

FOUNDATION QUESTIONS FOR PAPERS 2 AND 3

Number

1. Here are four fractions.

$$\frac{1}{2} \quad \frac{17}{24} \quad \frac{3}{4} \quad \frac{5}{12}$$

Write these fractions in order of size.
Start with the smallest fraction.

2. (a) Work out $\frac{4}{5}$ of 210 cm.

(b) Work out $(6 - 2.5)^2 + \sqrt{9.34 - 2.58}$

3. Lethna worked out $\frac{2}{5} + \frac{1}{2}$

She wrote

$$\frac{2}{5} + \frac{1}{2} = \frac{2}{10} + \frac{1}{10} = \frac{3}{10}$$

The answer of $\frac{3}{10}$ is wrong.

(a) Describe one mistake that Lethna made.

Dave worked out $1\frac{1}{2} \times 5\frac{1}{3}$

He wrote:

$$1 \times 5 = 5 \quad \text{and} \quad \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$
$$\text{So} \quad 1\frac{1}{2} \times 5\frac{1}{3} = 5\frac{1}{6}$$

The answer of $5\frac{1}{6}$ is wrong.

(b) Describe one mistake that Dave made.

4. Toby invested £7500 for 2 years in a savings account.

He was paid 4% per annum compound interest.

How much money did Toby have in his savings account at the end of 2 years?

5. Here are two numbers.

$$29 \quad 37$$

Nadia says both of these numbers can be written as the **sum** of two square numbers.

Is Nadia correct?

You must show how you get your answer.

6. The length, L cm, of a line is measured as 13 cm correct to the nearest centimetre.

Complete the following statement to show the range of possible values of L .

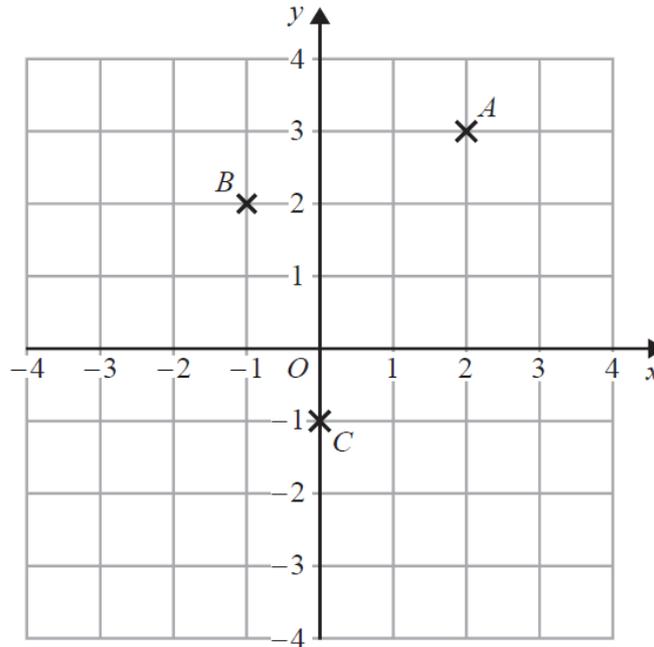
$$\dots \leq L < \dots$$

8. Abi invests £500 for 4 years in a bank account.
 The account pays simple interest at a rate of 2.3% per year.
 Work out the total amount of interest Abi has got at the end of 4 years.

9. Jim rounds a number, x , to one decimal place.
 The result is 7.2. Write down the error interval for x .

Algebra

1.



- (a) Write down the coordinates of point C .
 $ABCD$ is a square.
 (b) On the grid, mark with a cross (X) the point D so that $ABCD$ is a square.
 (c) Write down the coordinates of the midpoint of the line segment BC .

2. Make t the subject of the formula $w = 3t + 11$

3. Becky has some marbles.

Chris has two times as many marbles as Becky. Dan has seven more marbles than Chris.
 They have a total of 57 marbles.

Dan says,

“If I give some marbles to Becky, each of us will have the same number of marbles.”

Is Dan correct? You must show how you get your answer.

4. Boxes of chocolates cost £3.69 each.

A shop has an offer.

Ali has £50

He is going to get as many boxes of chocolates as possible.

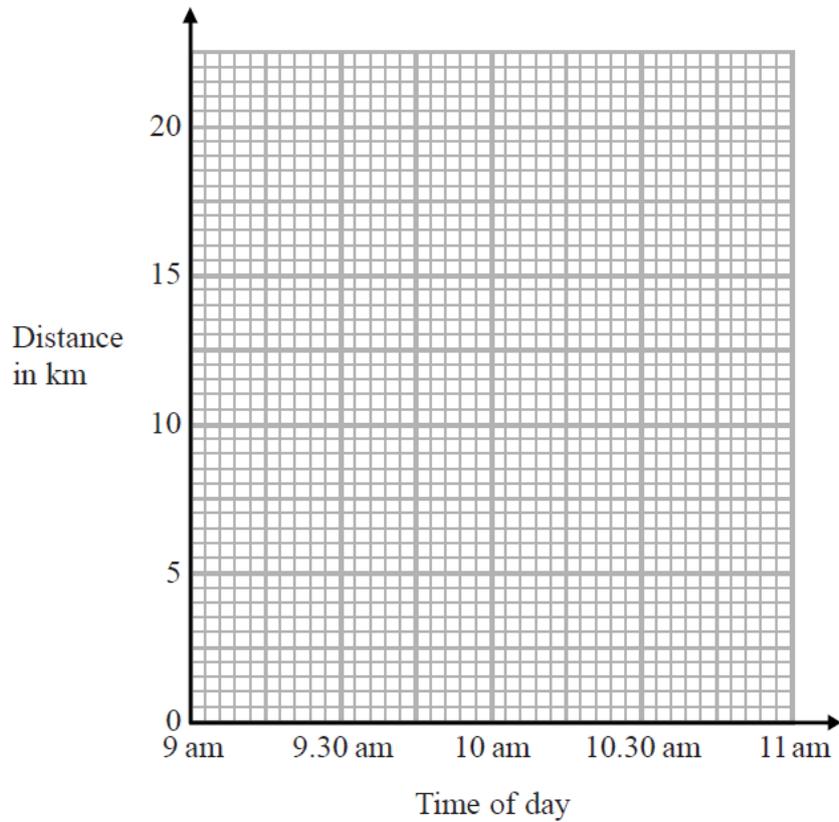
How many boxes of chocolates can Ali get?

