2024 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 should be written in the exam.

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

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

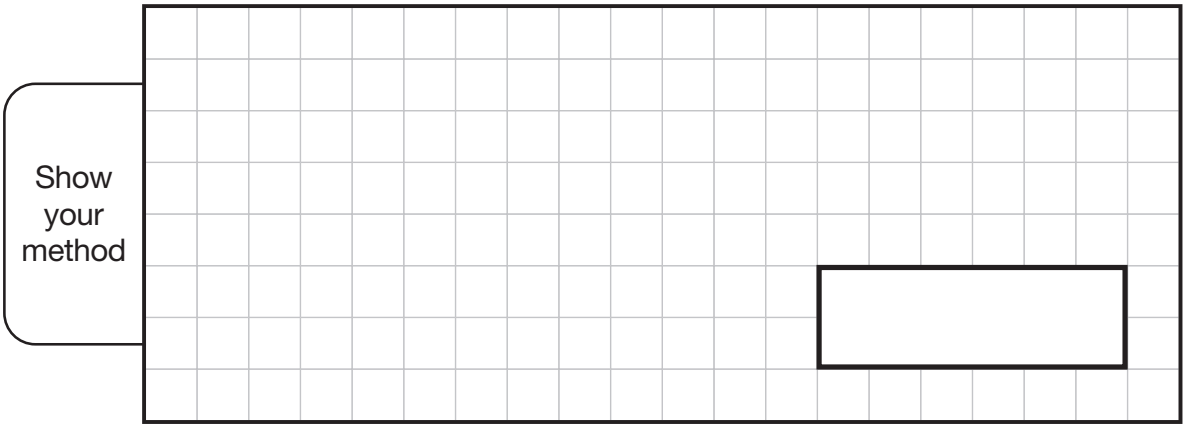
You have **40 minutes** to complete this test.

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**.

