

Write your name here

Surname	Other names
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Centre Number

Candidate Number

Edexcel GCSE

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Mathematics A

Paper 2 (Calculator)

Higher Tier

Thursday 8 November 2012 – Afternoon

Time: 1 hour 45 minutes

Paper Reference

1MA0/2H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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6/6/7/4/



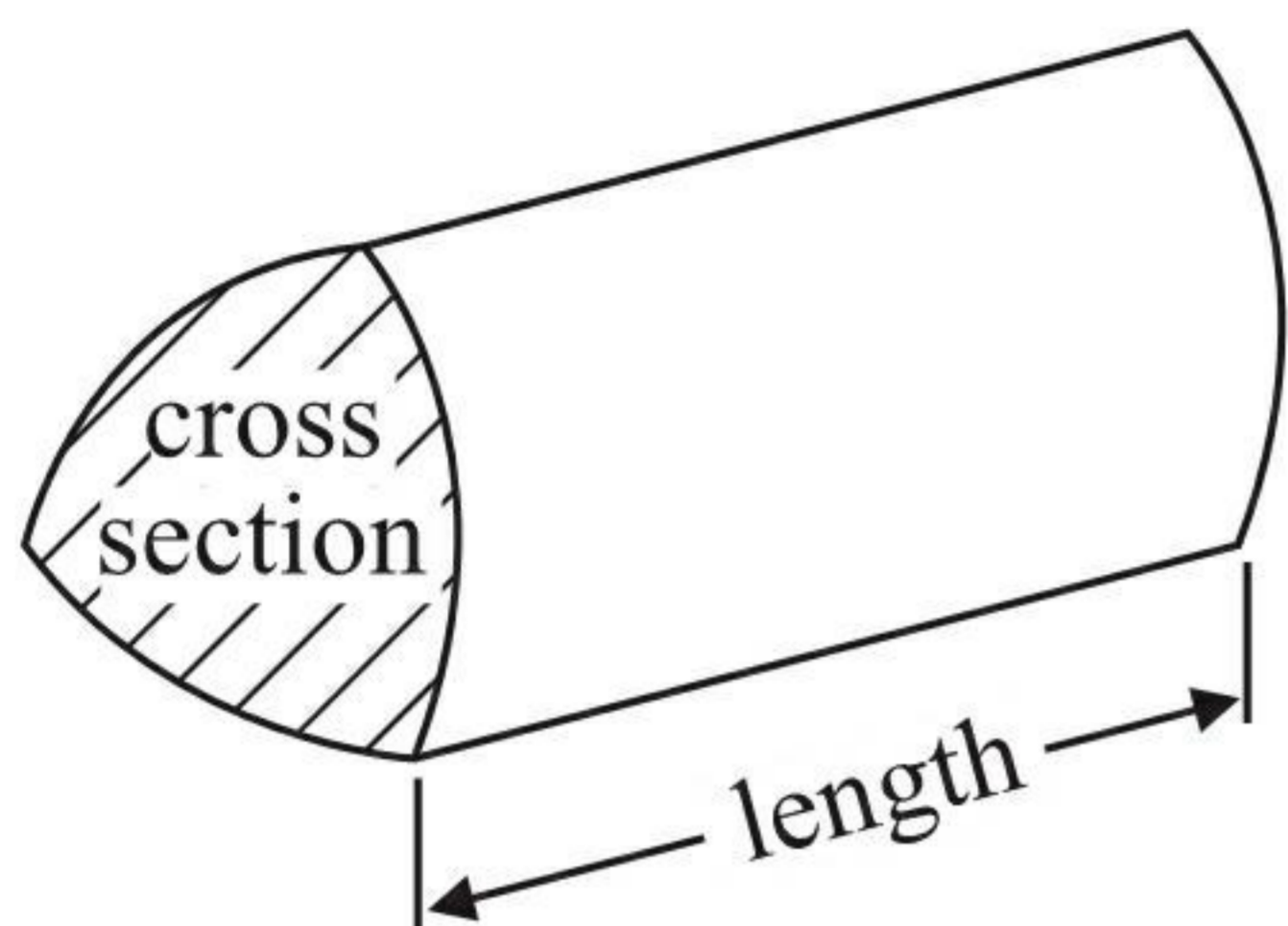
PEARSON

GCSE Mathematics 1MA0

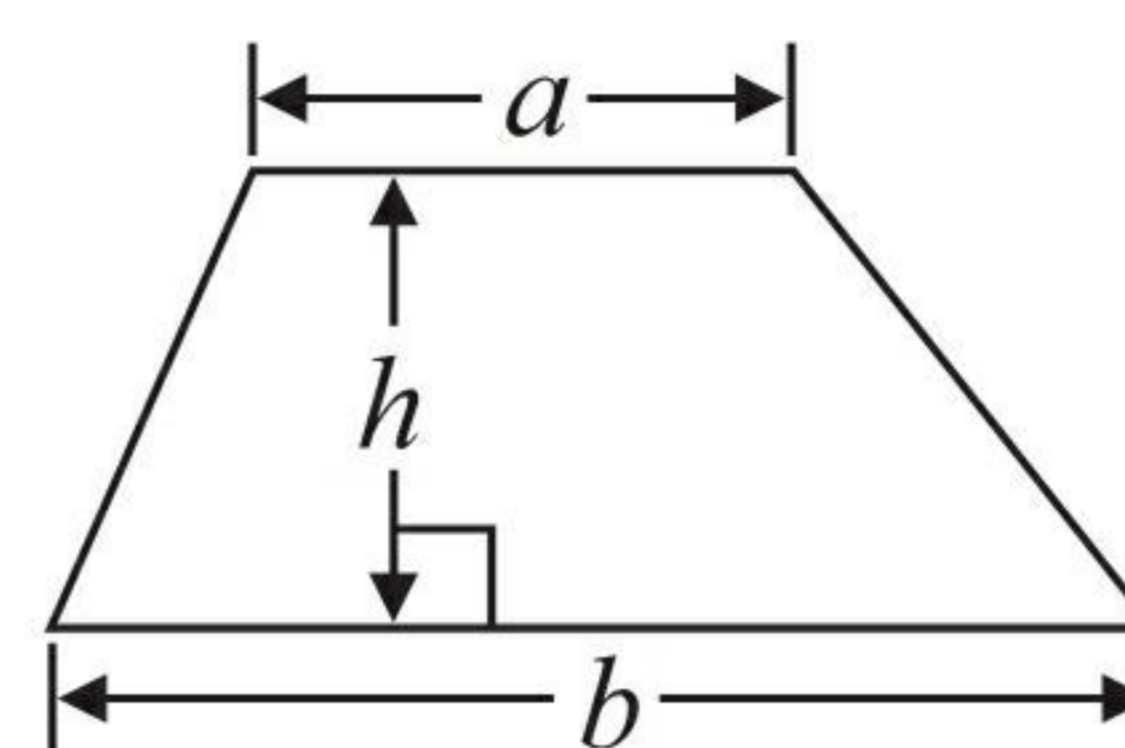
Formulae: Higher Tier

**You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.**

Volume of prism = area of cross section \times length

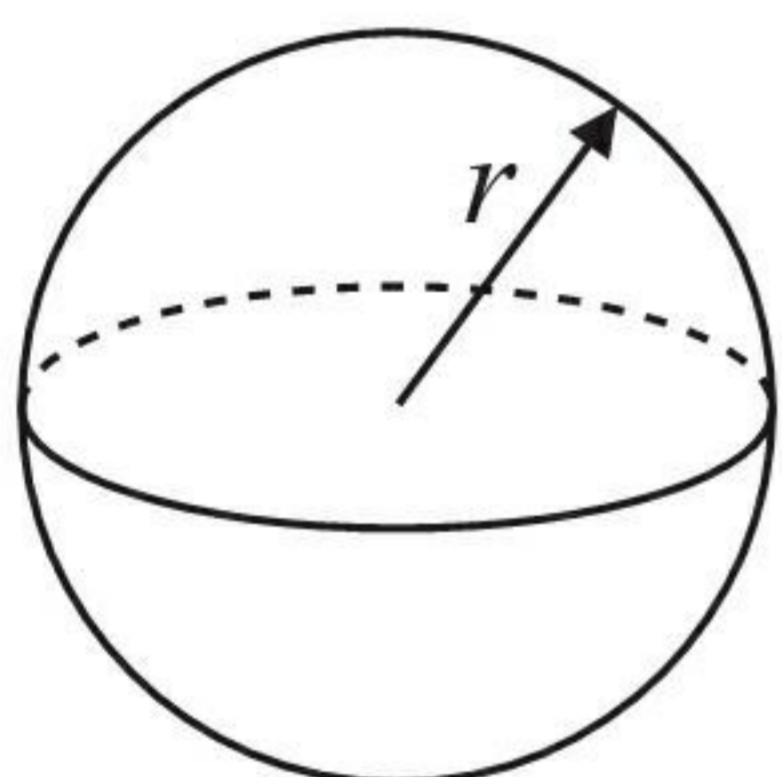


Area of trapezium = $\frac{1}{2} (a + b)h$



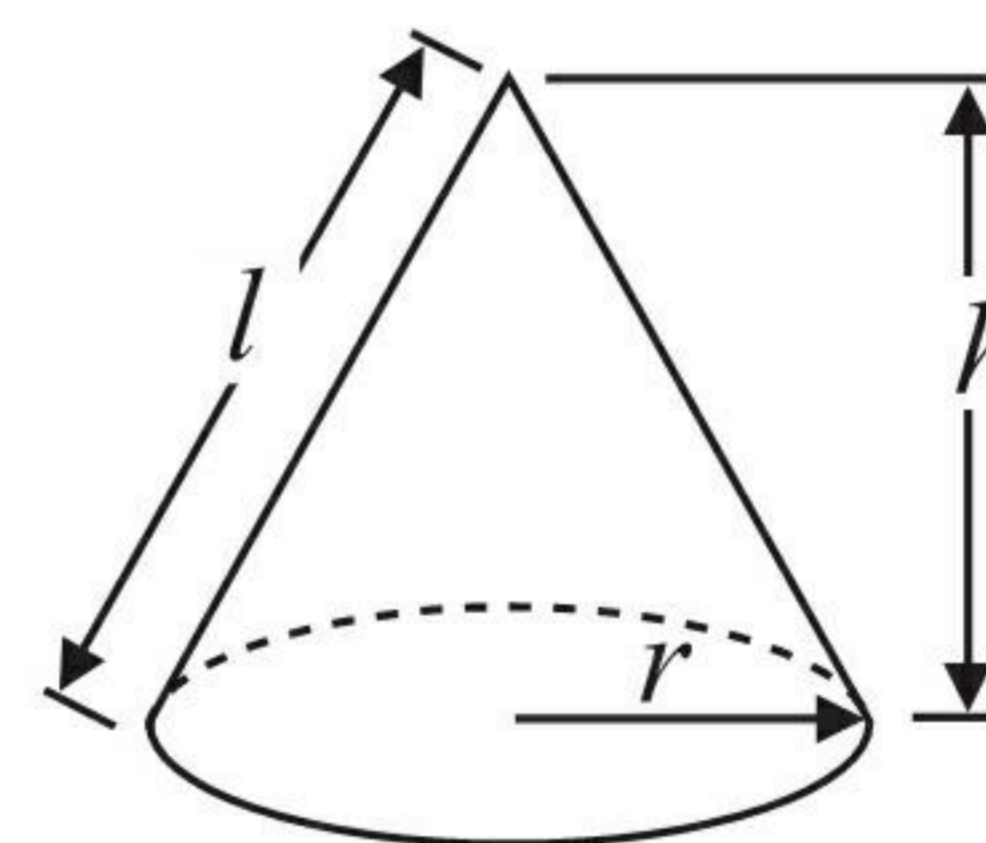
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$

