June 2014

Predicted Paper 2

Solutions

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

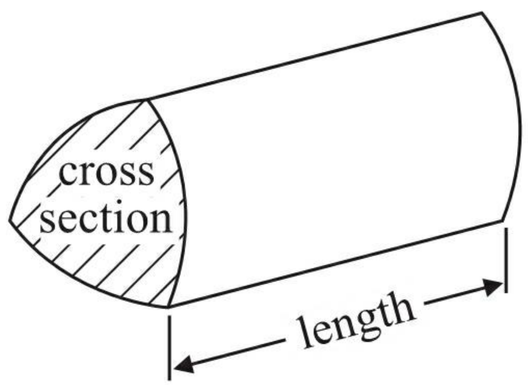
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

GCSE Mathematics 1MA0

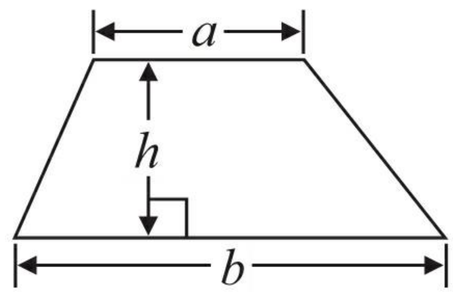
Formulae: Higher Tier

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 × length

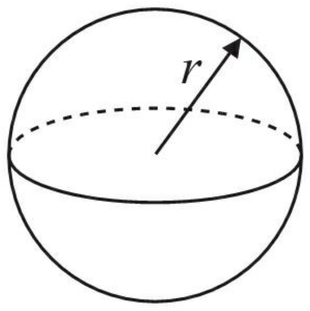


Area of trapezium = $\frac{1}{2}(a + b)h$



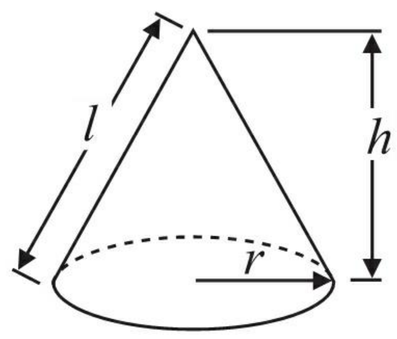
Volume of sphere = $\frac{4}{3}\pi r^3$

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

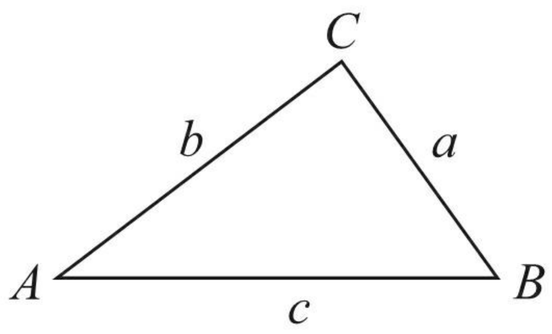


Volume of cone = $\frac{1}{3}\pi r^2 h$

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

$$x = \frac{-b \quad \sqrt{(b^2 - 4ac)}}{2a}$$

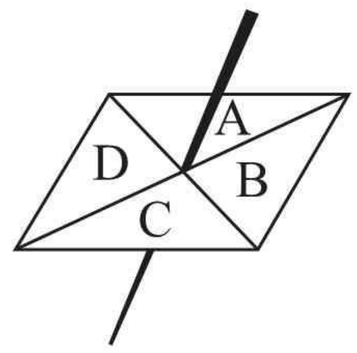
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

1

Here is a four-sided spinner.
The sides of the spinner are labelled A, B, C and D.



The table shows the probability that the spinner will land on A or on B or on D.

Letter	A	B	C	D
Probability	0.12	0.39		0.18

Amber spins the spinner once.

(a) Work out the probability that the spinner will land on C.

0.12 + 0.39 + 0.18 = 0.69

1 − 0.69 =

0.31

(2)

Lucy is going to spin the spinner 50 times.

(b) Work out an estimate for the number of times the spinner will land on A.

0.12 × 50

6

(2)

(Total for Question 1 is 4 marks)

2. Here is a list of ingredients for making apple crumble for 2 people.

Apple Crumble
for 2 people

10 ounces apples
4 ounces flour
2 ounces sugar
1 ounce butter
1 tablespoon water
1 teaspoon baking powder

1 ounce	=	28 grams
1 tablespoon	=	15 m*l*
1 teaspoon	=	5 m*l*

Anne is going to make apple crumble for 5 people.

(a) Work out how much flour she needs.
Give your answer in grams.

2people → 5people

×2.5

4×2.5 = 10 ounces

10×28

280 grams

(3)

David is making an apple crumble.
He uses 140 grams of butter.

(b) Work out how many people he is making apple crumble for.

140 grams = 5 ounces

(140 ÷ 28 = 5)

1 ounce = 2 people

5 ounces = 10 people

10

(2)

(Total for Question 2 is 5 marks)

3.

Here is a right-angled triangle.

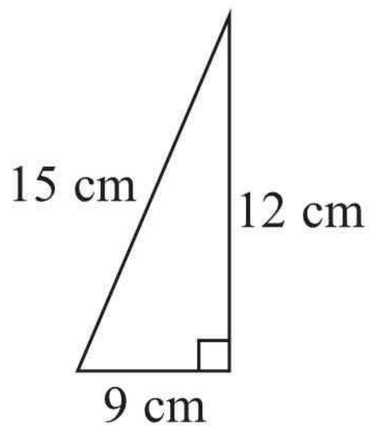


Diagram **NOT** accurately drawn

The shape below is made from 4 of these triangles.

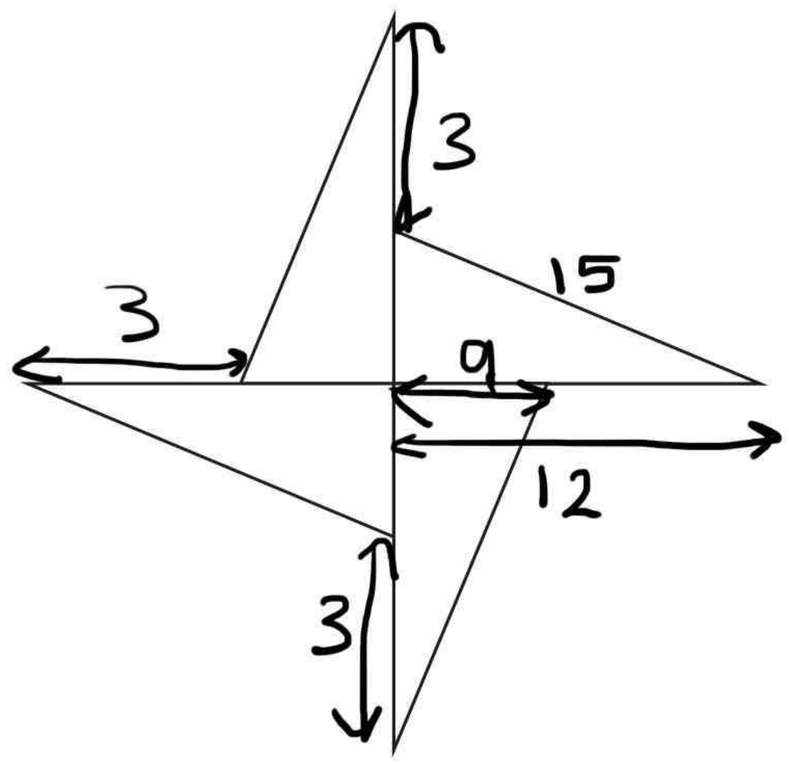


Diagram **NOT** accurately drawn

12 − 9 = 3

Work out the perimeter of the shape.

