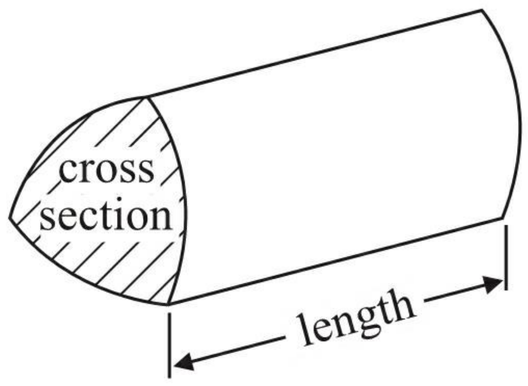
GCSE Mathematics 1MA0

Formulae: Higher Tier

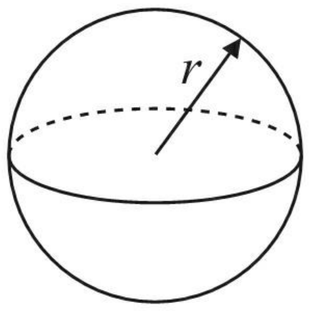
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

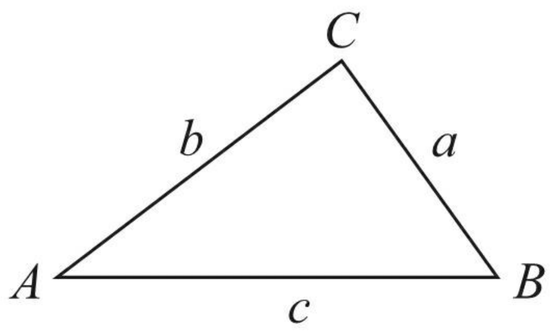


Volume of sphere = $\frac{4}{3}\pi r^3$

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



In any triangle ABC

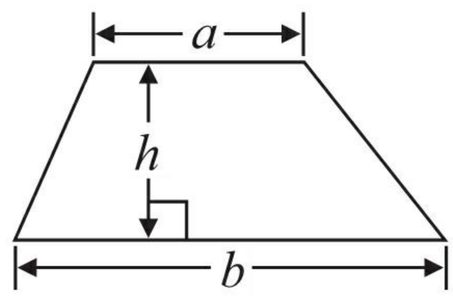


Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

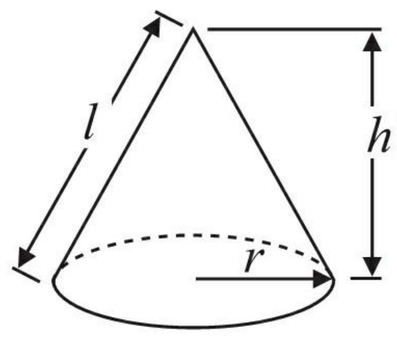
Area of triangle = $\frac{1}{2}ab\sin C$

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



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

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



The Quadratic Equation

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

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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Here is a cuboid.

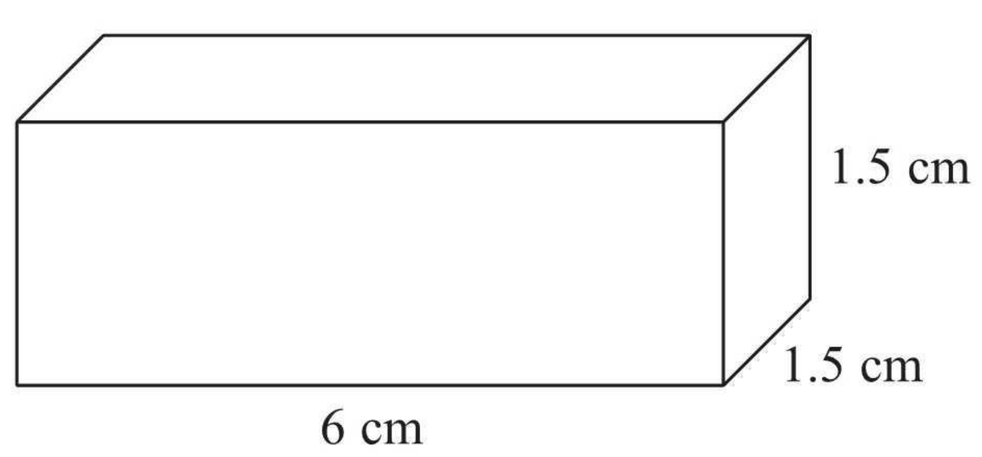


Diagram **NOT** accurately drawn

The cuboid is 6 cm by 1.5 cm by 1.5 cm.

