SPRINGFIELD SECONDARY SCHOOL

End-Of-Year Examination 2024

Secondary 2 Express

STUDENT NAME	
CLASS	
REGISTER NUMBER	

MATHEMATICS

Paper 1

4052/01

23 September 2024

1 hour 45 minutes

Candidates answer on the question paper
Additional Materials: nil

READ THESE INSTRUCTIONS FIRST

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

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.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 70.

For Examiner's Use	
Total	/70
My Target	

Do not turn over this question paper until you are told to do so.

Answer **all** the questions.

1 A train travels at an average speed of 55.3 km/h for 6.75 hours.

(a) By rounding these numbers correct to 1 significant figure, find an estimate of the distance travelled by the train.
Show the numbers you use.

Answer ..... km [1]

(b) Without doing any further calculation, explain why the actual distance travelled by the train is less than the answer to **part (a)**.

Answer .....

..... [1]

---

2 Jane invests \$4300 at a simple interest rate of 2.3% per year for 4 years.

Calculate the total value of her investment at the end of 4 years.

Answer \$ ..... [2]

---

3 Write as a single fraction in its simplest form $\frac{5}{h-4k}+\frac{9}{2h-8k}$.

Answer ..... [2]

---

4 y is inversely proportional to the square of x.

(a) Given that $y = 8$ when $x = 2$, write the formula for y in terms of x.

Answer ..... [2]

(b) Find y when $x = 8$.

Answer ..... [1]

---

5 The height of each of the 25 plants in the class hydroponics set-up was recorded to the nearest centimetre.
The results are shown in the stem-and-leaf diagram.

1	5	6	7	8	8	9			
2	0	2	4	4	4	5	6	7	9
3	1	3	5	5	6	7	8		
4	2	2	5						

Key: 3 | 1 represents 31 centimetres

(a) Write down the median of the heights.

Answer ..... cm [1]

(b) When the height of the 26th plant is added to the diagram, the median increases.

State a possible value for the height of the 26th plant in centimetres.
Explain your answer.

Answer
The height of the plant is ..... because .....

.....

..... [2]

---

6 In May 2024, the number of international visitor arrivals in Japan was 3 040 100. This was a 9.6% increase compared to May 2019.

Calculate the number of international visitor arrivals in May 2019, correct to the nearest hundred.

Answer ..... [2]

---

7 **(a)** Solve $3x-8=7$.

Answer $x=$ ..... [1]

(b) Simplify $7b+a-3(2a+b)$.

Answer ..... [2]

---

8 Find the greatest integer value satisfying $-3y>11$.

Answer ..... [2]

---

9 These are the first four terms in a sequence.

11 17 23 29

(a) Find the sixth term of the sequence.

Answer ..... [1]

(b) Find an expression for the nth term of the sequence.

Answer ..... [1]

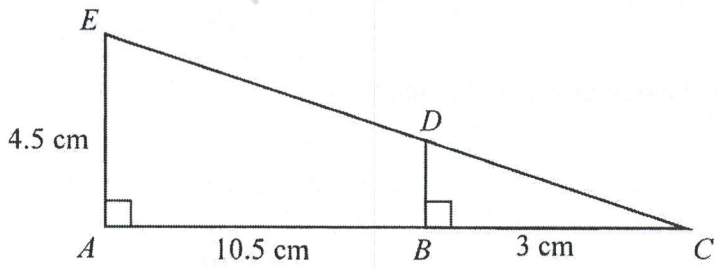
(c) Hence, explain whether 109 is part of the sequence.

Show your working clearly.

Answer .....

..... [2]

10 Triangles ACE and BCD are similar.



(a) Work out the area of triangle BCD.

Answer ..... cm^2 [2]

(b) Work out the length of CE.

Answer ..... cm [2]

---

11 A map is drawn to a scale of 1 : 250 000 .

(a) The distance between Town A and Town B on the map is 9.5 cm.

Calculate the actual distance, in kilometres, between Town A and Town B.

