2023 national curriculum tests

Key stage 2

Mathematics

Paper 3: reasoning

First name						
Middle name						
Last name						
Date of birth	Day		Month		Year	
School name						
DfE number						

.CG Maths.
Worked Solutions

Please note that these worked solutions have neither been provided nor approved by the Standards and Testing Agency 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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Instructions

You **must not** use a calculator to answer any questions in this test.

Questions and answers

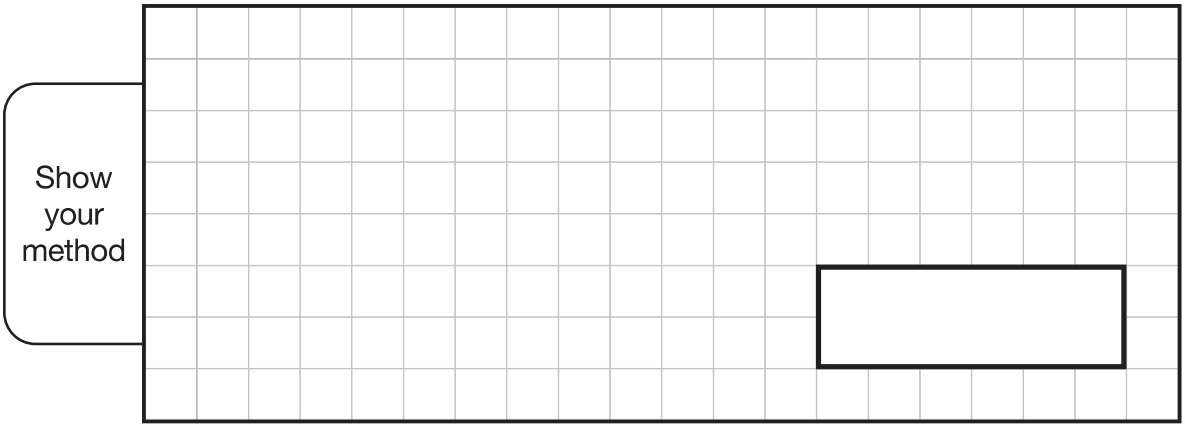
You have **40 minutes** to complete this test.

Follow the instructions for each question.

Work as quickly and as carefully as you can.

If you need to do working out, you can use the space around the question.
Do not write over any barcodes.

Some questions have a method box like this:



For these questions, you may get a mark for showing your method.

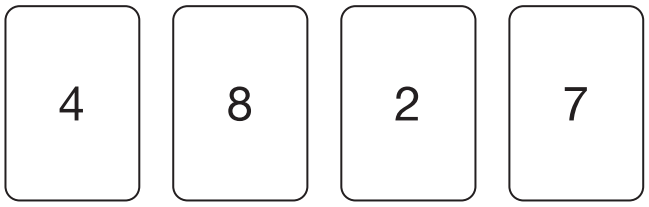
If you cannot do a question, **go on to the next one**.
You can come back to it later, if you have time.

If you finish before the end, **go back and check your work**.

Marks

The number under each line at the side of the page tells you the number of marks available for each question.

1 Chen has these digit cards.



She uses three of the cards to make a **three-digit** number.

Each card can be used only **once**.

Chen puts the **4** in the **tens** place.

Write the **lowest** three-digit number that Chen could make.

The tens place

2 4 7

1 mark

The smallest digits should be used first as the place value of the first digits is more

2 Tick the number **eighty thousand, three hundred and six**.

Tick **one**.