Work out the total surface area of the cuboid.

$1.5 \times 6 = 9$

$1.5 \times 1.5 = 2.25$

$(9 \times 4) + (2.25 \times 2)$

40.5 ..... cm^2

(Total for Question 1 is 3 marks)

***2** Here is a list of ingredients for making 18 mince pies.

Ingredients for 18 mince pies
225 g of butter
350 g of flour
100 g of sugar
280 g of mincemeat
1 egg

x 2.5

Elaine wants to make 45 mince pies.

Elaine has

1 kg of butter
1 kg of flour
500 g of sugar
600 g of mincemeat
6 eggs

Does Elaine have enough of each ingredient to make 45 mince pies?
You must show clearly how you got your answer.

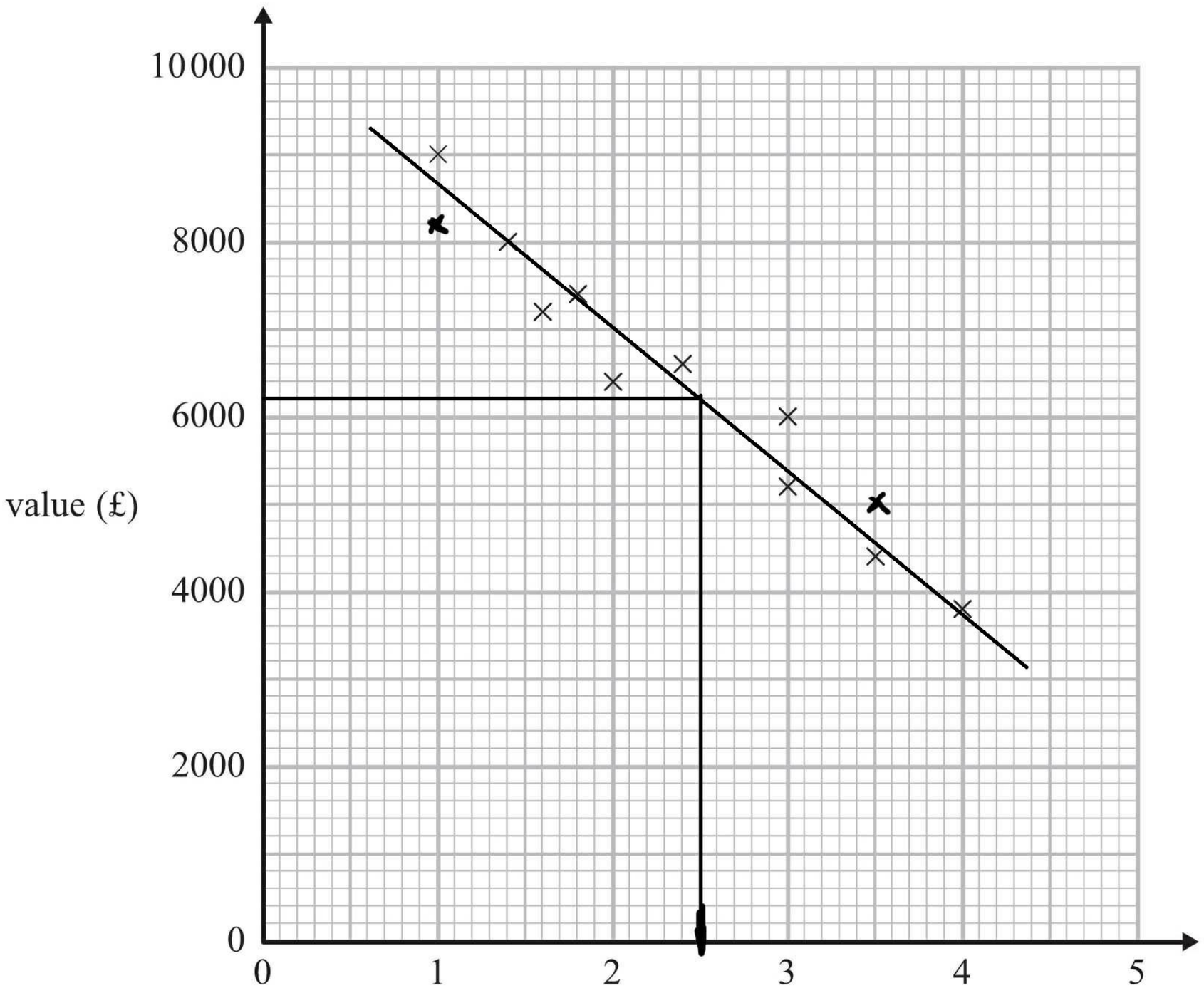
Butter 225 x 2.5 = 562.5g ✓
Flour 350 x 2.5 = 875g ✓
Sugar 100 x 2.5 = 250g ✓
Mincemeat 280 x 2.5 = 700g x
Eggs 1 x 2.5 = 2.5 eggs ✓

