

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

# GCSE MATHEMATICS

## Example-Problem Past Paper

# F

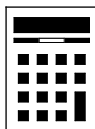
Foundation Tier      Paper 3      Calculator

June 2023

### Materials

For this paper you must have:

- a calculator
- mathematical instruments.



### Instructions

- Engage with the fully-worked solutions in full before attempting the shadow questions.
- Explain the fully-worked solutions to yourself, anticipating the next steps in the worked solutions, making links between the problems and the mathematics used to solve them.
- Apply the methods learnt from the fully-worked solutions to the shadow questions, writing down all workings in the spaces provided. Your thought process is important.
- Do all rough work in this book.

### Information

- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper.
- You should ask your teacher for help on a question if you don't understand a part of the fully-worked solution. Remember to be specific, understanding why the step was completed, rather than simply getting the correct answer.

### Advice

In all calculations, show clearly how you work out your answer.

Where a calculator has been used, show clearly what you entered into the calculator.

Answer **all** questions in the spaces provided.1 (a) Solve  $5x = 15$ 

[1 mark]

$$\begin{array}{r} 5x = 15 \\ \div 5 \quad \div 5 \\ \hline x = 3 \end{array}$$

$$x = 3$$

1 (b) Solve  $y + 7 = 50$ 

[1 mark]

$$\begin{array}{r} y + 7 = 50 \\ - 7 \quad - 7 \\ \hline y = 43 \end{array}$$

$$y = 43$$

1 (c) Solve  $\frac{c}{4} = 8$ 

[1 mark]

$$\begin{array}{r} \frac{c}{4} = 8 \\ \times 4 \quad \times 4 \\ \hline c = 32 \end{array}$$

$$c = 32$$

Answer **all** questions in the spaces provided.

Do not write  
outside the  
box

**1 (a)** Solve  $6y = 42$

[1 mark]

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$$y = \underline{\hspace{4cm}}$$

**1 (b)** Solve  $h + 8 = 35$

[1 mark]

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$$h = \underline{\hspace{4cm}}$$

**1 (c)** Solve  $\frac{a}{7} = 9$

[1 mark]

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$$a = \underline{\hspace{4cm}}$$

Turn over ►

Shadow paper based on June 2023 question paper

8300/3F

2 Here is a list of numbers.

10 8 2 11 12 15 4 4  
2 4 4 8 10 11 12 15

2 (a) Write down the mode.

[1 mark]

most common

Answer 4

2 (b) Work out the median.

[2 marks]

middle number 2 4 4 8 10 11 12 15

$$\frac{8+10}{2} : \frac{18}{2} : 9$$

Answer 9

2 (c) Work out the range. largest - smallest

[1 mark]

$$15 - 2 : 13$$

Answer 13

**2** Here is a list of numbers.

20    18    13    1    13    7    2    5

**2 (a)** Write down the mode.

**[1 mark]**

Answer \_\_\_\_\_

**2 (b)** Work out the median.

**[2 marks]**

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Answer \_\_\_\_\_

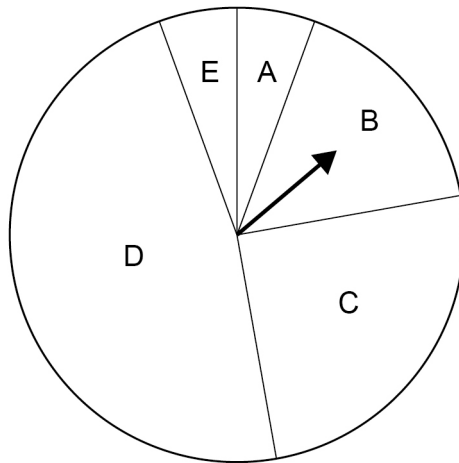
**2 (c)** Work out the range.

**[1 mark]**

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Answer \_\_\_\_\_

- 3 (a) A fair spinner with five sections is spun.



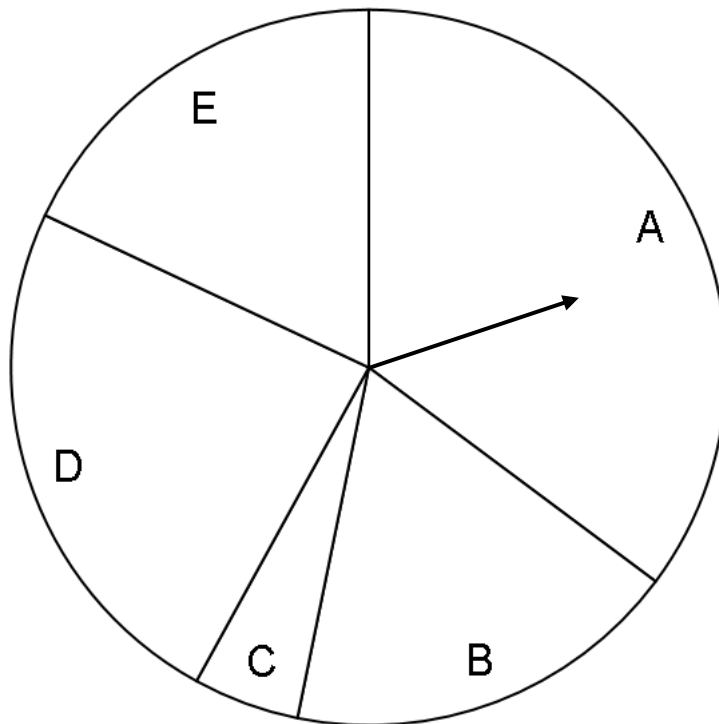
Complete these statements.