8,306 ☐ Eight thousand, three hundred and six

80,036 ☐ Eighty thousand and thirty-six

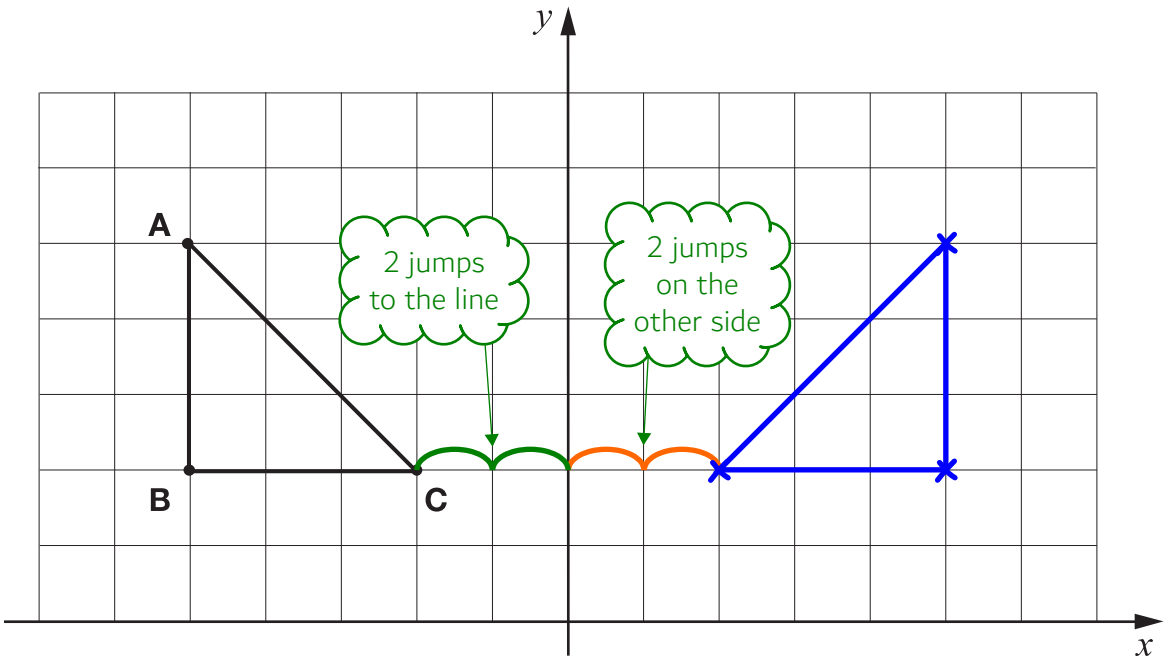
80,306 ☑

800,306 ☐ Eight hundred thousand, three hundred and six

80,300,006 ☐ Eighty million, three hundred thousand and six

1 mark

3 Amina draws triangle **ABC** on a grid as shown.



1 mark

She then reflects the triangle in the y-axis.

Draw the reflected triangle on the grid.

Use a ruler.

For each corner, count the number of jumps to the line then do the same number of jumps on the other side. Then join up the corners with a ruler

4 Write the next **two** numbers in this sequence.

1,780 1,880 1,980 | 2080 | 2180

1 mark

It increases by 100 between each term of the sequence

5 Circle the two decimals that round to the **same** whole number.

13 15 18

13.2 14.7 15.9 16.3 17.6

1 mark

Both of these round to 16 as 15.9 has a 9 in the tenths place which causes it to round up and 16.3 has a 3 in the tenths place which causes it to round down

6 Write the missing number to make the calculation correct.

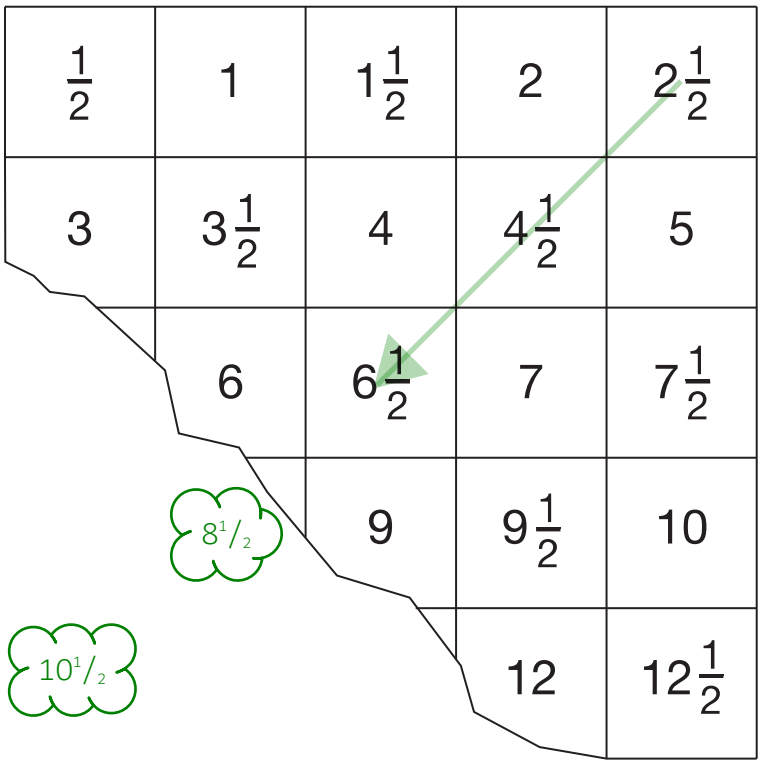
$1{,}300{,}450 = 1{,}000{,}000 + \boxed{300000} + 400 + 50$