Elaine doesn't have enough mincemeat to make 45 mince pies.

(Total for Question 2 is 4 marks)

3 The scatter graph shows some information about 10 cars, of the same type and make.

The graph shows the age (years) and the value (£) of each car.



The table shows the age and the value of two other cars of the same type and make.

age (years)	1	3.5
value (£)	8200	5000

(a) On the scatter graph, plot the information from the table.

(1)

(b) Describe the relationship between the age and the value of the cars.

as age increases, the cars value decreases

(1)

A car of the same type and make is $2\frac{1}{2}$ years old.

(c) Estimate the value of the car.

£ 6200

(2)

(Total for Question 3 is 4 marks)

4 Rhiana plays a game.

The probability that she will lose the game is 0.32
The probability that she will draw the game is 0.05

Rhiana is going to play the game 200 times.

Work out an estimate for the number of times Rhiana will win the game.

$1 - 0.37 = 0.63$

$0.63 \times 200 = 126$

126

(Total for Question 4 is 3 marks)

5 Mason is doing a survey to find out how many magazines people buy.

He uses this question on his questionnaire.

How many magazines do you buy?

☐ 0 to 4 ☐ 4 to 8 ☐ 8 to 12

(a) Write down **two** things wrong with this question.

1 there is no true scale

2 there is overlap: 4 and 8 are included in two boxes

(2)

(b) Write a better question for Mason to use on his questionnaire to find out how many magazines people buy.

How many magazines do you buy a month?

☐ 0 ☐ 1-3 ☐ 4-6 ☐ 7 or more

(2)

Mason asks his friends at school to do his questionnaire.
This may **not** be a good sample to use.

(c) Give **one** reason why.

they are likely to all be the same age

(1)

(Total for Question 5 is 5 marks)

6 Tame Valley is a company that makes yoghurt.

A machine fills trays of 20 pots with yoghurt.
In one hour, the machine fills a total of 15 000 pots.

Work out how many seconds the machine takes to fill each tray of 20 pots.

1 hour = 3600 seconds

15 000 pots = 750 trays

$\frac{3600}{750} = 4.8$

4.8 ..... seconds

(Total for Question 6 is 4 marks)

7 Colin, Dave and Emma share some money.

Colin gets $\frac{3}{10}$ of the money.

Emma and Dave share the rest of the money in the ratio 3 : 2

What is Dave's share of the money?

100%

30%

5 parts

70% left

$\frac{70}{5} = 14$

each part is 14%

$14 \times 2 = 28\%$

28%

(Total for Question 7 is 4 marks)

