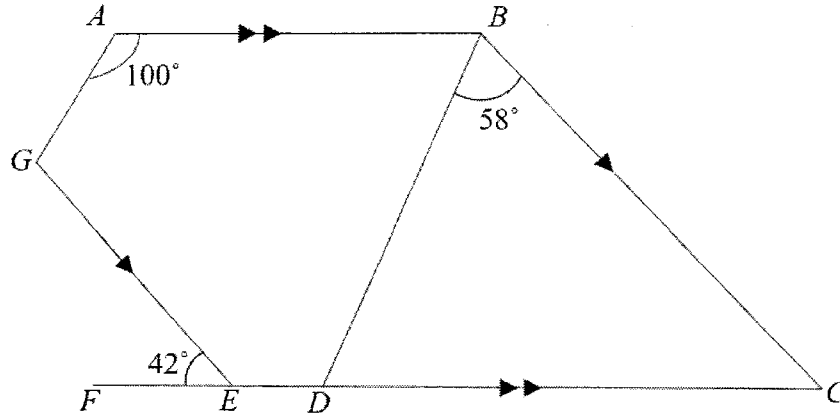
Answer 6 [A1] minutes [2]

- (ii) If the same train travels at 30 km/h from Station Y to Station A in 2 minutes, find its average speed, in km/h, for its journey from Station K to A.

$$\begin{aligned} & \text{Distance from Y to A} \\ &= 30 \times \frac{2}{60} \\ &= 1 \text{ km} \quad [\text{B1}] \\ & \text{Average Speed} \\ &= \frac{5+1}{(6+2) \div 60} \quad [\text{M1}] \text{ accept time in min} \\ &= 45 \end{aligned}$$

Answer 45 [A1] km/h [3]

- 14 In the diagram, $CDEF$ is a straight line.
 AB is parallel to CF and BC is parallel to EG .
 Angle $BAG = 100^\circ$, angle $FEG = 42^\circ$ and angle $CBD = 58^\circ$.



- (a) Find angle BCD , giving a reason for your answer.

angle $BCD = 42^\circ$ [B1] because
 corresponding angles, GE is parallel to BC . [B1] award only if
 first B1 is correct [2]

- (b) Find angle BDE , giving a reason for your answer.

angle $BDE = 58^\circ + 42^\circ$ because
 $= 100^\circ$ [B1]
 exterior angles of a triangle [B1] award only if first B1 is correct [2]
 or angle sum of triangle, adjacent angles on a straight line

- (c) Find angle AGE .

$\angle AGH$
 $= 180^\circ - 100^\circ$ (interior angles, $AB \parallel GH$) [M1]
 $= 80^\circ$

$\angle HGE = 42^\circ$ (alternate angles, $GH \parallel FD$) [M1]

$\angle AGE$
 $= 80^\circ + 42^\circ$
 $= 122^\circ$



Answer 122° [A1] [3]

- (d) Is AG parallel to BD ?
Explain your answer.

Answer Yes because $\angle GAB + \angle ABD = 100^\circ + 80^\circ = 180^\circ$
[B1]

By converse of interior angles, since the two angles are
supplementary, AG is parallel to BD [2]

- 15 (a) The table below shows some of the points on the line $y = mx + c$.

x	-3	-1	1	3
y	3	2	1	0

On the grid on Pg 17, plot the points given in the table and join them with a straight line.

[3]

- (b) Use your graph to find the value of m and of c .

$$\begin{array}{l}
 m \\
 = \text{gradient} \\
 = -\frac{2}{4} \\
 = -\frac{1}{2}
 \end{array}
 \quad \text{Or} \quad
 \begin{array}{l}
 m \\
 = \text{gradient} \\
 = -\frac{3-0}{-3-3} \\
 = \frac{3}{-6} \\
 = -\frac{1}{2}
 \end{array}$$