1 mark

The number is broken up into different parts. The different parts of the number are shown in the same colour

7 Here is part of a number square.

The other part of the square has been torn off.



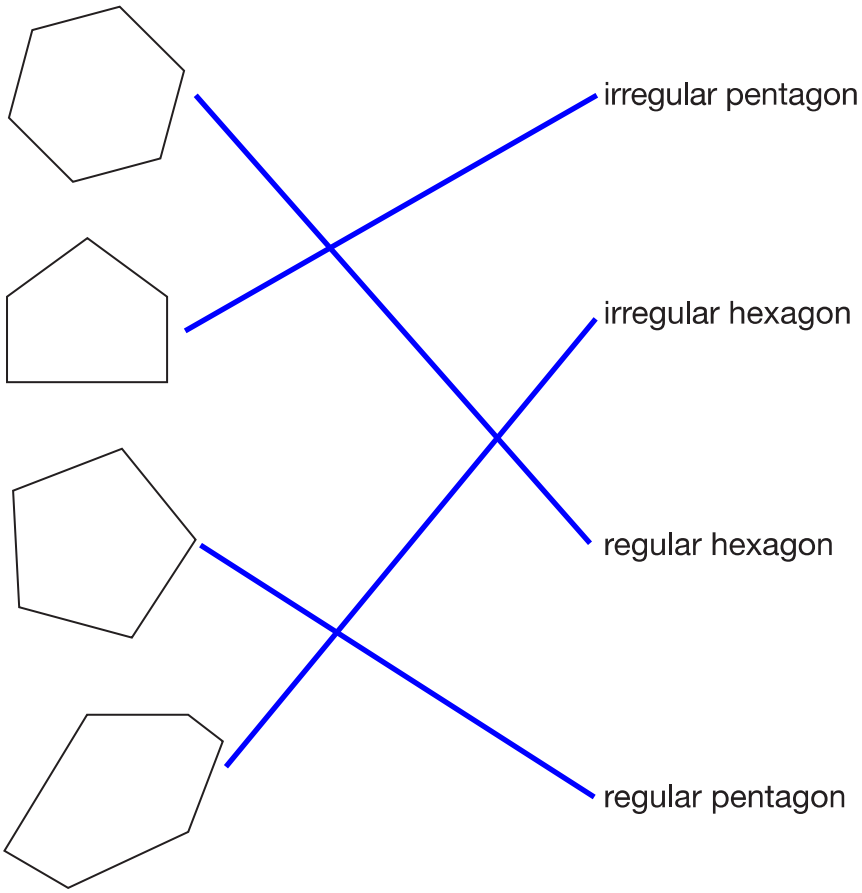
What number was in the bottom-left corner of the number square?

The numbers increase by 2 as they go diagonally down to the left in the direction indicated by the arrow

$\boxed{10\frac{1}{2}}$

1 mark

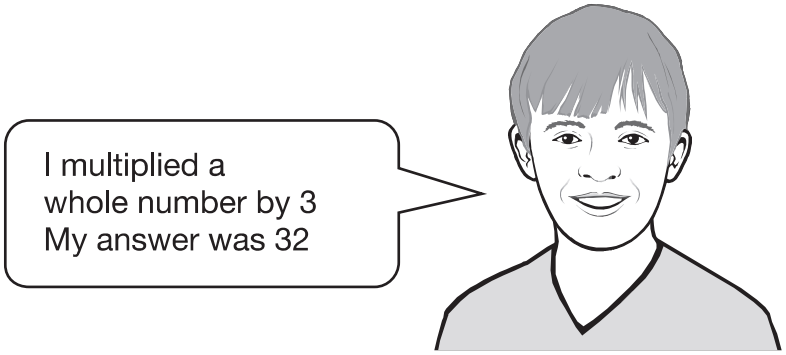
8 Match each shape to the correct name.