8 The diagram shows the plan of a playground.

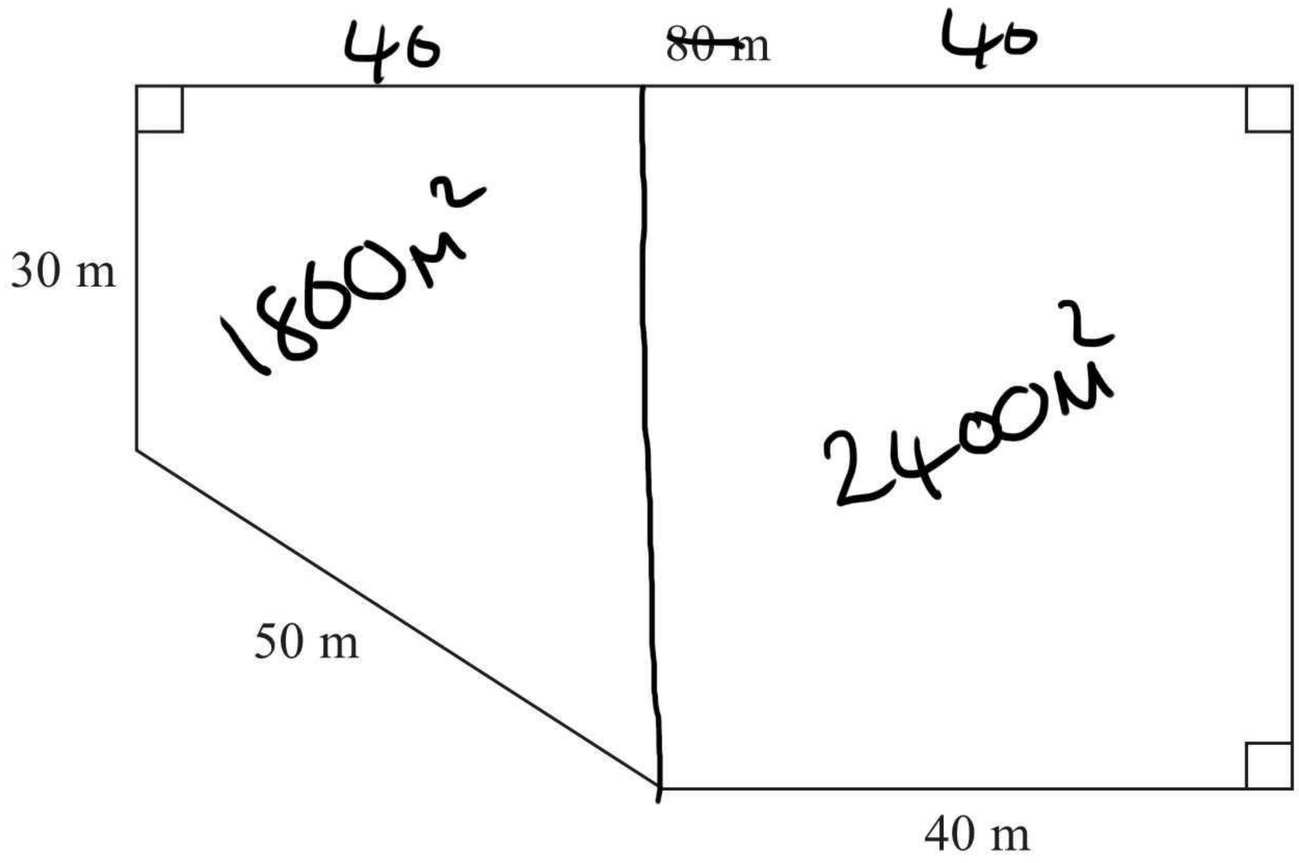


Diagram **NOT** accurately drawn

Bill is going to cover the playground with tarmac.
It costs £2.56 to cover each square metre with tarmac.

Work out the total cost of the tarmac Bill needs.

Total area = 4200m²

4200 x £2.56

£ 10752

(Total for Question 8 is 4 marks)