Answer ..... km [2]

(b) The area of Town C is 97.25 km^2 .

Calculate the area, in square centimetres, of Town C on the map.

Answer ..... cm^2 [2]

---

12 **(a)** Write 756 as a product of its prime factors, giving your answer in index form.

Answer ..... [1]

(b) An integer A written as a product of prime factors is $A = 2^3 \times 3^2 \times 5 \times 7$.

Find the highest common factor (HCF) of A and 756.

Answer HCF = ... [1]

(c) The number $756p$ is a perfect cube, where p is a positive integer.

Find the least possible value of p.

Answer p = ... [1]

---

13 The table shows which country, Spain, England or Portugal, the students from a class are supporting for the UEFA European Football Championship 2024.

	Frequency	Sector angle
Spain	19	
England	13	
Portugal	8	

[2]

A pie chart is to be drawn to show this information.

Calculate the angle of each sector of the pie chart.
Write your answer in the table.

---

14 Joel mixed orange juice and cucumber juice in the ratio 4 : 5.
He then mixed the mixture of orange juice and cucumber juice with soda water in the ratio 2 : 5.
He used 440 millilitres of orange juice.
Find the total volume of the drink he made in litres.

Answer ..... litres [3]

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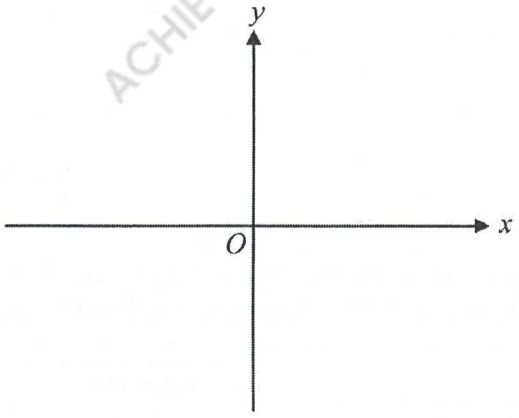
15 **(a)** Sketch the graph of $y = (x-3)(x+2)$ on the axis below.
Include all axial intercepts in your sketch.



[3]

(b) Write down the equation of the line of symmetry of $y = (x-3)(x+2)$.

Answer ..... [1]

---

16 Mr Koh rented a car for a road trip in Japan.
He drove for 48 minutes at 90 km/h from Town X to Town Y.
In Town Y, he took a break for 22 minutes at a convenience store.
He then drove 80 km at 85 km/h to Town Z where he stopped for the day.

(a) Calculate the distance between Town X and Town Y.

Answer ..... km [1]

(b) Calculate the average speed of his entire journey from Town X to Town Z.

Answer ..... km/h [3]

---

17 A ladder rests against a vertical wall on horizontal ground.
The ladder is 8 m long.

The safe working angle for this ladder is between 70° and 78°, inclusive, to the horizontal.

What is the furthest distance the base of the ladder can be from the wall while still being in a safe position for use?
Show your working.

Answer

[3]

---

18 **(a)** Each letter of the word 'MISSISSIPPI' is written on cards.
The cards are placed face down and shuffled.
A card is drawn at random.

(i) What is the probability of drawing a card with the letter 'S'?

Answer ..... [1]

(ii) What is the probability of drawing a card with the letter 'W'?

Answer ..... [1]

(b) A bag contains red and green balls.
The number of green balls is 5 more than twice the number of red balls.
The probability of drawing a red ball from the bag is $\frac{3}{10}$.

Find the number of green balls in the bag.

Answer ..... green balls [3]

19 Elias is flying a kite attached to a string of length 110 m.
The angle of elevation of the kite from his hand is 72°.

(a) Find the vertical height of the kite above his hand.
Give your answer to the nearest metre.

Answer ..... m [2]

(b) The kite is blown by the wind such that the vertical height of the kite from his hand is now 65 m.
Find the angle of elevation of the kite from his hand.