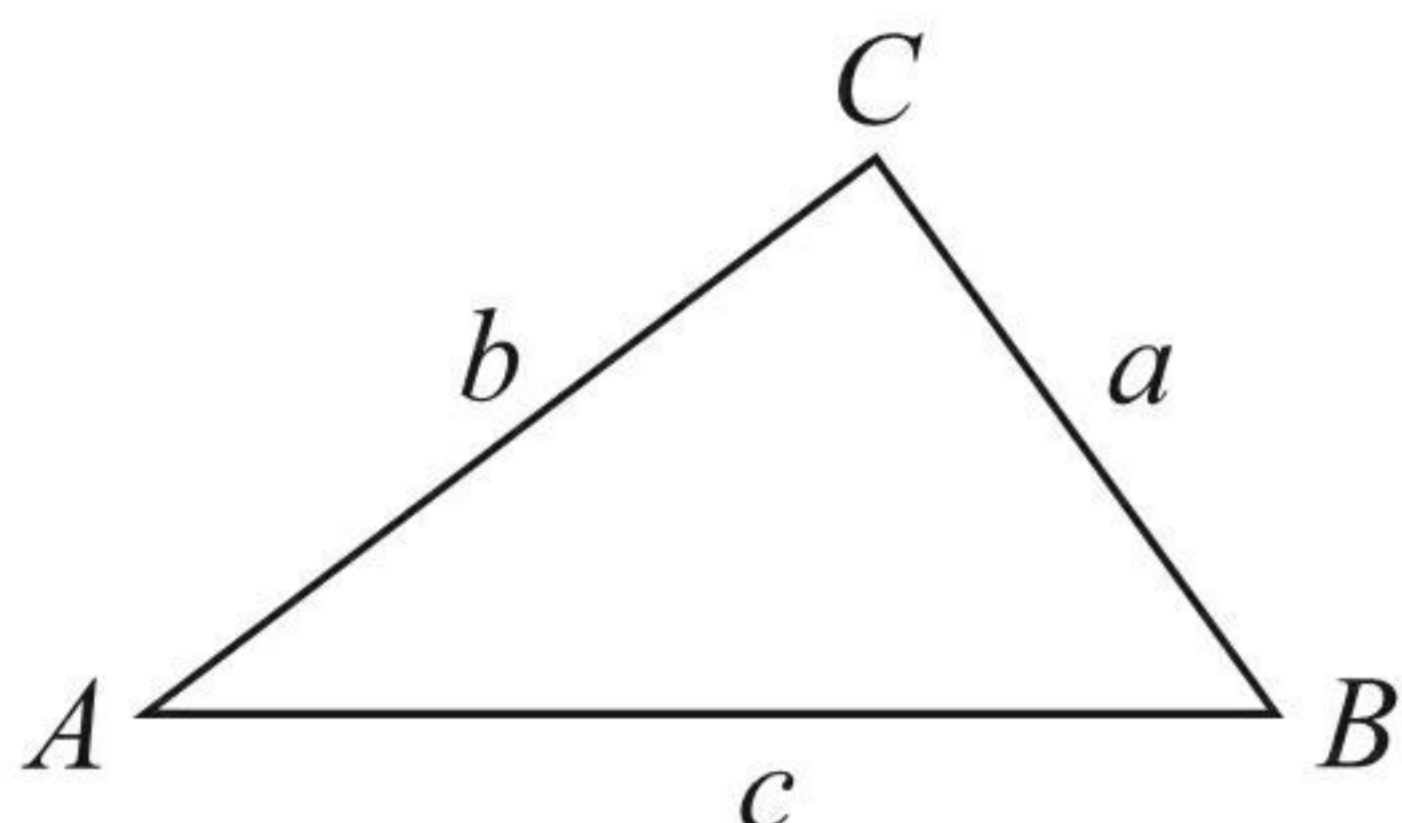


Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Use a calculator to work out

$$\frac{\sqrt{20.4}}{6.2 \times 0.48}$$

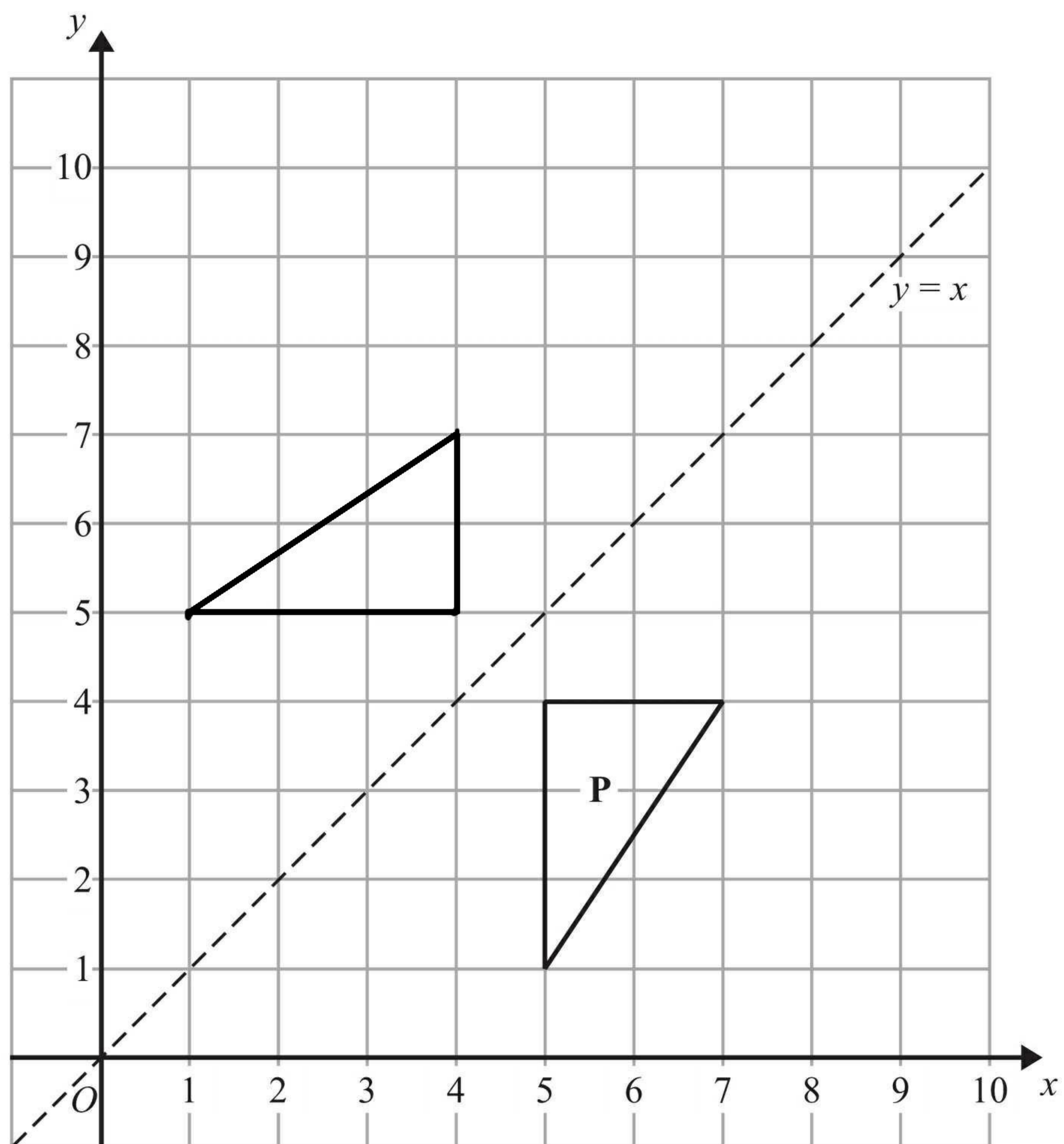
Write down all the figures on your calculator display.
Give your answer as a decimal.

..... 1.5176868

(Total for Question 1 is 2 marks)



2 (a)