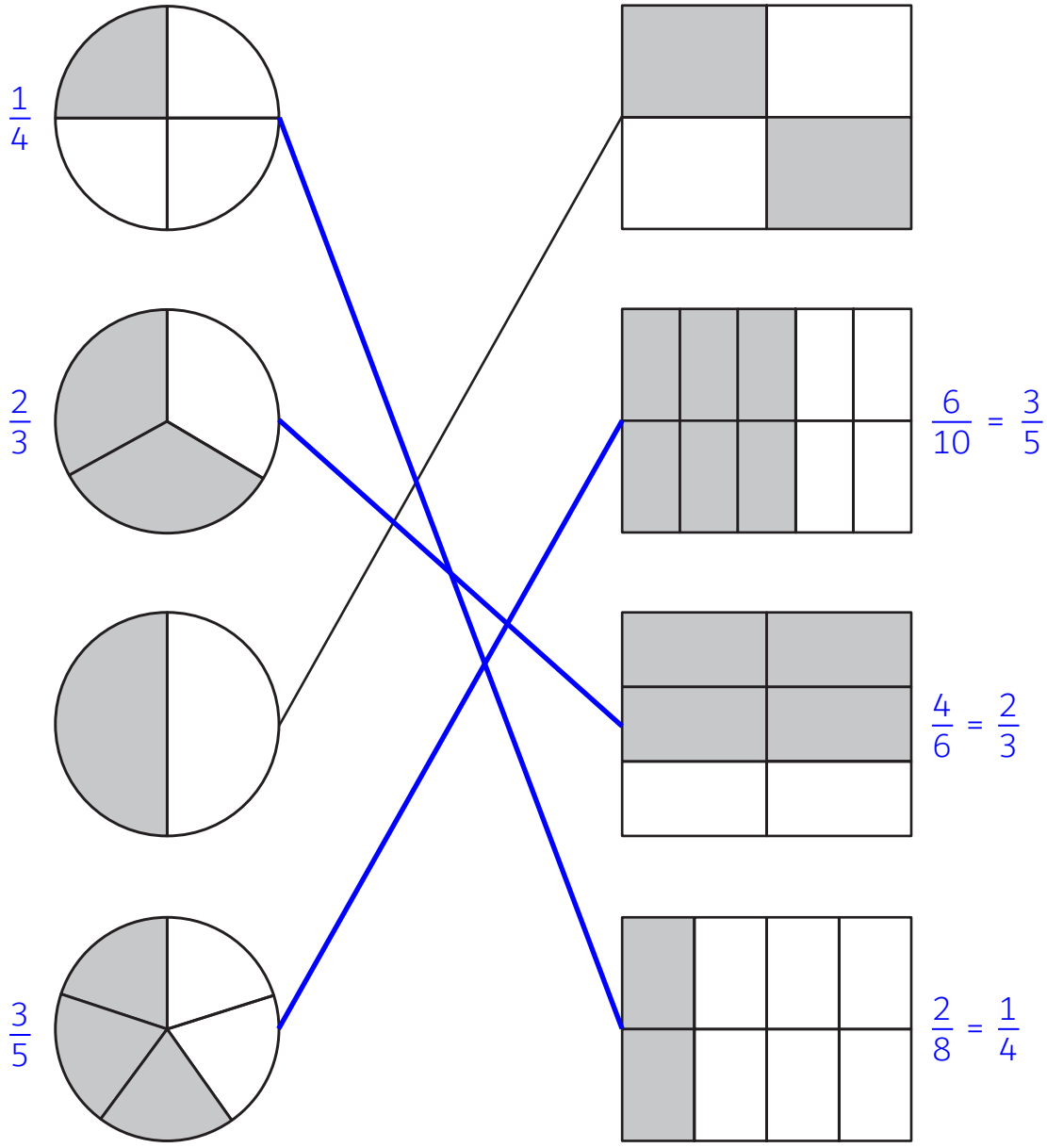
Marks

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

1 These shapes have a fraction shaded.

Match each shaded fraction of a circle to the same shaded fraction of a rectangle.

One has been done for you.



1 mark

Expressing the fractions of each shape which is shaded then simplifying them if possible by dividing both the numerator and denominator by the same amount

2 The temperature in a freezer is −40 °C.

The temperature increases by 10 °C.

What is the new temperature?

-30 °C

1 mark

10 needs to be added to the -40. This makes it less negative. 40 - 10 = 30 so -40 + 10 = -30

3 Jack buys milk and orange juice from a shop.

£1.45 **£2.40**

He pays with a £5 note.

How much **change** does Jack get?

Show your method

	1	.	4	5		5	.	0	0
+	2	.	4	0	-	3	.	8	5
	3	.	8	5		1	.	1	5
	A					B			

£ 1.15

2 marks

A: Adding the £1.45 and the £2.40 works out that the total cost is £3.85.

B: Subtracting the £3.85 total cost from the £5 he pays works out that he has paid £1.15 too much so this is the change he gets

4 The diameter of the Moon is 3,476 kilometres.

What is this diameter to the **nearest hundred** kilometres?

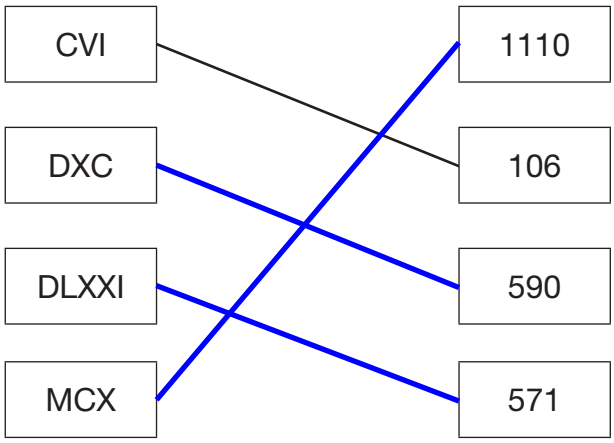
3500 **km**

1 mark

The 4 is in the hundreds place. The 7 after it causes the 4 to be rounded up to a 5. Then everything after this 5 is set to 0

5 Match each of these Roman numerals to the correct number.

One has been done for you.