Boxes of chocolates

3 for the price of 2

5. Factorise $x^2 + 3x - 4$

6. At 9 am, Bradley began a journey on his bicycle.
 From 9 am to 9.36 am, he cycled at an average speed of 15 km/h.
 From 9.36 am to 10.45 am, he cycled a further 8 km.
 (a) Draw a travel graph to show Bradley's journey.



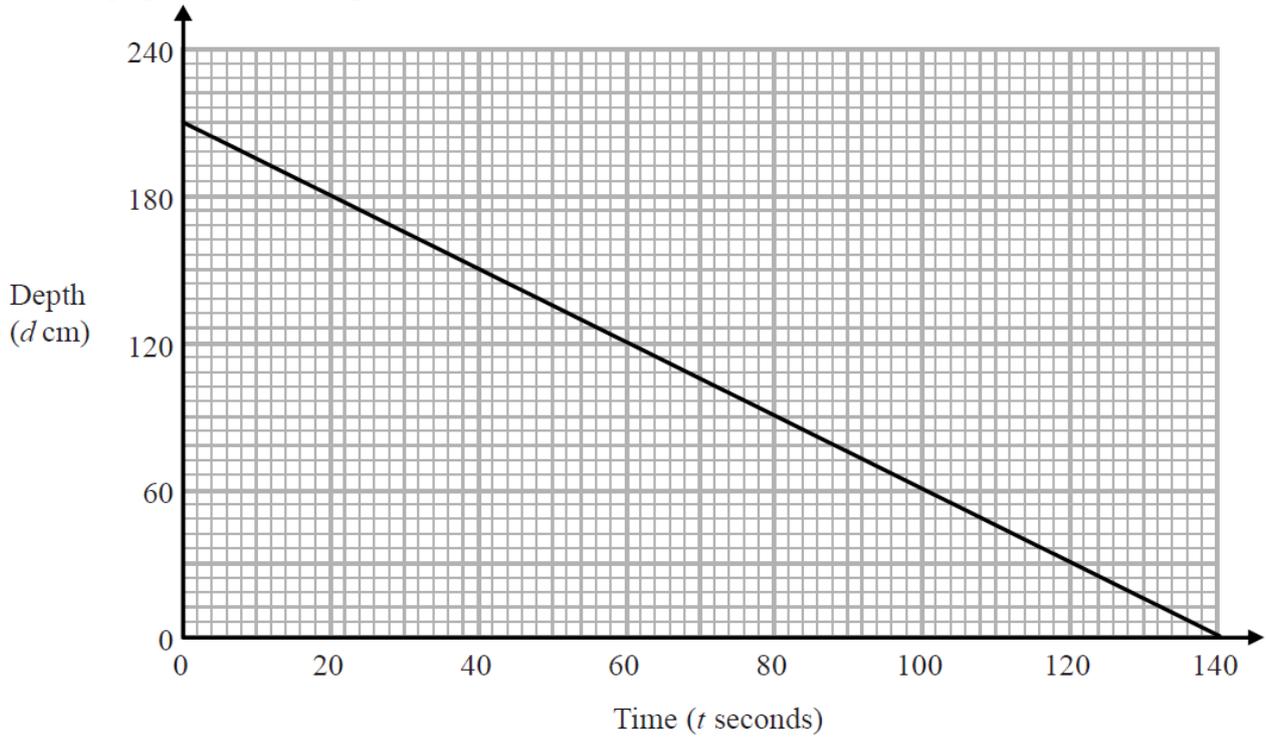
- From 10.45 am to 11 am, Bradley cycled at an average speed of 18 km/h.
 (b) Work out the distance Bradley cycled from 10.45 am to 11 am.

7. Complete this table of values.

n	$3n + 2$
12
.....	47

8. (a) Simplify $7x + 2y - 3x + 4y$
 (b) Factorise $10x - 15$
 (c) Solve $5p = 3p + 8$
9. (a) Expand and simplify $3(y - 2) + 5(2y + 1)$
 (b) Simplify $5u^2w^4 \times 7uw^3$