[2 marks]

The spinner is **most likely** to land on section D

The spinner is **equally likely** to land on sections A and E

- 3 (a) A fair spinner with five sections is spun.



Complete these statements.

[2 marks]

The spinner is **least likely** to land on section \_\_\_\_\_

The spinner is **equally likely** to land on sections \_\_\_\_\_ and \_\_\_\_\_

**3 (b)** Two different spinners are spun.

One spinner has sections labelled with colours.

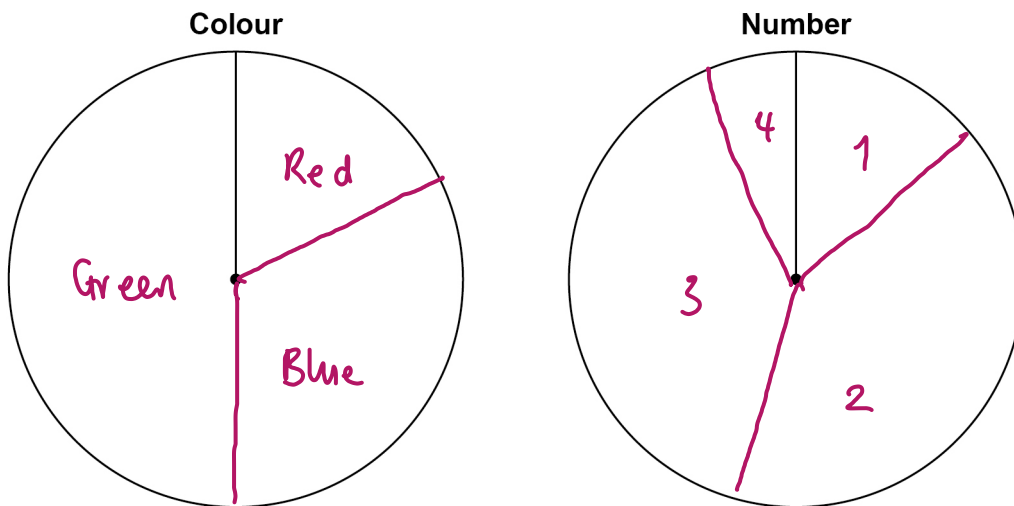
The other spinner has sections labelled with numbers.

Here is a list of **all** the possible outcomes.

Red 1	Red 2	Red 3	Red 4
Blue 1	Blue 2	Blue 3	Blue 4
Green 1	Green 2	Green 3	Green 4

Show the possible sections on the two spinners.

**[2 marks]**





**3 (b)** Two different spinners are spun.

One spinner has sections labelled with colours.

The other spinner has sections labelled with shapes.

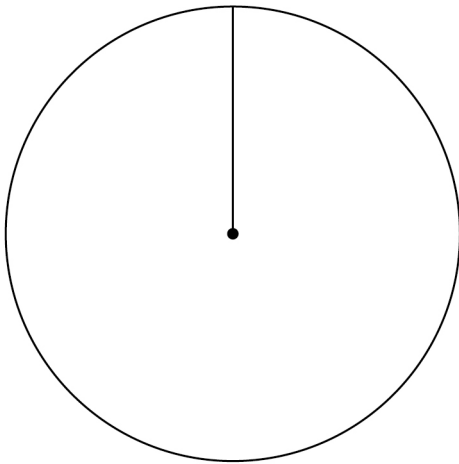
Here is a list of **all** the possible outcomes.

Red Square	Blue Square	Green Square	Yellow Square
Red Circle	Blue Circle	Green Circle	Yellow Circle
Red Triangle	Blue Triangle	Green Triangle	Yellow Triangle

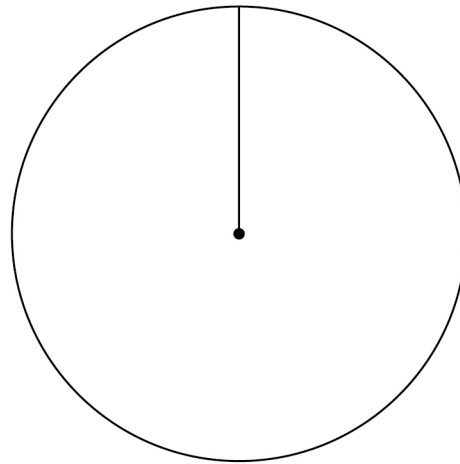
Show the possible sections on the two spinners.

**[2 marks]**

**Colour**



**Shape**



- 4 A reel holds 9.5 metres of ribbon.  
2 pieces of ribbon are cut from the reel.  
Each piece is 20 centimetres long.  
What length of ribbon is left on the reel?  
State the units of your answer.

**[3 marks]**

$$20\text{cm} \times 2 = 40\text{cm}$$

$$9.5\text{m} = 950\text{cm}$$

$$950\text{cm} - 40\text{cm} = 910\text{cm}$$

Answer 910cm

- 4** A roll holds 10.5 metres of wallpaper.  
3 pieces of wallpaper are cut from the roll.  
Each piece is 80 centimetres long.  
What length of wallpaper is left on the roll?  
State the units of your answer.

**[3 marks]**

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Answer \_\_\_\_\_

- 5 (a) The term-to-term rule for a sequence is

subtract 1 then multiply by 5

The 1st term is 4

Work out the 3rd term.