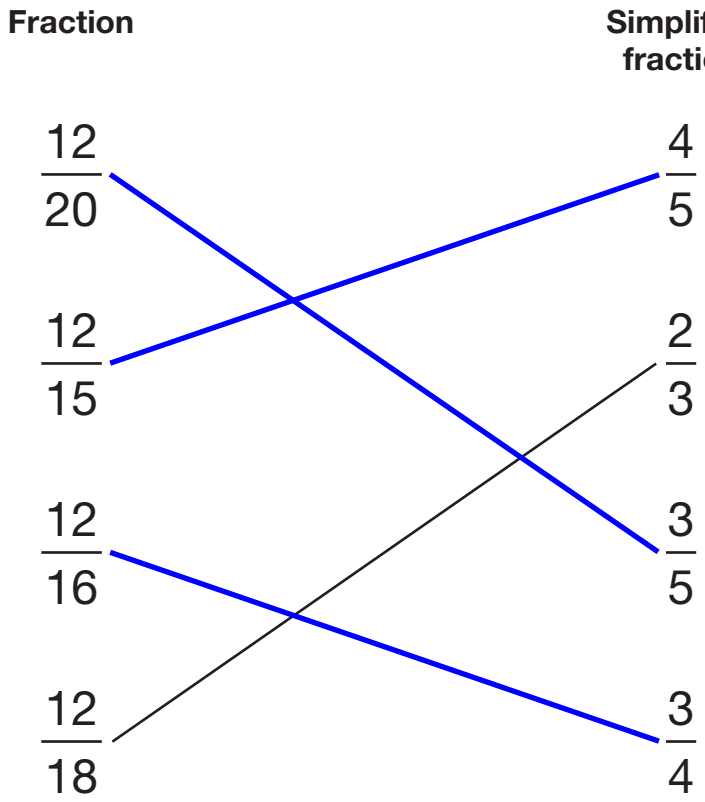


1 mark

I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1000. The numerals are added or if a smaller numeral is before a larger numeral, it is subtracted. So DXC = 500 - 10 + 100 = 490, DLXXI = 500 + 50 + 10 + 10 + 1 = 571 and MCX = 1000 + 100 + 10 = 1110

6 Match each fraction to its equivalent simplified fraction.

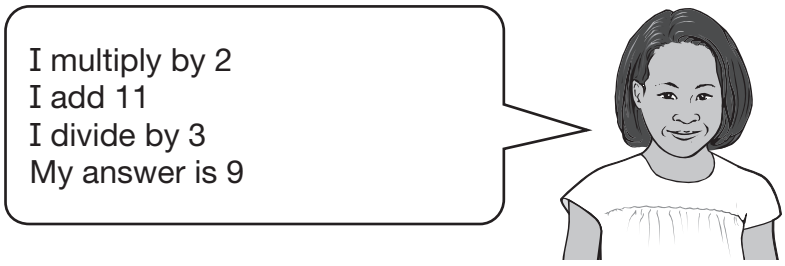
One has been done for you.



1 mark

Both the numerator and denominator of 12/20 can be divided by 4 to give 3/5.
Both the numerator and denominator of 12/15 can be divided by 3 to give 4/5.
Both the numerator and denominator of 12/16 can be divided by 4 to give 3/4

7 Emma thinks of a number. She says,



What number did Emma think of?

