AQA

Please write clearly in block capitals.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

GCSE
MATHEMATICS

F

Foundation Tier   Paper 2 Calculator
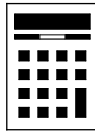
Wednesday 7 June 2023   Morning   Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

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

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
TOTAL	

Please note that these worked solutions have neither been provided nor approved by AQA and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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

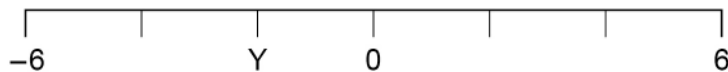**1 (a)** Here is a number line.
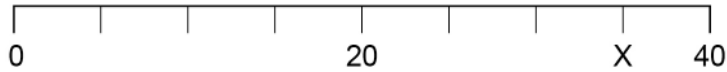
What number is at X?

[1 mark]

Answer _____ 35

20 - 0 = 20
20 ÷ 4 = 5
40 - 5 = 35

Dividing the difference between 0 and 20 by the 4 divisions between them works out that each division is 5. X is 1 division before 40 so subtracting 5 works out X

1 (b) Here is a different number line.

What number is at Y?

[1 mark]

Answer _____ -2
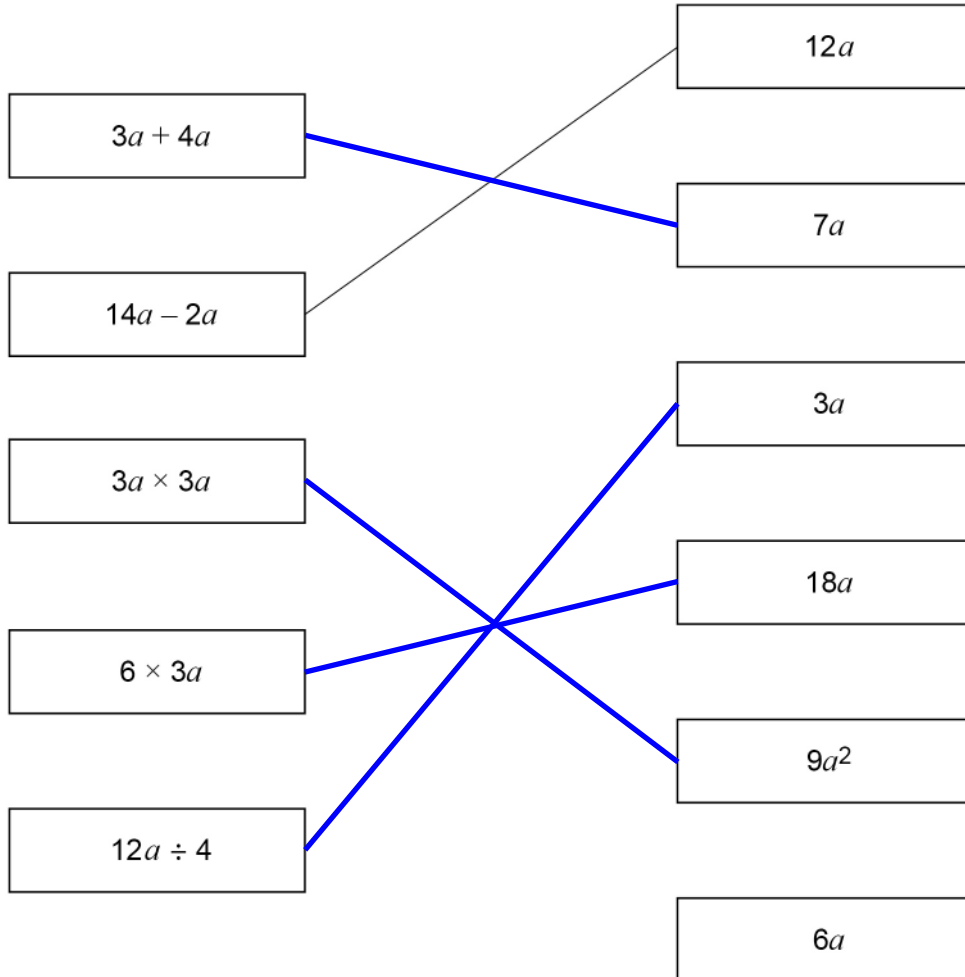
6 - 0 = 6
6 ÷ 3 = 2
0 - 2 = -2

Dividing the difference between 0 and 6 by the 3 divisions between them works out that each division is 2. Y is 1 division before 0 so subtracting 2 works out Y

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2 Match each expression on the left with the simplified expression on the right.