[2 marks]

$$(4 - 1) \times 5 = 3 \times 5 = 15$$

$$(15 - 1) \times 5 = 14 \times 5 = 70$$

Answer 70

- 5 (b) The term-to-term rule for a different sequence is

add 20 then divide by 2

The 2nd term is 50

Work out the 1st term.

[2 marks]



$$50 \times 2 = 100 \quad 100 - 20 = 80$$

Answer 80

- 5 (a)** The term-to-term rule for a sequence is

add 3 then multiply by 4

The 1st term is 1

Work out the 3rd term.

**[2 marks]**

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Answer \_\_\_\_\_

- 5 (b)** The term-to-term rule for a different sequence is

subtract 45 then divide by 5

The 2nd term is 30

Work out the 1st term.

**[2 marks]**

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Answer \_\_\_\_\_

- 6** Scarlett leaves home at 10.00 to cycle to the supermarket.  
Here is part of a distance-time graph of her trip to the supermarket.



- 6 (a)** She arrives at the supermarket at 10.20  
How far is the supermarket from her home?

[1 mark]

Answer 7 km

- 6 (b)** She leaves the supermarket at 10.35  
How long does she stay at the supermarket?

[1 mark]

Answer 15 minutes

- 6 (c) Scarlett cycles home at a constant speed using the same route.  
It takes her 3 minutes longer than her journey to the supermarket.  
Complete the distance-time graph.

[2 marks]

20 minutes + 3 minutes : 23 minutes

10:35 + 23m : 10:58

- 7 This week, Liam works  
25 hours at £10.20 per hour  
and  
extra hours at the weekend at £11.80 per hour.

Here are the extra hours he works at the weekend.

Saturday	7 am to 10 am
Sunday	1 pm to 3 pm

3 hrs }  
2 hrs } 5 hours

In **total**, how much is he paid this week?

[4 marks]

25 × £10.20 = £255

5 × £11.80 = £59

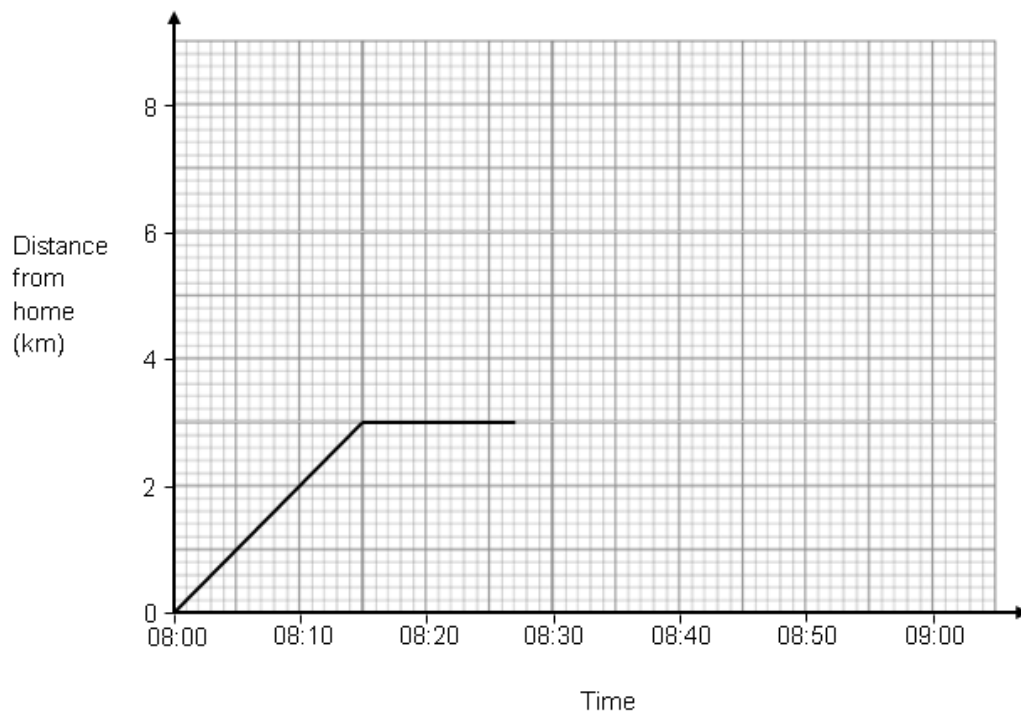
£255 + £59 = £314

Answer £

314

Turn over ►

- 6** Ronnie leaves home at 08.00 to cycle to a friend's house.  
Here is part of a distance-time graph of his trip.



- 6 (a)** He arrives at the friend's house at 8:15  
How far is Ronnie's friend's house from his home?

[1 mark]

Answer \_\_\_\_\_ km

- 6 (b)** Ronnie leaves his friend's house at 8.27  
How long does he stay at his friend's?

[1 mark]

Answer \_\_\_\_\_ minutes



- 6 (c)** Ronnie cycles home at a constant speed using the same route.  
It takes him 6 minutes longer than his journey to his friend's house.  
Complete the distance-time graph.

**[2 marks]**


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- 7** This week, Anisha works  
24 hours at £10.40 per hour  
and  
extra hours at the weekend at £15.60 per hour.

Here are the extra hours she works at the weekend.

<b>Saturday</b>	6 am to 10 am
<b>Sunday</b>	2 pm to 8 pm

In **total**, how much is she paid this week?

**[4 marks]**


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Answer £ \_\_\_\_\_

- 8 Three oranges have masses of 60 g, 70 g and 85 g

Show that their **total** mass is between  $\frac{1}{5}$  and  $\frac{1}{4}$  of a kilogram.