9 × 3
27 - 11
16 ÷ 2

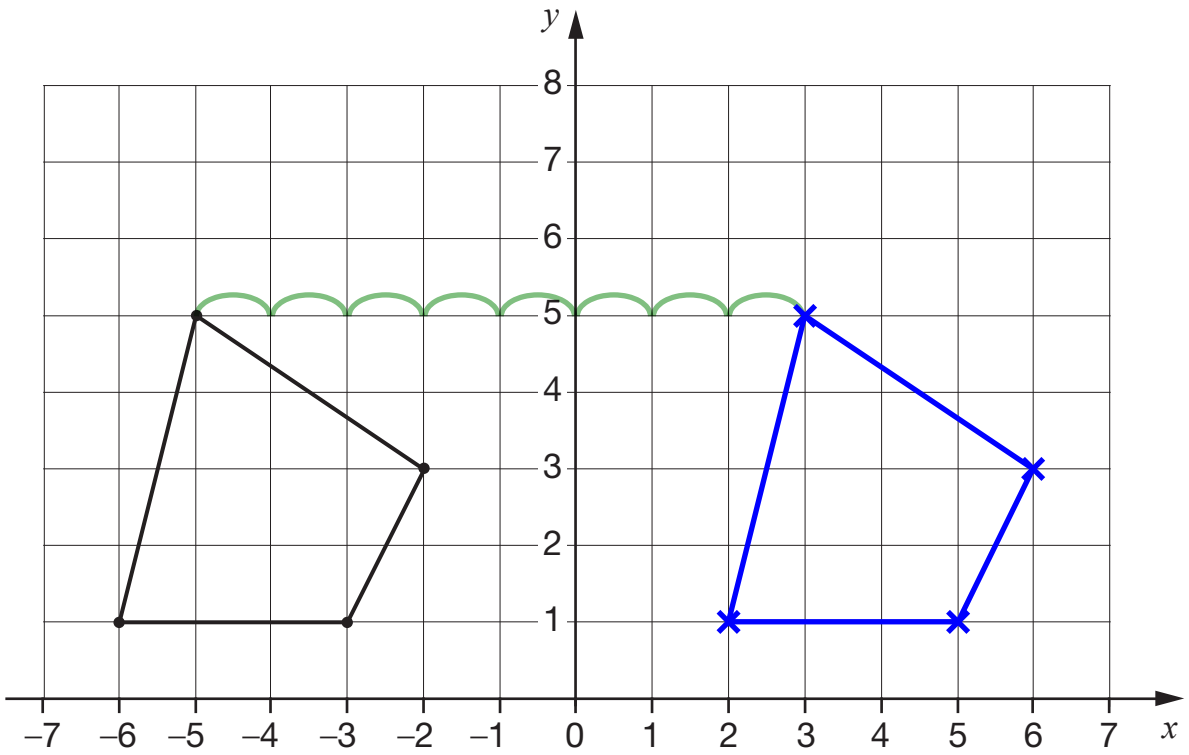
8

1 mark

Doing the opposite operations in the opposite order takes it from the answer back to the original number. The opposite of dividing is multiplying. The opposite of adding is subtracting. The opposite of multiplying is dividing

8 Here is a shape.

Draw the shape after it is translated 8 units to the right.



1 mark

Use a ruler.

Moving each corner 8 units to the right then joining them up with a ruler

9 Write the missing numbers in the table.

Number of weeks	Number of days
1	7
2	14
4	28
6	42
10	70
15	105

6 × 7 = 42

6 × 10 = 70

1 mark

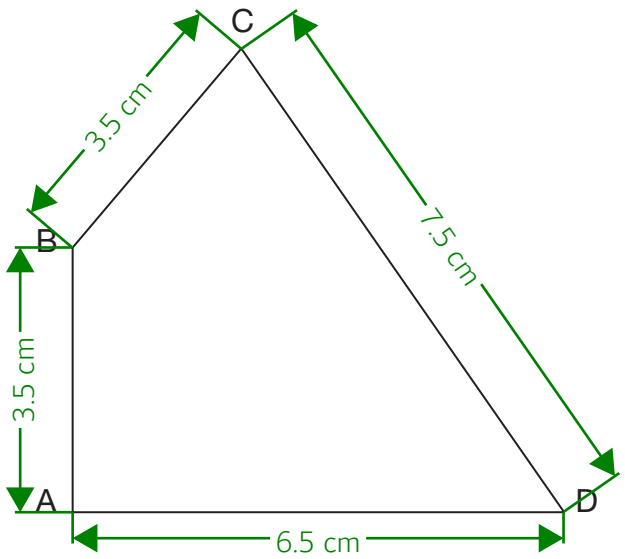
There are 7 days in a week

$$7\overline{)105} = 15$$

Dividing the 105 days by 7 works out that it is 15 lots of 7 so is 15 weeks

10

35
+ 35
+ 65
+ 75
210
1



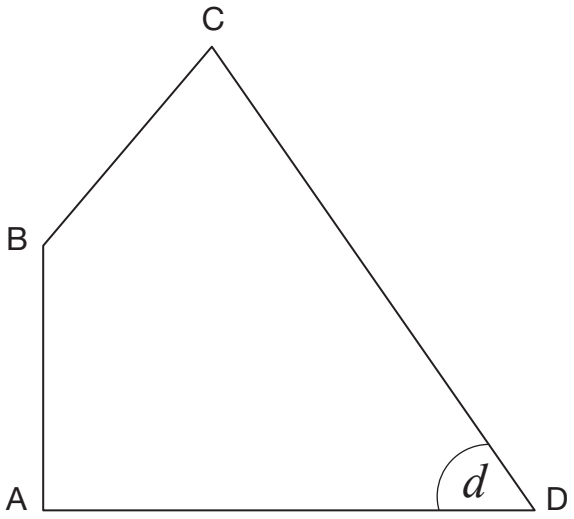
What is the perimeter of the shape, **in millimetres**?