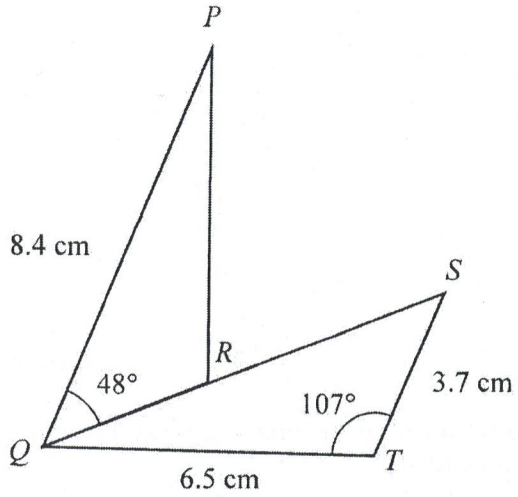
Answer ..... ° [2]

(c) State one assumption that you have made in the above calculations.

Answer .....

..... [1]

20 In the figure, triangle PQR is congruent to triangle QST.
$PQ = 8.4$ cm, $QT = 6.5$ cm and $ST = 3.7$ cm.
Angle $PQR = 48°$ and angle $QTS = 107°$.



(a) Find

(i) QR,

Answer ..... cm [1]

(ii) angle SQT.

Answer Angle SQT = ... ° [1]

(b) A student claims that the lines PQ and ST are parallel.
Is his claim true? Explain your answer.

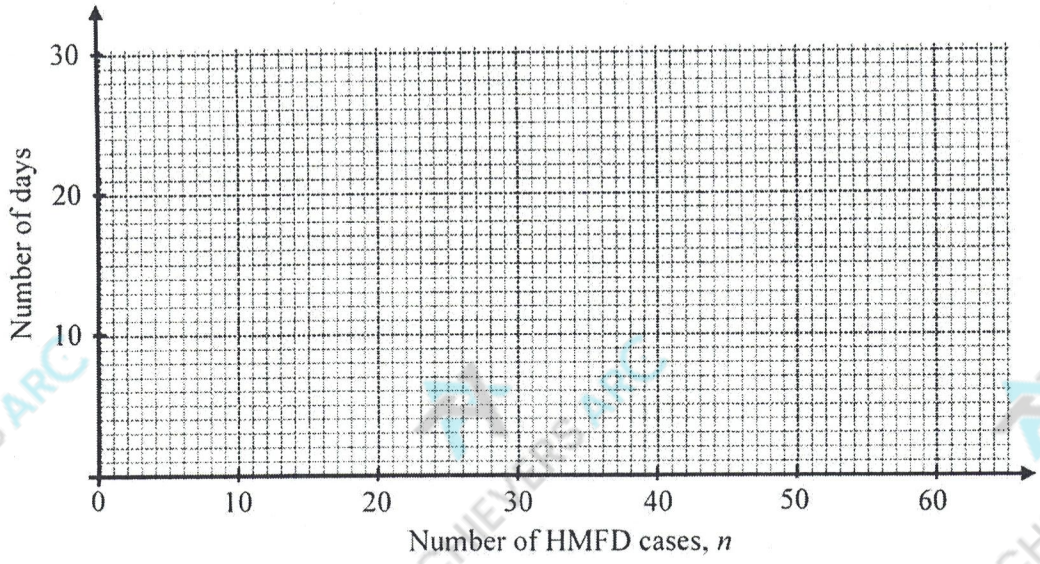
Answer .....

..... [2]

21 The number of hand, foot and mouth disease (HFMD) cases, n, seen by a doctor each day over a period of 80 days was recorded in the table below.

Number of HMFD cases, n	Number of days
$20 \leq n < 30$	16
$30 \leq n < 40$	22
$40 \leq n < 50$	28
$50 \leq n < 60$	14

(a) Complete the histogram to illustrate the data in the table.



[2]

(b) Calculate an estimate for the mean number of HMFD cases seen by the doctor each day.

Answer ..... [2]

(c) State the modal class of the data.

Answer ..... [1]

(d) A day is chosen at random.
What is the probability that there are at least 40 cases of HMFD on that day?
Give your answer as a fraction in the simplest form.