[3 marks]

$$1 \text{ kg} = 1000 \text{ g}$$

$$\frac{1}{5} \text{ of } 1 \text{ kg} = 1000 \text{ g} \div 5 = 200 \text{ g}$$

$$\frac{1}{4} \text{ of } 1 \text{ kg} = 1000 \text{ g} \div 4 = 250 \text{ g}$$

$$60 \text{ g} + 70 \text{ g} + 85 \text{ g} = 215 \text{ g}$$

$$200 \text{ g} < 215 \text{ g} < 250 \text{ g}$$

- 9 For each statement, tick the correct box.

[3 marks]

	Always true	Sometimes true	Never true
One of the three angles of a triangle is $90^\circ$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
One of the three angles of a triangle is obtuse	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
One of the three angles of a triangle is reflex (more than $180^\circ$ )	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- 8 Three plums have masses of 40 g, 40 g and 35 g

Show that their **total** mass is between  $\frac{1}{10}$  and  $\frac{1}{8}$  of a kilogram.

[3 marks]

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- 9 For each statement, tick the correct box.

[3 marks]

	Always true	Sometimes true	Never true
At least one of the three angles in a triangle has to be acute.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All three angles in a triangle are the same size.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
One of the three angles of a triangle is obtuse.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10 (a) Simplify fully  $p^2 \times p$

[1 mark]

$$p \times p \times p = p^3$$

Answer  $p^3$

10 (b) Simplify fully  $3a + 5c - a + 6c$

[2 marks]

$$3a - a + 5c + 6c$$

$$2a + 11c$$

Answer  $2a + 11c$

**10 (a)** Simplify fully  $m^5 \times m^3$

**[1 mark]**

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Answer \_\_\_\_\_

**10 (b)** Simplify fully  $8h + 9g - 2h + 5g$

**[2 marks]**

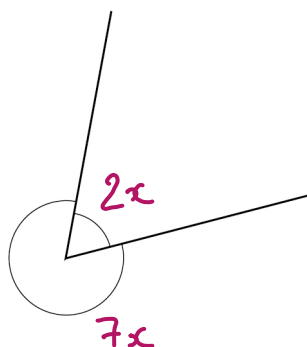
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Answer \_\_\_\_\_

11

Two angles around a point are shown.

Not drawn  
accurately

The angles are in the ratio 2 : 7

Show that the larger angle is  $280^\circ$ **[2 marks]**

$$2x + 7x = 360$$

$$9x = 360$$

$$\div 9 \quad \div 9$$

$$x = 40$$

$$7x = 7 \times 40 = 280^\circ$$

- 11 Two angles on a straight line are shown.



Not drawn  
accurately

The angles are in the ratio 4 : 11

Show that the smaller angle is  $48^\circ$

[2 marks]

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12 (a)  $c > 4$      $d < 4$      $c - d = 6$

Work out a possible pair of values for  $c$  and  $d$ .

[2 marks]

$c$	5	6	7	8	9	10	11
$d$	4	3	2	1	0		

$c = 6$      $d = 0$

12 (b)  $w$  is greater than 1 **and** less than 2  
 $x$  is greater than 0 **and** less than 1

$w + x = 2.6$

Work out a possible pair of values for  $w$  and  $x$ .

[2 marks]

$w$	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
$x$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9

$w = 1.8$      $x = 0.8$



**12 (a)**     $a > 7$      $b < 3$      $a - b = 10$

Work out a possible pair of values for  $a$  and  $b$ .

**[2 marks]**

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$$a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

**12 (b)**     $w$  is greater than 4 **and** less than 5  
 $x$  is greater than 1 **and** less than 2

$w + x = 6.5$

Work out a possible pair of values for  $w$  and  $x$ .

**[2 marks]**

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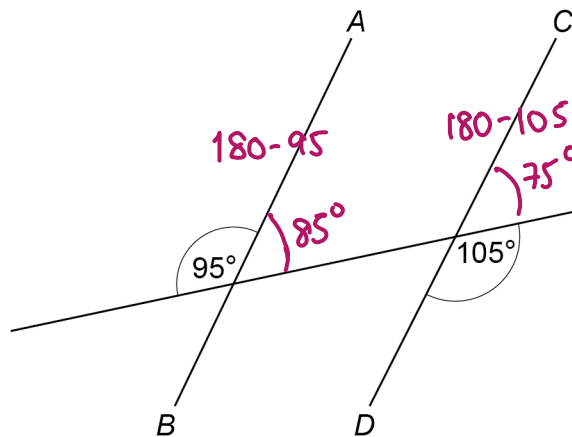


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$$w = \underline{\hspace{2cm}} \quad x = \underline{\hspace{2cm}}$$

13

Here are three straight lines.

Not drawn  
accuratelyAre the lines  $AB$  and  $CD$  parallel?

Tick a box.