Use a ruler.

There are 10 mm in 1 cm so multiplying each of the measurements in cm by 10 to convert them to mm. Then adding the lengths of all the outside sides gives the perimeter

210 **mm**

1 mark



Measure the size of angle d.

Use an angle measurer.

d is 55 °

1 mark

11 Write the missing digits to make this **subtraction** correct.

$$\begin{array}{r} 5\ \overset{6}{\cancel{7}}\ \overset{1}{\square} \\ -\ 3\ \square\ 5 \\ \hline \square\ 6\ 8 \end{array}$$

2 marks

Orange square: adding the 5 to the 8 gives 13 so the missing digit must be 3 and 1 was borrowed from the 7.

Green square: 0 is subtracted from 6 to get 6 so the missing digit must be 0.

Pink square: 5 - 3 = 2

12 Here are four fractions.

$\frac{7}{8}$ $\frac{35}{40}$ $\frac{1}{5}$ $\frac{8}{40}$ $\frac{3}{4}$ $\frac{30}{40}$ $\frac{8}{10}$ $\frac{32}{40}$

Write the fractions in order starting with the least.

$\frac{1}{5}$ $\frac{3}{4}$ $\frac{8}{10}$ $\frac{7}{8}$

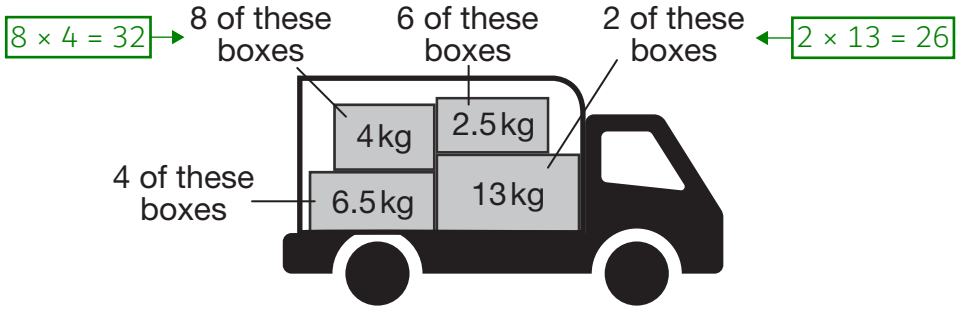
least

1 mark

Converted each of the fractions into equivalent fractions with the same denominator so that they can be compared

13 There are 20 boxes on a truck.

The boxes are in 4 different sizes.



What is the **total mass** of the 20 boxes on the truck?

Show your method

$6.5 \times 4 = 26.0$ A

$2.5 \times 6 = 15.0$ B

$26 + 32 + 15 + 26 + 99$ C

99 kg

2 marks

A: Working out that the total mass of 4 boxes of mass 6.5 kg is 26 kg.

B: Working out that the total mass of 6 boxes of mass 2.5 kg is 15 kg.

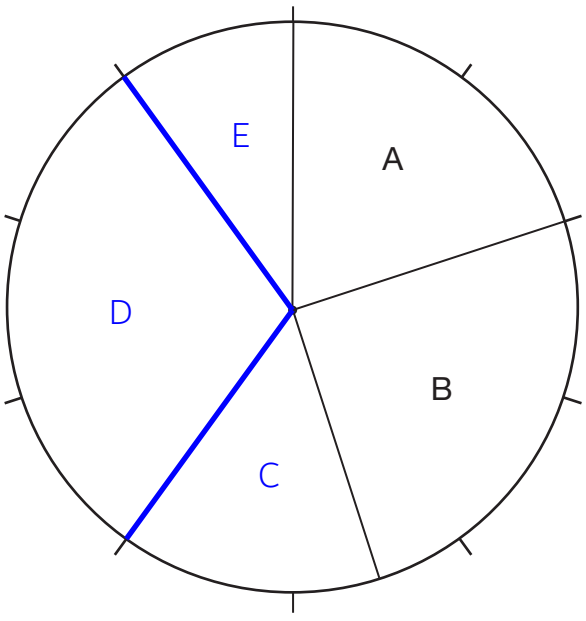
C: Adding the masses of all the boxes works out that the total mass the 20 boxes is 99 kg

14 Look at the data in this table.

Label	Percentage
A	20%
B	25%
C	15%
D	30%
E	10%

Using this data, draw **two** lines and write **three** labels to complete the pie chart.

