What do you know about decimals?

What is 5.48 + 6.75?

What is 1.64 - 0.47?

What is 3.6 x 10?

What is 6.03 x 100?

What is 5.2 ÷ 10?

What is 324 ÷ 100?

What is 0.7 x 8?

Round 7.5 to the nearest integer.

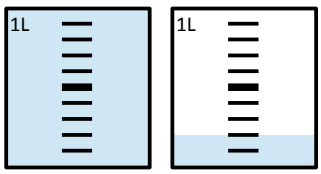
Round 4.84 to 1 d.p.

How many 0.1's would make 5.2 in total?

Do all of the bottles hold the same amount?

They should - but perhaps we should measure them to find out for sure.

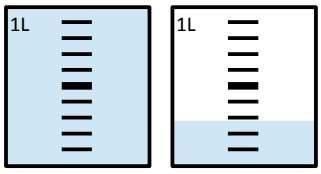






Alice

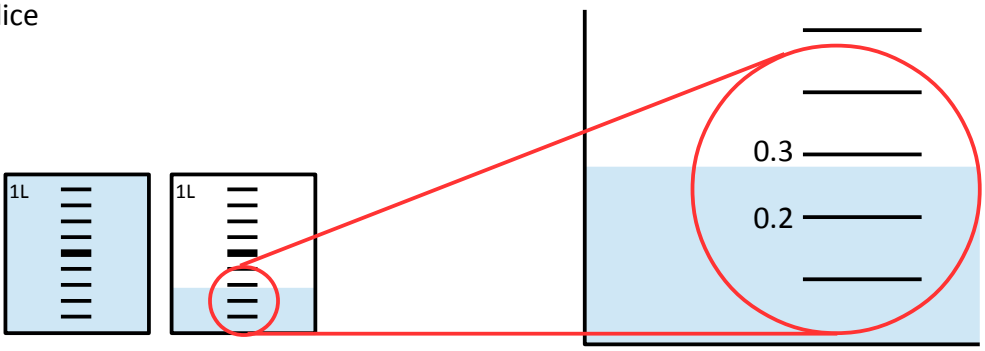
My bottle is exactly 1.2L.

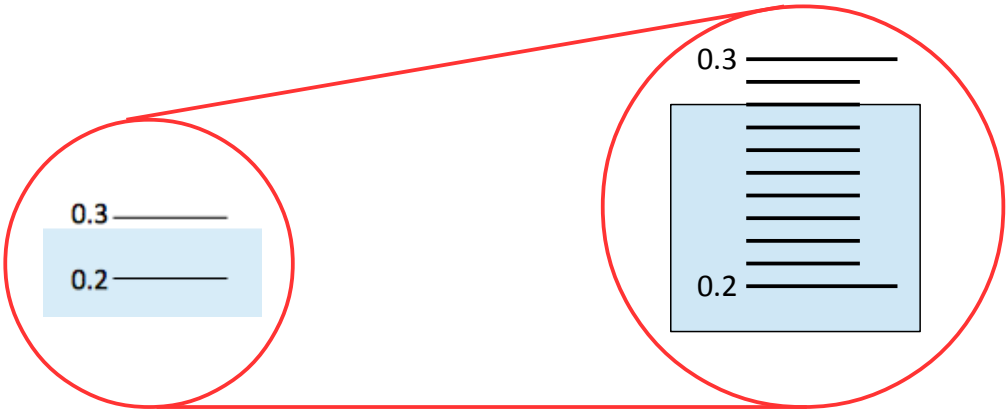


My bottle is between 1.2L and 1.3L.



Sarah







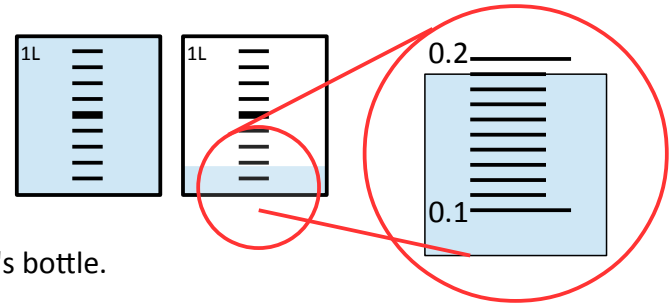
Sarah

So my bottle holds 1.28L

Do all of the bottles hold the same amount?