[B1] negative sign

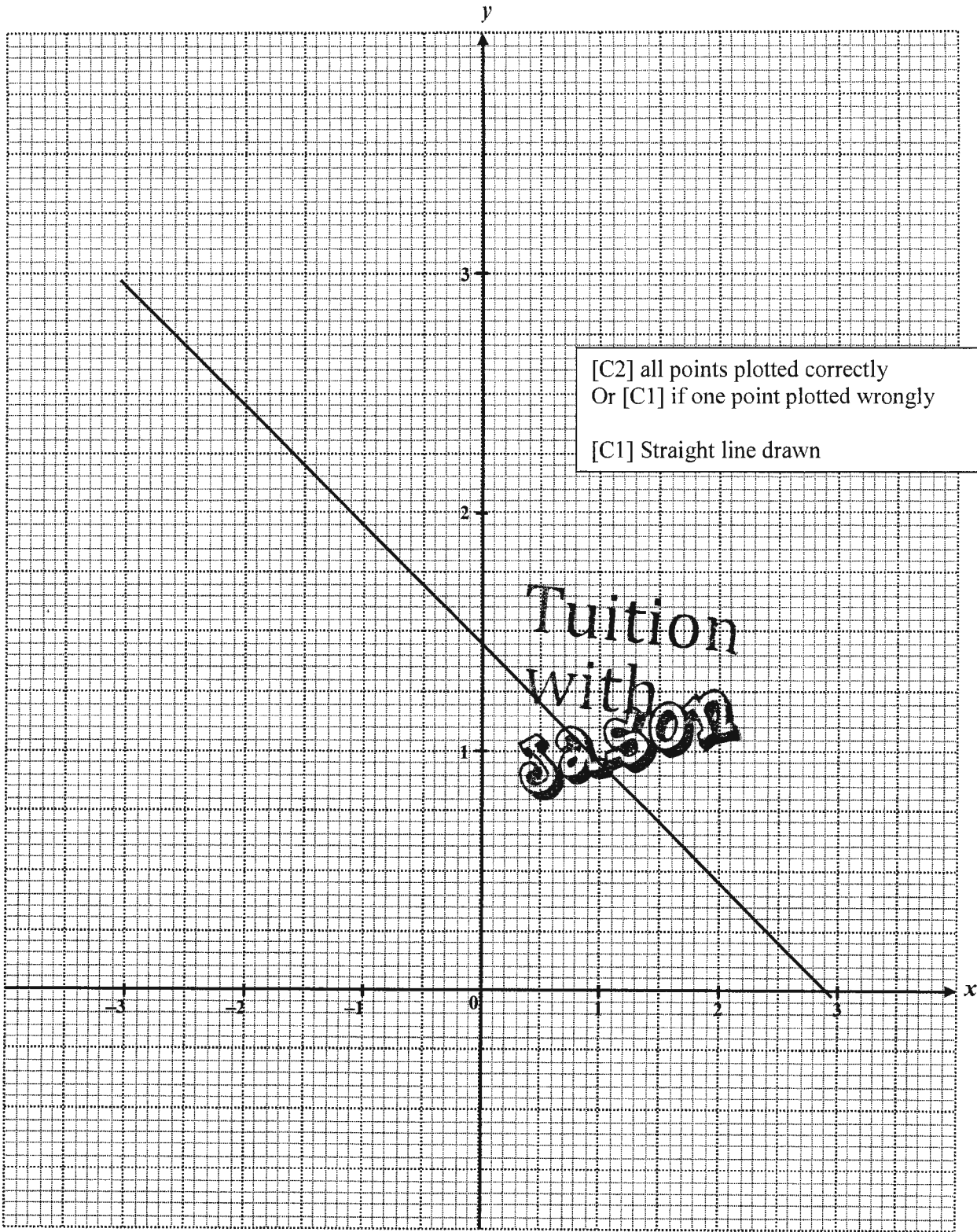
[B1] $\frac{1}{2}$ or $\frac{2}{4}$

Answer $m = -\frac{1}{2}$ [2]

$c = \frac{3}{2}$ [B1] [1]

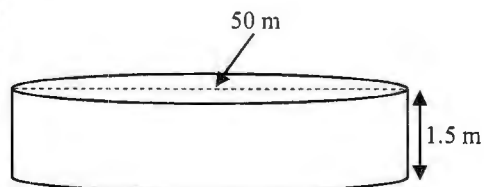
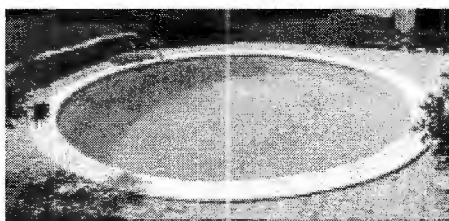
- (c) Write down the equation of the horizontal line that passes through c in (b).