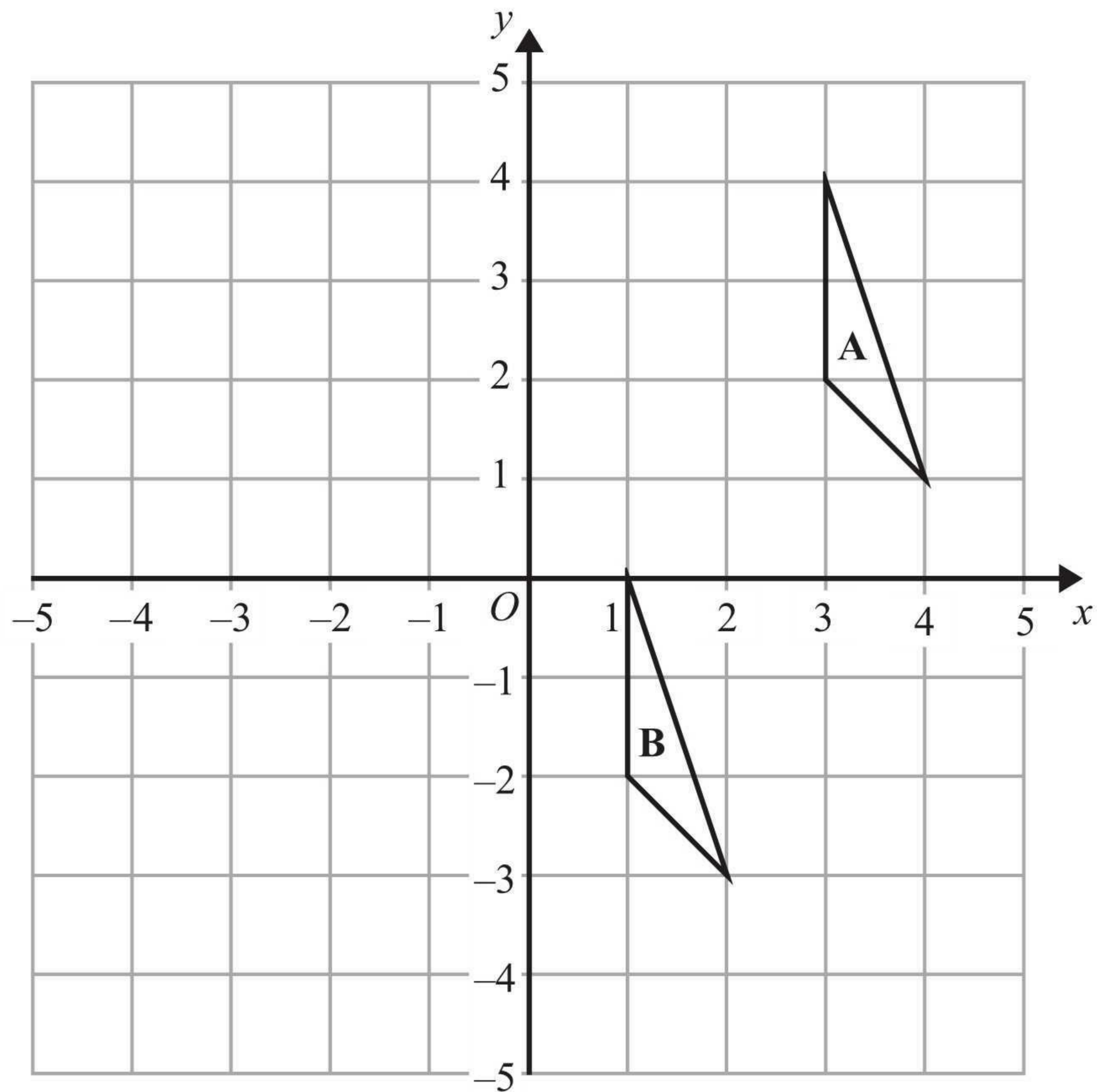


Reflect shape **P** in the line $y = x$

(2)



(b)



Describe fully the single transformation that maps triangle **A** onto triangle **B**.

translation by vector $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$

(2)

(Total for Question 2 is 4 marks)



*3 A company sells boxes to factories.
Fred buys boxes.
The boxes are sold in packs of 1000
Each pack costs £193.86

Fred orders 3 packs of boxes.
He gets a discount on his total order.

The table shows the discount he will get.

Total Order	Discount
£100 - £300	5%
£301 - £400	10%
£401 and above	15%

Work out the total cost of the order after the discount.
You must show your working.

$$3 \times £193.86 = £581.58$$

Fred will get a 15% discount

$$0.85 \times £581.58 = £494.34 \quad (2dp)$$

Fred has to pay £494.34 for the boxes.

(Total for Question 3 is 5 marks)



4 The table gives some information about the birds Paula sees in her garden one day.

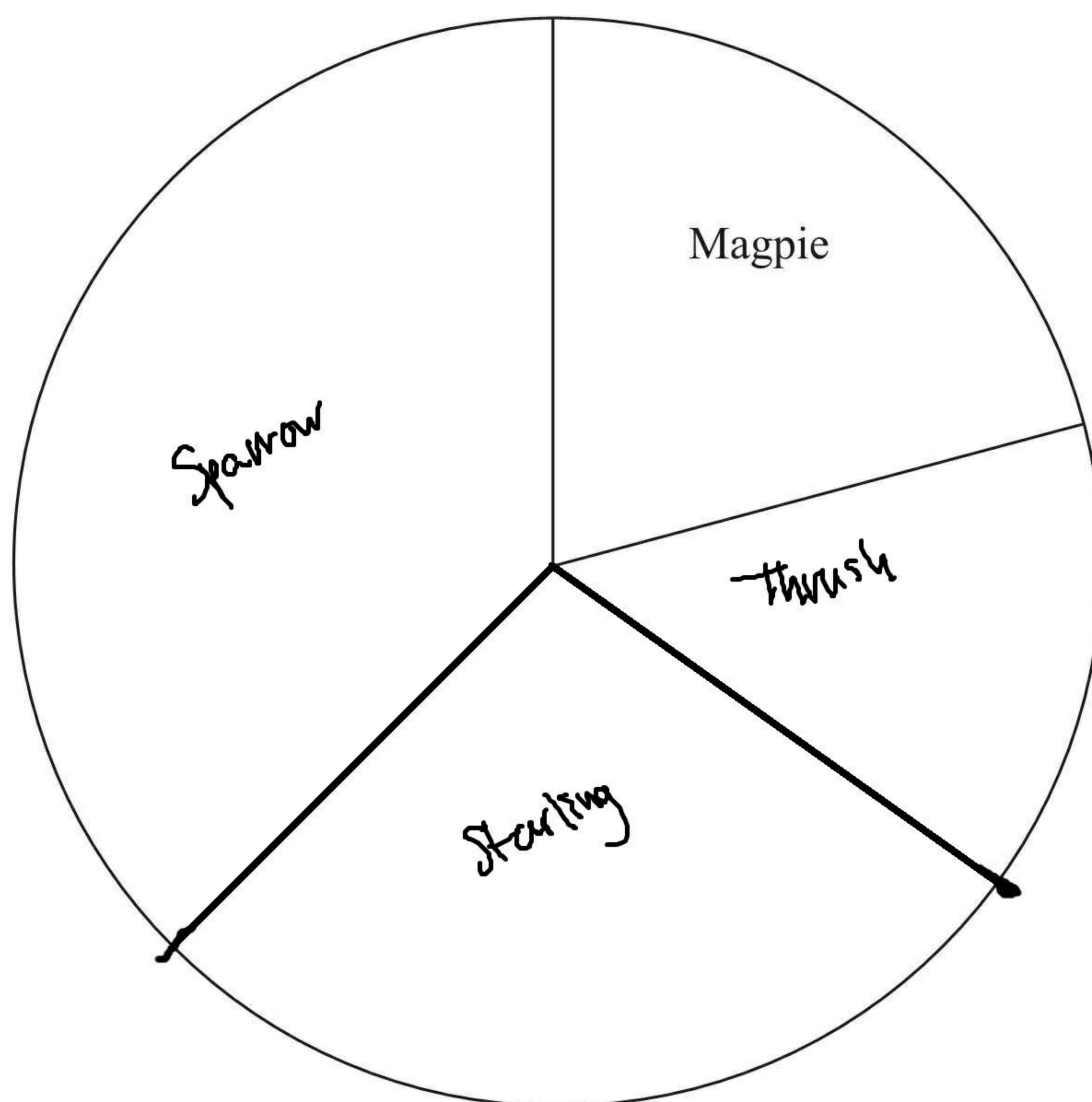
Bird	Frequency
Magpie	15
Thrush	10
Starling	20
Sparrow	27
<i>Total</i>	<i>72</i>

75
50
100
135

Complete the accurate pie chart.

$$360 \div 72 = 5$$

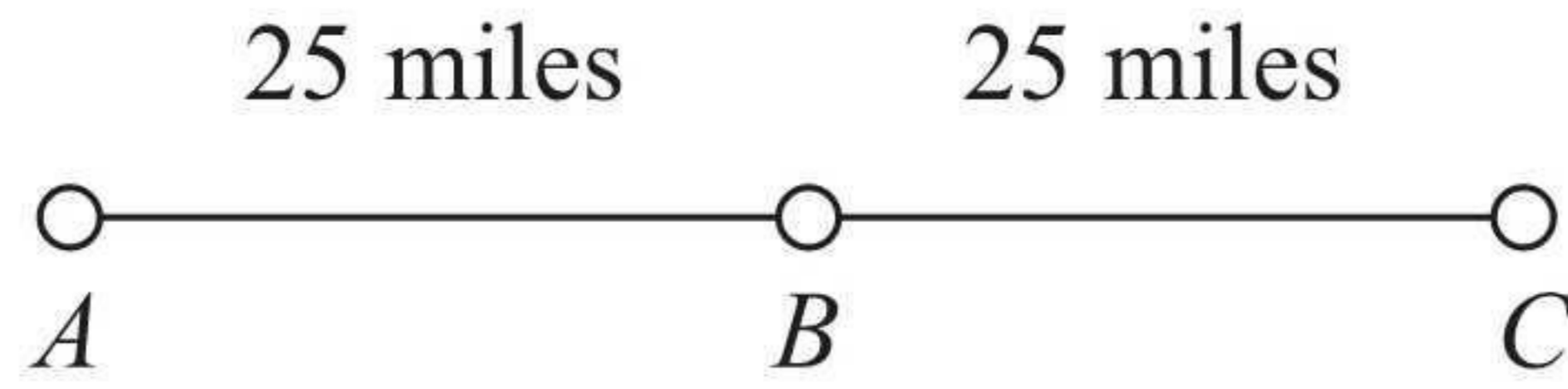
Each bird is 5°



(Total for Question 4 is 3 marks)



5



A, B and C are 3 service stations on a motorway.

AB = 25 miles

BC = 25 miles

Aysha drives along the motorway from A to C.

Aysha drives at an average speed of 50 mph from A to B.

She drives at an average speed of 60 mph from B to C.

Work out the difference in the time Aysha takes to drive from A to B and the time Aysha takes to drive from B to C.

Give your answer in minutes.

$$A \text{ to } B \quad \frac{25}{50} = 0.5 \text{ hours} \quad (30 \text{ mins})$$

$$B \text{ to } C \quad \frac{25}{60} = \frac{5}{12} \text{ hours} \quad (25 \text{ mins})$$