(4 × 3) + (4 × 15)

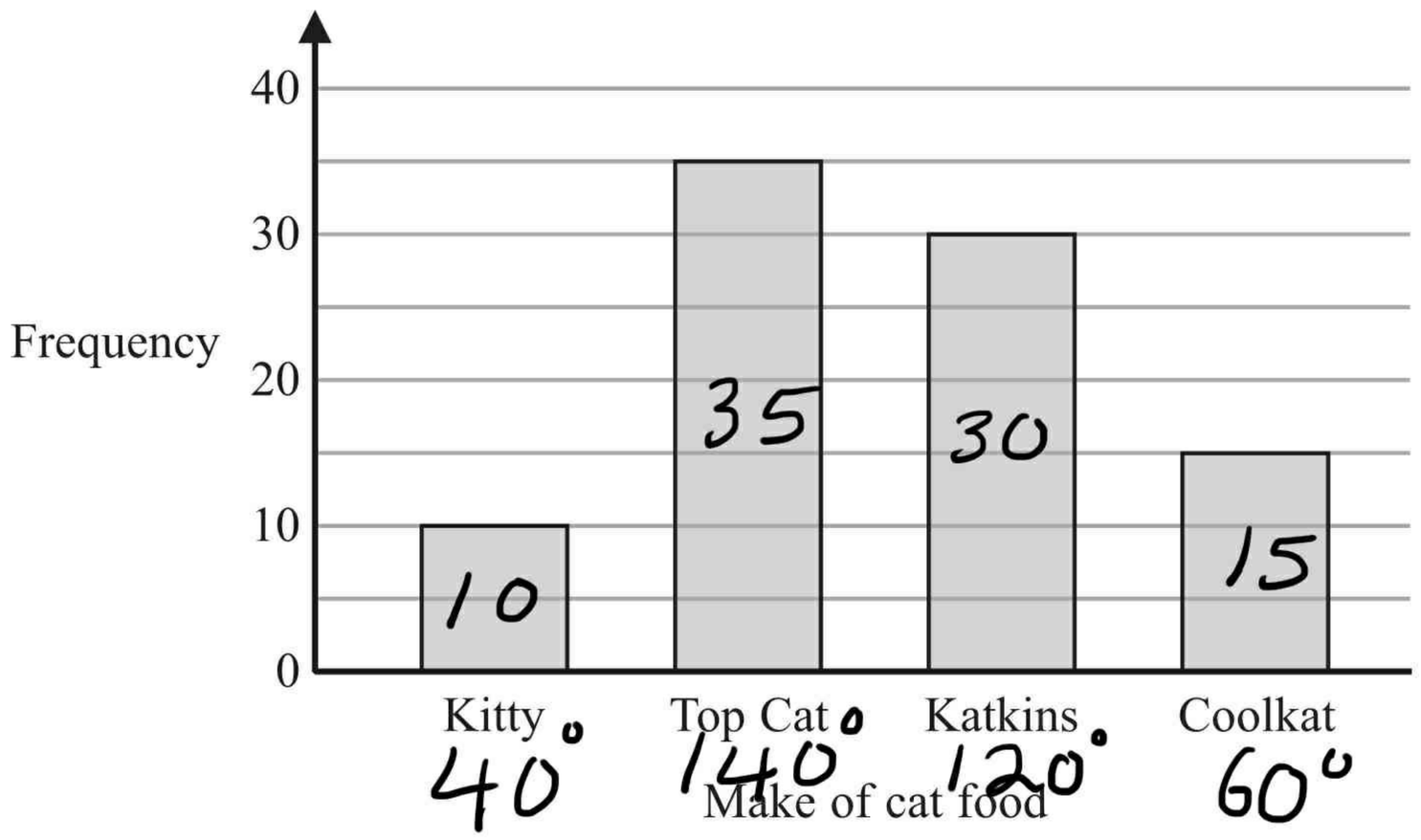
72 ..... cm

(Total for Question 3 is 3 marks)

4.

A survey was carried out for a magazine.
90 cat owners were asked to write down the make of cat food their cats liked best.

The bar chart shows information about the results.



40° 140° 120° 60°

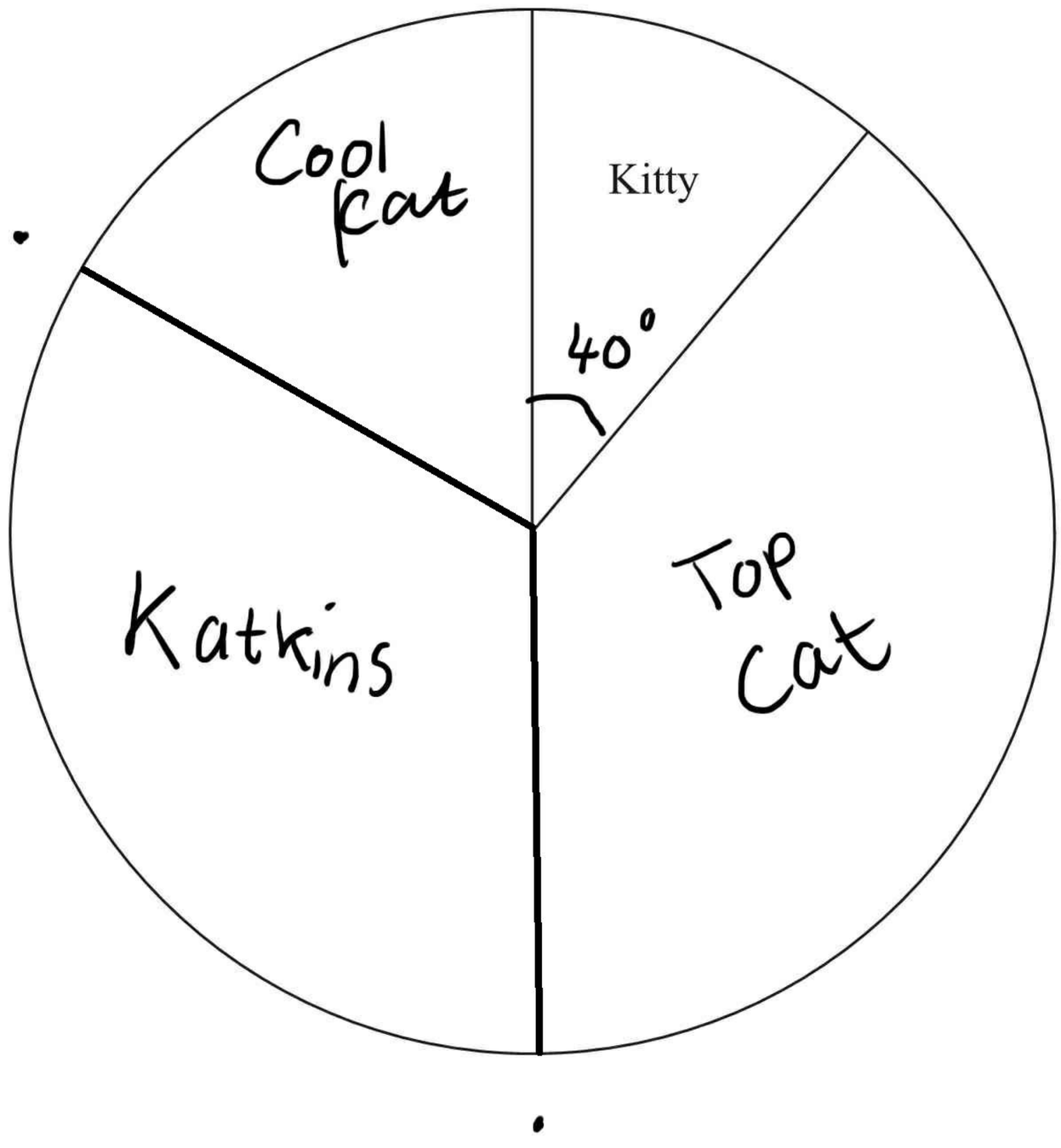
90

The information in the bar chart is going to be shown in a pie chart.