1 mark

Regular means that all the sides and angles are the same. Irregular means that not all the sides and angles are the same. Pentagons have 5 sides and hexagons have 6 sides

9 Jack says,



Explain why Jack is **not** correct.

32 is not in the 3 times table

1 mark

Numbers in the 3 times table (3, 6, 9, 12, 15...) are all the result of multiplying a whole number by 3

10 Write the missing square number to make this addition correct.

$8^2 + \underline{\quad 3 \quad}^2 = 73$

1 mark

$8^2 = 8 \times 8 = 64$. 9 must be added to this to get 63 and $9 = 3^2$ as $3 \times 3 = 9$

11 At the start of April, a shop had **15,000** games.

The shop sold:

- **7,918** games in April
- **4,624** games in May.

How many games did the shop have left at the end of May?

Show your method

$$\begin{array}{r} {}^{0}\cancel{1}\,{}^{14}\cancel{5}\,{}^{9}\cancel{0}\,{}^{9}\cancel{0}\,{}^{1}0 \\ -\quad 7\,9\,1\,8 \\ \hline {}^{6}\cancel{7}\,{}^{1}0\,{}^{7}\cancel{8}\,{}^{1}2 \\ -\quad 4\,6\,2\,4 \\ \hline 2\,4\,5\,8 \end{array}$$

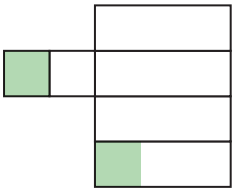
2458 games

2 marks

Subtracting the 7918 games sold in April from the 15000 games the shop had at the start of April works out there there were 7082 games left at the end of April. Then subtracting the 4624 games sold in May from this works out that there were 2458 games left at the end of May

12 This is a drawing of a cuboid.

Tick the nets that could make the cuboid.



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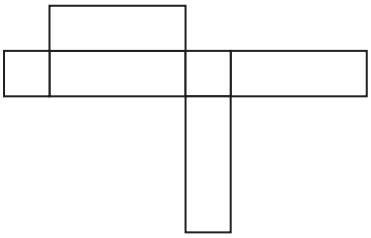

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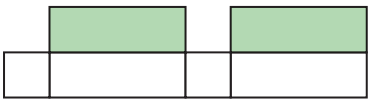

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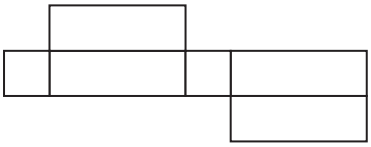


☑

2 marks

The parts highlighted in green will clash on the nets not ticked and will therefore not form the cuboid

13 Write the missing number to make this calculation correct.

$754 \times 6 + 754 \times 3 = 754 \times$ [9]

6 lots of 754

3 lots of 754

Adding 6 lots of 754 and 3 lots of 754 gives 9 lots of 754

1 mark

14 Here are five digit cards.

1	2	3	4	5

Use two cards to make a fraction **equivalent to 25%**

25% is 1/4. This is a conversion which could be known. Otherwise, percentage is out of 100 so 25% = 25/100 which simplifies to 5/20 by dividing both the numerator and denominator by 5, which then simplifies to 1/4 by dividing both the numerator and denominator by 5

$\frac{1}{4}$

1 mark

Use two cards to make a fraction **equivalent to 0.4**

The 4 is in the tenths place so is worth 2/10. This simplifies to 2/5 by dividing both the numerator and denominator by 2

$\frac{2}{5}$

1 mark

15 Amina went to a concert one evening.

It took her an hour and twenty minutes to get there from home.

She arrived at ten past seven.

At what time did she leave home?