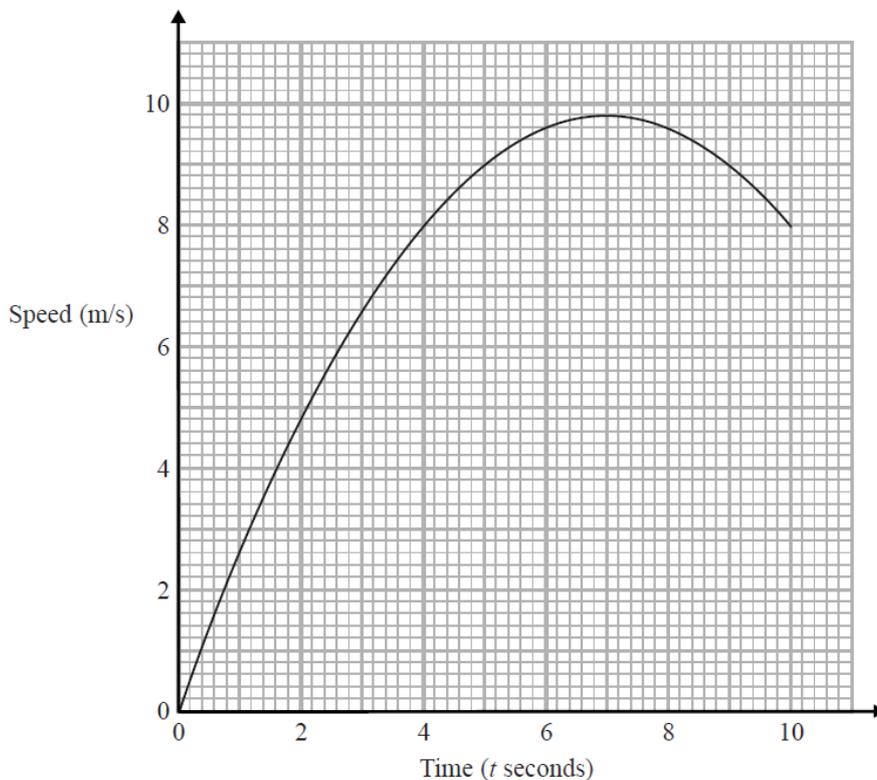
10. The graph shows the depth, d cm, of water in a tank after t seconds.



- (a) Find the gradient of this graph.
- (b) Explain what this gradient represents.

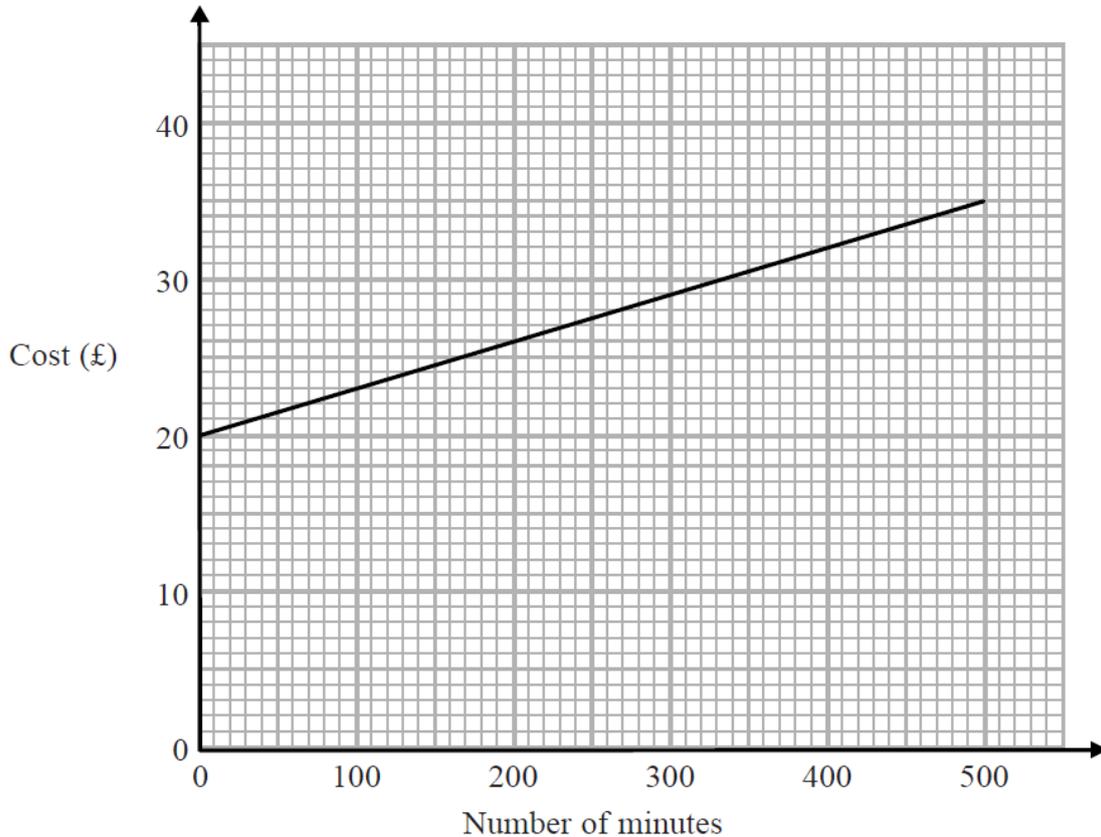
11. Karol ran in a race.

The graph shows her speed, in metres per second, t seconds after the start of the race.



- (a) Write down Karol's speed 3 seconds after the start of the race.
 - (b) Write down Karol's greatest speed.
- There were two times when Karol's speed was 9 m/s.
- (c) Write down these two times.

12. The graph shows the cost of using a mobile phone for one month for different numbers of minutes of calls made.



- (a) Interpret the y-intercept.
 (b) Find the gradient and interpret it.

13. Make t the subject of the formula $y = \frac{t}{3} - 2a$

14. Solve the simultaneous equations
 $2x - 4y = 19$
 $3x + 5y = 1$

Ratio and Proportion

1. The length of a car is 3.6 metres.
 Karl makes a scale model of the car.
 He uses a scale of 1 cm to 30 cm.
 Work out the length of the scale model of the car.
 Give your answer in centimetres.

2. Here is a list of ingredients for making 16 mince pies.

Ingredients for 16 mince pies
240 g of butter
350 g of flour
100 g of sugar
280 g of mincemeat

Elaine wants to make 72 mince pies.
 How much of each ingredient will Elaine need?

3. Martin has 8 pints of soup in a pan.
He also has 24 soup bowls. He puts 0.3 pints of soup into each bowl.
How much soup has Martin left over?