$\frac{360}{90} = 4$

Use the information in the bar chart to complete the pie chart.

4° per person



(Total for Question 4 is 3 marks)

*5. Ketchup is sold in three different sizes of bottle.

Small bottle Medium bottle Large bottle

A small bottle contains 342 g of ketchup and costs 88p
A medium bottle contains 570 g of ketchup and costs £1.95
A large bottle contains 1500 g of ketchup and costs £3.99

Which bottle is the best value for money?
You must show your working.

Small Bottle : $\frac{88}{342}$ = 0.257 p per gram

Medium $\frac{195}{570}$ = 0.342p per gram

Large $\frac{399}{1500}$ = 0.266 p per gram

The small bottle is better value for money

(Total for Question 5 is 4 marks)

6.

Susie has to deliver some packages and some parcels.

The total number of packages is 4 times the number of parcels.
The total number of packages and parcels is 40

→ This is a ratio!

4 : 1

5 parts

Each parcel has a weight of 1.5 kg.
The total weight of the packages and parcels is 37.6 kg.

Each of the packages has the same weight.

Work out the weight of each package.

$40 \div 5 = 8$

Each part is 8

32 : 8

↗ packages ↑ parcels

Parcels weigh: $8 \times 1.5 = 12\text{kg}$

Packages weigh: $37.6 - 12 = 25.6\text{kg}$

$\frac{25.6}{32} = 0.8\text{kg}$

0.8 kg

(Total for Question 6 is 4 marks)

7.

The diagram shows the marking on a school playing field.

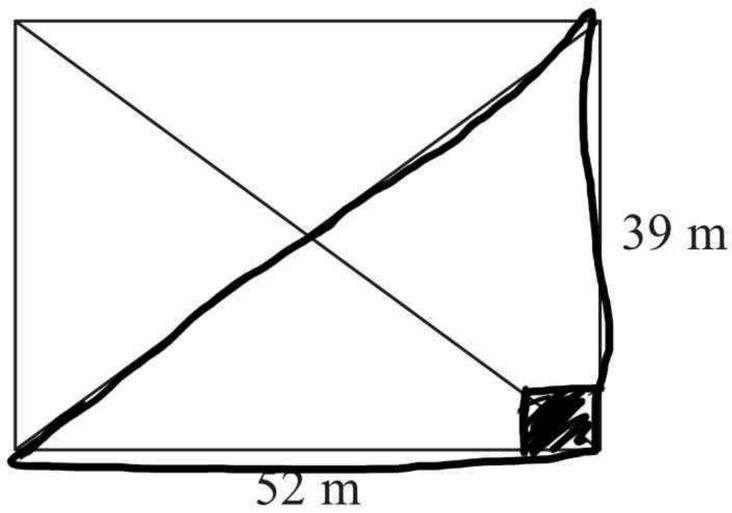


Diagram **NOT** accurately drawn

pythag !!!

The diagram shows a rectangle and its diagonals.

Work out the total length of the four sides of the rectangle and its diagonals.

$\sqrt{52^2 + 39^2} = 65$

$(52 + 39 + 65) \times 2 = 156$

156 m

(Total for Question 7 is 5 marks)

8.

Mr and Mrs Adams sold their house for £168 000
They made a profit of 12% on the price they paid for the house.

Calculate how much they paid for the house.

12% has already been added

£168000 = 112%.

£1500 = 1%.

£150000 = 100%.

£ 150000

(Total for Question 8 is 3 marks)

9.

Faisel weighed 50 pumpkins.

The grouped frequency table gives some information about the weights of the pumpkins.

Weight (w kilograms)		Frequency	
$0 < w \leqslant 4$	2	× 11	22
$4 < w \leqslant 8$	6	× 23	138
$8 < w \leqslant 12$	10	× 14	140
$12 < w \leqslant 16$	14	× 2	28
			328

Work out an estimate for the mean weight.

remember midpoint × freq.

$$\frac{328}{50} = 6.56$$

6.56 kg

(Total for Question 9 is 4 marks)

10.

The equation

$$x^3 - 6x = 84$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show all your working.

Trial	$(x)^3 - 6(x)$	comment
4.5	$(4.5)^3 - 6(4.5) = 64.125$	too low
4.7	$(4.7)^3 - 6(4.7) = 75.623$	too low
4.8	$(4.8)^3 - 6(4.8) = 81.792$	too low
4.9	88.249	too high
4.85	84.984	too high

4.8

(Total for Question 10 is 4 marks)

11.

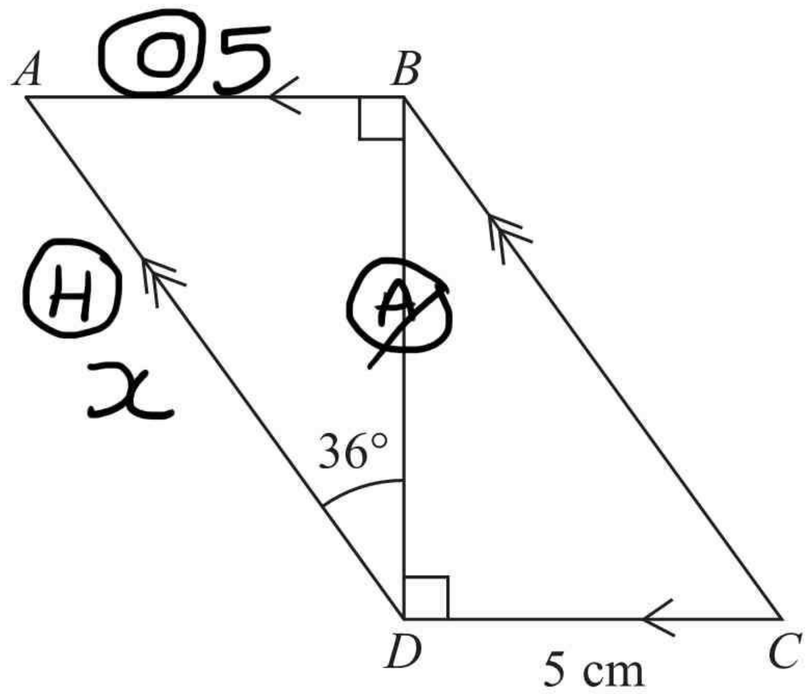


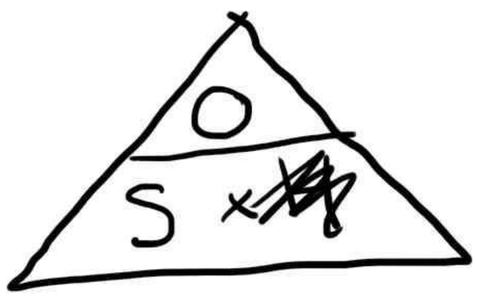
Diagram **NOT** accurately drawn

ABCD is a parallelogram.