Yes

☐

No

☒

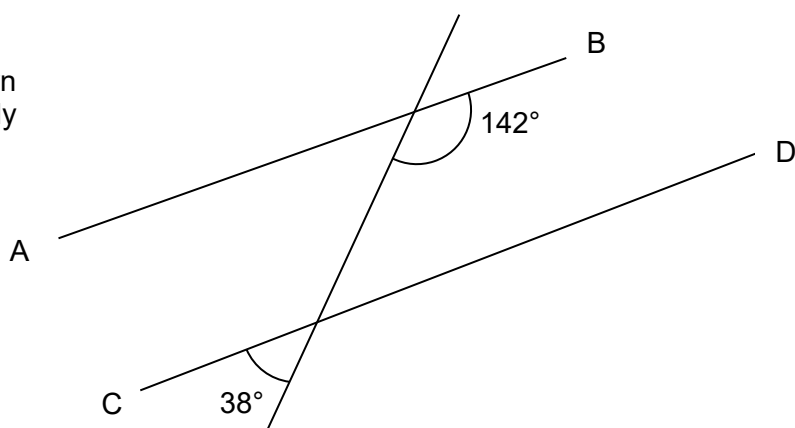
Show working to support your answer.

[2 marks]

$85^\circ$  and  $75^\circ$  angles are corresponding angles, but not equal, so  $AB$  and  $CD$  are not parallel.

13

Here are three straight lines.

Not drawn  
accuratelyAre the lines  $AB$  and  $CD$  parallel?

Tick a box.

Yes

☐

No

☐

Show working to support your answer.

**[2 marks]**

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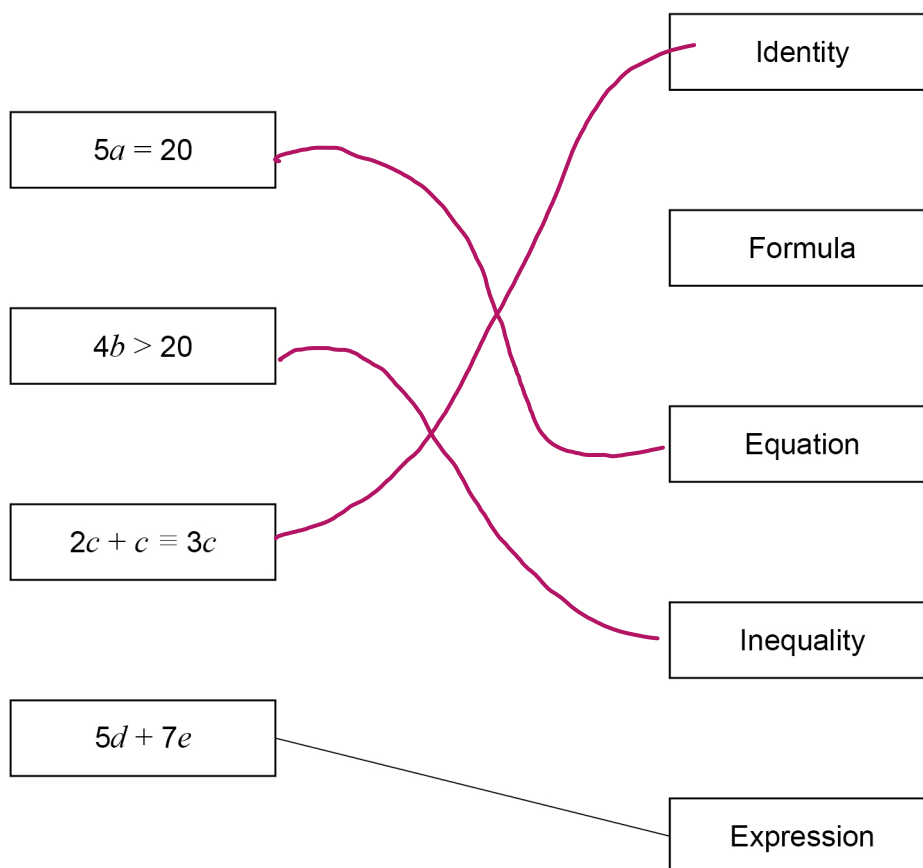
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14

Match the algebra to the correct description.

One has been done for you.

[3 marks]



14

Match the algebra to the correct description.

One has been done for you.

[3 marks]

$$4(a + 3) \equiv 4a + 12$$

Identity

$$3b - 6a$$

Formula

$$5x + 7 = 22$$

Equation

$$A = 2r + 6d$$

Inequality

Expression

Turn over ►

15

Popcorn is sold in bags.

8 small bags have a total mass of 496 g

5 small bags and 2 large bags have a total mass of 638 g

Work out the mass of a large bag.

**[4 marks]**

$$\begin{array}{r|l}
 8 \text{ small} & 496 \text{ g} \\
 \hline
 1 \text{ small} & 62 \text{ g} \\
 \hline
 5 \text{ small} & 310 \text{ g}
 \end{array}$$

Handwritten calculations showing the mass of 1 small bag (62 g) and 5 small bags (310 g) derived from the given information.

$$\begin{array}{r}
 638 \text{ g} \\
 - 310 \text{ g} \\
 \hline
 328 \text{ g} \quad (2 \text{ large bags})
 \end{array}
 \qquad
 328 \div 2 = 164$$

Answer 164 g

**15**

Potatoes are sold in bags.

2 large bags have a total mass of 650 g

4 small bags and 3 large bags have a total mass of 1975 g

Work out the mass of a small bag.

**[4 marks]**

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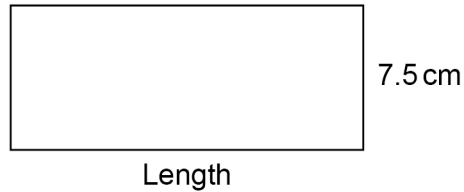
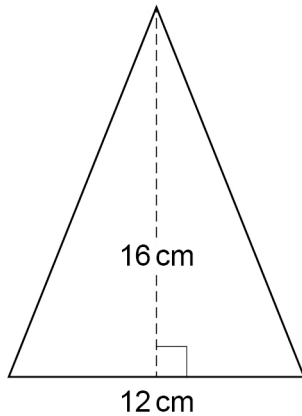
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Answer \_\_\_\_\_ g

16

The rectangle and the triangle have the same area.