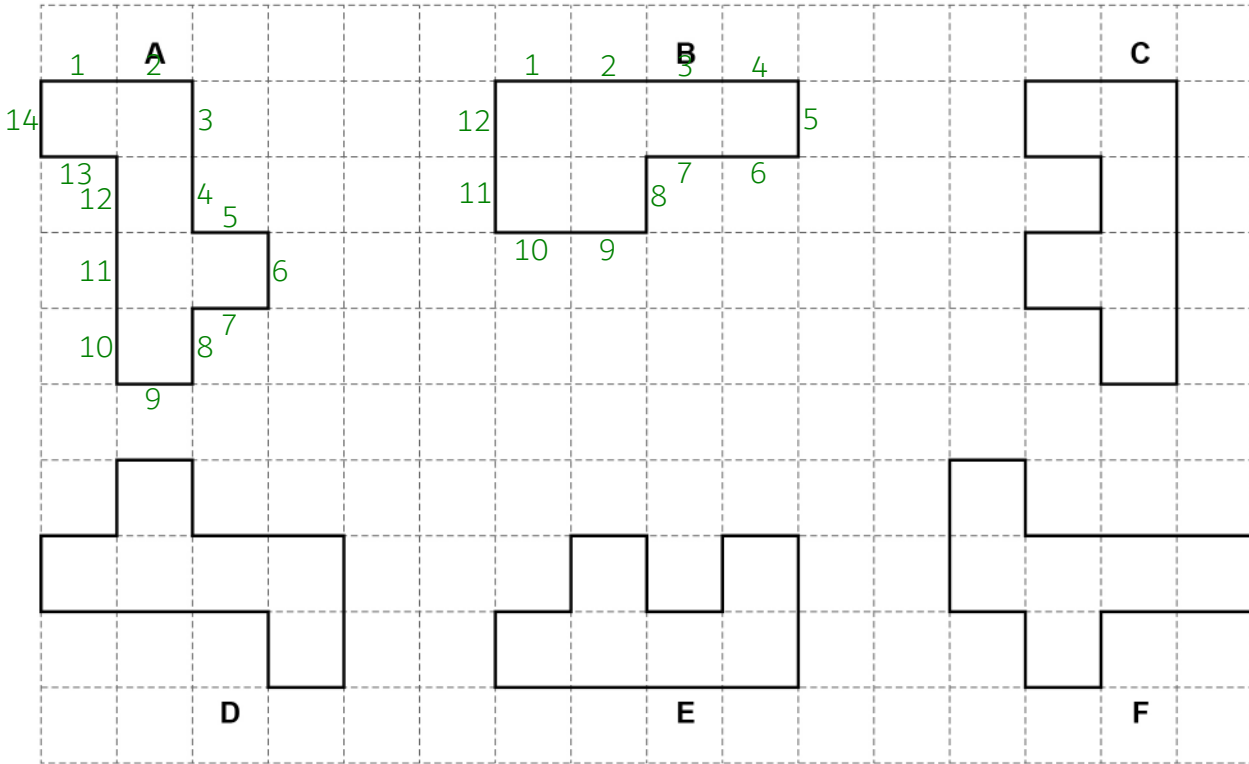One has been done for you.

[4 marks]

$3a + 4a$	$12a$
$14a - 2a$	$7a$
$3a \times 3a$	$3a$
$6 \times 3a$	$18a$
$12a \div 4$	$9a^2$
	$6a$

Turn over for the next question

Turn over ▶

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3 Here are some shapes.

Each shape has an area of six square centimetres.

3 (a) Which has the bigger perimeter, shape **A** or shape **B**?

You **must** show the lengths of both perimeters.

[2 marks]

A=14
B=12

Perimeter is the distance around the outside of the shape.
The perimeter of A is 14 cm and the perimeter of B is 12 cm

Answer _____ A _____

14 cm is bigger than 12 cm

3 (b) Which shape is congruent to shape **A**?