DC = 5 cm
Angle *ADB* = 36°

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

SOH CAH TOA



$\frac{5}{\sin(36)}$

$\sin(x) = \frac{O}{H}$

$\sin(36) = \frac{5}{x}$

$x \sin(36) = 5$

$x = \frac{5}{\sin(36)}$

8.51 ..... cm

(Total for Question 11 is 4 marks)

12.

Ella is designing a glass in the shape of a cylinder.

The glass must hold a minimum of $\frac{1}{2}$ litre of liquid.

The glass must have a diameter of 8 cm.

Calculate the minimum height of the glass.

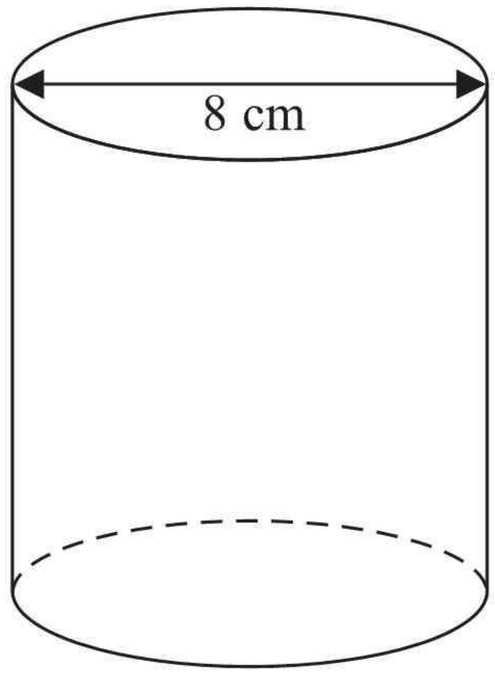


Diagram **NOT** accurately drawn

volume = $\pi r^2 h$

$500 = \pi \times (4)^2 (h)$

$500 = 16\pi \times h$

$\frac{500}{16\pi} = h$

(3sf)

9.95 cm

(Total for Question 12 is 5 marks)

13.

Martin bought a computer for £1200
At the end of each year the value of the computer is depreciated by 20%.

After how many years will the value of the computer be £491.52?
You must show your working.

Multiplying by 0.8 takes off 20%.

Yr 1 $1200 \times 0.8 = £960$

Yr 2 $960 \times 0.8 = £768$

Yr 3 $768 \times 0.8 = £614.40$

Yr 4 $614.40 \times 0.8 = £491.52$

4

(Total for Question 13 is 3 marks)

14. The table shows the number of students in each year group at a college.

Year group	Number of students
1	182
2	140
3	98
Total	420

The college secretary took a stratified sample of 135 students, by year group.

Work out the number of year 2 students in her sample.

$\frac{140}{420} \times 135$

45

(Total for Question 14 is 2 marks)

15.

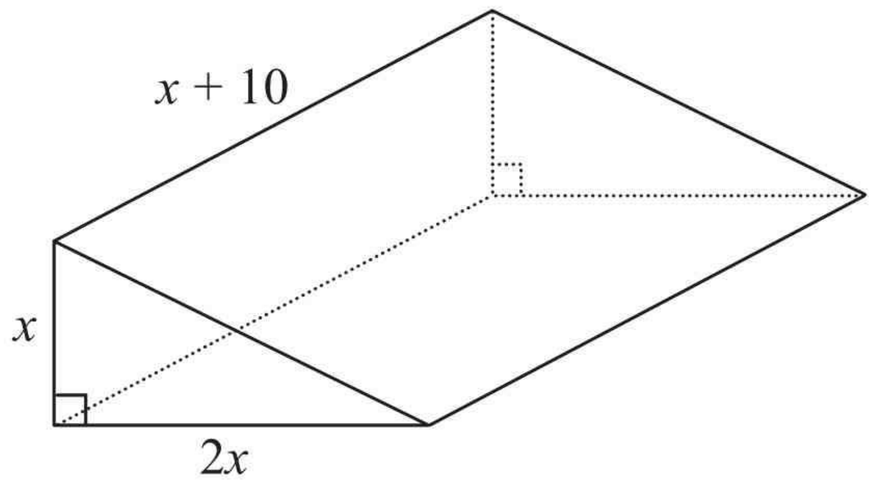


Diagram **NOT** accurately drawn

The diagram shows a solid triangular prism.
All the measurements are in centimetres.

The volume of the prism is V cm^3.

Find a formula for V in terms of x.
Give your answer in simplified form.

Volume = area of front x how far back

$$= \frac{2x \times x}{2} \times (x+10)$$

$$= \frac{2x^2}{2}(x+10)$$

$$= x^2(x+10)$$

$$= x^3 + 10x^2$$

$x^3 + 10x^2$

(Total for Question 15 is 3 marks)

16.

(a) Factorise $x^2 + 5x + 4$

$(x+4)(x+1)$

(2)

(b) Expand and simplify $(3x - 1)(2x + 5)$

$6x^2 + 15x - 2x - 5$

$6x^2 + 13x - 5$

(2)

(c) Write as a single fraction $\frac{1}{2x} + \frac{1}{5x} - \frac{1}{3x}$

$\frac{15}{30x} + \frac{6}{30x} - \frac{10}{30x}$

$\frac{11}{30x}$

(2)

(Total for Question 16 is 6 marks)

17.

(a) Given that x is an integer such that $-2 < x \leqslant 3$

y is an integer such that $-1 \leqslant y < 5$

and $y = x$

write down the possible values of x.

$-1, 0, 1, 2, 3$

$-1, 0, 1, 2, 3, 4$

$-1, 0, 1, 2, 3$

(2)