Answer ..... [1]

End of Paper

SPRINGFIELD SECONDARY SCHOOL

End-Of-Year Examination 2024

Secondary 2 Express

STUDENT NAME			
CLASS		REGISTER NUMBER	

MATHEMATICS

Paper 2

4052/02

30 September 2024

1 hour 45 minutes

Candidates answer on the question paper
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1 **(a)** Factorise fully

(i) $6a^2b - 12ab + 4a^3b^2$,

Answer ..... [1]

(ii) $6x^2 - y + 3xy - 2x$.

Answer ..... [2]

(b) Make q the subject of $\sqrt[3]{\frac{p+q^3}{p}} = 2q$.

Answer q = ... [3]

---

2 At an amusement park, the prices of tickets for adults and children are \$5.50 and \$3.20 respectively.
The number of adult tickets and children tickets sold are represented by x and y respectively.

(a) The total number of tickets sold is 119.
Form an equation connecting x and y.

Answer ..... [1]

(b) The total sales of tickets amount to \$486.60.
Form an equation connecting x and y.

Answer ..... [1]

(c) Hence, find the number of adult tickets and the number of children tickets sold.

Answer ..... Adult tickets
..... Children tickets [3]

---

3 Jolene received 4500 Euros (€) from her aunt visiting from France.
The exchange rate between Singapore dollars ($) and euros (€) is $1 = €0.69.

(a) Calculate the amount Jolene received in Singapore dollars.
Give your answer correct to the nearest cent.

Answer $ ..... [1]

3. (b) Jolene put 60% of the money she received into a savings account.
She then gives $\frac{1}{4}$ of the remaining amount to a charity.
What percentage of the original amount does she have left?

Answer .....% [2]

A designer bag costs €570 in France.
Jolene thought of asking her aunt to purchase it and ship it back to Singapore.
The shipping fee is $43.

(c) Calculate the total cost, in Euros (€), of the designer bag if her aunt buys it and ships it to Singapore.

Answer € ..... [2]

(d) A website was selling the same bag for €700.
During a sale, the website offerd a 17% discount with a delivery charge of €10.

Which option is cheaper for Jolene, and by how much?
Show your working clearly.

Answer Jolene should buy the bag from her aunt / the website (circle one)

as it is cheaper by ..... [3]