9

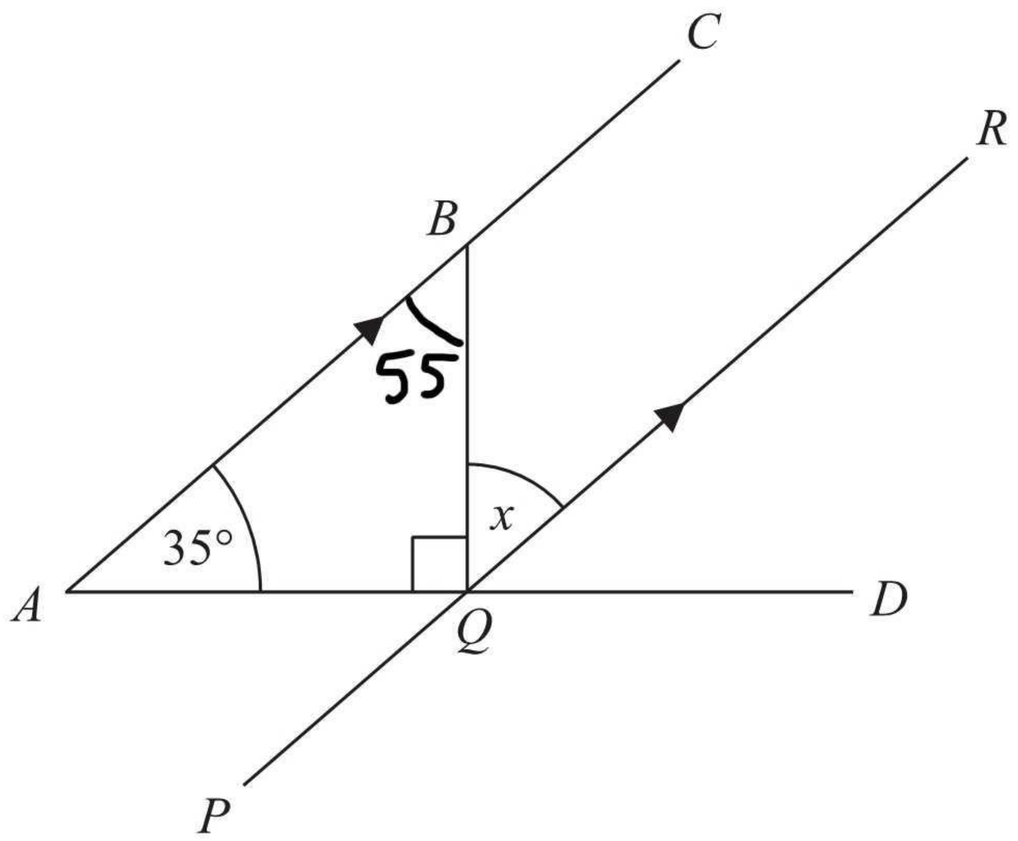


Diagram **NOT** accurately drawn

ABC, *PQR* and *AQD* are straight lines.
ABC is parallel to *PQR*.

Angle *BAQ* = 35°
Angle *BQA* = 90°

Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

ABQ = 55° Angles in a triangle add up to 180°

x = 55° Alternate angles are equal

$x =$ 55 °

(Total for Question 9 is 4 marks)

10 The equation

$$x^3 + 2x = 110$$

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.

x	$x^3 + 2x$	Comment
4.5	$(4.5)^3 + 2(4.5)$ $= 100.125$	too small
4.6	106.536	too small
4.7	113.223	too big
4.65	109.844625	too small

$x =$ 4.7

(Total for Question 10 is 4 marks)

11 *XYZ* is a right-angled triangle.

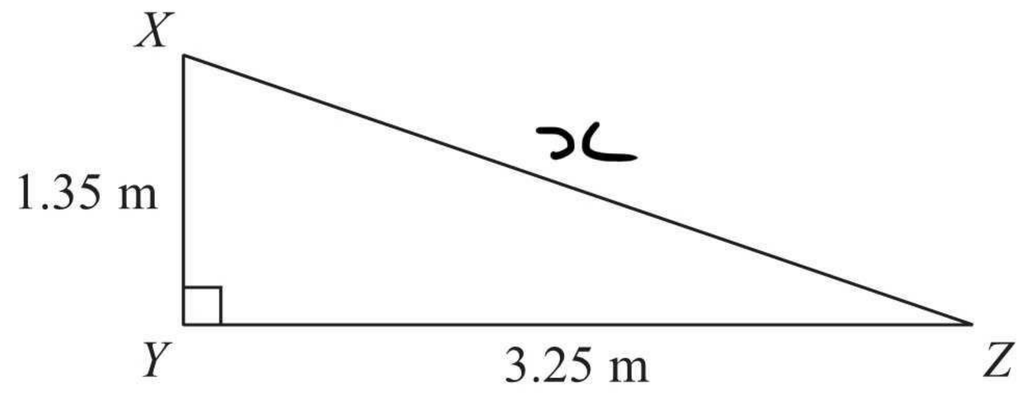


Diagram **NOT** accurately drawn

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

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

$(1.35)^2 + (3.25)^2 = x^2$

$12.385 = x^2$

$3.52 (3sf) = x$

3.52 ..... m

(Total for Question 11 is 3 marks)

12 (a) Solve $3(x - 2) = x + 7$

$3x - 6 = x + 7$

$2x - 6 = 7$

$2x = 13$

$x = 6.5$

$x =$ 6.5

(3)

(b) Solve $\frac{2 - y}{5} = 1$

$2 - y = 5$

$2 = 5 + y$

$-3 = y$

$y =$ -3

(2)

(Total for Question 12 is 5 marks)

***14** Viv wants to invest £2000 for 2 years in the same bank.

The International Bank	**The Friendly Bank**
Compound Interest	Compound Interest
4% for the first year 1% for each extra year	5% for the first year 0.5% for each extra year

At the end of 2 years, Viv wants to have as much money as possible.

Which bank should she invest her £2000 in?