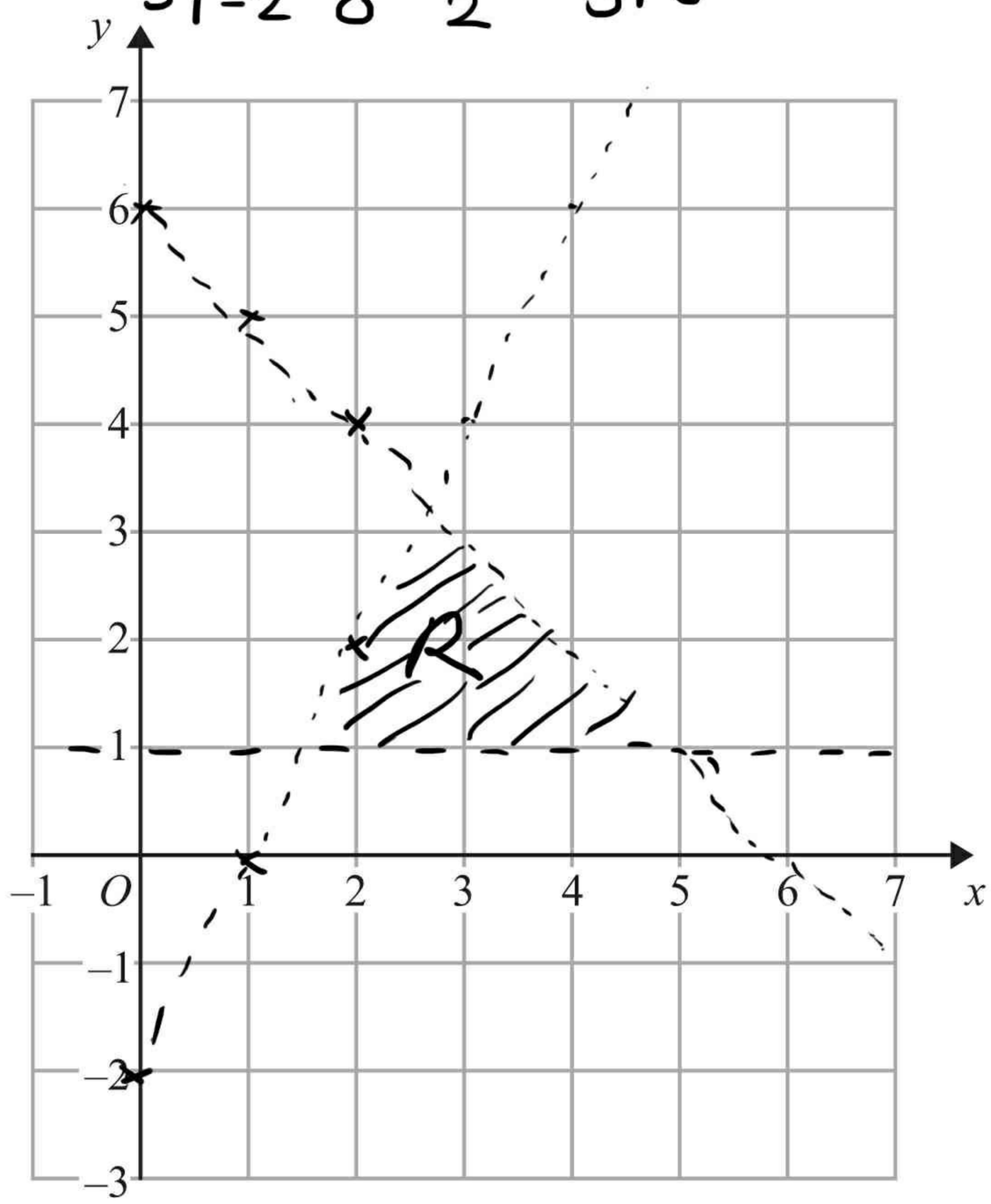
(b) On the grid below, show by shading the region defined by the inequalities

$y > 1$ $\quad$ $y < 2x - 2$ $\quad$ $y < 6 - x$ $\quad$ $x > 0$

Mark this region with the letter R.

x	0	1	2
y	−2	0	2

x	0	1	2
y	6	5	4

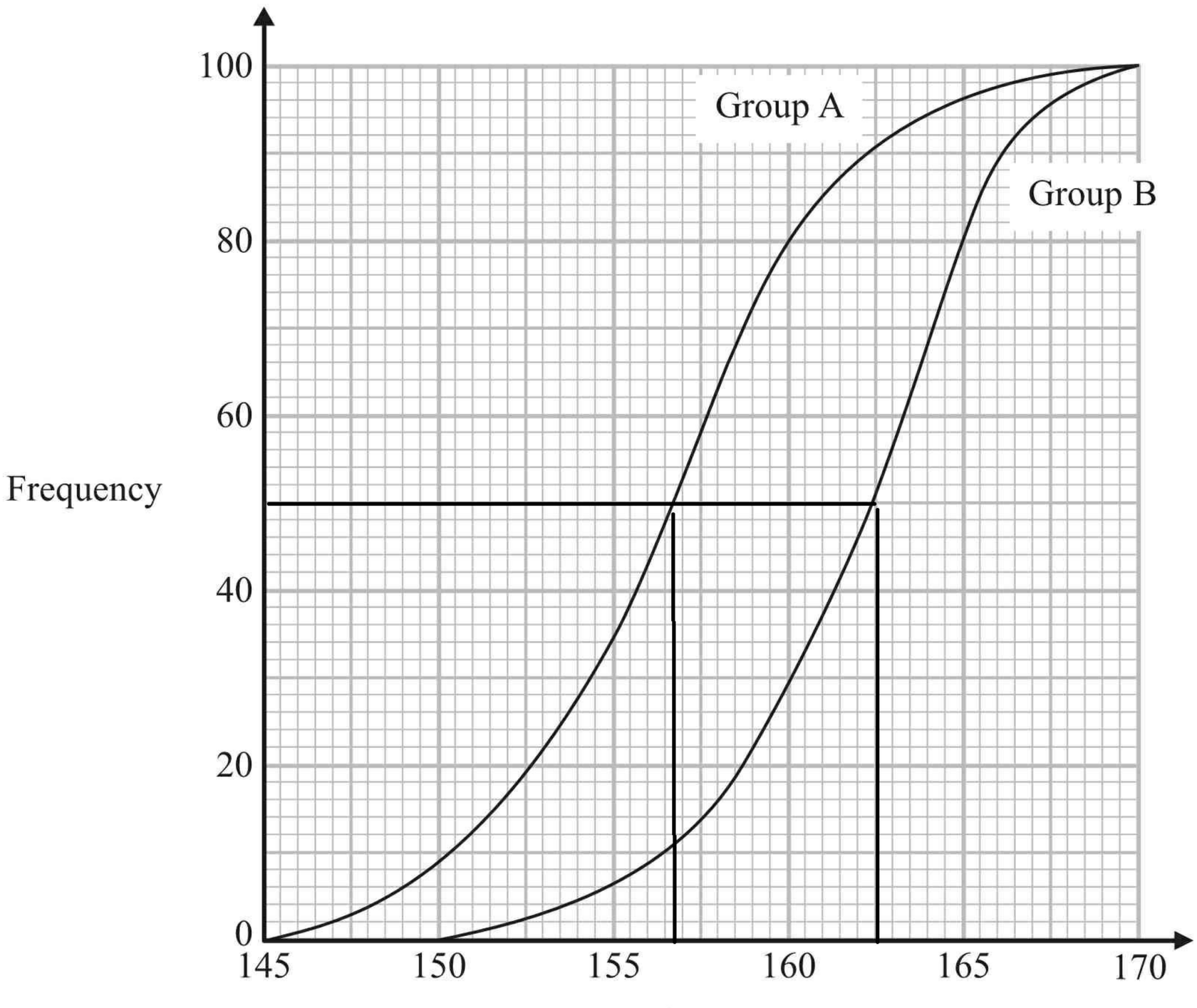


(4)

(Total for Question 17 is 6 marks)

18.

The cumulative frequency graphs give information about the heights of two groups of children, group A and group B.



Compare average and spread.

Compare the heights of the children in group A and the heights of the children in group B.

Group A Median: 156.75

B Median: 162.5

Group B are taller on average

Group A Range: 25

B Range: 20

Group A's heights are more spread out

(Total for Question 18 is 2 marks)

19.

Solve $5x^2 + 6x - 2 = 0$

Give your solutions correct to 2 decimal places.