5

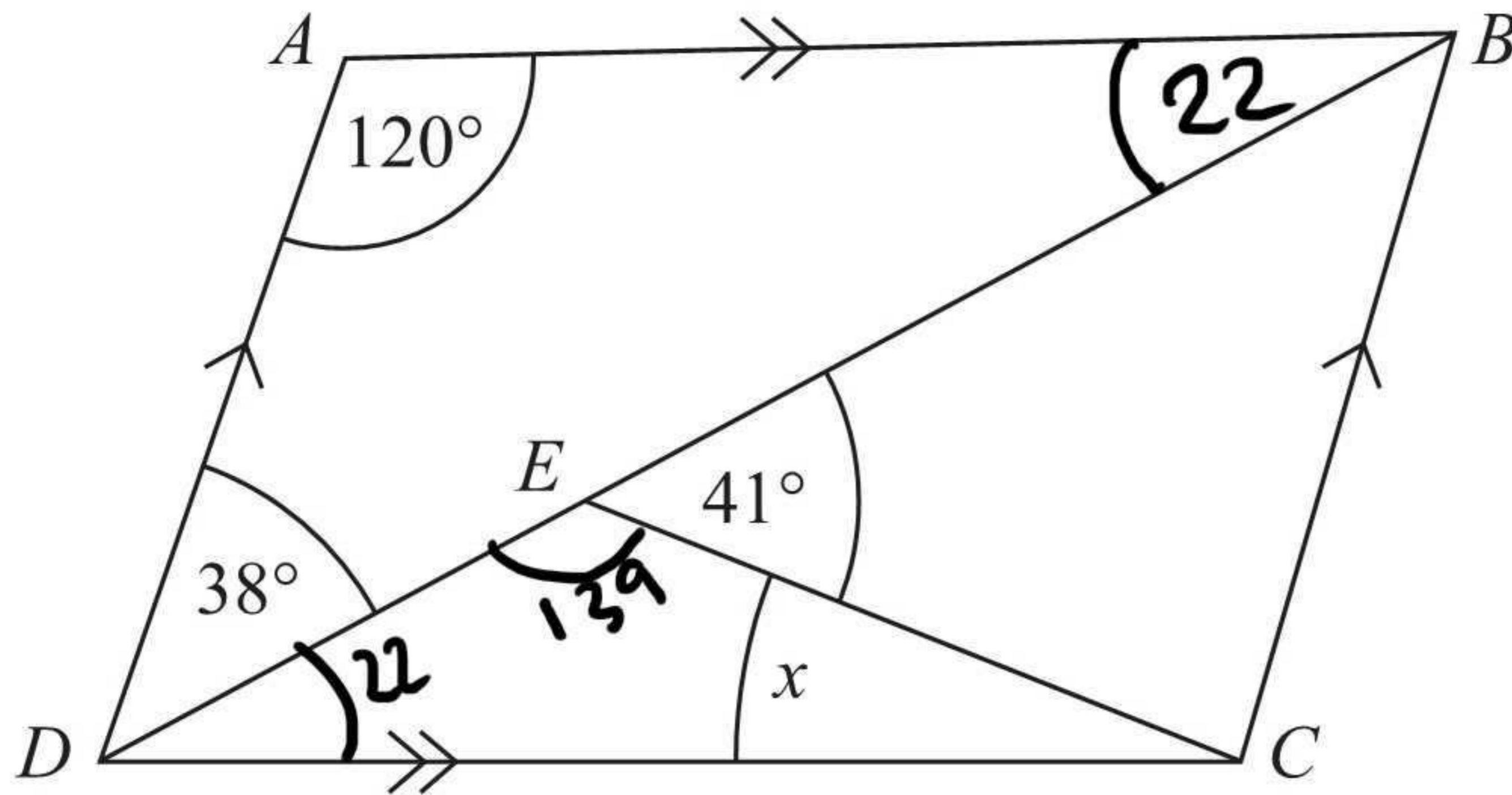
..... minutes

(Total for Question 5 is 3 marks)



*6

Diagram **NOT**
accurately drawn



ABCD is a parallelogram.

Angle *ADB* = 38° .

Angle *BEC* = 41° .

Angle *DAB* = 120° .

Calculate the size of angle *x*.

You must give reasons for your answer.

$\angle ABD = 22^\circ$ Angles in triangle add to 180°

$\angle BDC = 22^\circ$ Alternate angles are equal

$\angle CED = 139^\circ$ Angles on a straight line equal 180°

$x = 19^\circ$ Angles in a triangle equal 180°

(Total for Question 6 is 4 marks)



7 160 cm of gold wire has a weight of 17.8 grams.

Work out the weight of 210 cm of the gold wire.

$$\frac{17.8}{160} \times 210$$

23.3625 grams

(Total for Question 7 is 3 marks)

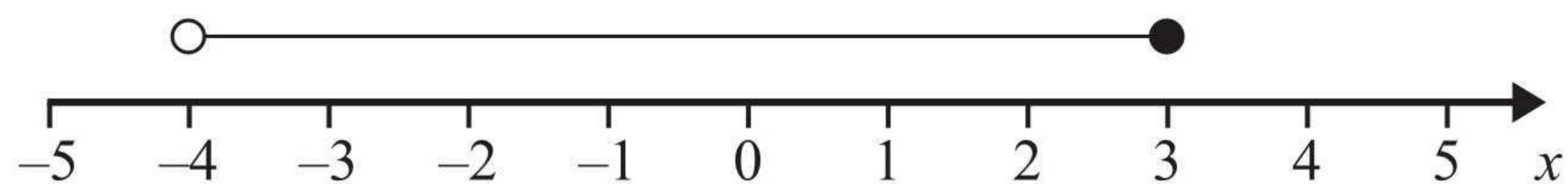
8 (a) n is an integer.

$$-1 \leq n < 4$$

List the possible values of n .

-1, 0, 1, 2, 3
(2)

(b)



Write down the inequality shown in the diagram.

$-4 < x \leq 3$
(2)

(c) Solve $3y - 2 > 5$

$$3y > 7$$

$$y > \frac{7}{3}$$

$$y > 2.\dot{3}$$

$y > \frac{7}{3}$
(2)

(Total for Question 8 is 6 marks)



9 The stem and leaf diagram gives information about the numbers of tomatoes on 31 tomato plants.

0	8	8	9				
1	1	1	5	5			
2	1	2	2	6	7	8	8
3	0	<u>2</u>	5	5	7	9	
4	2	2	3	5	8	8	
5	1	1	3	4	7		

Key: 5 | 7 = 57 tomatoes

(a) Work out the median.

32

(1)

(b) Work out the interquartile range.

45 - 21

24

(2)

(Total for Question 9 is 3 marks)



*10 In the UK, petrol cost £1.24 per litre.
In the USA, petrol cost 3.15 dollars per US gallon.

1 US gallon = 3.79 litres
£1 = 1.47 dollars

Was petrol cheaper in the UK or in the USA?

USA \$3.15 per US Gallon
\$ 3.15 per 3.79 litres (dividing by 3.79)
\$ 0.83 per litre (dividing by 1.47)
£ 0.57 per litre

Petrol is cheaper in the USA. 57p is less than £1.24.

(Total for Question 10 is 4 marks)



11 The diagram shows a cube and a cuboid.

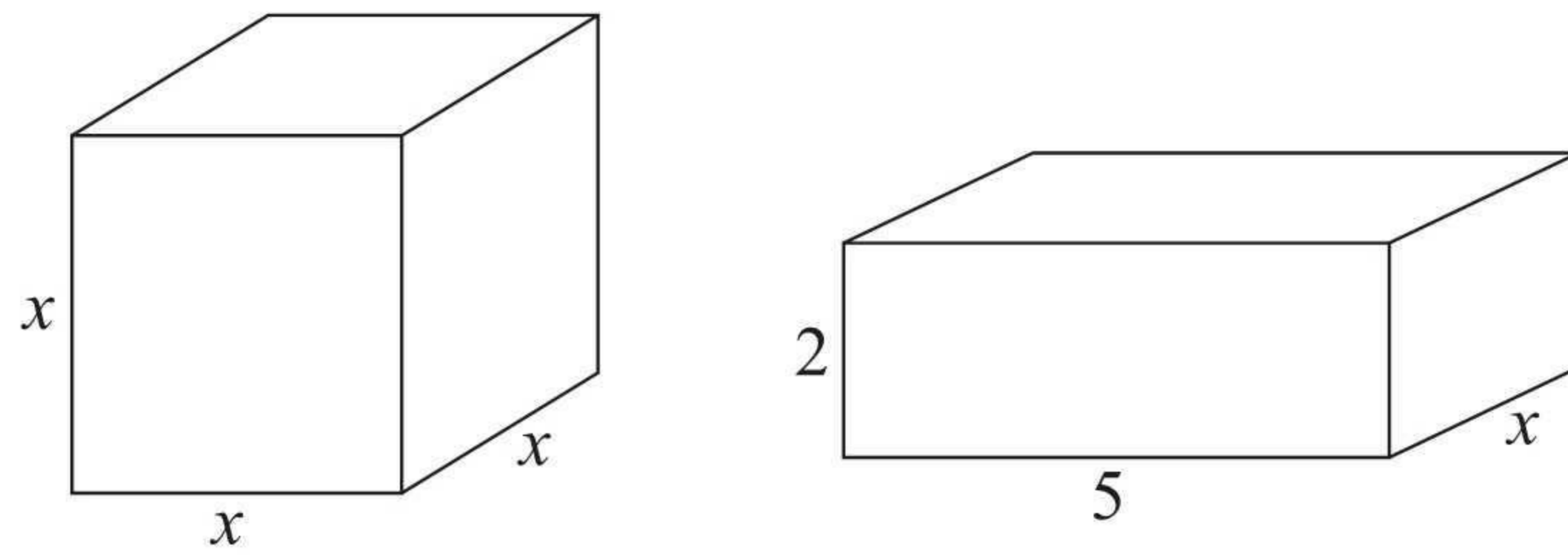


Diagram NOT accurately drawn

All the measurements are in cm.
The volume of the cube is 100 cm^3 more than the volume of the cuboid.

(a) Show that $x^3 - 10x = 100$

$$\begin{aligned}
 x \times x \times x - 100 &= 2 \times 5 \times x \\
 x^3 - 100 &= 10x \\
 x^3 - 10x &= 100
 \end{aligned}
 \tag{2}$$

(b) Use a trial and improvement method to find the value of x .
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	$x^3 - 10x$	Comment
5	$(5)^3 - 10(5) = 75$	too small
5.5	$(5.5)^3 - 10(5.5) = 111.375$	too big
5.3	95.877	too small
5.4	103.464	too big
5.35	99.630...	too small

$x = 5.4$
(4)