Matthew

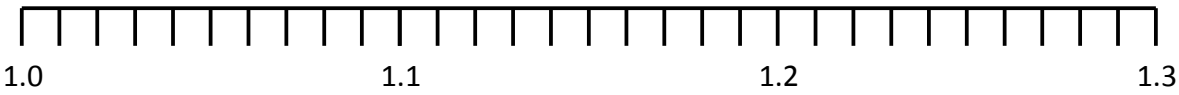
These diagrams show how much is in my bottle.



Write down how much water is in Matthew's bottle.

Eventually, the group measured the contents of 6 bottles. Their results were:

1.2L 1.28L 1.19L 1.3L 1.26L 1.2L.



1 Using this number line to help you, write their results in ascending order of volume.

Let's think about the structure of decimal numbers

When 1 is divided into 10 equal parts.

Each part can be written as $1 \div 10$, $\frac{1}{10}$ or 0.1 and is read as one tenth

0.6 is the same as $6 \times \frac{1}{10}$ or $\frac{6}{10}$ and is read as six tenths

0.01 is the same as dividing 0.1 into 10 equal parts.

Each part can be written as $0.1 \div 10$, $1 \div 100$, $\frac{1}{100}$ or 0.01 and is read as one hundredth or zero point zero one.

0.08 is the same as $8 \times \frac{1}{100}$ or $\frac{8}{100}$ and is read as eight hundredths or zero point zero eight.

0.68 is the same as $\frac{6}{10} + \frac{8}{100}$ or $\frac{68}{100}$ and is read as zero point six eight.

2 What can we say about 1.26?


Alice

It's made up of 1 and ☐ added together.

It's smaller than 1.3.


Sarah


Jon

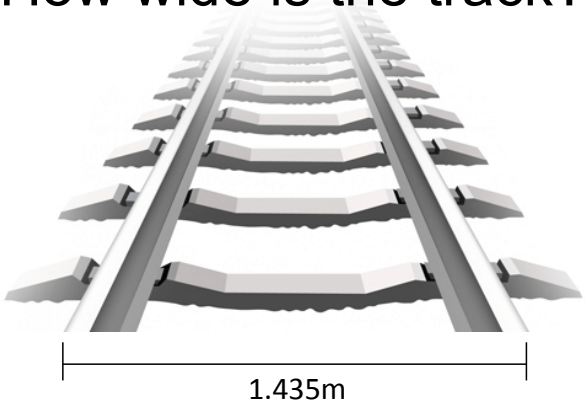
It's made up of ☐ unit, ☐ 0.1's and ☐ 0.01's

It's made up of ☐ 0.01's.


Matthew

Explain their thinking.

How wide is the track?

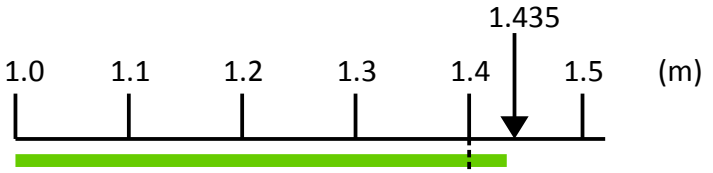


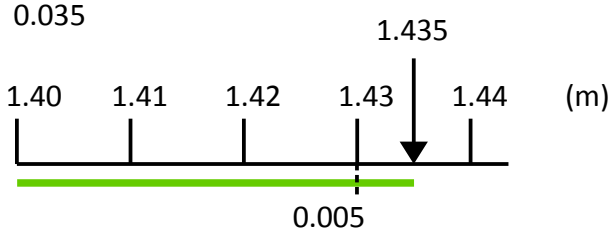
The width of the standard gauge track in the UK is 1.435 meters. Let's look at that number...



Amber

What does the 5 in 1.435 represent?





0.001 is the same as dividing 0.01 into 10 equal parts.