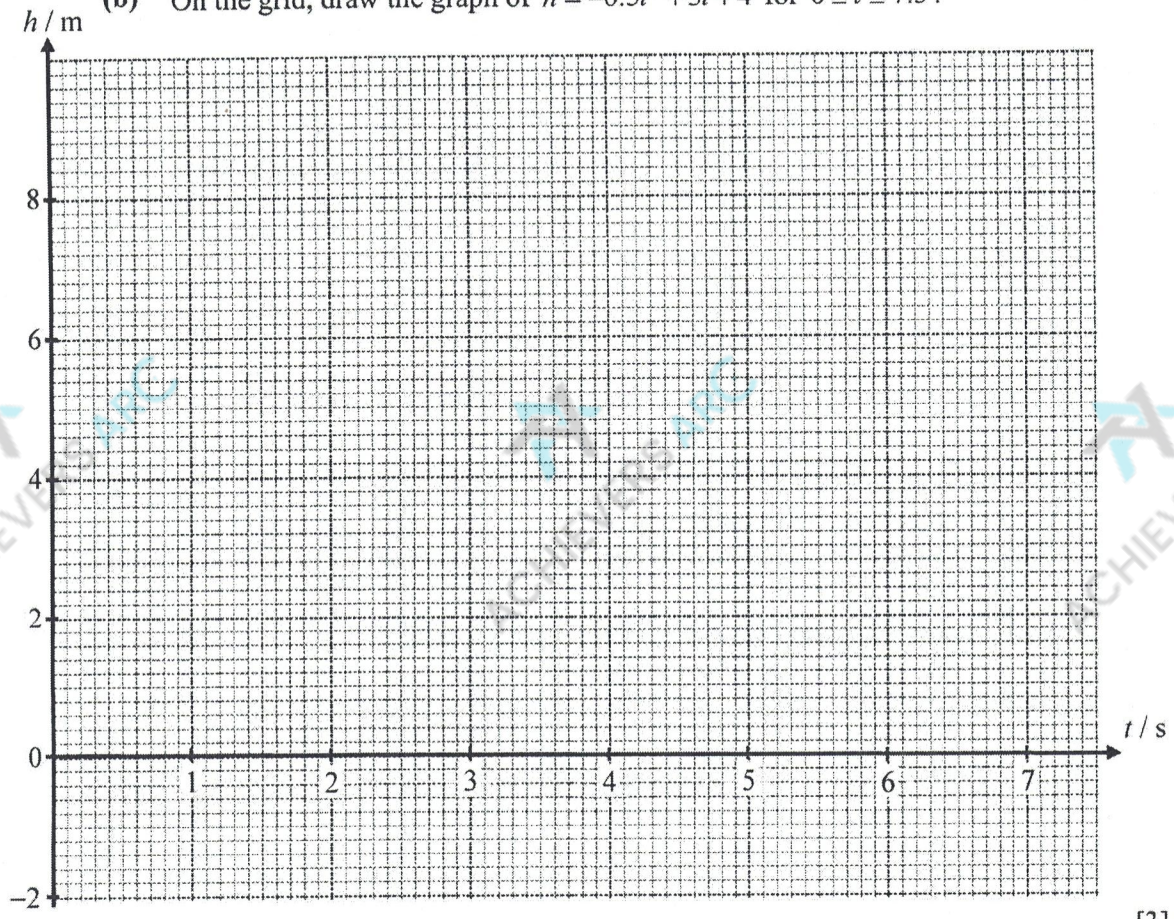
4 A ball is launched into the air from an elevated platform.
The height, h metres, of the ball from the ground is modelled by the equation $h = -0.5t^2 + 3t + 4$, where t represents the time, in seconds, after the ball is launched.

(a) Complete table of values for $h = -0.5t^2 + 3t + 4$.
Give your answer correct to 1 decimal place.

t	0	1	2	4	6	7	7.5
h	4	6.5	8	8	4		−1.6

[1]

(b) On the grid, draw the graph of $h = -0.5t^2 + 3t + 4$ for $0 \leq t \leq 7.5$.



[3]

(c) Using your graph, find

(i) the maximum height of the ball,

Answer ..... m [1]

(ii) the time taken for the ball to hit the ground.

Answer ..... s [1]

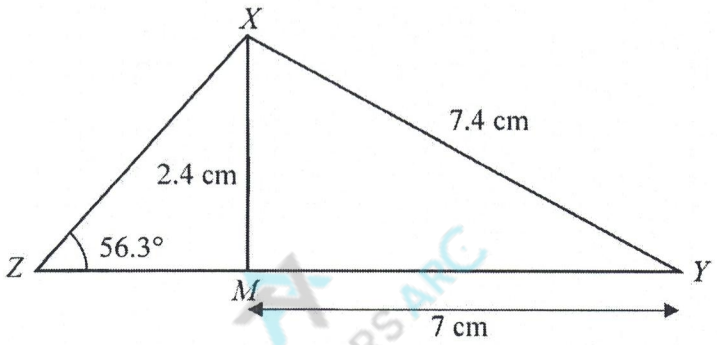
(d) Another ball is launched from the ground at $t = 3$.
The path of the ball can be modeled by the equation $y = 2t - 6$.

(i) On the grid in part **(b)**, draw the line $y = 2t - 6$ for $3 \leq t \leq 7.5$. [2]

(ii) Using your graph, find the time that both balls are at the same height from the ground.

Answer ..... s [1]

5



The diagram shows a triangle XYZ.
$XY = 7.4$ cm, $YM = 7$ cm and $MX = 2.4$ cm.
Angle $XZM = 56.3°$.