[1 mark]

Answer _____ D _____

Congruent means the same shape and size

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3 (c) Which **two** shapes fit together to make a rectangle?
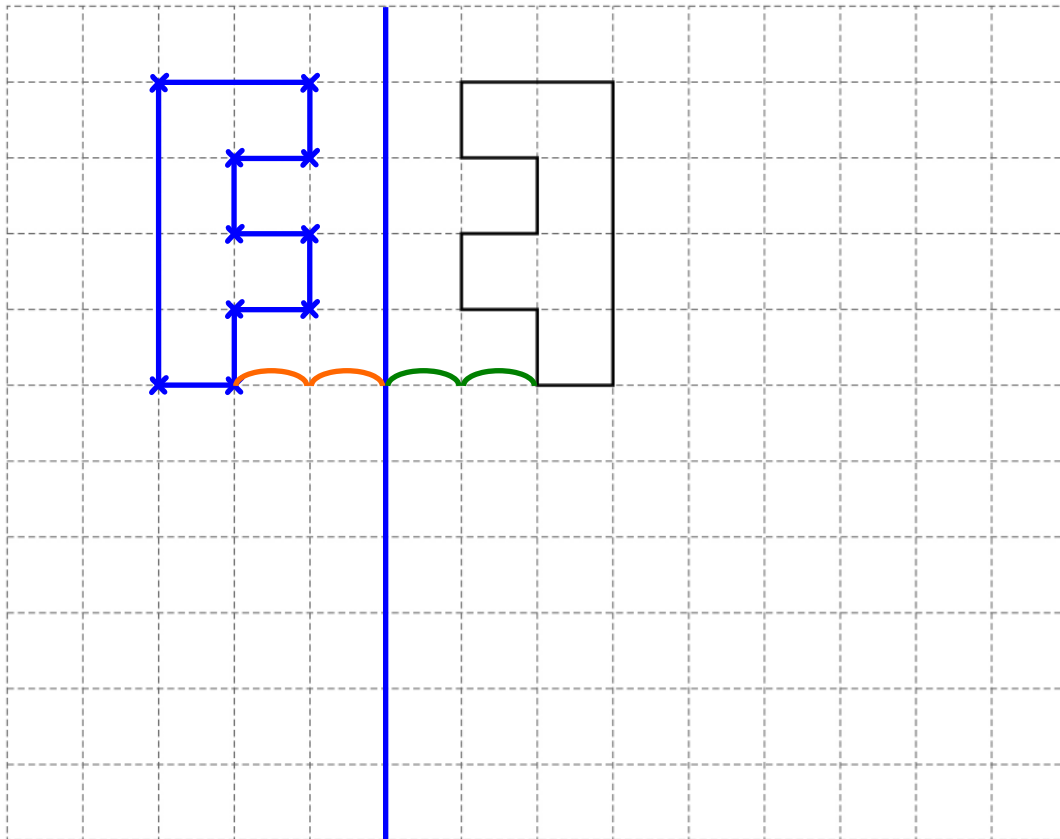
[1 mark]

Answer _____ C _____ and _____ E _____

See bottom of page

3 (d) On this grid draw a reflection of shape **C**.

Show your mirror line.

[2 marks]

Reflected by counting the number of jumps to the line from each corner then doing the same number of jumps on the other side. Then joining up the corners