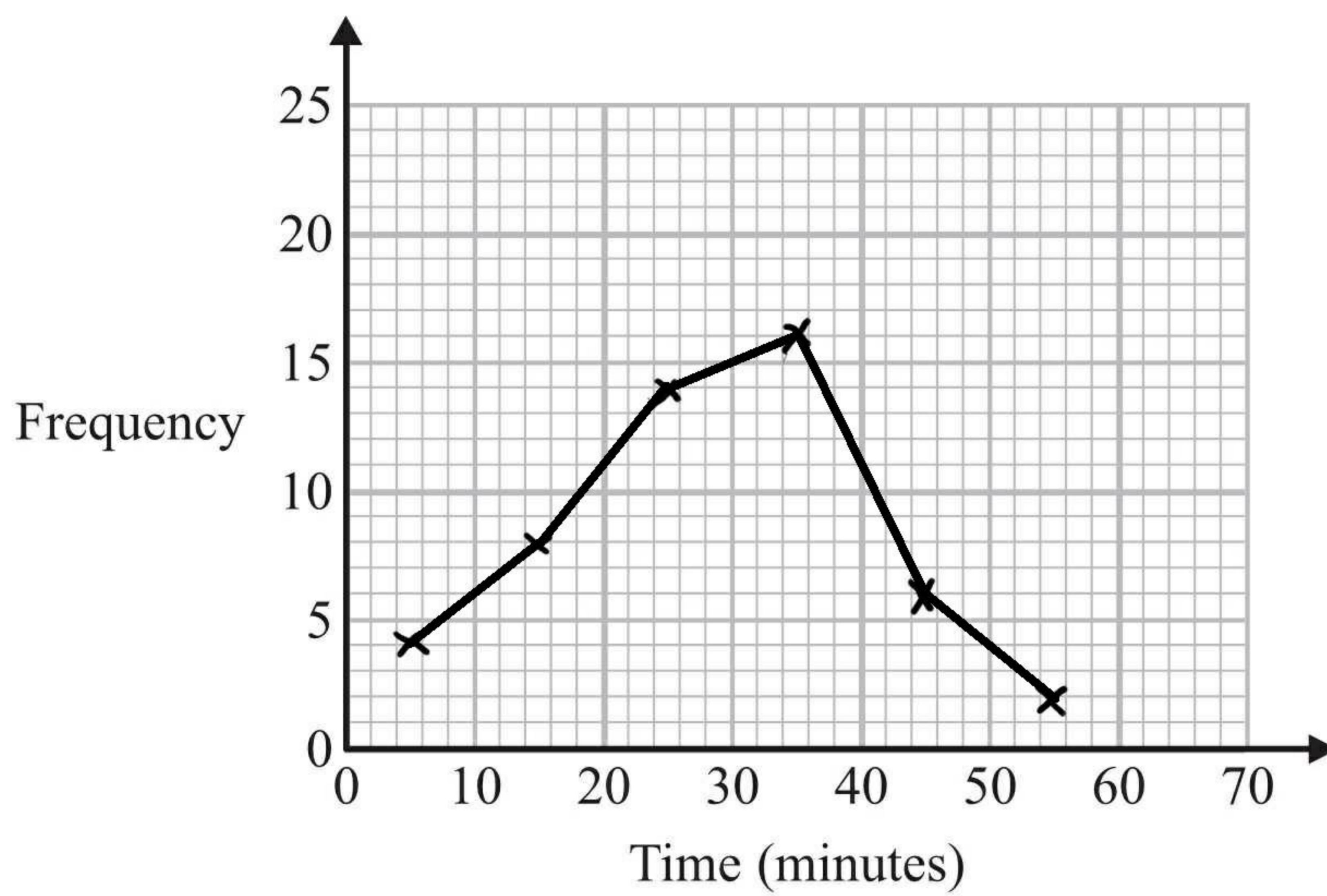
(Total for Question 11 is 6 marks)



12 The frequency table gives information about the times it took some office workers to get to the office one day.

Time (t minutes)	Frequency
$0 < t \leq 10$	4
$10 < t \leq 20$	8
$20 < t \leq 30$	14
$30 < t \leq 40$	16
$40 < t \leq 50$	6
$50 < t \leq 60$	2

(a) Draw a frequency polygon for this information.



(2)

(b) Write down the modal class interval.

$$\underline{30 < t \leq 40}$$

(1)

One of the office workers is chosen at random.

(c) Work out the probability that this office worker took more than 40 minutes to get to the office.

$$\frac{8}{50}$$

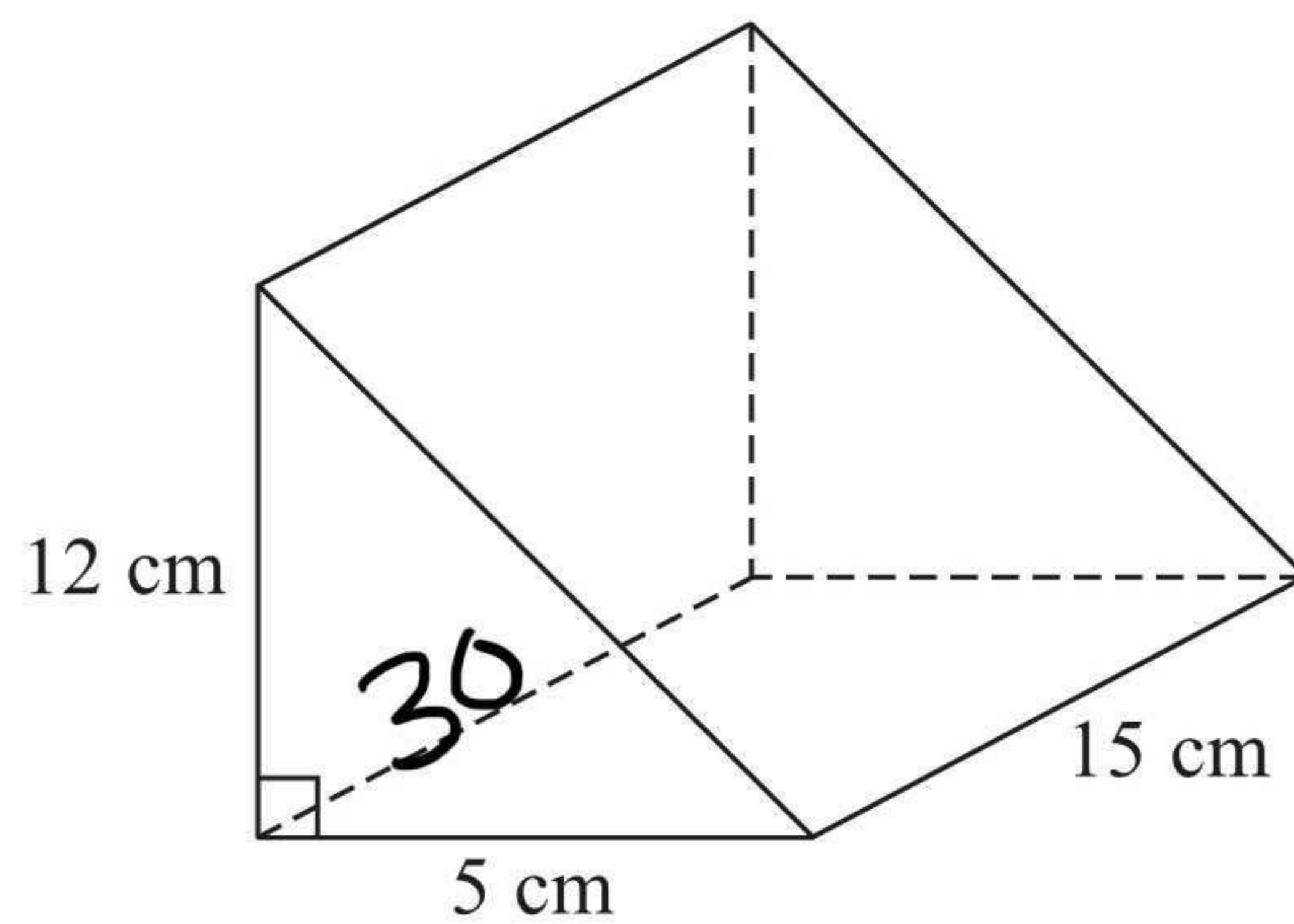
(2)

(Total for Question 12 is 5 marks)



13 The diagram shows a solid triangular prism.

Diagram **NOT**
accurately drawn



The prism is made from metal.
The density of the metal is 6.6 grams per cm^3 .

Calculate the mass of the prism.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\begin{aligned} \text{Vol.} &= \text{area of cross section} \times \text{length} \\ &= 30 \times 15 = 450 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} 6.6 &= \frac{\text{mass}}{450} \\ \text{mass} &= 6.6 \times 450 \end{aligned}$$

..... 2970 grams

(Total for Question 13 is 3 marks)



14 (a) Factorise

$x^2 + 7x$

$$x(x+7)$$

(1)

(b) Factorise

$y^2 - 10y + 16$

$$(y-8)(y-2)$$

(2)

*(c) (i) Factorise

$2t^2 + 5t + 2$

$$(2t+1)(t+2)$$

(ii) t is a positive whole number.

The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

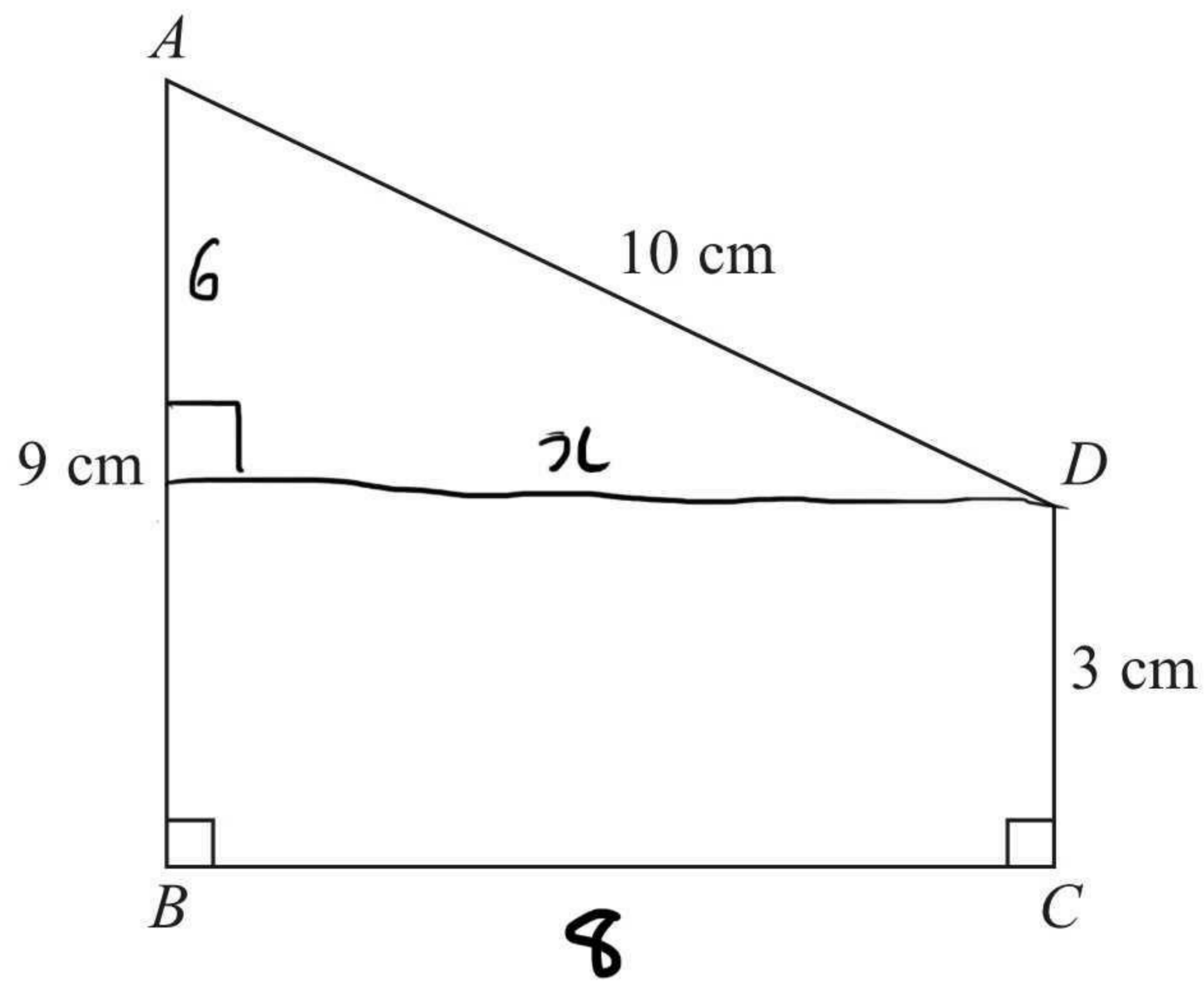
the expression can be factorised, when
a number is substituted in the two
brackets will become two factors,
(They will not be 1 or the value of the expression)⁽³⁾

(Total for Question 14 is 6 marks)



15 $ABCD$ is a trapezium.