$\overset{6}{7}\overset{7}{:}\overset{1}{1}0$
$-1:20$
$5:50$

5:50 pm

1 mark

The concert started at 7:20 pm.

It finished at 9:05 pm.

How long did the concert last?

$\overset{8}{9}\overset{6}{:}05$
$-7:20$
$1:45$

1 hours 45 minutes

1 mark

Subtracting the staring time from the finishing time works out the difference in time and therefore how long it lasted. When borrowing an hour, it is worth 60 minutes so 6 is added to the tens column for the minutes

Ten past seven in the evening can be expressed as 7:10pm. Subtracting the 1 hour and 20 minutes from this works out the time she left home. When borrowing an hour, this is worth 60 minutes so 6 is added to the tens column for the minutes

16 A box of 24 chocolate eggs has a mass of **870 grams.**

The empty box has a mass of **30 grams.**

What is the mass of **one** chocolate egg?

Show your method

870 − 30 = 840

24 × 1 = 24
24 × 2 = 48
24 × 3 = 72
24 × 4 = 96
24 × 5 = 120

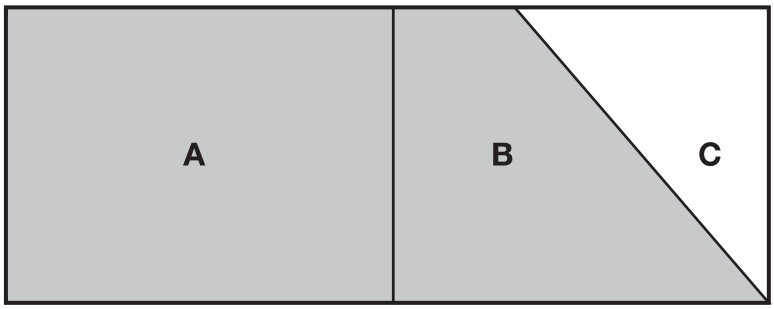
840 ÷ 24 = 35

35 g

2 marks

Subtracting the mass of the empty box works out that the total mass of the chocolate eggs is 840g. Dividing this by the 24 chocolate eggs works out the mass of one chocolate egg. Listing out the 24 times table helps with the division

17 This rectangle is divided into three parts.



Not to scale

Part **A** is $\frac{1}{2}$ of the area of the rectangle.

Part **B** is $\frac{1}{3}$ of the area of the rectangle.

What **fraction** of the area of the rectangle is **shaded**?

$\frac{1}{2}+\frac{1}{3}$

$\frac{3}{6}+\frac{2}{6}$

$\frac{5}{6}$

1 mark

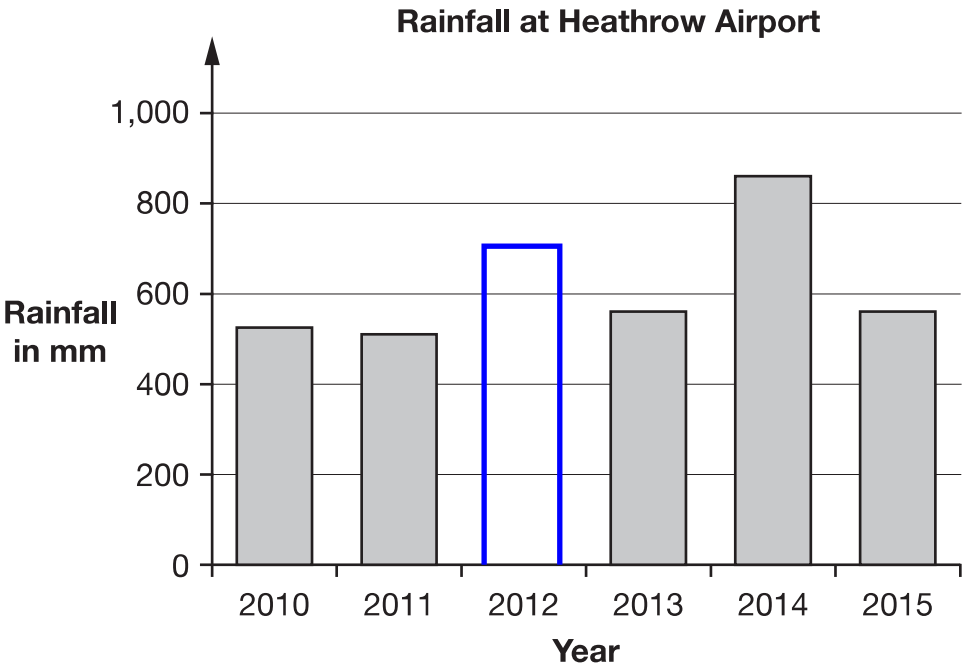
Adding the 1/2 for Part A and the 1/3 for Part B works out what fraction of the area of the rectangle is shaded. To add the fractions the denominators need to be the same so both the numerator and denominator of 1/2 are multiplied by 3 to get 3/6 and both the numerator and denominator of 1/3 are multiplied by 2 to get 2/6. Then the numerators can be added and the denominator stays the same