C

E

Turn over for the next question

Turn over ▶

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0 5
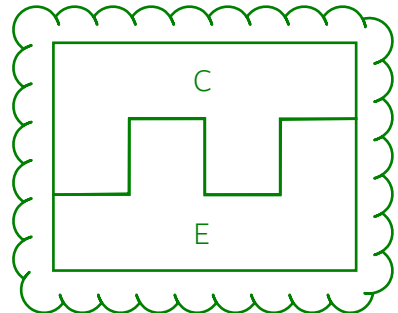
4 Points *P* and *Q* are shown on the grid.
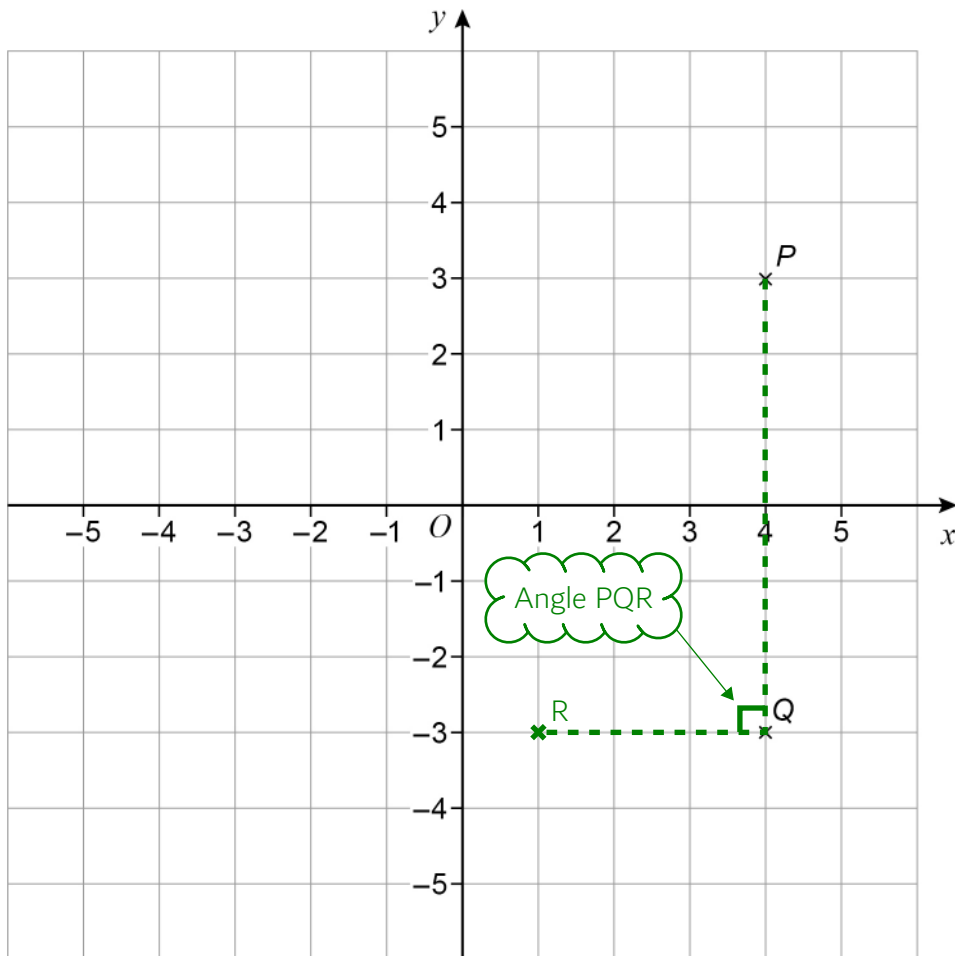
4 (a) Write down the coordinates of *P*.

[1 mark]

Answer (___4___ , ___3___)

x-coordinate   y-coordinate

4 (b) Angle *PQR* is a right angle.

Work out possible coordinates for *R*.

[1 mark]

Answer (___1___ , ___-3___)

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IB/M/Jun23/8300/2F

5 (a) A shop sells bottles of orange juice.

Each bottle costs 75p

Work out the greatest number of bottles that can be bought with £5

[2 marks]

$500 \div 75$

There is 100p in £1 so multiplying the £5 by 100 converts it into 500p. Dividing this by the 75p works out how many lots of 75p go into it

6.6̇ is rounded down as 7 is too many and there needs to be a whole number of bottles

Answer _____ 6 _____

5 (b) Two shops sell bottles of apple juice.

Shop X
pack of 4 bottles
Was £2.50
Now 10% off

Shop Z
pack of 12 bottles
£7

At which shop is it cheaper to buy 24 bottles?

Show working to support your answer.

[4 marks]

$24 \div 4$ — This works out that 6 packs of 4 bottles must be bought from shop X

6×2.50 — This works out that the normal cost of 6 packs is £15

$15 \times \dfrac{100-10}{100}$ — Subtracting the 10% from 100% expresses the percentage it decreases to. Putting this over 100 converts it into a fraction, which when the £15 is multiplied by it is reduced by 10%

13.5 — From shop X it costs £13.50

$24 \div 12$
2×7
14 — 2 packs of 12 bottles must be bought from shop Y. This will cost £14

Answer _____ X _____

£13.50 is less than £14

Turn over ▶

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6 A game has four cards labelled A, B, C and D.

Ellie picks two of the cards at random.

Complete the list of the **six** possible pairs of cards she could pick.

[2 marks]

AB
AC
AD
BC
BD
CD

The pairs are systematically listed. AB is the same as BA

7 (a) Complete the boxes using

two **different** even numbers

and

two **different** odd numbers.

[2 marks]

$$\boxed{1} + \boxed{2} + \boxed{3} + \boxed{40} = 46$$

Odd   Even   Odd   Even

Starting with 1, 2 and 3 then subtracting these from 46 to work out that 40 must be added to these to get 46

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7 (b)   Complete the boxes using

a factor of 12

and

a factor of 40

[2 marks]

$$\boxed{3} \times \boxed{10} = 30$$

10 is a common factor of 30 and 40 as both 30 and 40 can be divided by 10. So one of the numbers could be 10. This must be multiplied by 3 to get 30 and 3 is a factor of 12

7 (c)   Complete the boxes using

a square number

and

a prime number.