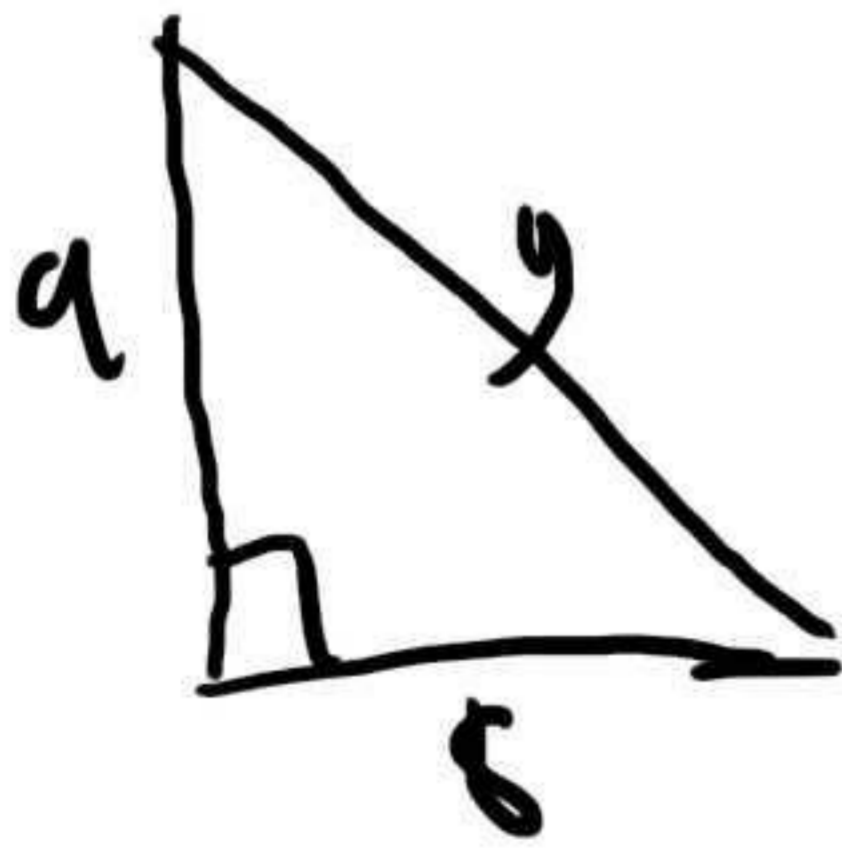
Diagram **NOT** accurately drawn



- $AD = 10$ cm
- $AB = 9$ cm
- $DC = 3$ cm
- Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
Give your answer correct to 3 significant figures.

$$\begin{aligned}
 x^2 + 6^2 &= 10^2 \\
 x^2 &= 10^2 - 6^2 \\
 x^2 &= 100 - 36 = 64 \\
 x &= 8
 \end{aligned}$$



$$\begin{aligned}
 y^2 &= 9^2 + 8^2 \\
 y^2 &= 81 + 64 \\
 y^2 &= 145 \\
 y &= \sqrt{145} = 12.0 \text{ (3 s.f.)}
 \end{aligned}$$

..... 12.0 cm

(Total for Question 15 is 5 marks)



16 Bill's weight decreases from 64.8 kg to 59.3 kg.

Calculate the percentage decrease in Bill's weight.
Give your answer correct to 3 significant figures.

$$\frac{\text{Change}}{\text{original}} \times 100$$

$$\frac{5.5}{64.8} \times 100$$

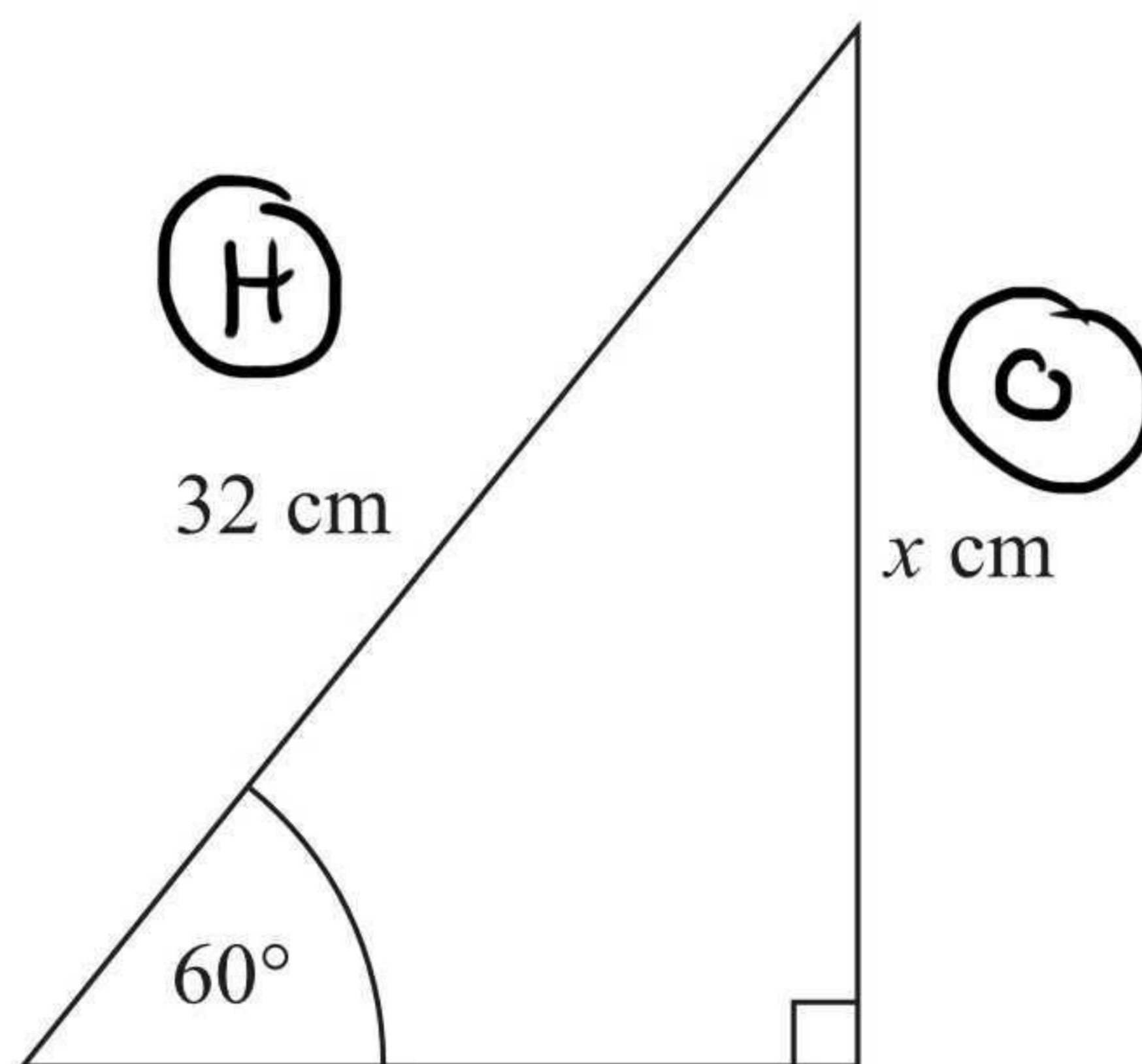
(3sf)

8.49 %

(Total for Question 16 is 3 marks)

17

Diagram NOT
accurately drawn



Calculate the value of x .

Give your answer correct to 3 significant figures.

$$\sin(60) = \frac{x}{32}$$

$$32 \times \sin(60) = x$$

$$x = 27.7 \text{ cm}$$

27.7 cm

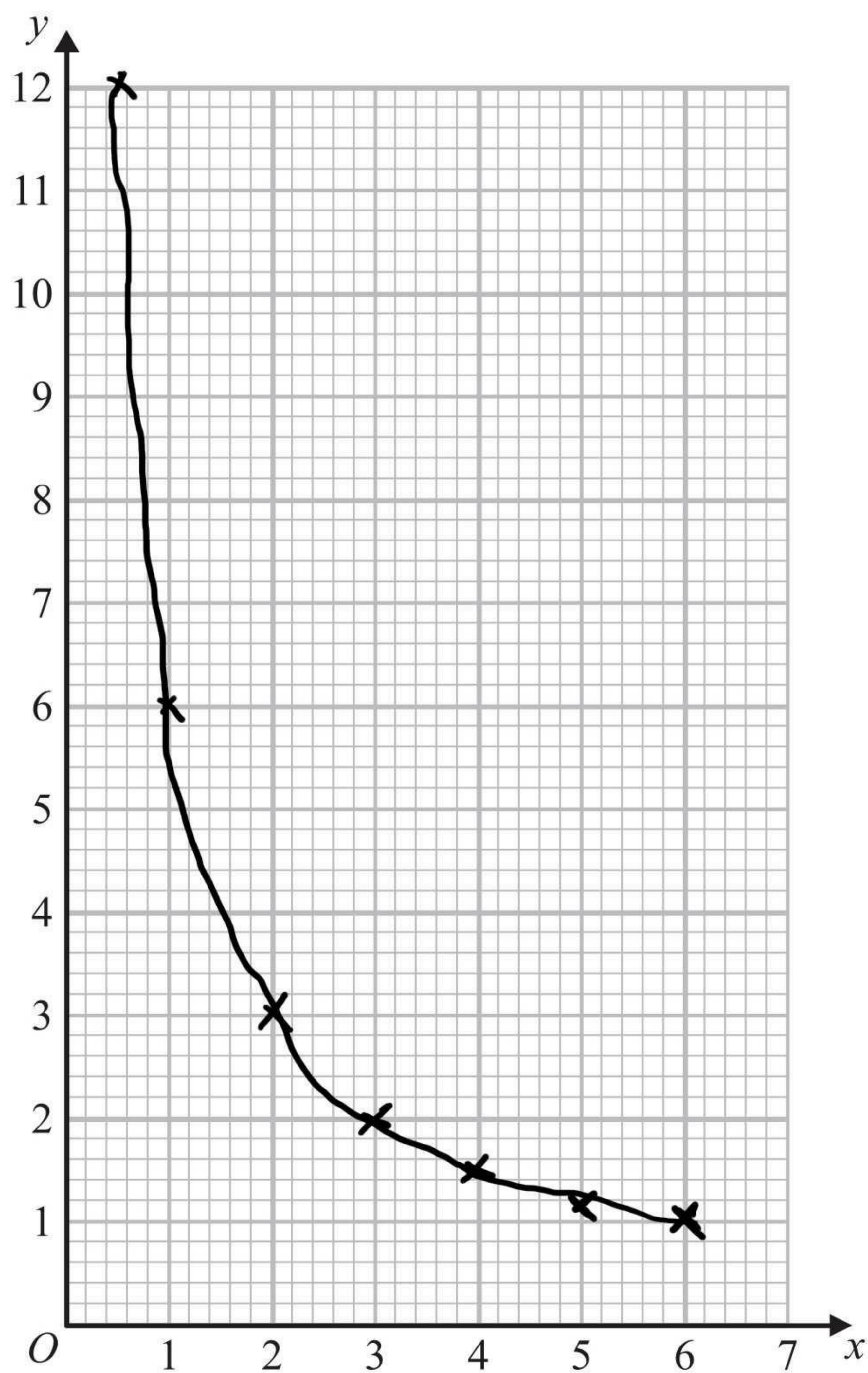
(Total for Question 17 is 3 marks)