Not drawn  
accurately

Work out the length of the rectangle.

[3 marks]

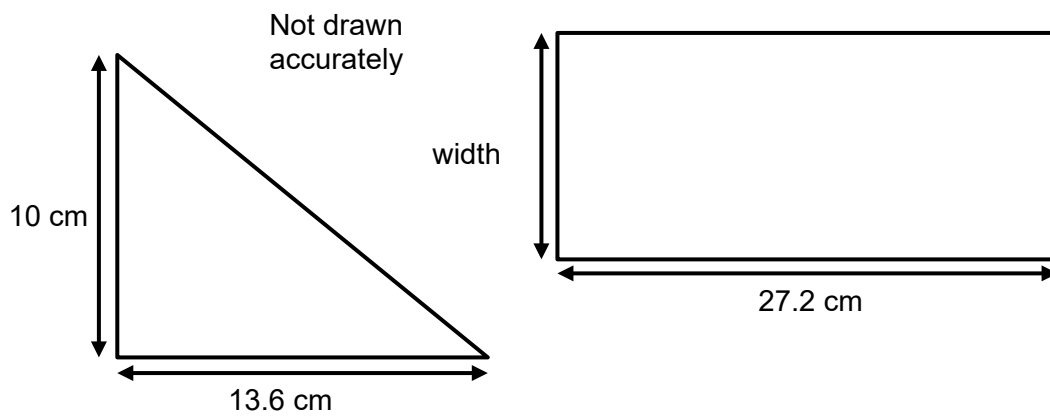
$$\text{Area of triangle} = \frac{12 \times 16}{2} = 96 \text{ cm}^2$$

$$\frac{96}{7.5} = 12.8$$

Answer 12.8 cm



- 16** The square and the triangle have the same area.



Work out the width of the rectangle.

**[3 marks]**

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Answer \_\_\_\_\_ cm

- 17 Match the name to the correct sequence.  
One has been done for you.

[2 marks]

Name	Sequence
Quadratic sequence	4, 5, 9, 14, 23... <i>(Handwritten: +4, +5, +9)</i>
Linear sequence	-3, 1, 5, 9, 13... <i>(Handwritten: +4, +4, +4, +4)</i>
Fibonacci-type sequence	-4, -1, 1, 5, 12...
	8, 11, 16, 23, 32...

*(Handwritten: A line connects 'Quadratic sequence' to '8, 11, 16, 23, 32...'. Another line connects 'Linear sequence' to '-3, 1, 5, 9, 13...'. A third line connects 'Fibonacci-type sequence' to '-4, -1, 1, 5, 12...'.)*

- 18 The number of hedgehogs in England is expected to **reduce** by 4% each year.  
Assume there are now 1 000 000 hedgehogs in England.  
Work out the expected number of hedgehogs in England after **five** years.  
You **must** show your working.

[3 marks]

$$1000\,000 \times 0.96^5 = 815,372.6976$$


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Answer 815,372

- 17** Match the name to the correct sequence.  
One has been done for you.

**[2 marks]**

Name	Sequence
Quadratic sequence	10, 7, 4, 1, -2...
Linear sequence	7, 16, 27, 40, 55
Fibonacci-type sequence	1, 5, 9, 11, 13
	2, 5, 7, 12, 19, 31

- 18** The number of foxes in England is expected to **increase** by 2% each year.  
Assume there are now 357 000 foxes in England.  
Work out the expected number of foxes in England after **six** years.  
You **must** show your working.

**[3 marks]**


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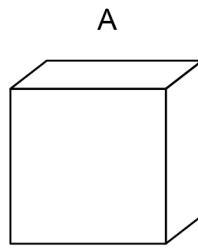
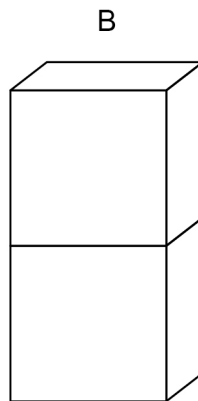
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Answer \_\_\_\_\_

**Turn over ►**

19

Here is cuboid A.

Cuboid B is made from **two** of cuboid A.

volume of A : volume of B = 1 : 2

Matthew says,

“surface area of A : surface area of B must be 1 : 2 because B is made of 2 of A.”

Is Matthew correct?

Tick **one** box.
☐

Yes

☒

No

☐

Cannot tell

Give a reason for your answer.

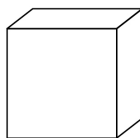
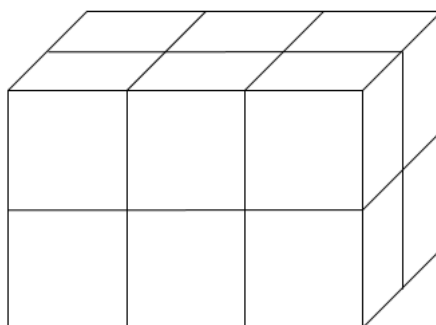
**[2 marks]**

A's surface area is formed from 6 faces.

B's is formed of 10 faces, without the two that meet.

19

Here is a cube A.