4. Three companies sell the same type of furniture.
The price of the furniture from Pooles of London is £1480
The price of the furniture from Jardins of Paris is €1980
The price of the furniture from Outways of New York is \$2250
The exchange rates are

$$£1 = €1.34$$

$$£1 = \$1.52$$

Which company sells this furniture at the lowest price?
You must show how you get your answer.

5. There are 5 grams of fibre in every 100 grams of bread.
A loaf of bread has a weight of 400 g.
There are 10 slices of bread in a loaf.
Each slice of bread has the same weight.
Work out the weight of fibre in one slice of bread.

6. In a breakfast cereal, 40% of the weight is fruit.
The rest of the cereal is oats.
(a) Write down the ratio of the weight of fruit to the weight of oats.
Give your answer in the form $1 : n$.
A different breakfast cereal is made using only fruit and bran.
The ratio of the weight of fruit to the weight of bran is $1 : 3$
(b) What fraction of the weight of this cereal is bran?

7. The densities of two different liquids A and B are in the ratio $19 : 22$
The mass of 1 cm^3 of liquid B is 1.1 g.
 5 cm^3 of liquid A is mixed with 15 cm^3 of liquid B to make 20 cm^3 of liquid C.
Work out the density of liquid C.

8.

Living to 100 years old

1 in 3 babies born last year
are expected to live
to 100 years old

720 000 babies were born last year.
How many of these babies are expected to live to 100 years old?

9. A sprinter runs a distance of 200 metres in 25 seconds.
Work out the average speed of the sprinter.

10. There are 64 cards in a pack. Each card is either red or black.
The ratio of the number of red cards to the number of black cards is $1 : 1$
8 red cards are removed from the pack.
Find the ratio of the number of red cards now in the pack to the number of black cards
now in the pack. Give your answer in its simplest form.

11. Here is a list of ingredients for making chocolate mousse for 2 people.

<p style="text-align: center;">Chocolate mousse for 2 people</p> <p>40 grams sugar 110 grams dark chocolate 2 eggs $\frac{1}{4}$ teaspoon lemon juice</p>

Ellie has 250 grams of sugar and 550 grams of dark chocolate.
She assumes that she has plenty of lemon juice and plenty of eggs.

(a) What is the greatest number of people Ellie can make chocolate mousse for?
You must justify your answer.

Ellie only has 6 eggs.

(b) What effect would this have on the greatest number of people Ellie can make chocolate mousse for?

12. Water flows through a pipe at a rate of 20 gallons per minute.

1 gallon = 4.55 litres.

Change 20 gallons per minute to litres per second.

Give your answer correct to 3 significant figures.

13. On a farm

the number of cows and the number of sheep are in the ratio 6 : 5

the number of sheep and the number of pigs are in the ratio 2 : 1

The total number of cows, sheep and pigs on the farm is 189.

How many sheep are there on the farm?

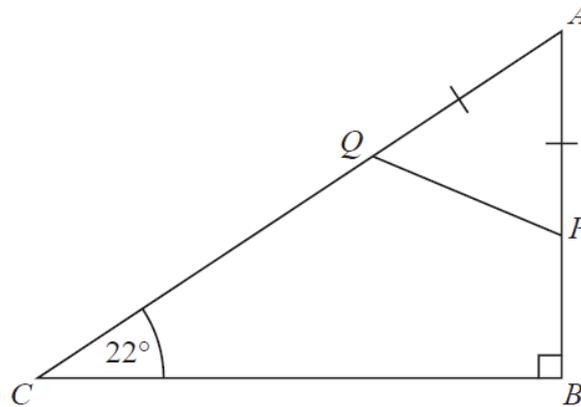
14. The ratio of the number of boys to the number of girls in a school is 4 : 5

There are 95 girls in the school.

Work out the total number of students in the school.

Shape

1. ABC is a right-angled triangle.

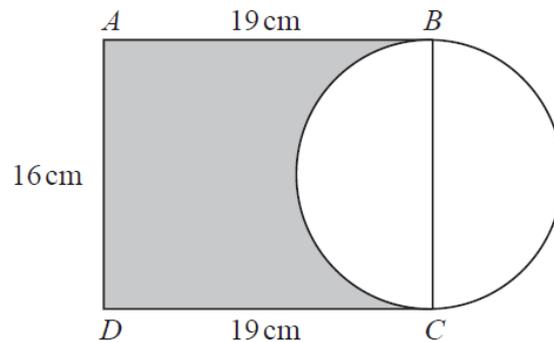


P is a point on AB . Q is a point on AC . $AP = AQ$.

Work out the size of angle AQP .

You must give a reason for each stage of your working.

2. Here is a diagram showing a rectangle, $ABCD$, and a circle.

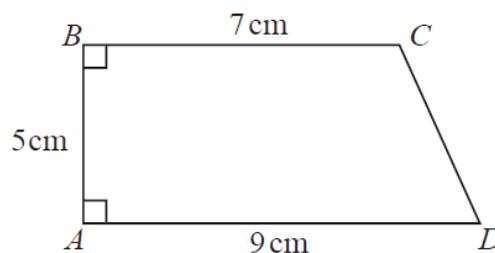


BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.

Give your answer correct to 1 decimal place.

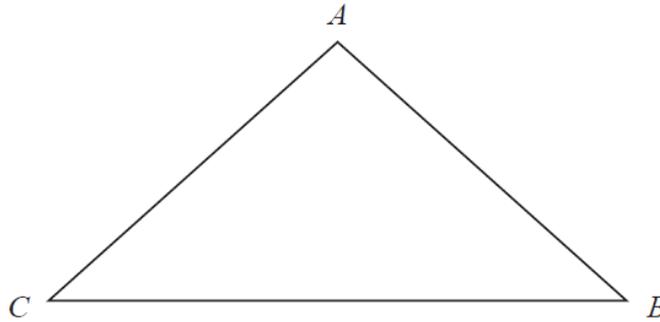
3. $ABCD$ is a trapezium.