Use a ruler.



2 marks

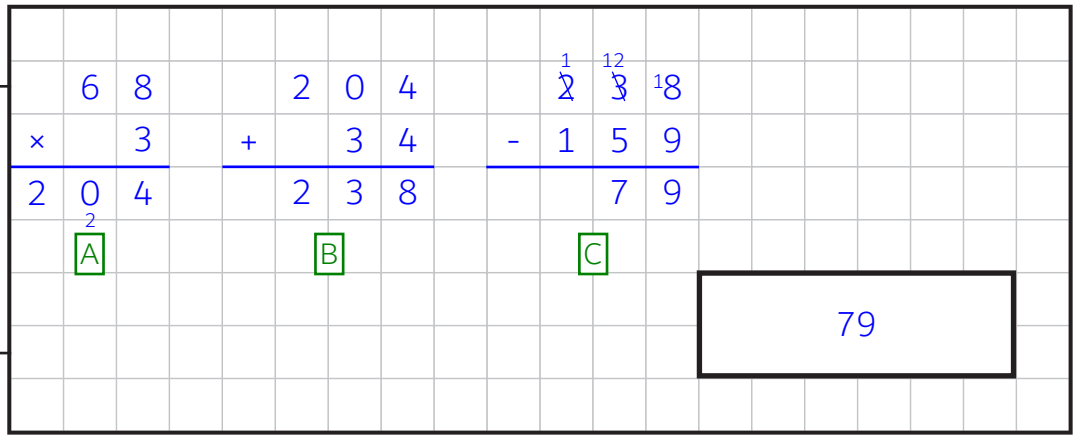
There are 10 equal sections which represent 100%. Dividing the 100% by the 10 sections works out that each section is worth 10%. So D is 3 sections, E is 1 section and C is what is left over

15 35% of the 680 pupils at a school have a pet dog.

159 of the pupils who have a pet dog are boys.

How many of the pupils who have a pet dog are girls?

Show your method



2 marks

A: 10% of 680 is 68, which is found by dividing the 680 by 10 which removes a 0 from the end in this case. Multiplying the value of 10% by 3 works out that 30% of 680 is 204.

B: 5% is half of 10%. Half of 68 is 34. So 5% of 680 is 34. Adding the value of 5% to the value of 30% works out that 35% of 680 is 238.

C: 238 pupils have a pet dog. Subtracting the 159 boys who have a pet dog from the 238 pupils who have a pet dog works out that there are 79 girls who have a pet dog

16 Write a number in the box to make this correct.

$$\frac{3}{5} < \boxed{65} < 0.7$$

$$\frac{60}{100} \qquad \frac{65}{100} \qquad \frac{70}{100}$$

1 mark

Multiplying both the numerator and denominator of 3/5 by 20 so that it becomes 60/100, which has 100 as the denominator. 0.7 is 7/10, which can be converted to 70/100 by multiplying both the numerator and denominator by 10 so that it has 100 as the denominator. 65/100 is greater than 60/100 but less than 70/100

17 Tick the numbers that are factors of both 54 **and** 72

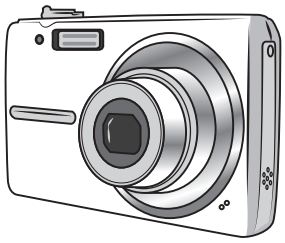
2	✓	They are both even so must be divisible by 2, so have 2 as a factor
3	✓	They are both divisible by 3, so have 3 as a factor
4		54 is not divisible by 4, so 4 is not a factor of 54
8		54 is not in the 8 times table, so 8 is not a factor of 54
9	✓	They are both in the 9 times table, so have 9 as a factor

1 mark

$3\overline{)5^{2}4}\ 18$ $\quad 3\overline{)7^{1}2}\ 24$

$4\overline{)5^{1}4}\ 13\ r2$

18 Layla wants to buy a camera that costs £65



For the first 10 weeks, she saves £2 each week.

Then she saves £3 each week.

How many weeks **altogether** does it take Layla to save £65?