[2 marks]

$$\boxed{36} \div \boxed{2} = 18$$

Starting with the smallest prime, multiplying 18 by prime numbers until a square number is found. 2 is the smallest prime and 18 x 2 = 36, which is a square number

Turn over for the next question

8

Turn over ▶

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8 93 people were asked if they played online games one day.

The frequency tree shows some information about their answers.

Played

More than one game played?

93

Yes → 48

No → 45

Yes → 12

No → 36
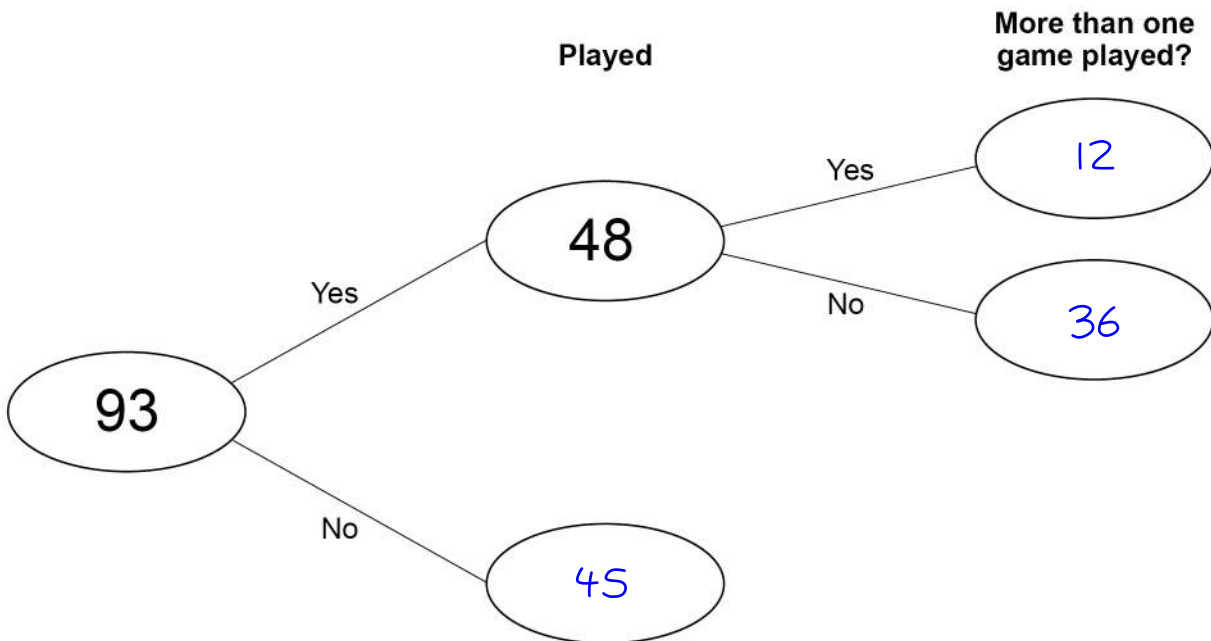
8 (a) 75% of the people who answered Yes played one game.

Complete the frequency tree.

[3 marks]

$93-48=45$ ← Subtracting the 48 who answered Yes from the 93 people in total leaves 45 who answered No

$\frac{75}{100} \times 48 = 36$ ← Percentage is out of 100 so putting the 75% over 100 converts it into a fraction. Multiplying the 48 by this fraction finds that 75% of 48 is 36

$48-36=12$ ← Subtracting the 36 who played one game from the 48 people who played works out that 12 played more than one game

8 (b) One of the 93 people is chosen at random.

P(used social media) is **more than** 0.68

What is the **smallest** possible number of people who used social media?

[2 marks]

$0.68 \times 93 = 63.24$

Multiplying the probability of 0.68 by the 93 people works out that there would be 63.24 people using social media. This is not a whole number of people and needs to be rounded up to the next whole number so that the probability is more than 0.68

Answer _____64_____

Turn over for the next question

5

Turn over ▶

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9 (a) The cost of a TV streaming service is

£6 per month for the first 4 months

then

£11 per month for the rest of the year.

Work out the **total** cost for the year.