18 This table shows the total rainfall and sunshine each year at Heathrow Airport from 2010 to 2015.

Year	Rainfall in mm	Sunshine in hours
2010	521	1,371
2011	509	1,540
2012	700	1,503
2013	560	1,452
2014	864	1,669
2015	562	1,508

Use this table to complete the graph.

Use a ruler.

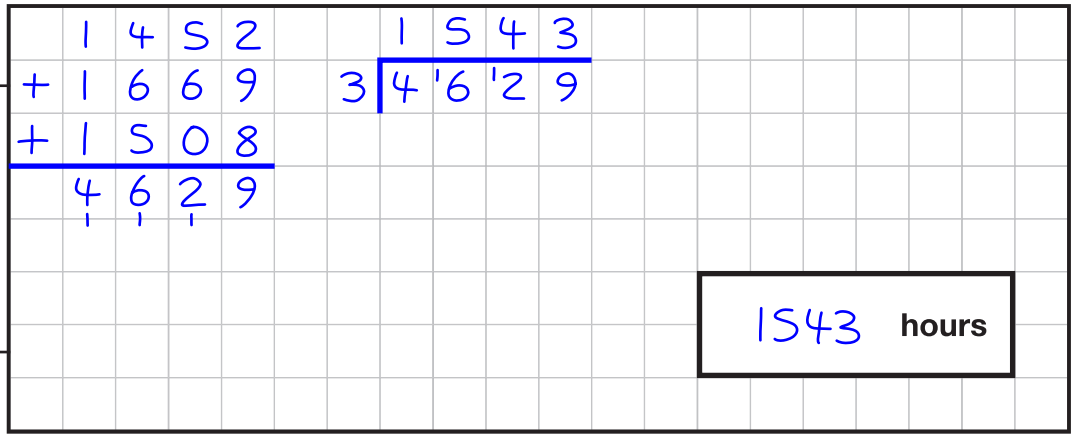


1 mark

There was 700mm of rainfall in 2012. 700 is halfway between 600 and 800

Use the table to calculate the **mean** hours of sunshine for Heathrow Airport from **2013** to **2015**.

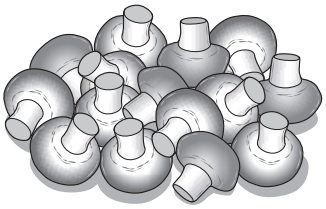
Show your method

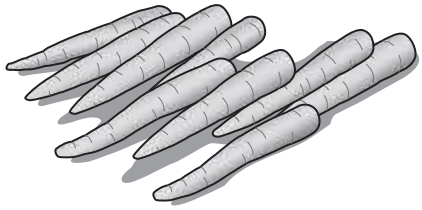


2 marks

To work out mean, add them all up and then divide by how many there are. Adding the numbers of sunshine for 2013, 2014 and 2015 then dividing by the 3 years works out the mean

19 These are the prices of some vegetables in a shop.





Mushrooms £3.20 for 1 kg	Carrots 60p for 1 kg

Layla buys **500 grams** of mushrooms and **1** $\frac{1}{4}$ **kg** of carrots.

She pays with a **£5** note.

How much change does Layla get?