(a) Show that triangle XYM is a right-angled triangle.
Show all your working clearly.
Answer

.....

..... [2]

(b) Find

(i) angle MXY,

Answer Angle MXY = ... ° [2]

(ii) XZ.

Answer ..... cm [2]

---

6 (a) 76 identical cartons of goods have a combined mass of 1672 kg.
Find the mass of 49 identical cartons of goods.

Answer ..... kg [2]

(b) An interior company is installing fixtures in a new condominium development with a total of 112 units. In the first 2 days, 12 workers completed the installation in 16 units.

Assuming all workers work at the same rate, how many days will it take for 9 workers to complete the installation in the remaining units?

Answer ..... days [3]

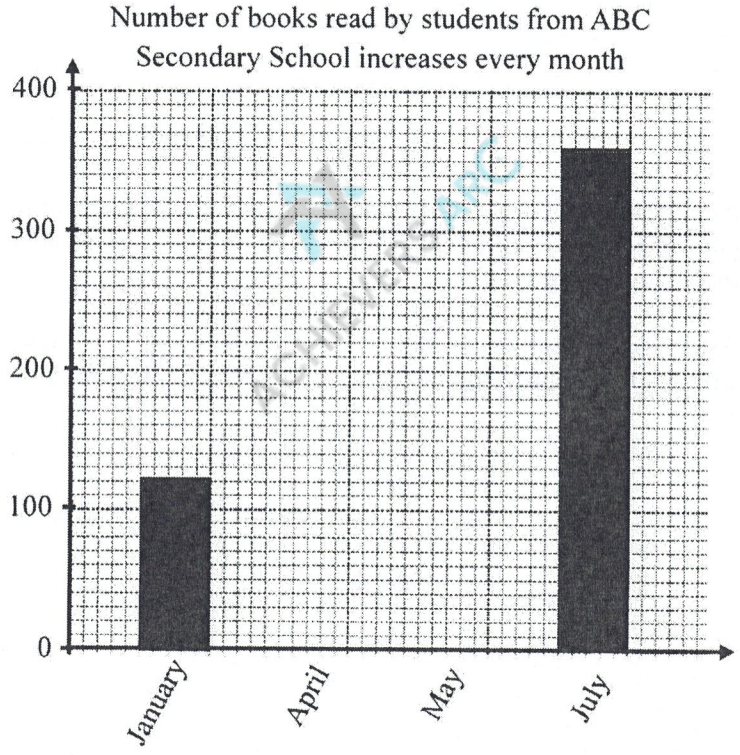
---

7 The pictogram shows the number of books read by students from ABC Secondary School in 4 different months.

Month	Number of books read
January	
April	
May	
July	

Each represents 40 books

(a) Complete the following bar chart based on the information in the pictogram.



[2]

(b) State one aspect of the bar chart that may be misleading and explain how this may lead to a misinterpretation of the bar chart.

Answer .....

..... [2]

8 A swimming pool can be filled by Tap A in $2x$ hours.
Tap B can fill the same swimming pool 6 hours faster than Tap A.

(a) Write down, in terms of x, the fraction of the pool filled by Tap A in 1 hour.

Answer ..... [1]

(b) Write down, in terms of x, the fraction of the pool filled by Tap B in 1 hour.

Answer ..... [1]

When both taps are turned on at the same time, it takes 4 hours to fill the swimming pool.

(c) Write down an equation to represent this information and show that it simplifies to $x^2 - 7x + 6 = 0$.

Answer

[3]

(d) Solve the equation $x^2 - 7x + 6 = 0$.