Answer $y = \frac{3}{2}$ [B1] [1]



- 16 A swimming pool, which is a man-made structure designed to hold water for water-related activities such as swimming and water polo, can come in various sizes.

- (a) A swimming pool can be modelled as a cylinder.
The cylindrical swimming pool has a diameter of 50 m and a height of 1.5 m.



- (i) The swimming pool contains water to a depth of 1.4 m.
Calculate the volume of the water in the swimming pool, giving your answer correct to 3 significant figures.

Volume of water

$$= \pi r^2 h$$

$$= \pi(25)^2(1.4)$$

$$= 2748.983572$$

$$= 2750$$

(3 s. f.)

[M1] must see 25, 1.4

Answer $\frac{2750 \text{ [A1]}}{\dots\dots\dots} \text{ m}^3$ [2]

- (ii) Calculate the total inner surface area of the swimming pool, giving your answer in terms of π .

Total inner surface area

$$= \pi r^2 + 2\pi r h$$

$$= \pi(25)^2 + 2\pi(25)(1.5)$$

$$= 625\pi + 75\pi$$

$$= 700\pi$$

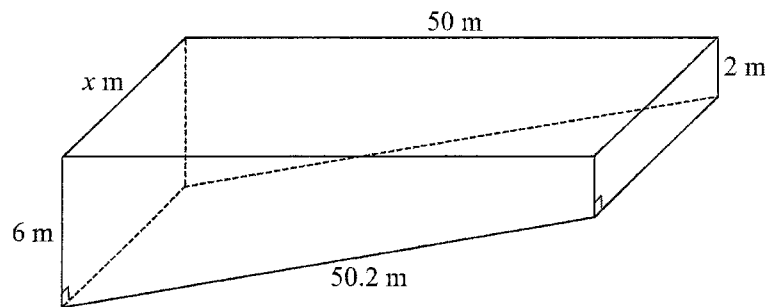
[M1] for $2\pi(25)(1.5)$

Answer $\frac{700\pi \text{ [A1]}}{\dots\dots\dots} \text{ m}^2$ [2]

- (b) Another swimming pool is built and it can be modelled as a trapezium prism.

Useful information

- It is 50 m long and can hold 5 000 000 litres of water when fully filled.
- It is 2 m deep at one end and slopes uniformly down to 6 m at the other end.



- (i) The breadth of this swimming pool is x m.
Find the value of x .

Base area

$$= \frac{1}{2}(6+2)(50) \quad \text{[M1] for trapezium formula}$$

$$= 200$$

$$5\,000\,000\text{l}$$

$$= 5\,000\,000\,000\text{ml}$$

$$= 5\,000\,000\,000\text{cm}^3 \div 100^3$$

$$= 5000\text{m}^3$$

Volume = base area \times height

$$5000 = 200 \times x$$

$$x = 25$$

Tuition
with
Jason

Answer $x = \frac{25 \text{ [A1]}}{\dots\dots\dots}$ [2]

- (ii) Bob is tasked to paint the inner surface of this swimming pool.
 1 litre of paint can cover 5 m^2 .
 Given that paint is sold in 15-litre containers, Bob claims that he needs to buy 25 such tins altogether.
 Justify whether his claim is true or false.
 Show your working clearly.

$$\begin{aligned} \text{Total surface area} \\ &= 2(200) + 6(25) + 2(25) + 50.2(25) \\ &= 1855 \text{m}^2 \end{aligned} \quad \text{[M1] see all 4 components}$$

$$\begin{aligned} \text{Number of litres} \\ &= 1855 \div 5 \\ &= 371 \text{l} \end{aligned} \quad \text{[M1] } \checkmark$$

$$\begin{aligned} \text{Number of tins} \\ &= 371 \div 15 \\ &= 24.733 \\ &= 25 \text{tins} \end{aligned} \quad \text{[M1] } \checkmark$$

Answer His claim is true because _____
 he needs 25 tins of paint to paint the swimming pool. [A1] \checkmark

.....

..... [4]