A square has the same perimeter as this trapezium.

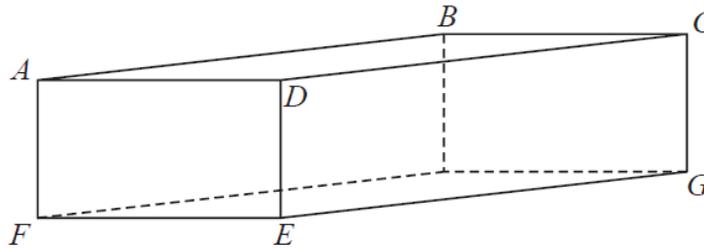
Work out the area of the square. Give your answer correct to 3 significant figures.

4. Here is a triangle ABC .



(a) Mark, with the letter y , the angle CBA .

Here is a cuboid.

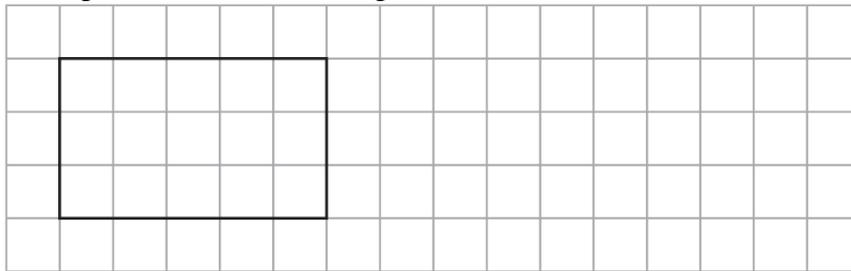


Some of the vertices are labelled.

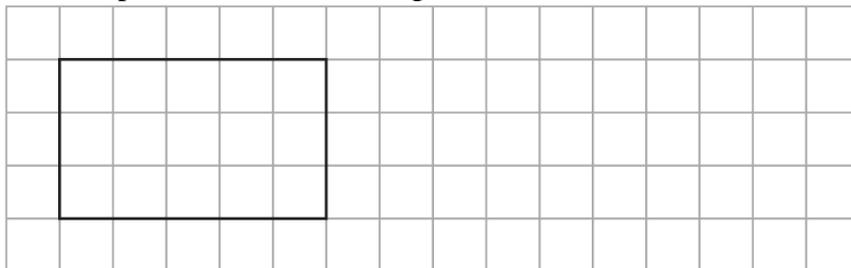
- (b) Shade in the face $CDEG$.
- (c) How many edges has a cuboid?
- (d) How many vertices has a cuboid?

5. Give an example to show that when a piece is cut off a rectangle the perimeter of the new shape

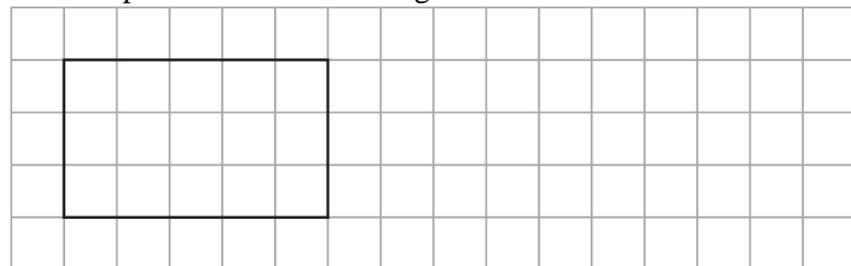
(i) is less than the perimeter of the rectangle,



(ii) is the same as the perimeter of the rectangle,



(iii) is greater than the perimeter of the rectangle.



6. ABC is an isosceles triangle.

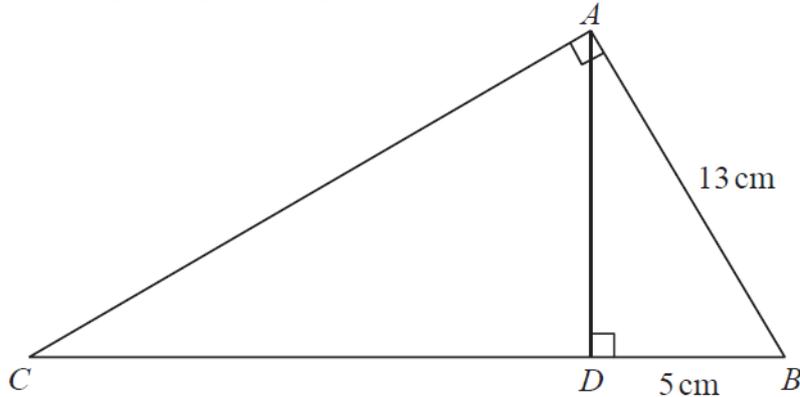
When angle $A = 70^\circ$, there are 3 possible sizes of angle B .

(a) What are they?

When angle $A = 120^\circ$, there is only one possible size of angle B .

(b) Explain why.

7. ABC and ABD are two right-angled triangles.



Angle $BAC = \text{angle } ADB = 90^\circ$

$AB = 13 \text{ cm}$

$DB = 5 \text{ cm}$

Work out the length of CB .