[2 marks]

6×4=24 ← Multiplying the cost per month for the first 4 months by 4 works out that the cost for the first 4 months is £24

12-4 ← There are 12 months in a year. Subtracting the first 4 months works out that there are another 8 months left in the year after the first 4 months

8×11 ← Multiplying the cost per month for the rest of the year by 8 works out that the cost for the next 8 months is £88

24+88

Answer £ _____ 112

Adding the cost of the first 4 months to the cost of the next 8 months works out that the total cost for the year is £112

9 (b) A TV series has ten episodes.

Nine episodes are each 50 minutes long.

One episode is 1 hour 42 minutes long.

Work out the **total** length of the series.

Give your answer in hours and minutes.

[3 marks]

0°50°×9+1°42° ← Entering the times in the calculator as sexagesimals. 0°50° means 0 hours and 50 minutes. 1°42° means 1 hour and 42 minutes

Answer _____ 9 _____ hours _____ 12 _____ minutes

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10 (a) There are 1020 books in a box.

$\frac{2}{5}$ of the books are blue.

How many are blue?

[2 marks]

$\frac{2}{5} \times 1020$ ← Working out 2/5 of the 1020 books. 'Of' means to multiply

Answer _____ 408 _____

10 (b) There are green pens and red pens in the box.

The ratio of green : red is 4 : 3

What fraction of the pens are green?

[1 mark]

4 + 3 = 7 so there are 7 parts in total in the ratio. 4 out of these 7 are for green

Answer _____ $\frac{4}{7}$ _____

10 (c) There are some calculators in the box.

220 are scientific.

30 are not.

What percentage of the calculators are scientific?

[2 marks]

$220 + 30$ ← Adding the 220 scientific calculators and the other 30 calculators works out that there are 250 calculators in total

$\frac{220}{250} \times 100$ ← Expressing the 220 scientific calculators as a fraction of the 250 calculators then multiplying this fraction by 100 to convert it into a percentage

Answer _____ 88 _____ %

10

Turn over ▶

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11 Here is a Venn diagram.

ξ = 60 people

H = people who own a gaming headset

W = people who own a smart watch

ξ

H   W

24   7   *8*

21
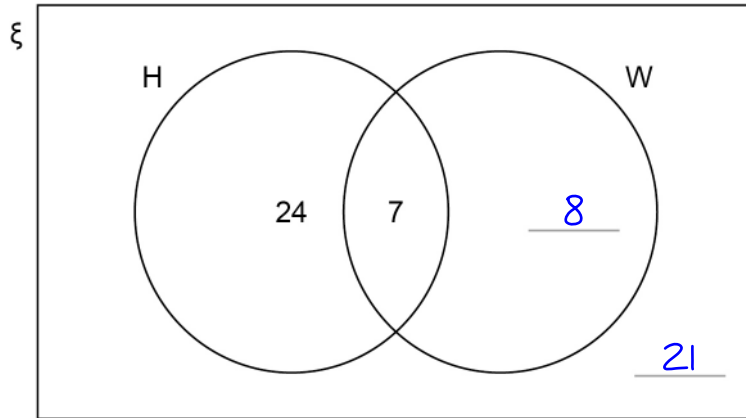
11 (a) 15 of the people own a smart watch.

Complete the Venn diagram.

[2 marks]

15−7 ← Subtracting the 7 who own both a gaming headset and a smart watch from the 15 who own a smart watch leaves 8 who own just a smart watch

60−24−7−8 ← Subtracting the 24 who own just a gaming headset, the 7 who own both and the 8 who own just a smart watch from the 60 people leaves 21 who own neither

11 (b) One of the 60 people is chosen at random.

What is the probability that they own **both** a gaming headset and a smart watch?

[1 mark]

Answer $\dfrac{7}{60}$

7 out of the 60 people own both a gaming headset and a smart watch

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11 (c) Marek is going to buy a gaming headset that costs £35

He already has £19

He plans to save the rest in two equal amounts over the next two weeks.

He uses this method to work out in pounds how much to save each week.

$$35 - 19 \div 2$$

What is wrong with his method?

[1 mark]

Should not divide by 2 first

The order of operations (BIDMAS) would be followed so the 19 would be divided by 2 first. There should be brackets around the 35 - 19 so that this is done first before dividing by 2

Turn over for the next question

4

Turn over ▶

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12 Kai says that 3 : 2 is an equivalent ratio to 9 : 6

Jo says that 1.5 : 1 is an equivalent ratio to 9 : 6

Who is correct?

Tick **one** box.