**A**Not drawn  
accuratelyCuboid B is made from **twelve** of cube A.**B**

volume of A : volume of B = 1 : 12

Henry says,

“surface area of A : surface area of B must be 1 : 12 because cuboid B is made of 12 of A.”

Is Henry correct?

Tick **one** box.
☐

Yes

☐

No

☐

Cannot tell

Give a reason for your answer.

**[2 marks]**


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

[2 marks]

$x$	-3	-2	-1	0	1
$y$	3	0	-1	0	3

$$(-2)^2 + 2(-2)$$

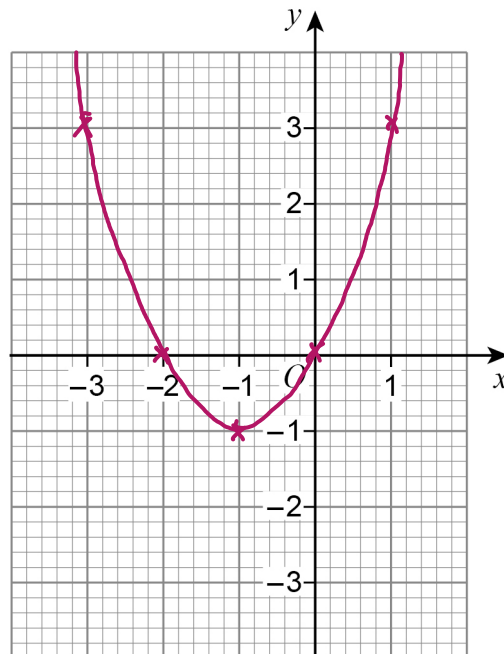
$$4 + -4 = 0$$

$$(1)^2 + 2(1)$$

$$1 + 2 = 3$$

- 20 (b) Draw the graph of  $y = x^2 + 2x$  for values of  $x$  from -3 to 1

[2 marks]



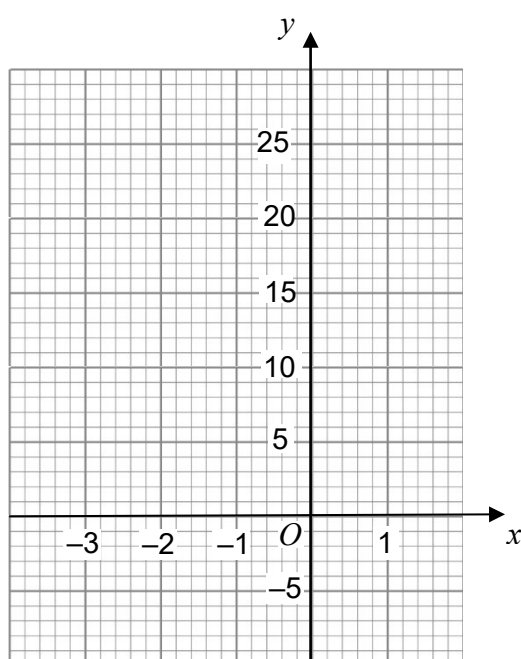
- 20 (a)** Complete the table of values for  $y = x^2 - 4x$

[2 marks]

$x$	-3	-2	-1	0	1
$y$	21		5	0	

- 20 (b)** Draw the graph of  $y = x^2 - 4x$  for values of  $x$  from -3 to 1

[2 marks]



Turn over ►

21

Jing has £2450

She saves some and gives the rest to her four brothers.

money saved : money given to brothers = 2 : 5

She gives each of her **four** brothers the **same** amount.

Does each brother receive more than £430 ?

You **must** show your working.

[4 marks]

saved ○○  $350 \times 2 = £700$  saved  
 given ○○○○○  $350 \times 5 = £1750$  given

$£2450 \div 7 = £350$   $\frac{£1750}{4} = £437.50$

Yes.



21

Shirley has £5625

She saves some and donates the rest to charity.

money saved : money given to charity = 2 : 7

She gives each of **five** charities the **same** amount.

Does each charity receive more than £870 ?

You **must** show your working.**[4 marks]**

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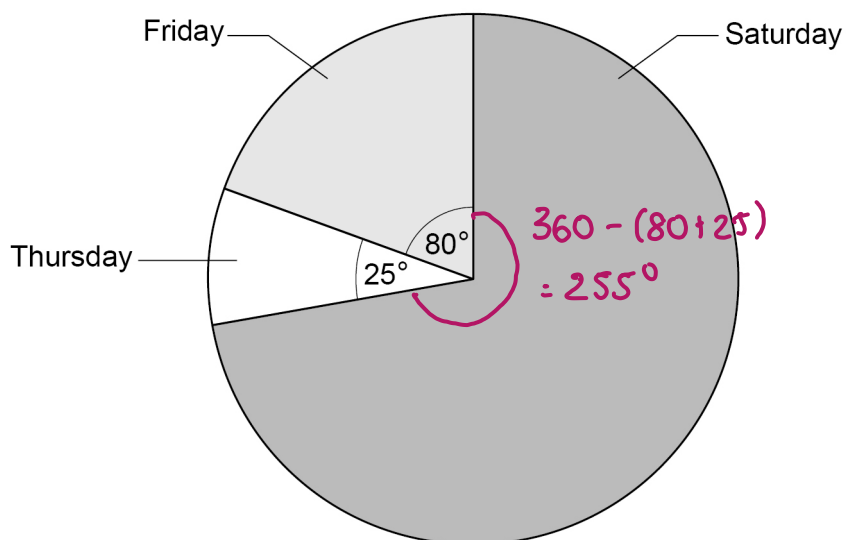
**Turn over ►**

22

The pie chart shows information about people at a fair during three days.