8. The smallest angle of a triangle is 25° .

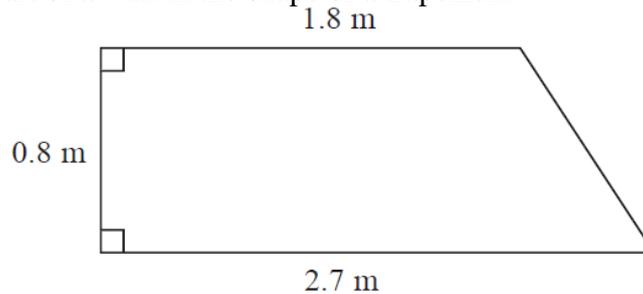
The triangle is enlarged by scale factor 3.

Ben says,

“The smallest angle of the enlarged triangle is 75° because $25 \times 3 = 75$ ”

Is Ben right? Explain your answer.

9. The diagram shows part of a wall in the shape of a trapezium.



Karen is going to cover this part of the wall with tiles.

Each rectangular tile is 15 cm by 7.5 cm.

Tiles are sold in packs.

There are 9 tiles in each pack.

Karen divides the area of the wall by the area of a tile to work out an estimate for the number of tiles she needs to buy.

(a) Use Karen’s method to work out an estimate for the number of packs of tiles she needs to buy.

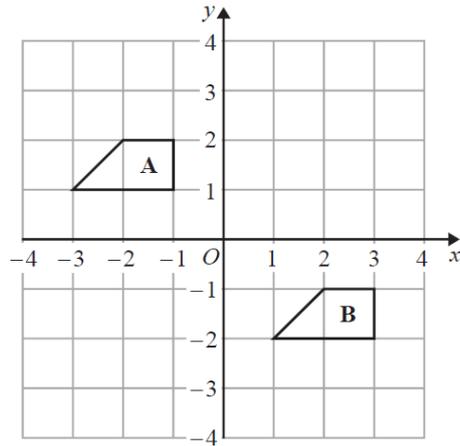
Karen is advised to buy 10% more tiles than she estimated.

Buying 10% more tiles will affect the number of the tiles Karen needs to buy.

She assumes she will need to buy 10% more packs of tiles.

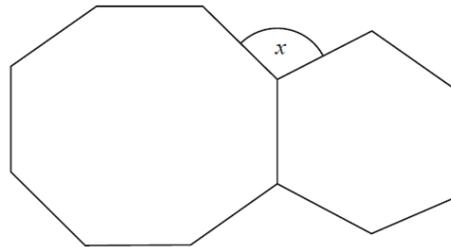
(b) Is Karen’s assumption correct? You must show your working.

10.



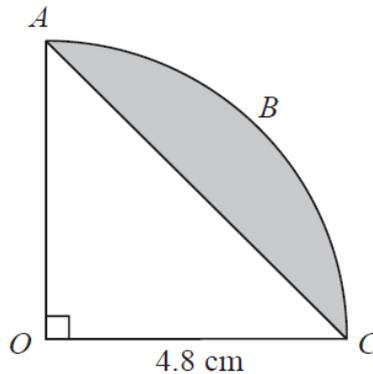
Describe the single transformation that maps shape **A** onto shape **B**.

11.



The diagram shows a regular octagon and a regular hexagon.
Find the size of the angle marked x . You must show all your working.

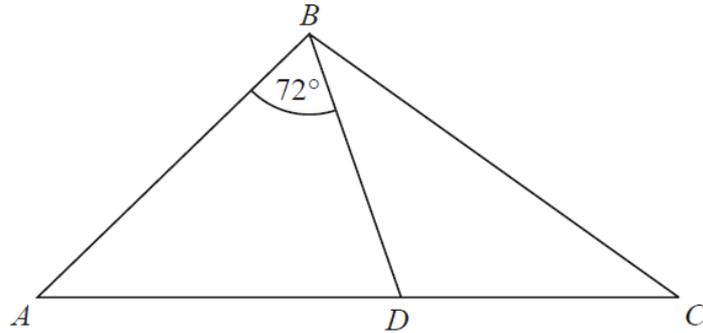
12.



The arc ABC is a quarter of a circle with centre O and radius 4.8 cm.
 AC is a chord of the circle.

Work out the area of the shaded segment.
Give your answer correct to 3 significant figures.

13.



ABC is an isosceles triangle with $BA = BC$.

D lies on AC .

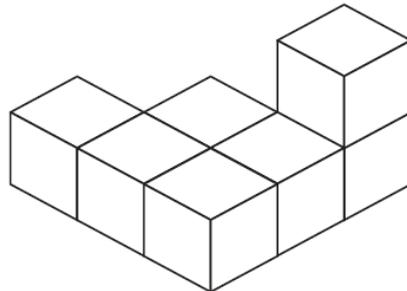
ABD is an isosceles triangle with $AB = AD$.

Angle $ABD = 72^\circ$

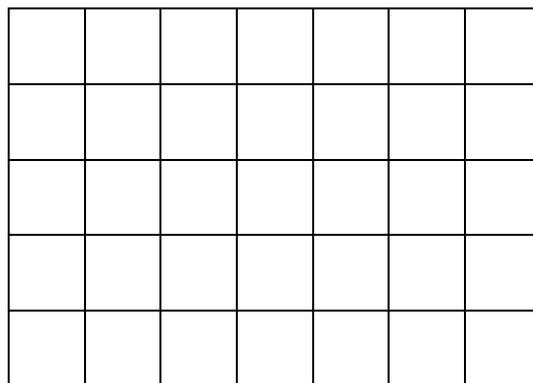
Show that the triangle BCD is isosceles.

You must give a reason for each stage of your working.

14. The diagram represents a solid made from seven centimetre cubes.



On the centimetre grid below, draw a plan of the solid.



Handling Data and Probability

1. Here are the heights, in centimetres, of 15 children.

123	147	135	150	147
129	148	149	125	137
133	138	133	130	151

(a) Show this information in a stem and leaf diagram.

One of the children is chosen at random.