Show your method

10 × 2 = 20 (A)

65 − 20 = 45 (B)

45 ÷ 3 = 15 (C)

10 + 15 = 25 (D)

25 **weeks**

2 marks

A: Multiplying the 10 weeks by the £2 each week works out that £20 has been saved so far.

B: Subtracting the £20 saved so far from the £64 cost of the camera works out that £45 is left to be saved.

C: Dividing the £45 left to be saved by the £3 each week works out that another 15 weeks are needed.

D: Adding the original 10 weeks to the extra 15 weeks works out that it will take 25 weeks to save £65

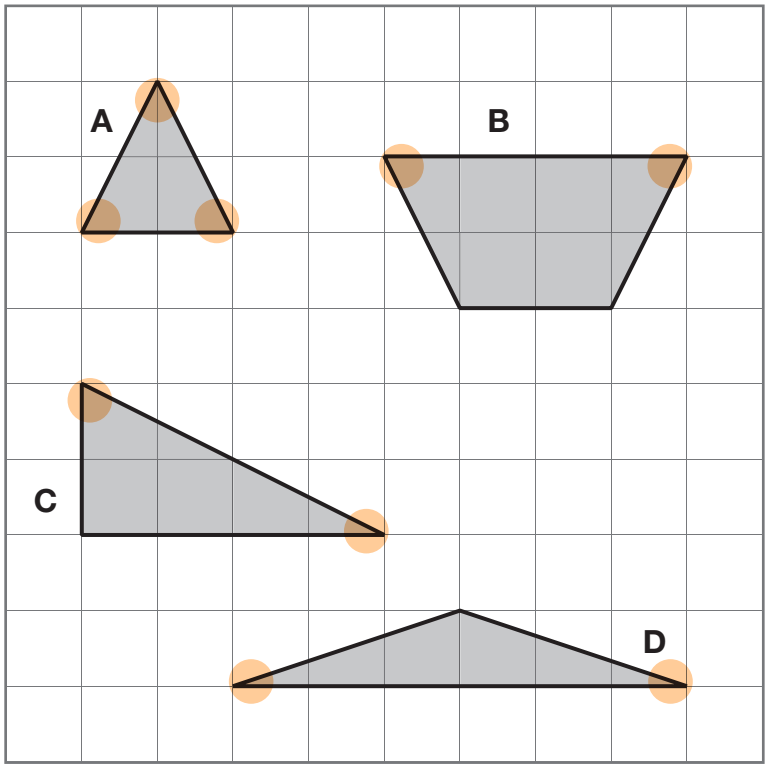
19 Complete this division.

$$\begin{array}{r} 3\;6\;4\;\text{r}1 \\ 12\overline{)\,4\;3\;{}^{7}6^{4}\;9} \end{array}$$

2 marks

3 lots of 12 go into 43 with a remainder of 7. So 3 must go in the orange box. 6 lots of 12 go into 76 with a remainder of 4. 4 lots of 12 make 48. 49 is 1 more than this so will leave a remainder of 1 at the end. So 9 must go in the green box

20 Here are four shapes on a grid.



Write the letters of **all** the shapes that have **only two** acute angles.

B, C, D

1 mark

Acute angles are less than 90°. They are all highlighted in orange

21 A band holds a concert for charity.

The tickets cost £27 each.