The International Bank

2000 × 1.04

= 2080

2080 × 1.01

= £2100.80

The Friendly Bank

2000 × 1.05

= 2100

2100 × 1.005

= £2110.50

She should invest her money in The Friendly Bank.

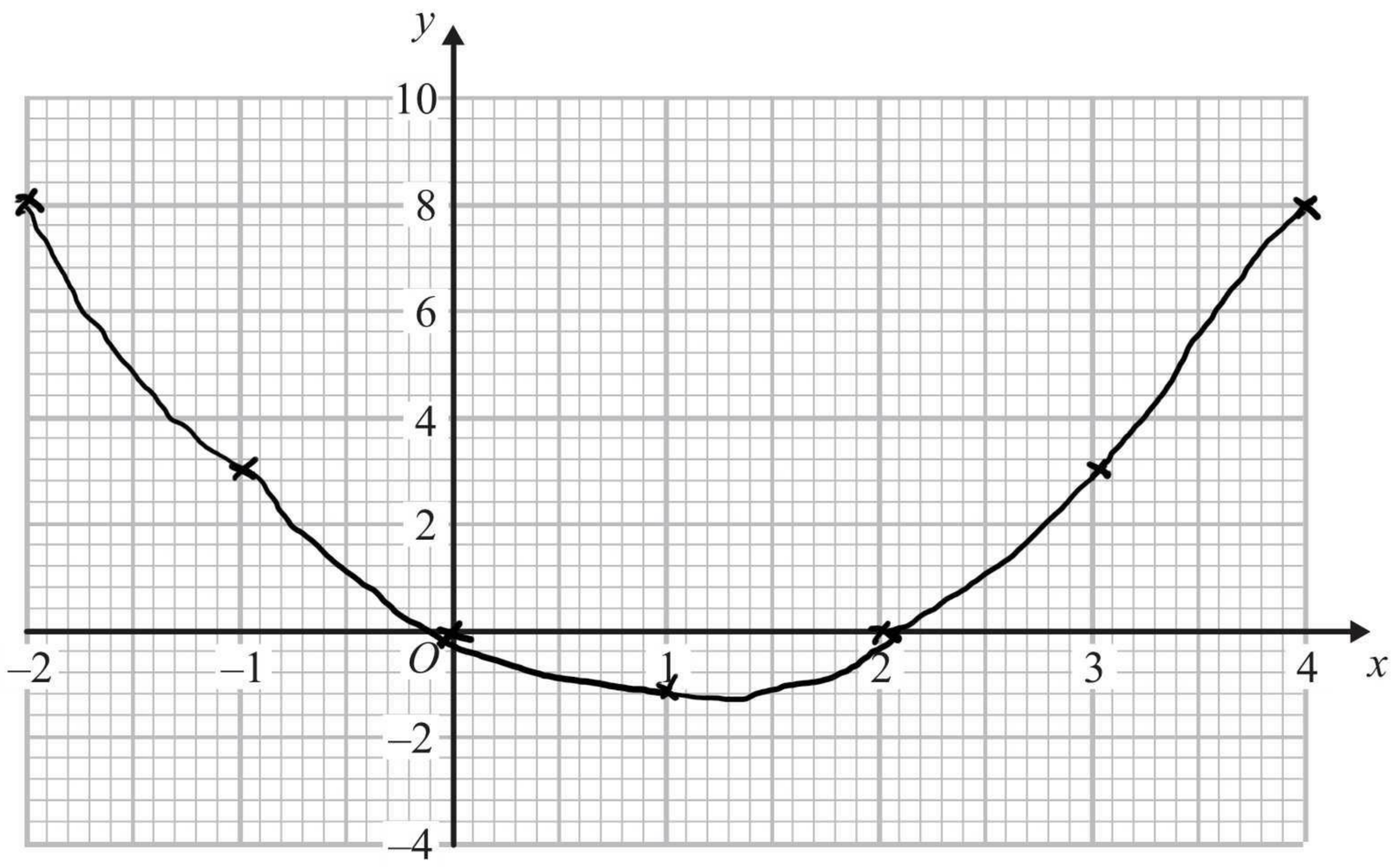
(Total for Question 14 is 4 marks)

15 (a) Complete the table of values for $y = x^2 - 2x$

x	–2	–1	0	1	2	3	4
y	8	3	0	-1	0	3	8

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from –2 to 4



(2)

(c) Solve $x^2 - 2x - 2 = 1$

$x^2 - 2x - 3 = 0$

$(x - 3)(x + 1) = 0$

$x = 3$ $x = -1$

$x = 3$ or $x = -1$

(2)