✓	Both of them
	Kai only
	Jo only
	Neither of them

Give reasons for your answer.

[2 marks]

Multiplying both sides of 3 : 2 by 3 gives 9 : 6
Multiplying both sides of 1.5 : 1 by 6 gives 9 : 6

Multiplying or dividing all sides of a ratio by the same amount makes an equivalent ratio

13 28 is increased by 25%

40 is decreased by 15%

Which answer is bigger?

Show how you decide.

[4 marks]

$$28 \times \frac{100+25}{100} = 35$$

Percentage is out of 100. Adding 25% to 100% increases it by 25%. Putting this over 100 converts it into a fraction. Multiplying the 28 by this fraction increases it by 25%

$$40 \times \frac{100-15}{100} = 34$$

Percentage is out of 100. Subtracting 15% from 100% decreases it by 15%. Putting this over 100 converts it into a fraction. Multiplying the 40 by this fraction decreases it by 15%

Answer _____ 35 _____

The answer of 35 is bigger than the answer of 34

Turn over for the next question

6

Turn over ▶

14 Factorise $12a + 15b$

[1 mark]

3 is the highest common factor of all the terms in the expression (the 12a and 15b). Bringing 3 out as a factor, dividing both terms by 3 and leaving the results in a bracket

Answer $\qquad$ 3(4a+5b)

15 Write down all the integers that satisfy the inequality

$$-3 \leqslant x < 2$$

[2 marks]

Answer $\qquad$ -3,-2,-1,0,1

Greater or equal to -3 and less than 2

16 A linear sequence starts

7   10   13   16

Work out an expression for the nth term of the sequence.

[2 marks]

The sequence increases by 3 between each term so must begin 3n. Going backward in the sequence finds that the 0th term (the one before the first term) is 4 so this must be what is added to 3n

Answer $\qquad$ 3n+4

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17 Jess saves 2p, 5p and 10p coins.

She has

- 45 10p coins
- 8 times as many 2p coins as **10p coins**
- £17.70 in total.

Work out   total **value** of 2p coins : total **value** of 5p coins

Give your answer in its simplest form.

[4 marks]

$45 \times 0.10 = 4.50$ ◄── 10p is £0.10. Multiplying this by 45 works out that the value of the 45 10p coins is £4.50

8×45 ◄── This works out that there are 360 2p coins

$360 \times 0.02 = 7.20$ ◄── 2p is £0.02. Multiplying this by 360 works out that the value of the 360 2p coins is £7.20

$17.70 - 4.50 - 7.20$ ◄── Subtracting the value of the 10p coins and the value of the 2p coins from the total value of all the coins works out that the value of the 5p coins is £6

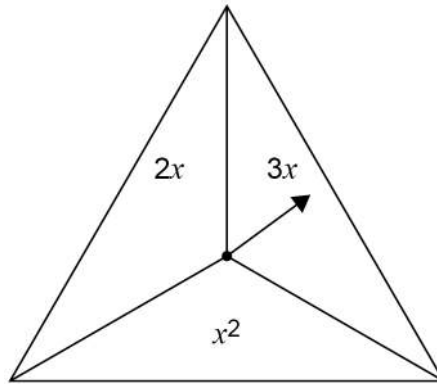$\dfrac{7.20}{6} = \dfrac{6}{5}$ ◄── Ratios simplify in a similar way to fractions. Putting the value of the 2p coins over the value of the 5p coins in the calculator simplifies it to 6/5. So the ratio must be 6 : 5 in its simplest form

Answer ____6____ : ____5____

Turn over ►

1 9

9

18 In a game,

- an ordinary fair six-sided dice is rolled
- the fair spinner shown is spun.

The score is the dice number **substituted** into the spinner expression.

18 (a) Complete the table to show all of the possible scores.

[2 marks]

	1	2	3	4	5	6
$2x$	2	4	6	8	10	12
$3x$	3	6	9	12	15	18
x^2	1	4	9	16	25	36

For the first row, all the numbers are multiplied by 2. For the second row, all of the numbers are multiplied by 3. For the third row, all of the numbers are squared

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18 (b) A player wins the game if their score is 10 or more.

Work out the probability that they win the game.

[1 mark]

8 out of the 18 possible scores are 10 or more

Answer $\dfrac{8}{18}$

18 (c) The game is played 711 times.

Estimate the number of games that are won.

[2 marks]

$\dfrac{8}{18} \times 711$

Multiplying the probability of winning by the number of games played estimates how many of them are won

Answer 316

Turn over for the next question

5

Turn over ▶

19 (a) Part of a regular polygon is shown.