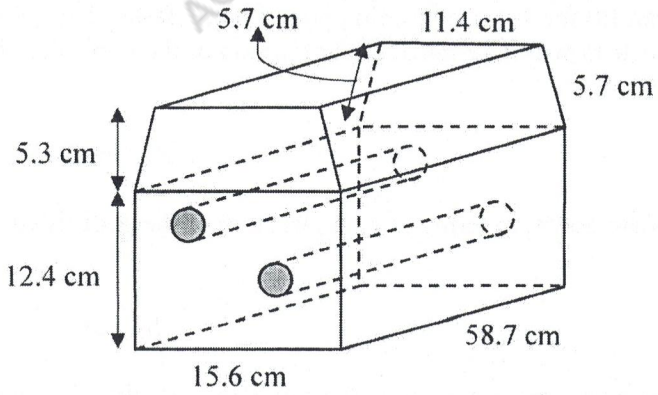
Answer $x =$ ..... or ..... [2]

(e) Explain why one of the solutions in part **(d)** must be rejected.

.....

..... [2]

9



A segment of a curb can be modelled using a composite solid consisting of a cuboid and a trapezoidal prism.
The curb is made of concrete and contains 2 identical cylindrical metal rods for structural support.
The diameter of each metal rod is 2 cm.

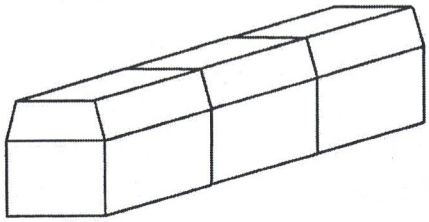
(a) Calculate the total volume of the segment of the curb.
Give your answer correct to 1 decimal place.

Answer ..... cm^3 [3]

(b) Calculate the volume of the concrete used in the segment of the curb, excluding the volume occupied by the metal rods.
Give your answer correct to 1 decimal place.

Answer ..... cm^3 [2]

3 identical segments of the curb are arranged in a row and placed on the ground as shown below.



(c) Calculate the total exposed surface area of the 3 segments.
Give your answer correct to 2 decimal places.

Answer ..... cm^2 [3]

10 John and Jacob are planning their exercise routines.
They record their body weights and speeds for walking and jogging

	John	Jacob
Body weight	90 kg	80 kg
Brisk walking speed	5 km/h	5 km/h
Jogging speed	8.5 km/h	9.5 km/h

They find the following information online about the benefits of exercise.

Health Advice

For recommended health benefits, adults should do at least 180 minutes of moderate-intensity aerobic physical activity or at least 90 minutes of vigorous-intensity aerobic physical activity each week.

For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes each week or an equivalent combination of moderate- and vigorous- intensity aerobic physical activity.

1 minute of vigorous-intensity aerobic physical activity = 2 minutes of moderate-intensity aerobic physical activity, e.g. 10 minutes of jogging = 20 minutes of brisk walking.

Approximate calories used during 30 minutes of aerobic physical activity.

	Body weight		
	70 kg	80 kg	90 kg
Walking 5 km/h	143	163	183
Walking 6 km/h	174	198	223
Jogging 8.5 km/h	325	372	419
Jogging 9.5 km/h	428	489	550

Other forms of aerobic physical activity.

1 hour of weight training uses approximately 4 calories per kilogram of body weight.

1 hour of yoga uses approximately 2 calories per kilogram of body weight.

(a) In their first week of exercise, John and Jacob each planned to go for 5 brisk walks.
They will walk the same route each time.
The total time spent on 5 brisk walks meets the minimum weekly target for recommended health benefits.

(i) Work out the distance of one of these walks.

Answer ..... km [2]

(ii) Work out how many more calories John uses in these 5 walks compared to Jacob.

Answer ..... calories [2]

(b) After one month, they decide to change their routines.

Jacob wants to maintain his current level of recommended health benefits.
He decides to do a 15-minute jog 4 times a week.
He will also take a 1-hour yoga class 2 times a week.

John wants to increase his time spent on exercise to achieve additional health benefits.
He decides to do a 30-minute brisk walk 4 times a week and a 30-minute jog twice a week.
He will also do a 1-hour weight training session twice a week.

Both Jacob and John meet their targets for their exercise routine.

John says:

> "I will use exactly twice the amount of calories compared to Jacob during our exercise each week."

Is John correct?
Justify your decision with calculations.
Answer

.....

..... [6]

End of Paper