(b) What is the probability that this child has a height greater than 140 cm?

2. $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{multiples of } 2\}$

$A \cap B = \{2, 6\}$

$A \cup B = \{1, 2, 3, 4, 6, 8, 9, 10\}$

Draw a Venn diagram for this information.

3. Finlay plays two tennis matches.

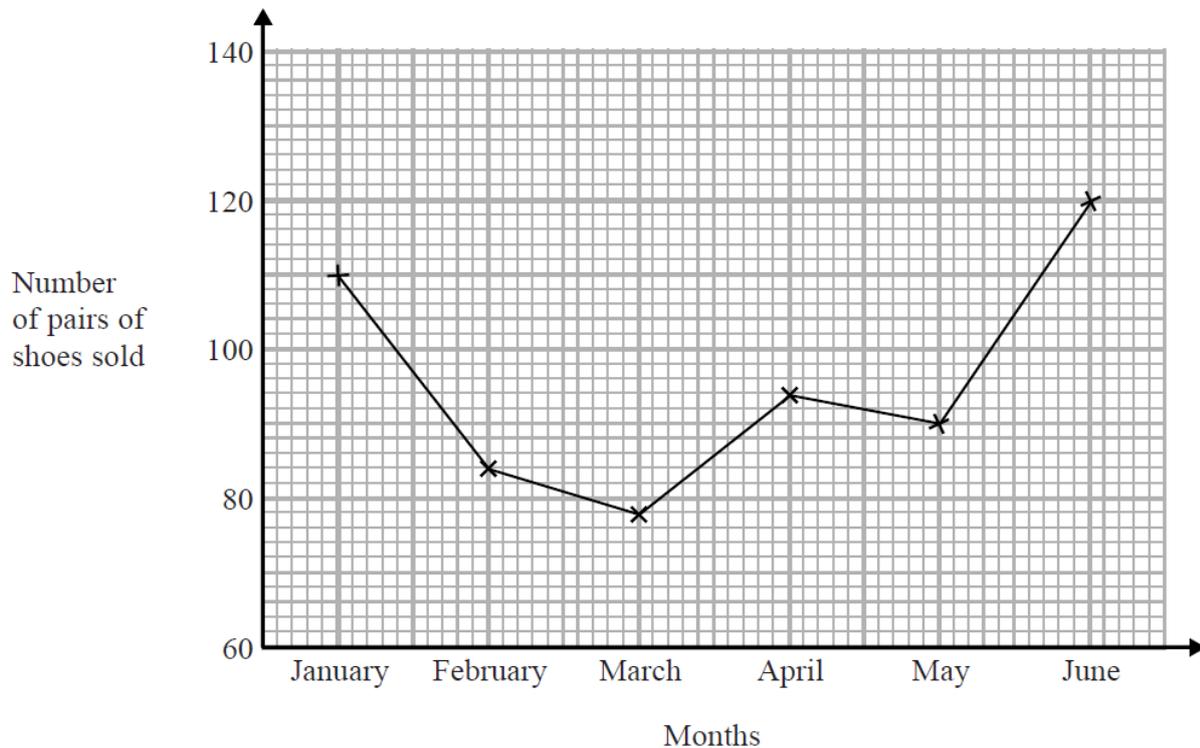
The probability that he will win a match is 0.7. Win and lose are the only options.

The probability of winning a match is constant.

(a) Work out the probability that Finlay wins both matches.

(b) Work out the probability that Finlay loses at least one match.

4. The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014.



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

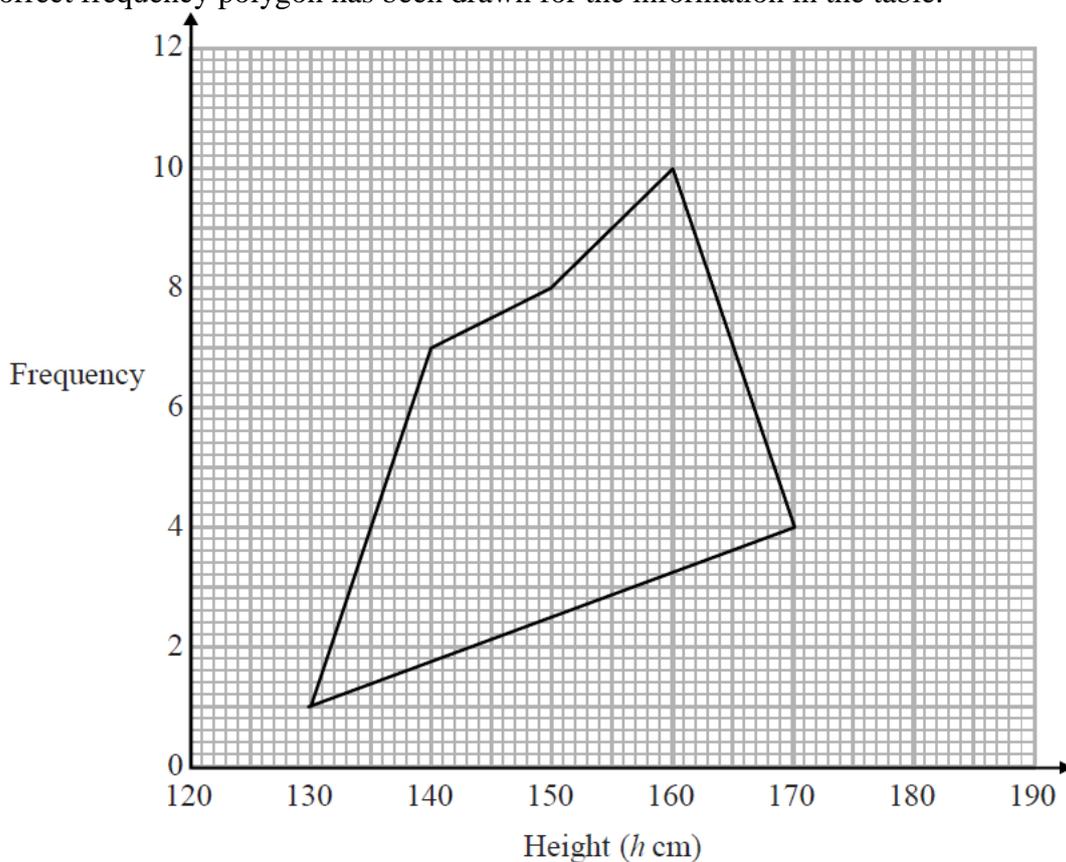
Did the shoe shop meet this sales target? You must show how you get your answer.