Not drawn accurately

x

Assume that the polygon is an octagon.

Work out the size of angle x.

[2 marks]

$360 \div 8$

Angle x is an exterior angle. The exterior angles of any polygon add up to 360°. As there are 8 sides in an octagon there are also 8 exterior angles. As it is regular all the exterior angles are the same so dividing 360° by the 8 exterior angles works out each one

Answer _____ 45 _____ °

19 (b) In fact, the polygon has **more** sides than an octagon.

What does this mean about the size of angle x ?

Tick **one** box.

[1 mark]

☐ It is more than the answer to part (a)

☐ It is the same as the answer to part (a)

☑ It is less than the answer to part (a)
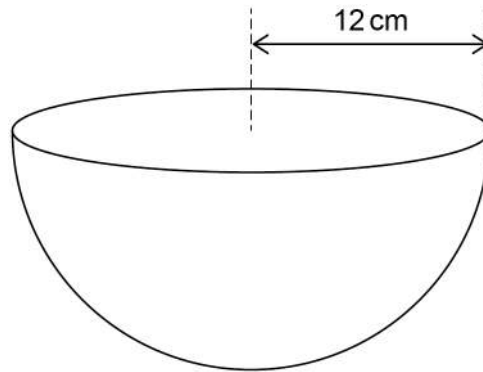
☐ It could be any of the above

There are more than 8 exterior angles so the 360° will be divided by more than 8. Dividing by more will make the exterior angles less

20 Write down the translation vector that maps shape A onto shape B.

[2 marks]

Answer _____ $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

Vectors are in the form $\begin{pmatrix} x \\ y \end{pmatrix}$. It has translated 4 in the x-direction (shown in green) and -3 in the y-direction (shown in orange)

Turn over for the next question

Turn over ▶

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2 3

21

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

A bowl is a hemisphere with radius 12 cm

12 cm

Water is poured into the bowl

at a rate of 325 cm^3 per second

for 8 seconds.

Does the water fill **more than** 70% of the bowl?

You **must** show your working.

[4 marks]

$325 \times 8 = 2600$

Multiplying the rate in which the water is poured into the bowl by the amount of time it is poured for works out that 2600 cm^3 is poured into the bowl

$\frac{1}{2} \times \frac{4}{3}\pi \times 12^3 \times \frac{70}{100} = 2533.3$

Substituting in the radius of 12 cm into the formula for the volume of a sphere, doing half of this to find the volume of the hemisphere then doing 70% of this finds that 70% of the bowl is 2533.3 cm^3. Percentage is out of 100 so putting the 70% over 100 converts it into a fraction, which when multiplied by finds 70%
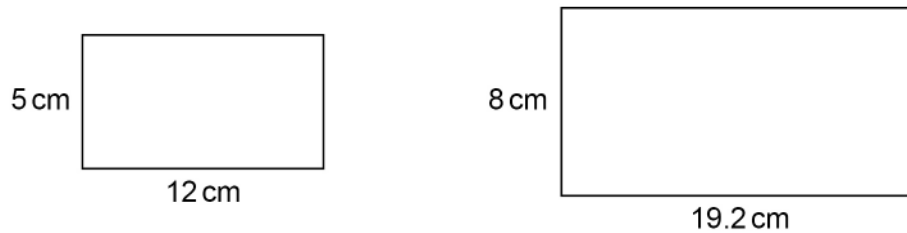
Yes

The 2600 cm^3 poured into the bowl is more than the 2533.3 cm^3 which is 70% of the bowl

22 Show that these two rectangles are similar.

[2 marks]

Not drawn accurately

5 cm

12 cm

8 cm

19.2 cm

$8 \div 5 = \frac{8}{5}$

$19.2 \div 12 = \frac{8}{5}$

Dividing the sides on the larger rectangle by the same sides on the smaller rectangle shows that the same scale factor has been used for all of the sides and therefore they must be similar

23 A factory packs x boxes of teabags per hour.

Each box contains 80 teabags.

Show that the factory packs $\dfrac{4x}{3}$ teabags per minute.

[2 marks]

$\dfrac{80x}{60} = \dfrac{4x}{3}$

Multiplying x by the 80 teabags in each box expresses how many teabags are packed per hour. There are 60 minutes in an hour so dividing this expression by 60 expresses how many teabags are packed per minute. This simplifies to 4x/3

END OF QUESTIONS

8

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