Each part can be written as 0.01 ÷ 10, 0.1 ÷ 100, 1 ÷ 1000 or $\frac{1}{1000}$

Each part is called one thousandth and read as zero point zero zero one.

0.005 is the same as $5 \times \frac{1}{1000}$ or $\frac{5}{1000}$ and is called five thousandths and read as zero point zero zero five.

We can write this in (base 10) place value notation as follows.

1000	100	10	1	0.1	0.01	0.001
			1	4	3	5
thousands	hundreds	tens	units	tenths	hundredths	thousandths

3

What can say about 1.435?

3 What can you say about 1.435?


Alice

It's made up of 1 and ☐ added together.

It's smaller than 1.5


Sarah


Matthew

It's made up of ☐ unit, ☐ 0.1's, ☐ 0.01's and ☐ 0.001's

It's made up of ☐ 0.001's.

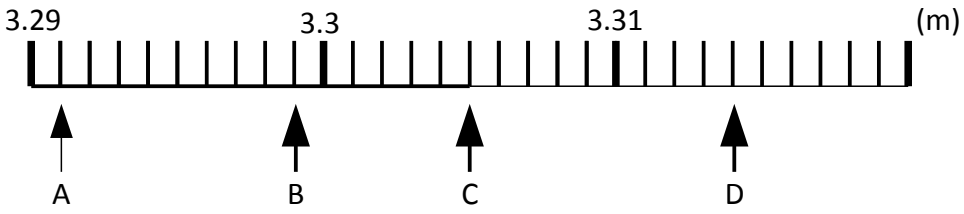

Jon

Explain their thinking.

Fitness check



1. How many 0.01's together make 2.63?
2. How many 0.001's together make 3.629?
3. Write down a number that is between 1.8 and 1.9.
4. Write down a number that is between 4.35 and 4.36.
5. What are the lengths indicated by the arrows, A, B, C, D?




Amber

It's easier if you write 3.3 as 3.30.

Is 3.3 the same as 3.30?


Matthew

4 How would you answer Matthew's question?

Adding and subtracting decimals


Amber

Amber bought three 1.5kg bags of apples. When she got home, she weighed them on her mother's scales. Their weights were 1.5kg, 1.48kg and 1.515kg. She then worked out the total weight and left a note for her brother to check.

Amber's Idea

Jon, check this for me.

$$\begin{array}{r} 15 \\ +\ 148 \\ +\ 1515 \\ \hline =1.678 \end{array}$$

It doesn't look right!

5 What did Amber do wrong?


Jon

Jon's response

Amber, you have to line the numbers by place value!

$$\begin{array}{r} 1.5 \\ +\ 1.48 \\ +\ 1.515 \\ \hline =\ 4.495\text{kg} \end{array}$$

Fitness check



Work out the answers to the following questions:

1. 2.3 + 4.68 + 5.376
2. 4.9 + 0.823 + 12.079
3. 2.63 – 1.584
4. 83.6 – 27.365
5. The fuel tank on my Hyundai I30 holds 53L of diesel. Although it wasn't empty, I filled up this morning with 34.63L of diesel. How much was already in the tank?
6. The world record for the men's 100m is 9.58 secs and for the women, it is 10.49 secs. How much faster is the men's record than the women's record?
7. The length of a new BMW 125d Sports model is 4.324m, and the width is 1.765m. My garage measures 6m by 2.5m. How much room will I have if I park the car in the middle of the garage?

Multiplying and dividing by 10



Jon

What number is 10 times bigger than 1.435?

Easy - every digit gets 10 times bigger, and so look what happens.



Sarah

1000	100	10	1	0.1	0.01	0.001
			1	4	3	5
		1	4	3	5	
thousands	hundreds	tens	units	tenths	hundredths	thousandths



Jon

So 10 x 1.435 = 14.35 That was easy!
In that case, I think I know how to divide by 10.