5. The grouped frequency table gives information about the heights of 30 students.

Height (h cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4

(a) Write down the modal class interval.

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon.

(c) Estimate the mean height of the students.

6. Jenny works in a shop that sells belts.

The table shows information about the waist sizes of 50 customers who bought belts from the shop in May.

Belt size	Waist (w inches)	Frequency
Small	$28 < w \leq 32$	24
Medium	$32 < w \leq 36$	12
Large	$36 < w \leq 40$	8
Extra Large	$40 < w \leq 44$	6

(a) Calculate an estimate for the mean waist size.

Belts are made in sizes Small, Medium, Large and Extra Large.

Jenny needs to order more belts in June.

The modal size of belts sold is Small.

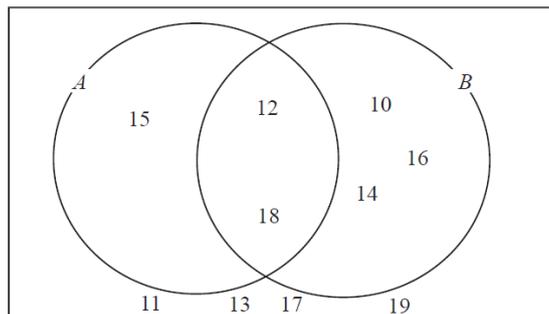
Jenny is going to order $\frac{3}{4}$ of the belts in size Small.

The manager of the shop tells Jenny she should **not** order so many Small belts.

(b) Who is correct, Jenny or the manager?

You must give a reason for your answer.

7. Here is a Venn diagram.



(a) Write down the numbers that are in set

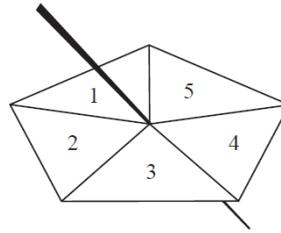
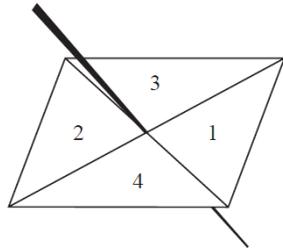
(i) $A \cup B$

(ii) $A \cap B$

One of the numbers in the diagram is chosen at random.

(b) Find the probability that the number is in set A'

8. Here are a 4-sided spinner and a 5-sided spinner.
The spinners are fair.



Jeff is going to spin each spinner once.

Each spinner will land on a number.

Jeff will get his score by adding these two numbers together.

(a) Complete the possibility space diagram for each possible score.

		5-sided spinner				
		1	2	3	4	5
4-sided spinner	1	2	3	4	5	6
	2	3				
	3	4				
	4	5				

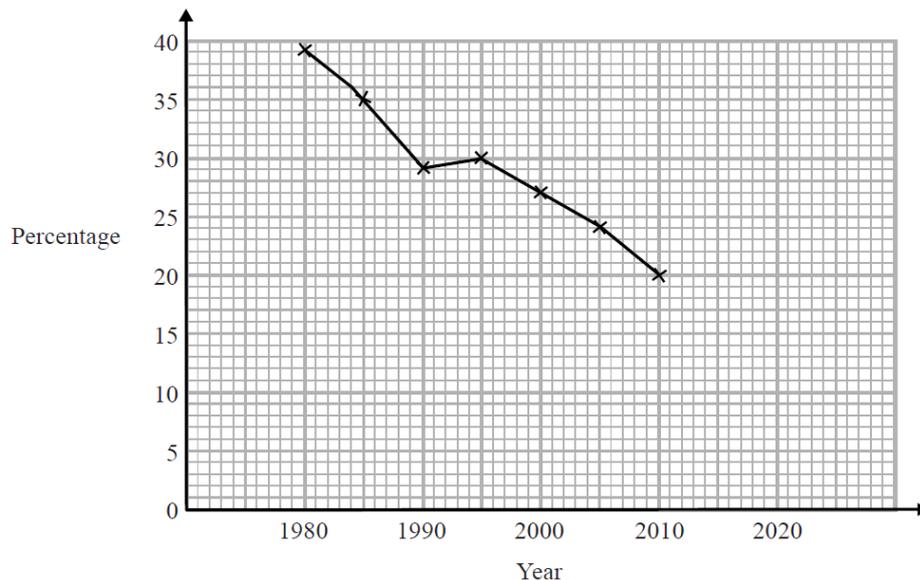
Jeff spins each spinner once.

(b) Find the probability that Jeff gets

(i) a score of 3

(ii) a score of 5 or more.

9. The time series graph shows information about the percentages of the people in a village that used the village shop for the years between 1980 and 2010.



(a) Describe the trend in the percentage of the people in the village who used the shop for this period.

(b) (i) Use the graph to predict the percentage of the people in the village likely to use the shop in the year 2020.

(ii) Is your prediction reliable?

Explain your answer.