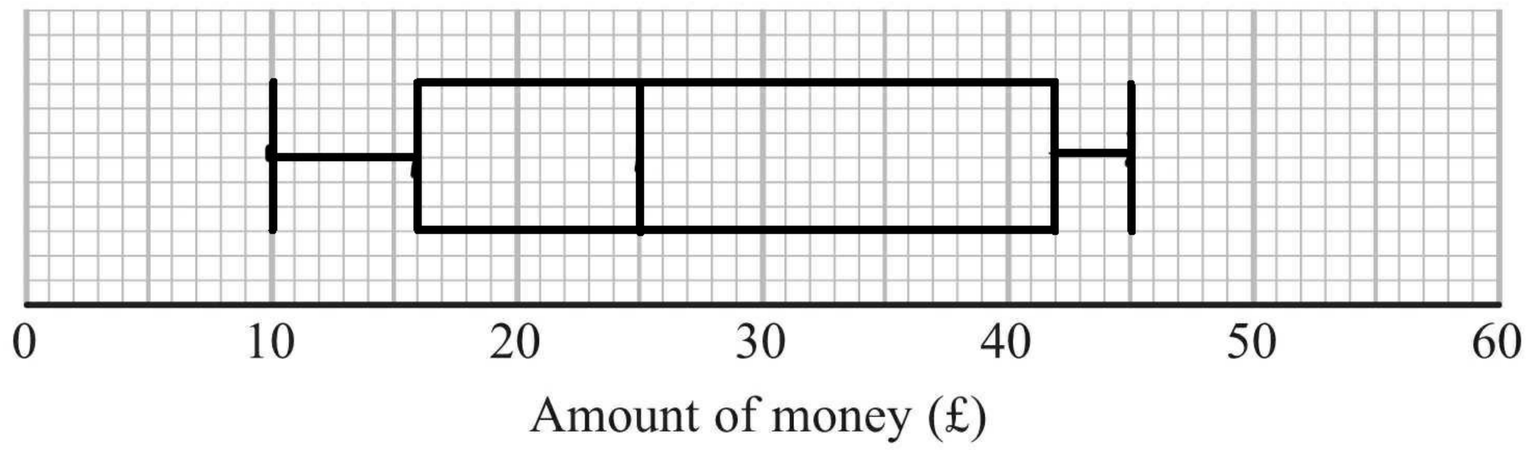
(Total for Question 15 is 6 marks)

17 Some girls did a sponsored swim to raise money for charity.

The table shows information about the amounts of money (£) the girls raised.

Least amount of money (£)	10
Greatest amount of money (£)	45
Median	25
Lower quartile	16
Upper quartile	42

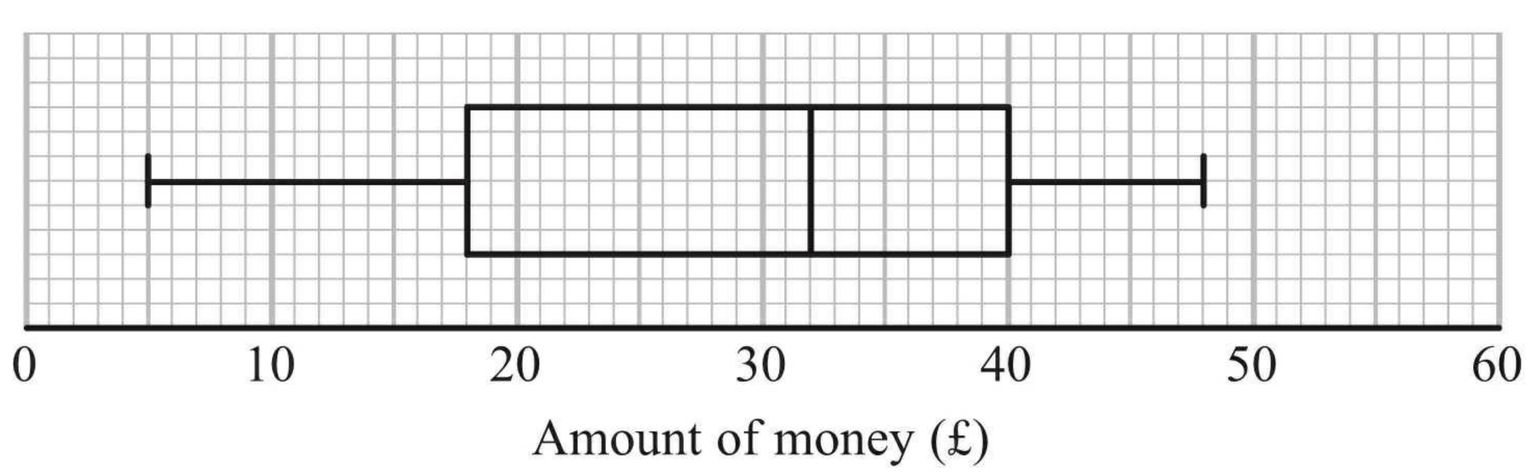
(a) On the grid, draw a box plot for the information in the table.