18 (a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y	12	6	3	2	1.5	1.2	1

(2)



(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leq x \leq 6$

(2)

(Total for Question 18 is 4 marks)



19 Rob is learning about the planets.

Rob makes a model of the Sun.

He also makes a model of the planet Jupiter.

Rob is going to hang the two models in the school hall.

Rob wants a distance of 16 m between the two models.

The real distance between the planet Jupiter and the Sun is 8×10^8 km.

Work out the scale Rob should use.

Give your answer in the form $1 : n$

$$16 : 8 \times 10^8$$
$$1 : 0.5 \times 10^8$$
$$1 : 5 \times 10^7$$

$$1 : 5 \times 10^7$$

(Total for Question 19 is 3 marks)

20 Simplify

$$\frac{x+1}{2} + \frac{x+3}{3}$$

$$\frac{3(x+1)}{6} + \frac{2(x+3)}{6}$$

$$\frac{3(x+1) + 2(x+3)}{6}$$

$$\frac{3x+3+2x+6}{6}$$

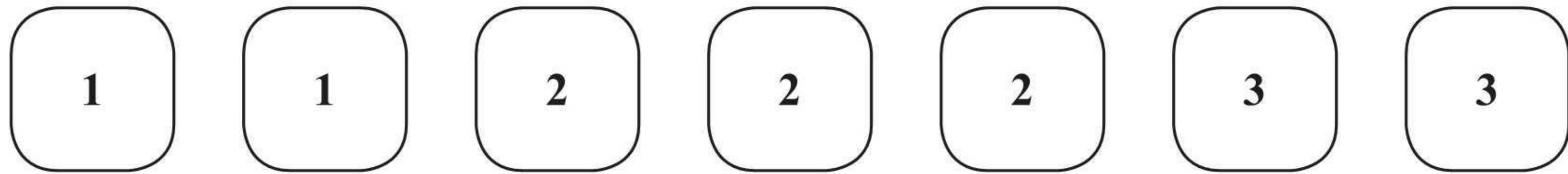
$$\frac{5x+9}{6}$$

$$\frac{5x+9}{6}$$

(Total for Question 20 is 3 marks)



21 Here are seven tiles.



Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

$$\frac{2}{7} \times \frac{1}{6}$$

$$\frac{2}{42}$$

(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.

$$\begin{aligned} P(1,2) &= \frac{2}{7} \times \frac{3}{6} = \frac{6}{42} \\ P(1,3) &= \frac{2}{7} \times \frac{2}{6} = \frac{4}{42} \\ P(2,3) &= \frac{3}{7} \times \frac{2}{6} = \frac{6}{42} \end{aligned}$$

$$\frac{16}{42}$$

(3)

(Total for Question 21 is 5 marks)



22 (a) Solve $2x^2 + 9x - 7 = 0$

Give your solutions correct to 3 significant figures.

$$a=2 \quad b=9 \quad c=-7$$

$$x = \frac{-(9) \pm \sqrt{(9)^2 - 4(2)(-7)}}{2(2)}$$

$$x = 0.676 \quad \text{or} \quad -5.18$$

.....
 $0.676 \text{ or } -5.18$
(3)

(b) Solve $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$

Give your solutions correct to 3 significant figures.

$$x = \frac{1}{y}$$

$$y = \frac{1}{x}$$

$$y = 1.48 \quad \text{or} \quad -0.193$$

.....
(2)

(Total for Question 22 is 5 marks)



23 The diagram shows a pyramid.

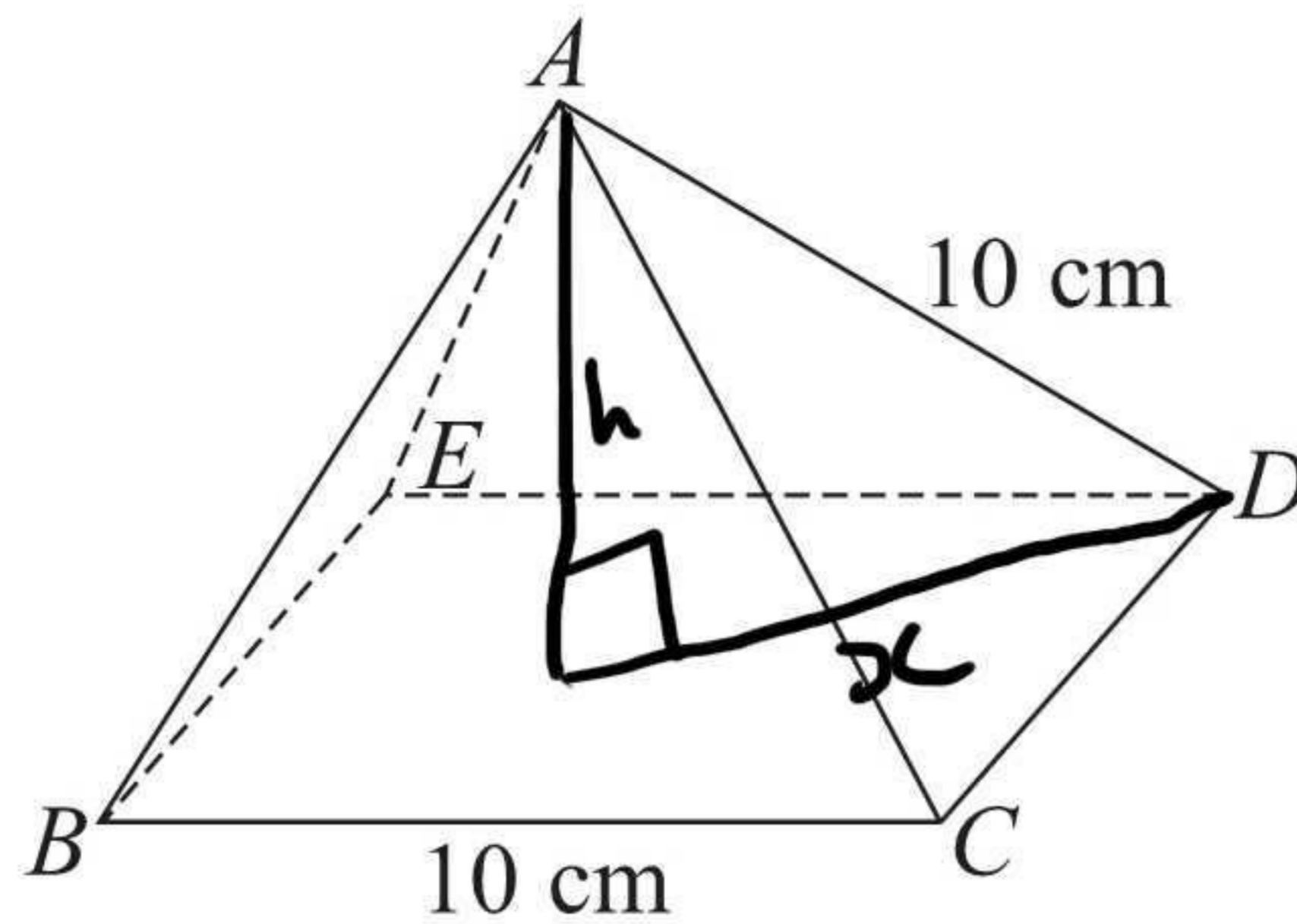


Diagram NOT accurately drawn

$BCDE$ is a square with sides of length 10 cm.

The other faces of the pyramid are equilateral triangles with sides of length 10 cm.

(a) Calculate the volume of the pyramid.

Give your answer correct to 3 significant figures.