Do not write  
outside the  
box

Not drawn  
accurately



There were 132 **more** people on Friday than on Thursday.

Work out the number of people on Saturday.

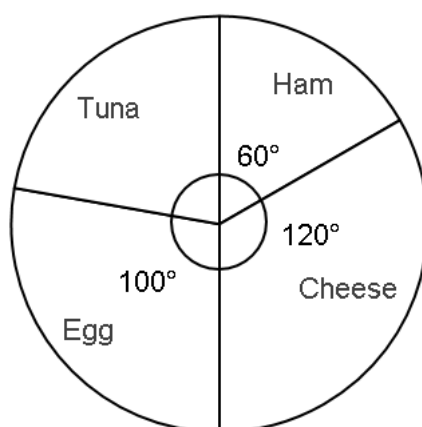
[3 marks]

$$80 - 25 = 55 \quad \div 11 \quad \begin{array}{r|l} 55^\circ & 132 \\ \hline 5^\circ & 12 \\ \hline \times 51 & 612 \end{array} \quad \begin{array}{l} \downarrow \div 11 \\ \downarrow \times 51 \end{array}$$

Answer 612

22

The pie chart shows information about customers choice of sandwich filling.



Not drawn  
accurately

12 **more** customers chose egg than chose ham.

Work out the number of customers who chose tuna.

[3 marks]

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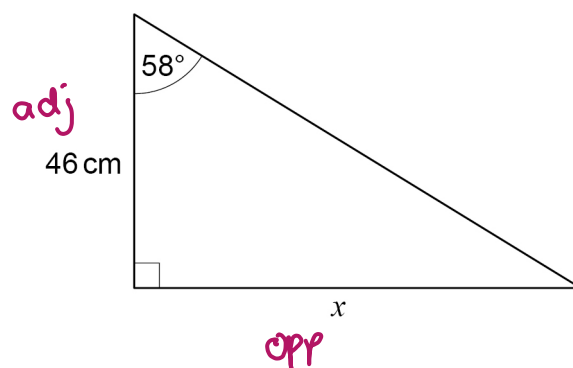
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Answer \_\_\_\_\_

Turn over ►

23

Use trigonometry to work out the value of  $x$ .Not drawn  
accurately

[3 marks]

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

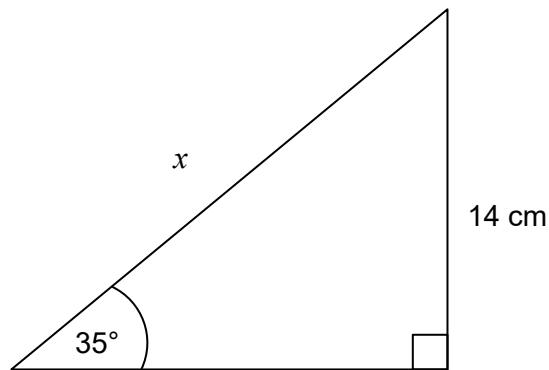
$$\tan 58^\circ = \frac{x}{46}$$

$$\times 6 \quad \times 6$$

$$(\tan 58) \times 46 = x = 9.602007174$$

$$x = 9.6 \text{ cm}$$

23

Use trigonometry to work out the value of  $x$ .Not drawn  
accurately**[3 marks]**

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 $x =$  \_\_\_\_\_ cm

24 Millie is estimating the value of  $\frac{1}{(\sqrt[3]{8.34})^2 \times 10.21}$

She rounds each decimal number to 1 significant figure.

24 (a) Work out Millie's estimate.

You **must** show your working.

[2 marks]

$$\frac{1}{(\sqrt[3]{8})^2 \times 10} : \frac{1}{2^2 \times 10} = \frac{1}{40}$$

Answer  $\frac{1}{40}$

24 (b) Millie says,

"My estimate must be more than the exact value."

**Without working out the exact value**, give a reason how she can know this.

[1 mark]

She rounded down in the denominator, so she is dividing by a larger value when working out the exact value.

24 Aiza is estimating the value of  $\frac{2}{(\sqrt{4.36})^3} \times 5.49$

She rounds each decimal number to 1 significant figure.

24 (a) Work out Aiza's estimate.  
You **must** show your working.

[2 marks]

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Answer \_\_\_\_\_

24 (b) Aiza says,  
"My estimate must be larger than the exact value."  
**Without working out the exact value**, give a reason how she can know this.

[1 mark]

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25 (a) Factorise  $x^2 + 8x + 15$ 

[2 marks]

15 $1 \times 15$  $1 + 15 = 16 \times$  $3 \times 5$  $3 + 5 = 8 \checkmark$ Answer  $(x + 3)(x + 5)$ 25 (b) Write down the **two** solutions of  $(y + 2)(y - 4) = 0$ 

[1 mark]

Answer  $y = -2, y = 4$ 

$$\begin{array}{rcl} y + 2 & = & 0 \\ -2 & -2 & \\ \hline y & = & -2 \end{array}$$

$$\begin{array}{rcl} y - 4 & = & 0 \\ +4 & +4 & \\ \hline y & = & 4 \end{array}$$



**25 (a)** Factorise  $x^2 + 4x - 21$

**[2 marks]**

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Answer \_\_\_\_\_

**25 (b)** Write down the **two** solutions of  $(y - 9)(y - 2) = 0$

**[1 mark]**

Answer \_\_\_\_\_

**END OF QUESTIONS**

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