(2)

Some boys also did the sponsored swim.

The box plot shows information about the amounts of money (£) the boys raised.



(b) Compare the amounts of money the girls raised with the amounts of money the boys raised.

The median amount raised by the boys was higher

The interquartile range of the girls was bigger

(2)

(Total for Question 17 is 4 marks)

***20** The diagram shows a ladder leaning against a vertical wall.

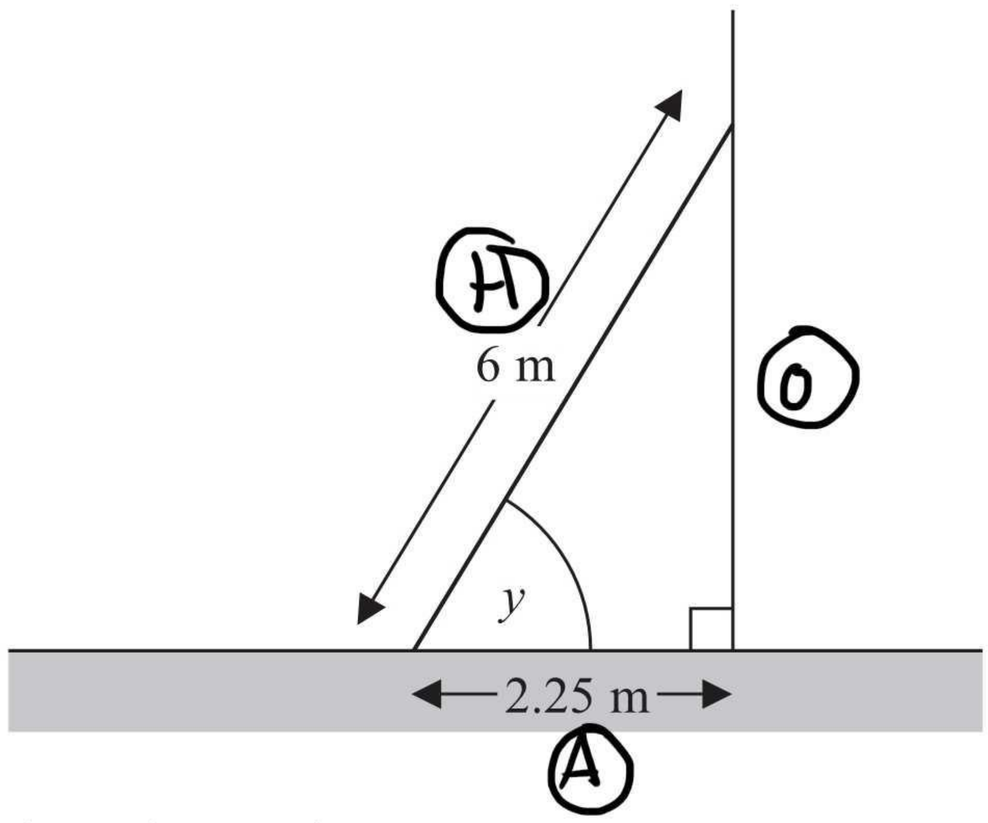


Diagram **NOT** accurately drawn

The ladder stands on horizontal ground.

The length of the ladder is 6 m.
The bottom of the ladder is 2.25 m from the bottom of the wall.

A ladder is safe to use when the angle marked y is about 75°.

Is the ladder safe to use?
You must show all your working.

$$\cos(y) = \frac{2.25}{6}$$

$$y = \cos^{-1}\left(\frac{2.25}{6}\right)$$

$$y = 67.98^{\circ} \text{ (2dp)}$$

The angle is not 'about' 75°, so the ladder is not safe.

(Total for Question 20 is 3 marks)