Quadratic Formula

$a = 5 \quad b = 6 \quad c = -2$

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

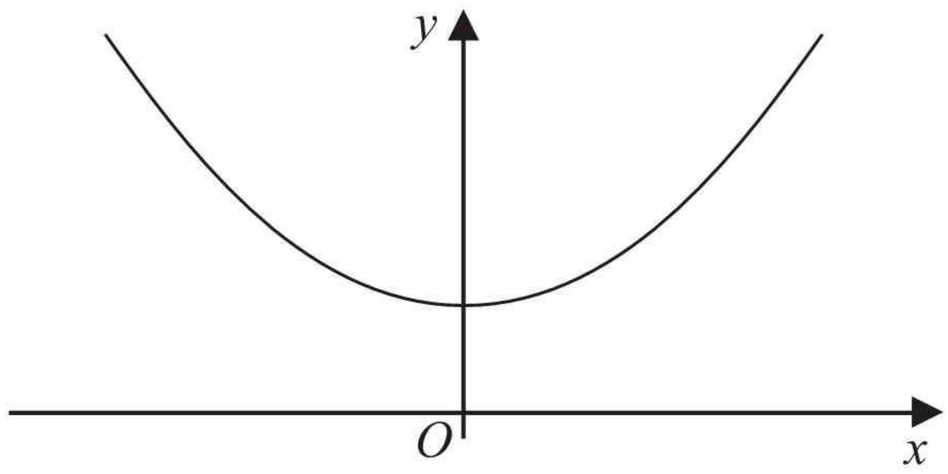
$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(5)(-2)}}{2(5)}$$

$x = 0.27 \quad x = -1.47$

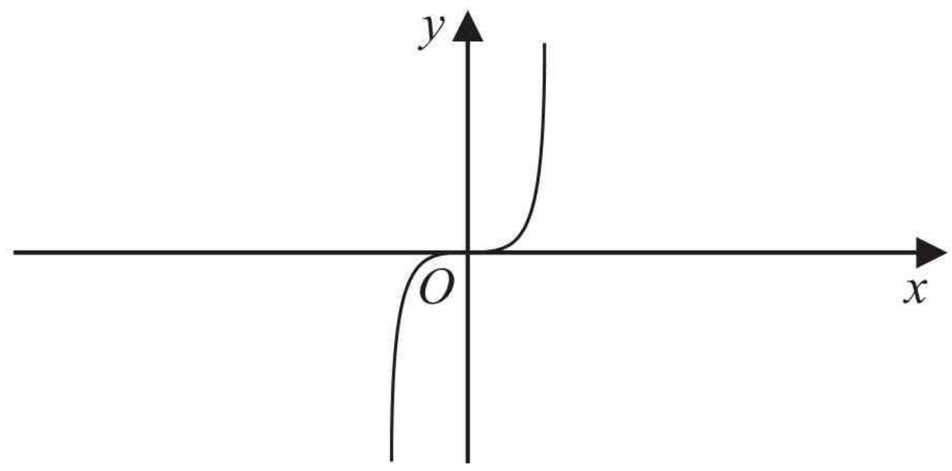
(Total for Question 19 is 3 marks)

20.

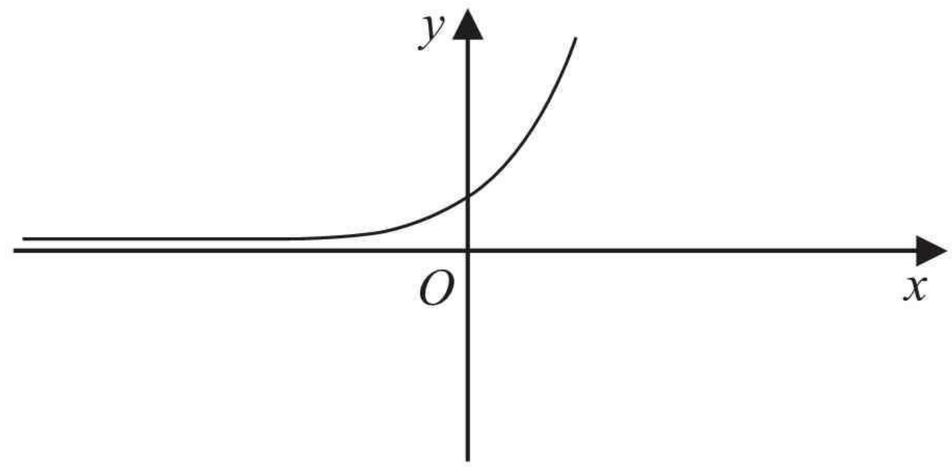
Here are three graphs.



A



B

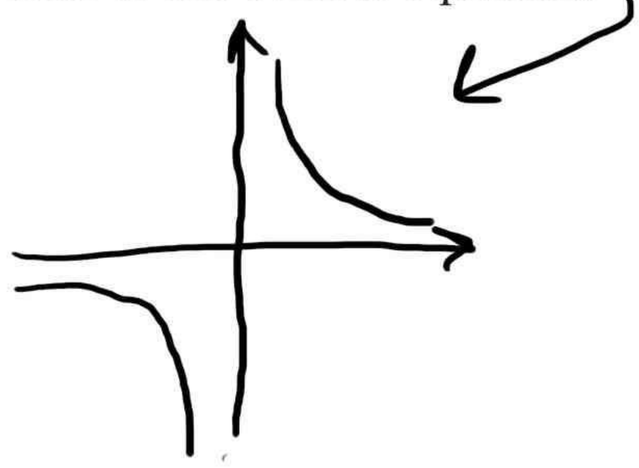


C

Here are four equations of graphs.

$y = x^3$ $\quad$ $y = x^2 + 4$ $\quad$ $y = \frac{1}{x}$ $\quad$ $y = 2^x$

Match each to the correct equation.



A and $y =$ $x^2 + 4$

B and $y =$ x^3

C and $y =$ 2^x

(Total for Question 20 is 3 marks)

21.

The table shows some information about the weights of oranges.