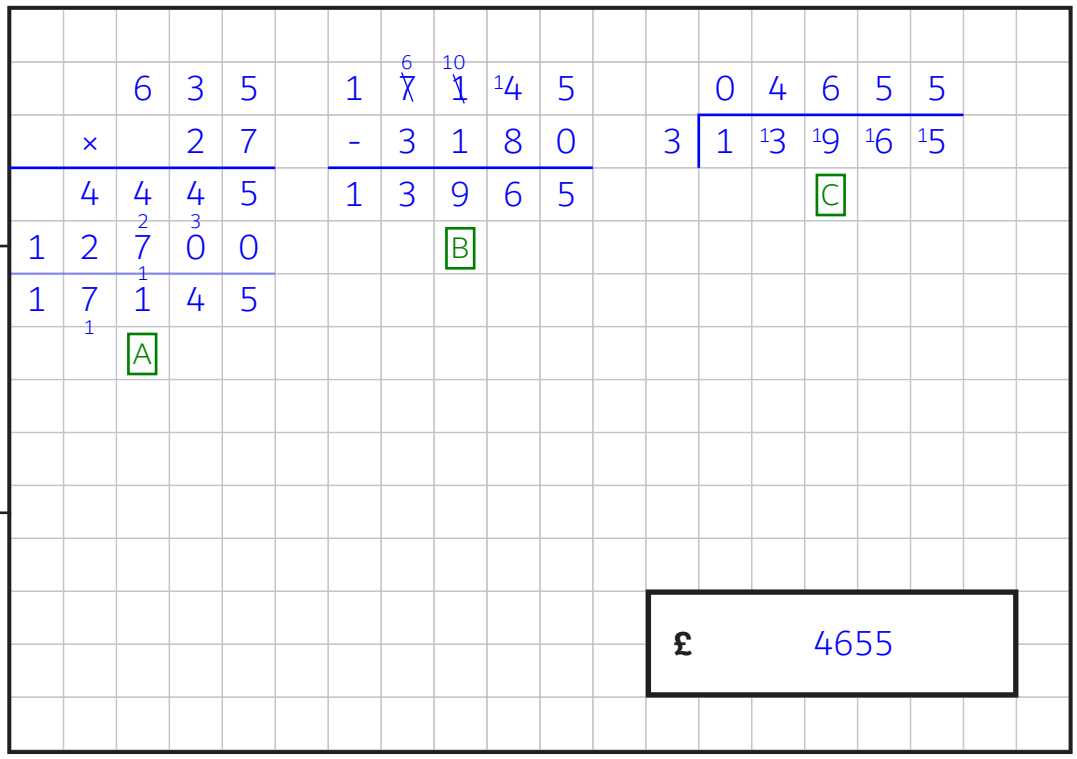
They sell 635 tickets.

They pay £3,180 to use the hall.

They give one-third of the **remaining** amount to charity.

How much money does the band give to charity?

Show your method



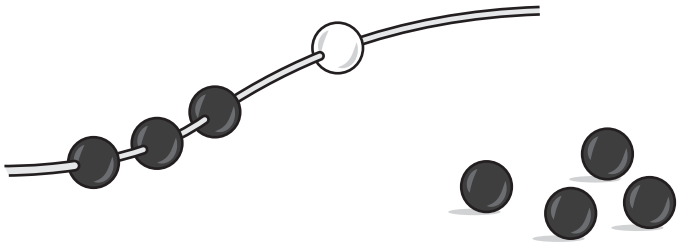
3 marks

A: Multiplying the 635 tickets by the £27 cost of each ticket works out that the income form the concert is £17145.

B: Subtracting the £3180 to use the hall from the £17145 income works out that the remaining amount is £13965.

C: Dividing the remaining £13965 by 3 works out that one-third of the remaining amount is £4655, which is given to charity

22 Sarah makes jewellery using black and white beads.



She uses this rule to work out how many black beads to use.

black = (white × 3) + 4

Sarah uses 12 **white** beads to make a necklace.

How many black beads does she use?

12 × 3
36 + 4

40

1 mark

Multiplying the number of white beads by 3 then adding 4 to the result

Sarah uses 25 **black** beads to make a bracelet.

How many white beads does she use?

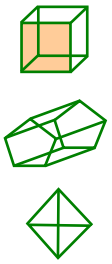
25 - 4
21 ÷ 3

7

1 mark

Doing the opposite operations in the opposite order to go back from the 25 black beads to the number of white beads. The opposite of adding 4 is subtracting 4 then the opposite of multiplying by 3 is dividing by 3

23 Complete the table.



Name of 3-D shape	Number of faces
cube	6
pentagonal prism	7
triangular-based pyramid	4

1 mark

A face of the cube is highlighted in orange

24 $\frac{1}{2} \times \frac{5}{6}$ is greater than the value of $\frac{1}{3} \times \frac{7}{8}$

Explain how you know.

$\frac{1}{2} \times \frac{5}{6} = \frac{5}{12} = \frac{10}{24}$

$\frac{1}{3} \times \frac{7}{8} = \frac{7}{24}$

1 mark

Fractions can be multiplied by multiplying the numerators and multiplying the denominators. Multiplying both the numerator and denominator of 5/12 by 2 makes it 10/24, which has the same denominator as 7/24. 10/24 is greater than 7/24

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