Show your method

1.60 | 2 | 3.'2 0

0.15 | 4 | 0.6²0

0.60 + 0.15 = 0.75

0.75 + 1.60 = 2.35

$^{4}\cancel{5}.^{1}\cancel{0}\,'0 - 2.35 = 2.65$

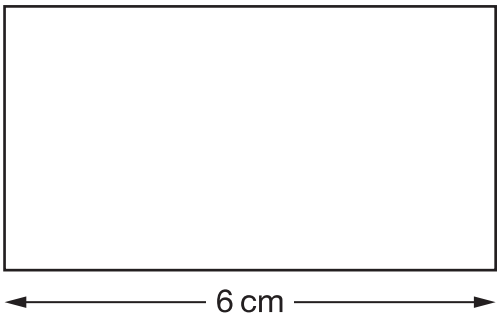
£ 2.65

2 marks

There are 1000 grams in a kilogram. 500 grams is half of 1000 grams so the cost of the mushrooms will be half of the £3.20. Dividing this by 2 works out the cost of the mushrooms. 60p is £0.60. Dividing the cost of 1kg of carrots by 4 works out that 1/4 kg of carrots costs £0.15. Adding the cost of 1 kg of carrots works out that $1^{1}/_{4}$ kg of carrots costs £2.35. Adding the cost of 500 grams of potatoes to this works out that the total cost is £2.35. Subtracting this from the £5 works out how much more has been paid than is due and therefore how much change Layla gets

20 The length of this rectangle is 6 cm.

The width is w cm.



Not actual size

Circle **all** the methods below that can be used to work out the **perimeter** of the rectangle.

A $w \times 6$

B $w \times 2 + 12$

C $2 \times (w + 6)$

D $6 + w + 6 + w$

2 marks

Perimeter is the total length of the sides around the outside of the shape.

A) w x 6 works out the area, not the perimeter.

B) w x 2 works out the length of 2 of the widths. 12 is the total length of both of the lengths. Adding these gives the perimeter.

C) w + 6 works out the total length of one width and one length. Multiplying this by 2 gives the perimeter as there are 2 lengths and 2 widths.

D) Adding 2 of the widths and 2 of the lengths gives the perimeter.

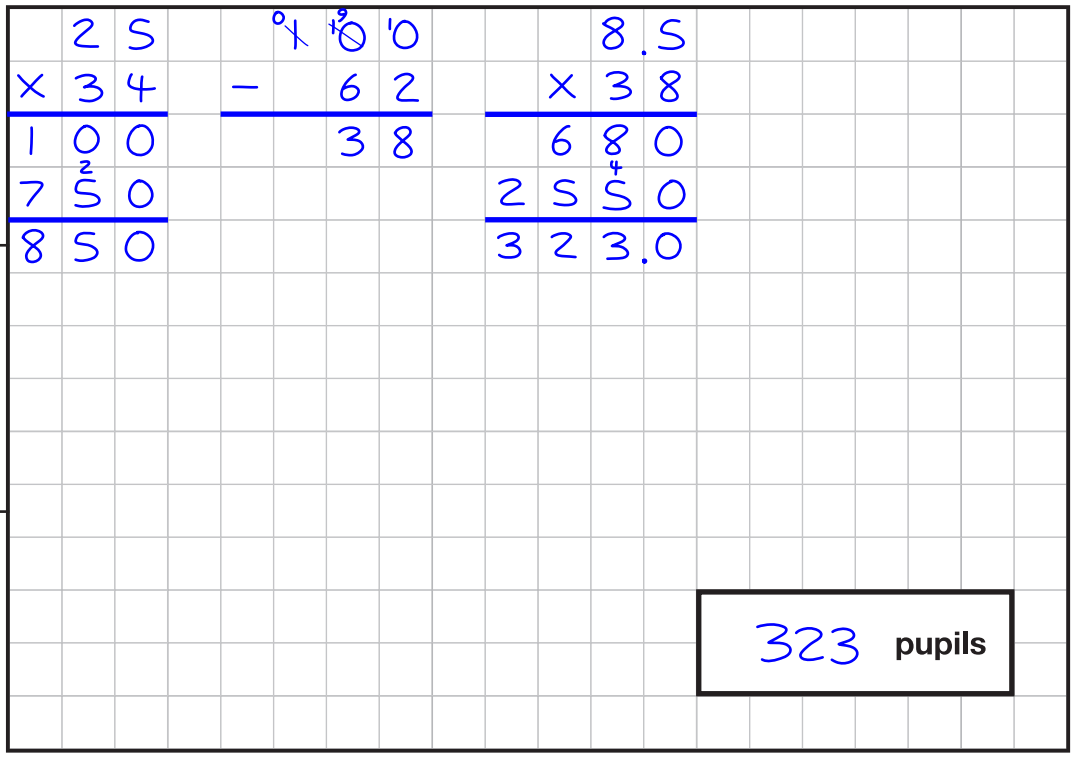
21 There are 25 classes in a school.