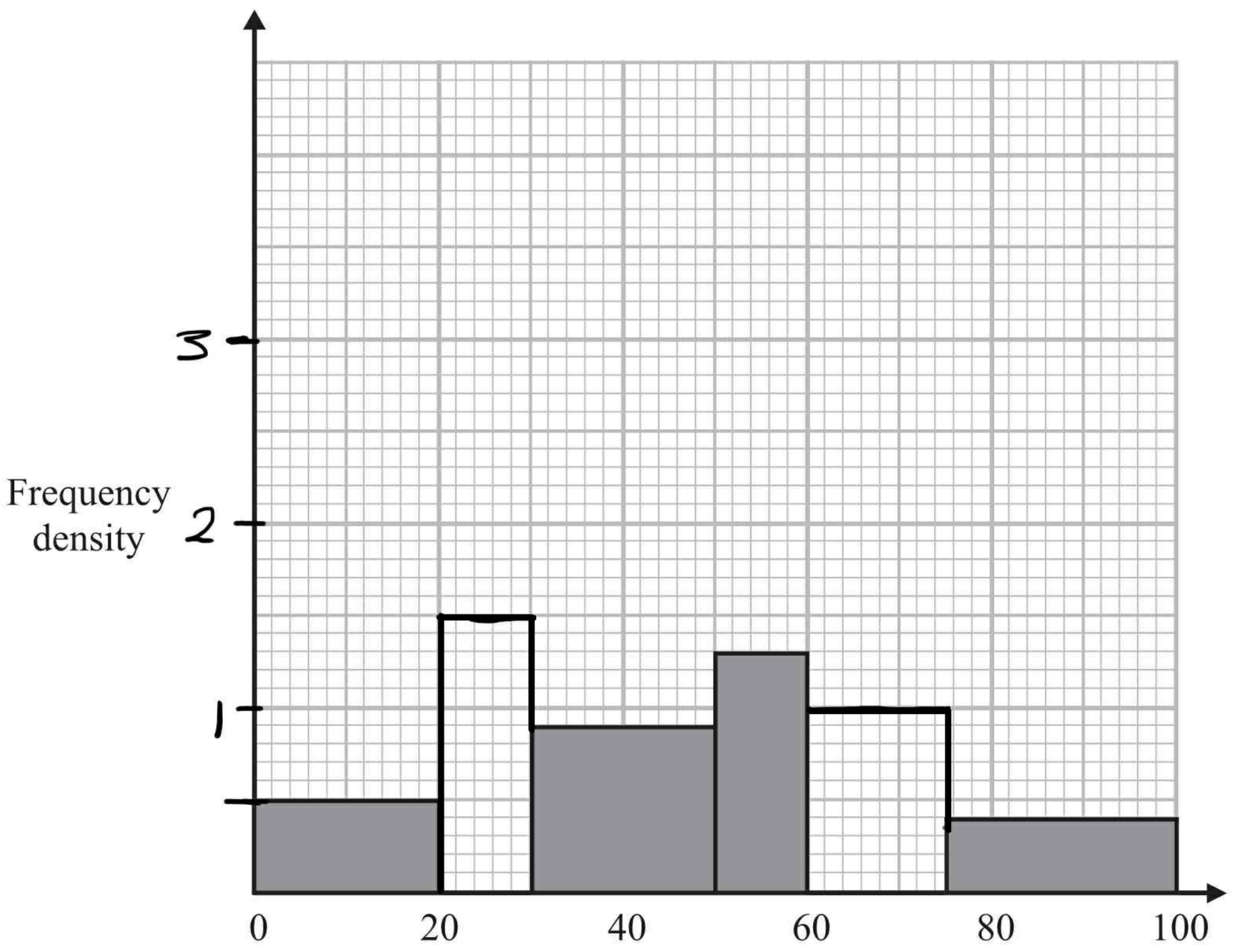
Weight (w grams)	Frequency
$0 < w \leqslant 20$	10
$20 < w \leqslant 30$	15
$30 < w \leqslant 50$	18
$50 < w \leqslant 60$	13
$60 < w \leqslant 75$	15
$75 < w \leqslant 100$	10

(a) Use the histogram to complete the table.

(2)

(b) Use the table to complete the histogram.

(2)

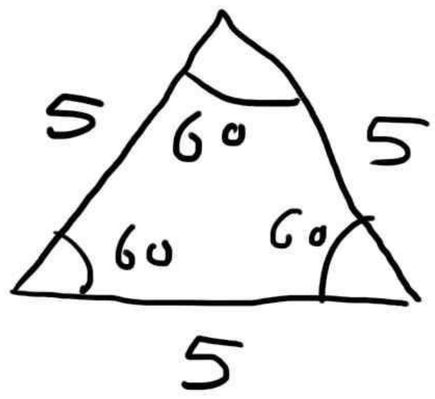


(Total for Question 21 is 4 marks)

22.

Jane has a flower bed in the shape of an equilateral triangle.
The perimeter of the flower bed is 15 metres.

(a) Work out the area of the flower bed.
Give your answer correct to 1 decimal place.



Area of triangle:

$\frac{1}{2}ab\sin C$

$0.5(5)(5)\sin(60)$

10.8 ..... m^2

(3)

Jane has some containers in the shape of hemispheres with diameter 35 cm.

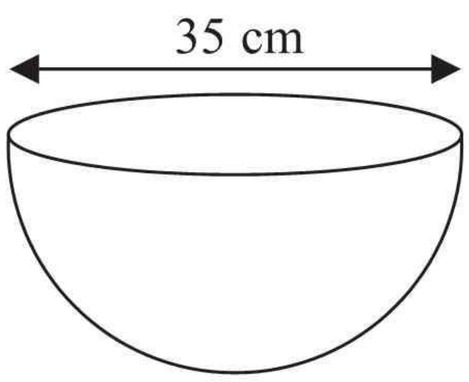


Diagram **NOT** accurately drawn

Jane is going to fill the containers completely with compost.
She has 80 litres of compost.
1 litre = 1000 cm^3.

(b) Work out how many containers Jane can fill completely with compost.

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

$= \frac{4}{3}\pi(17.5)^3$

$= 22449.2975$

Volume of hemisphere $= 11224.6\ldots cm^3$

$= 11.22$ litres

$80 \div 11.22 = 7.1$

7 .....

(4)

(Total for Question 22 is 7 marks)

23.

ABCD is a quadrilateral.

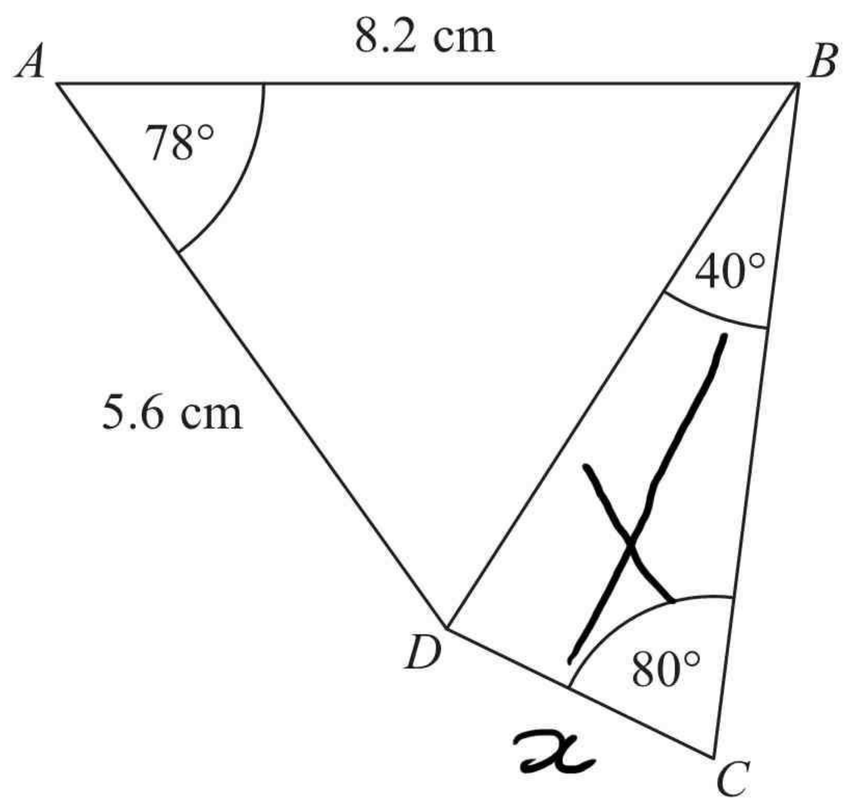


Diagram **NOT** accurately drawn

Work out the length of *DC*.
Give your answer correct to 3 significant figures.