diagonal $BD = \sqrt{10^2 + 10^2}$
 $= \sqrt{200}$

$$x = \frac{\sqrt{200}}{2} = \sqrt{50} = 5\sqrt{2}$$

$$10^2 = h^2 + (5\sqrt{2})^2$$

$$100 = h^2 + 50$$

$$50 = h^2$$

$$h = \sqrt{50}$$

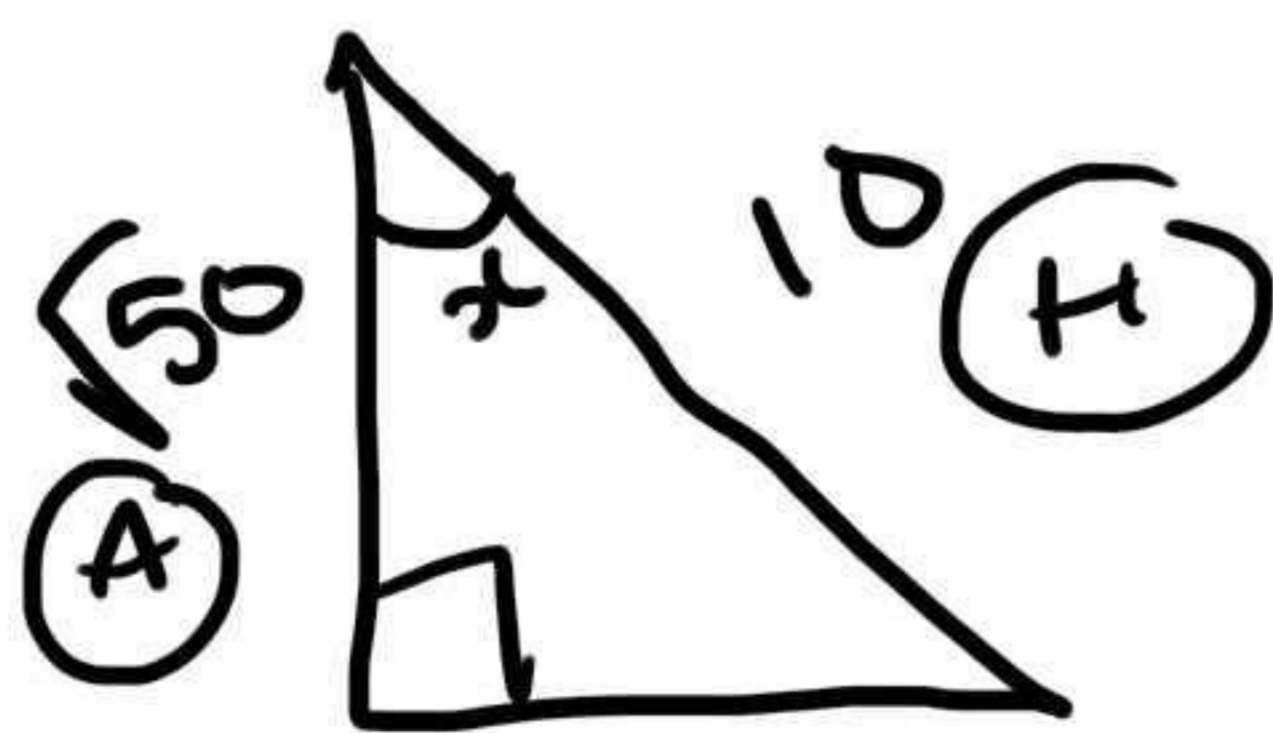
$$\text{Vol} = \frac{1}{3} \times 10^2 \times \sqrt{50}$$

$$= 236$$

(358)

236 cm³
(4)

(b) Find the size of angle DAB .



$$\cos(x) = \frac{\sqrt{50}}{10}$$

$$x = \cos^{-1}\left(\frac{\sqrt{50}}{10}\right)$$

$$= 45^\circ$$

90 °
(2)

(Total for Question 23 is 6 marks)

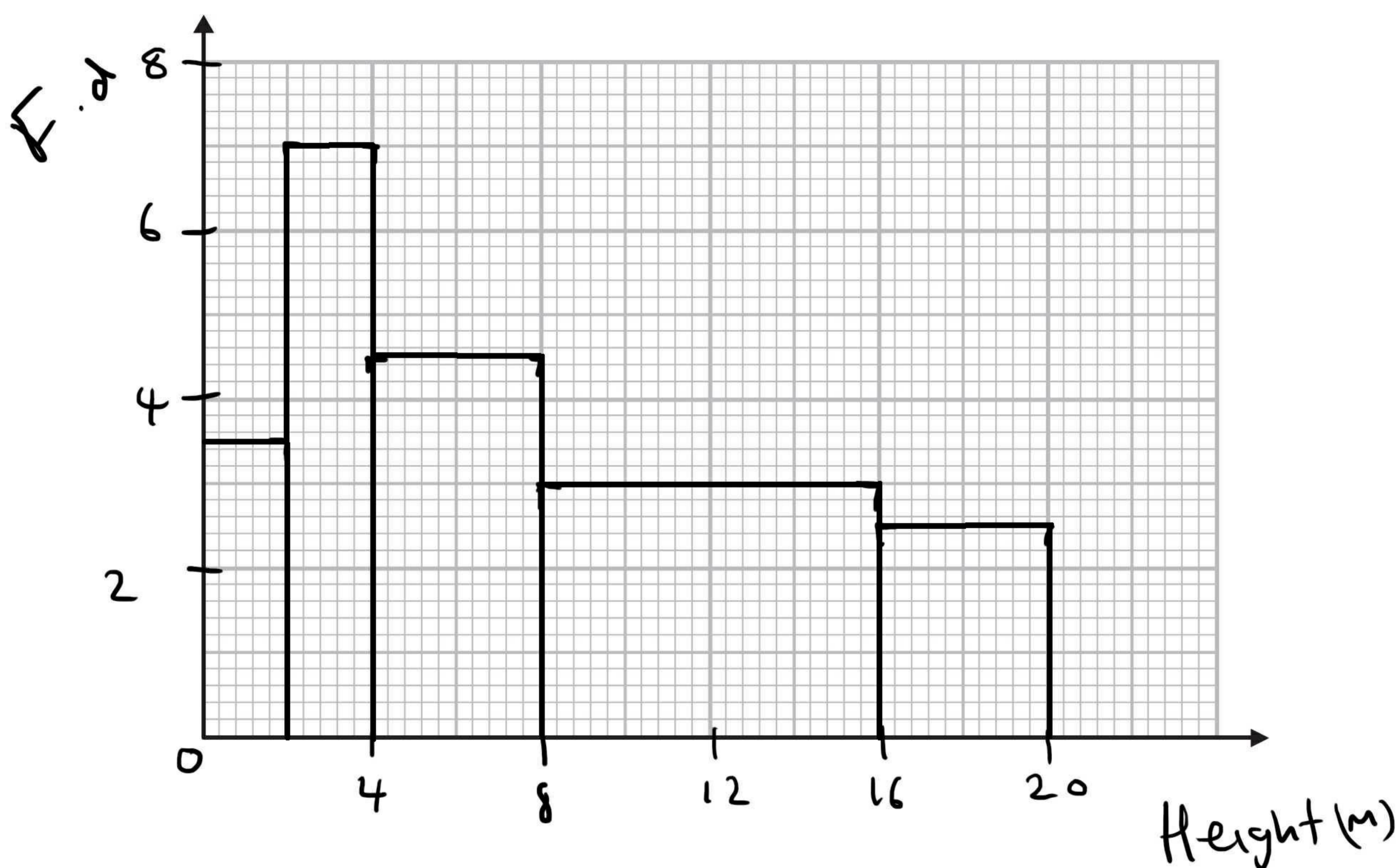


24 The table gives information about the heights, h metres, of trees in a wood.

Height (h metres)	Frequency
$0 < h \leq 2$	7
$2 < h \leq 4$	14
$4 < h \leq 8$	18
$8 < h \leq 16$	24
$16 < h \leq 20$	10

$F \cdot d$
3.5
7
4.5
3
2.5

Draw a histogram to show this information.



(Total for Question 24 is 3 marks)



*25 The diagram shows the triangle PQR .

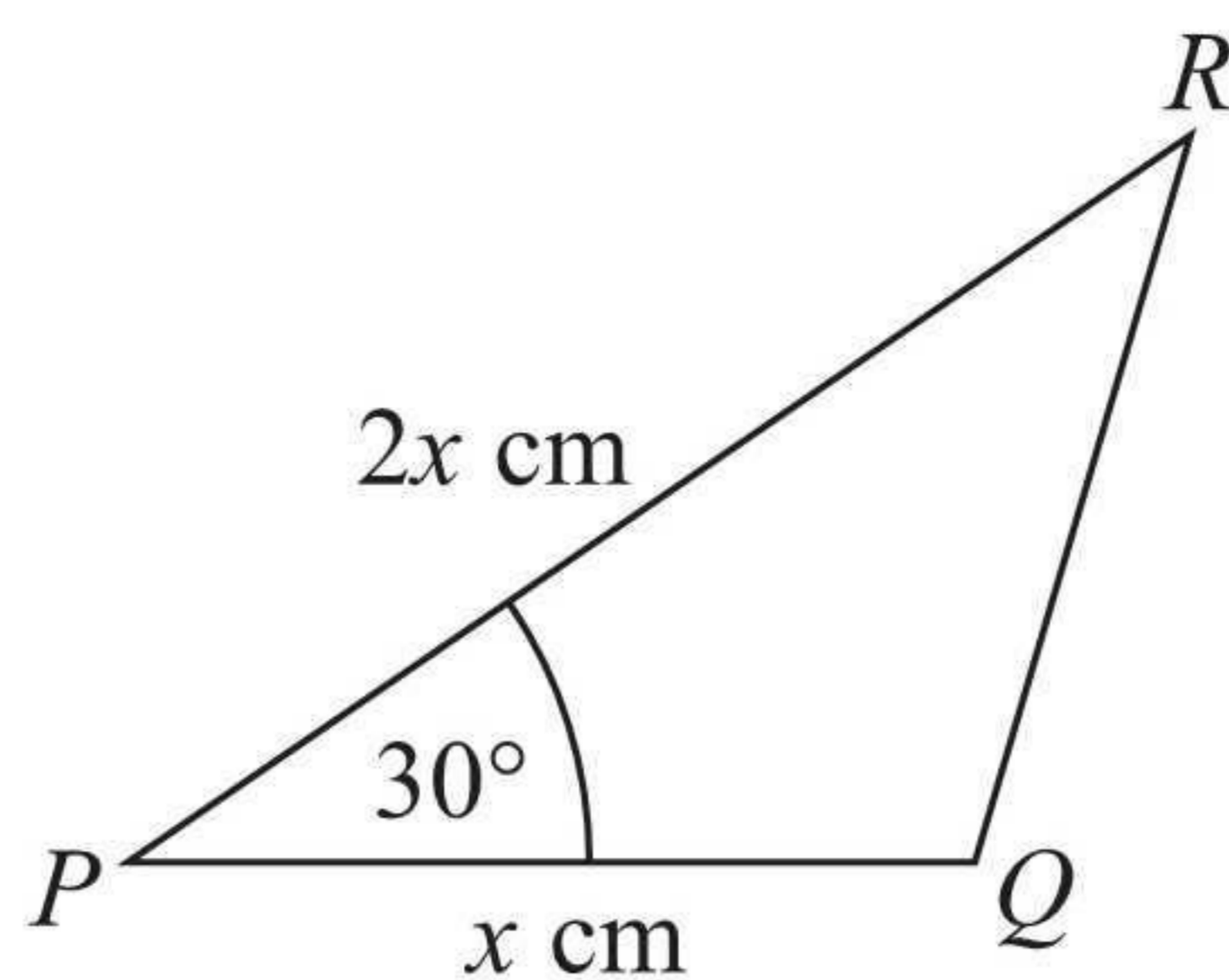


Diagram **NOT** accurately drawn

$$PQ = x \text{ cm}$$

$$PR = 2x \text{ cm}$$

$$\text{Angle } QPR = 30^\circ$$

The area of triangle $PQR = A \text{ cm}^2$

Show that $x = \sqrt{2A}$

$$A = \frac{1}{2} \times x \times 2x \sin(30)$$

$$A = \frac{1}{2} \times 2x^2 \times \frac{1}{2}$$

$$A = \frac{1}{4} \cdot 2x^2$$

$$A = \frac{1}{2} x^2$$

$$2A = x^2$$

$$\sqrt{2A} = x$$

(Total for Question 25 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS



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