Each class has 34 pupils.

62% of all the pupils play a sport after school.

What number of pupils do not play a sport?

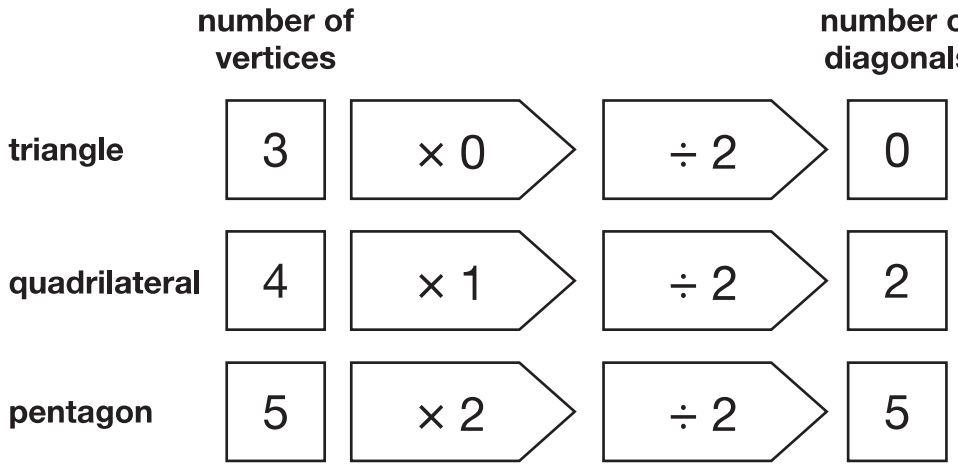
Show your method



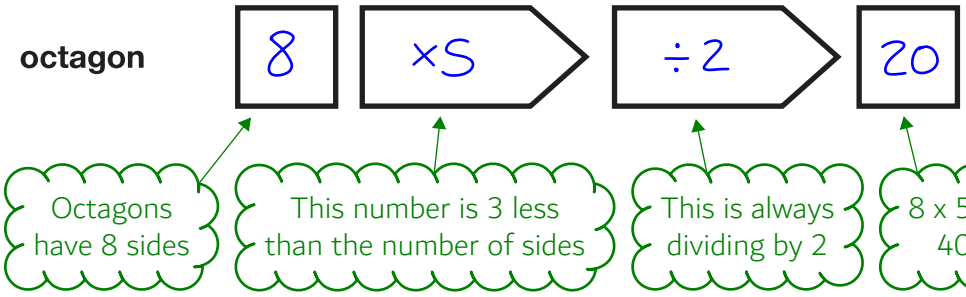
3 marks

Multiplying the 25 classes by the 34 pupils in each class works out that there are 850 pupils in total. Percentage is out of 100 so subtracting the 62% from 100% works out that 38% of pupils do not play a sport. 1% is 1/100 so dividing the 850 by 100 by moving the decimal point twice to the left finds that 1% of 850 is 8.5. Multiplying this by 38 works out that the 38% is 323 pupils

22 Megan uses these number machines to calculate how many diagonals different shapes have.



Complete the number machine for the **octagon**.



1 mark

23 Write the missing **decimals**.

One has been done for you.

a	b	$\frac{a}{b}$
1	4	0.25
3	20	0.15
5	8	0.625

2 marks

$$20\overline{)3.^{3}0^{10}0} = 0.15 \qquad 8\overline{)5.^{5}0^{2}0^{4}0} = 0.625$$

Dividing the value of a by the value of b works out a/b as a decimal

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Paper 3: reasoning
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