To find BD:

$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$= (8.2)^2 + (5.6)^2 - 2(8.2)(5.6)\cos(78)$$
$$= 79.5\ldots$$
$$a = 8.916\,579\,519$$

To find DC:

$$\frac{x}{\sin 40} = \frac{8.916\ldots}{\sin(80)}$$

$$x = \frac{8.916\ldots}{\sin(80)} \times \sin(40)$$

5.82 cm

(Total for Question 23 is 6 marks)

24.

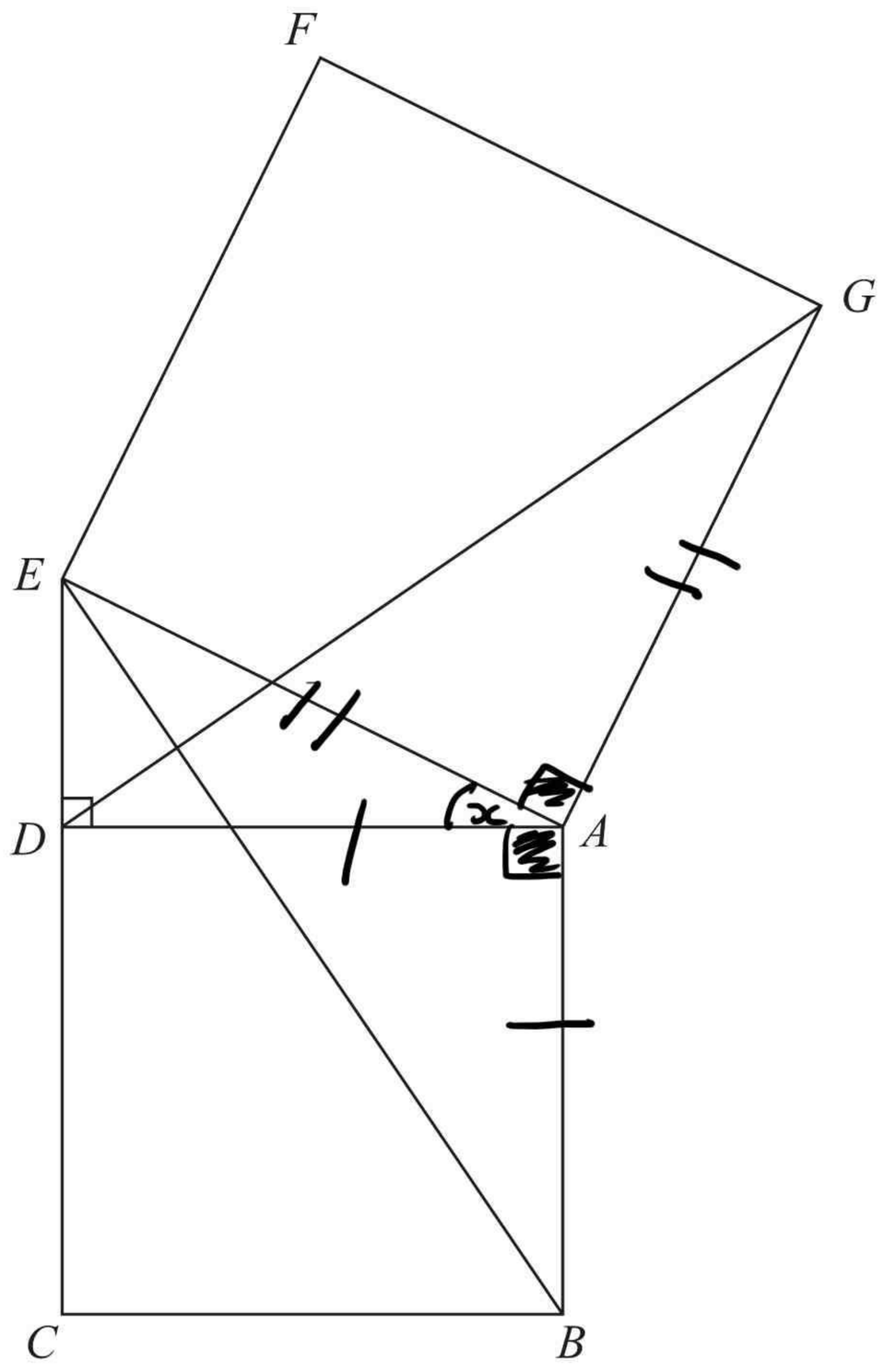


Diagram **NOT** accurately drawn

In the diagram,

ADE is a right-angled triangle,
ABCD and *AEFG* are squares.

Prove that triangle *ABE* is congruent to triangle *ADG*.

AB = AD sides of same square

AE = AG sides of same square

∠BAE = ∠DAG Both (90° + x)
↑
square

SAS ∴ triangles are congruent
(side, angle, side)

(Total for Question 24 is 3 marks)

25.

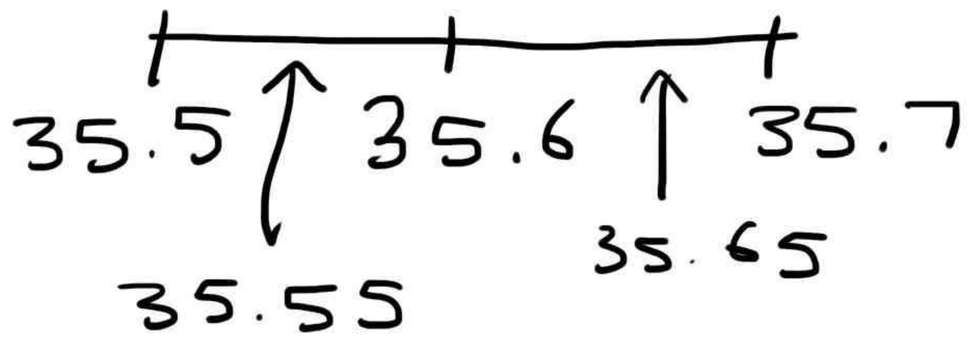
Sasha drops a ball from a height of d metres onto the ground.

The time, t seconds, that the ball takes to reach the ground is given by

$$t = \sqrt{\frac{2d}{g}}$$

where g m/s^2 is the acceleration due to gravity.

$d = 35.6$ correct to 3 significant figures.
$g = 9.8$ correct to 2 significant figures.

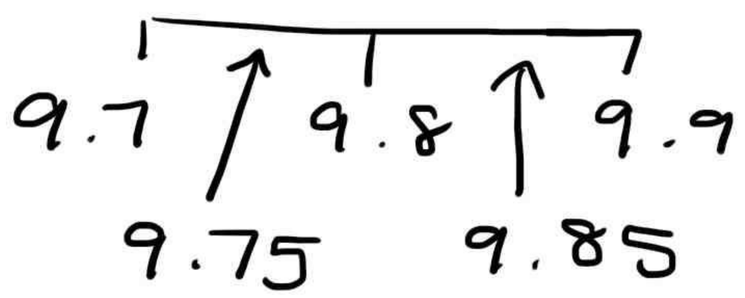


(a) Write down the lower bound of d.

35.55

(1)

(b) Calculate the lower bound of t.
You must show all your working.



Lower $t = \sqrt{\frac{2(\text{Lower } d)}{(\text{upper } g)}}$

$= \sqrt{\frac{2(35.55)}{9.85}}$

2.7 (2sf)

(3)

(Total for Question 25 is 4 marks)