6 Can you explain what Jon was thinking?

Fitness check

Write down the answers to the following questions

1. 10 x 12.5
2. 10 x 2.546
3. 10 x 0.038
4. 20 x 3.632 (*Think* 20 = 2 x 10)
5. 100 x 2.564 (*Think* 100 = 10 x 10)
6. 56.2 ÷ 10
7. 3.16 ÷ 10
8. 754 ÷ 10
9. 32.5 ÷ 20
10. 64.4 ÷ 100

7 Can you explain how to multiply and divide by 100?
What about multiplying and dividing by 1000?

Multiplication

Fitness check

Write down the answers to the following questions:

1. 1000 x 1.849
2. 10 x 23.63
3. 100 x 0.069
4. 1000 x 0.002
5. 87.2 ÷ 100
6. 4.28 ÷ 10
7. 654 ÷ 1000
8. 95.2 ÷ 100

More multiplication


Amber

I bought 4 cartons of juice today. Each one contains 0.34L of juice. How much juice did I buy altogether?


Evie

	Units	0.1	0.01
	0	3	4
+	0	3	4
+	0	3	4
+	0	3	4
	1	3	6

1 1

You could use column addition.

You could use the multiplication algorithm.

Units	0.1	0.01
0	3	4
	x	4
1	3	6

1 1

Amber bought 1.36L of juice today.


Matthew

Fitness Check

Calculate, using the multiplication algorithm:

1. 5.12 x 6
2. 23.18 x 7
3. 0.304 x 9
5. 12.417 x 8
6. 312.169 x 5
7. 6.004 x 9

7. A one pound coin weighs 9.5g. How much would 8 coins weigh?
8. A two pound coin weighs 15.98g. How much would 7 coins weigh?
9. On a Geography field trip, you were asked to measure the length of a bridge with a 1.82m stick. The length of the bridge was 9 sticks long. How long is the bridge in metric units?

Multiplication



Evie

My mum works at a local florist. She needs 2.46m of ribbon for each bouquet, and yesterday she made 27 bouquets. How much ribbon did she need?

Sarah's Idea



Sarah

Well 10 x 2.46 = 24.6
So 20 x 2.46 = 49.2
And 7 x 2.46 = 17.22
So 27 x 2.46 = 66.42

She needed 66.42m of ribbon.

Matthew's Idea

You could use the multiplication algorithm

Tens	Units	0.1	0.01	
	2	4	6	
	x	2	7	
4	9	2	0	x 20
1	7	2	2	x 7
6	6	4	2	x 27



Matthew

Fitness Check



Calculate, using the multiplication algorithm

1. 5.49 x 16
2. 3.18 x 17
3. 0.34 x 29
4. 9.41 x 38
5. 4.16 x 45
6. 0.04 x 69

7. The thickness of a 50p coin is 1.78mm. What would be the height of a stack of 18 50p coins?
8. A two pound coin weighs 15.98g. How much would 27 coins weigh?
9. On a Geography field trip, you were asked to measure the length of a bridge with a 1.82m stick. The length of the bridge was 19 sticks long. How long is the bridge in metric units?
10. A VW Polo is 3.97m long. A contain ship transports them in lines of 24 cars, bumper to bumper. How long is the line of cars?



Alice

I bought six coconuts, and their total weight is 7.8kg in total. If they are all the same weight, how much does one coconut weigh?



Jon

Jon's Idea

You could split 7.8kg into
6 kg and 18 0.1 kg
6 and 18 ÷ 6 = 3
So each coconut weighs
1kg + 0.3kg = 1.3kg

Sarah's Idea

You can split 7.8kg into
78 0.1kg
78 ÷ 6 = 13
So each coconut weighs
13 0.1kg = 1.3kg



Sarah



Matthew

Matthew's Idea

You can use short division

$$6 \overline{)\,7 \cdot {}^{1}8} \quad 1 \cdot 3$$

Fitness check

Calculate:

1. 6.24 ÷ 4
2. 14.65 ÷ 5
3. 4.02 ÷ 6
4. 0.301 ÷ 7
5. 7.353 ÷ 9
6. A coil of rope measures 16.2m long. If we divide this equally among 5 people, how much rope will each person get?
7. Eight identical Smart cars are lined up bumper to bumper, one behind the other. Their total length is 21.6m. What would be the length if one additional car is added to the line?
8. Seven litres of petrol weigh 6.3kg. How much would 4 litres weigh?

Rounding

158 children took place in a tennis tournament, and 113 took place in a soccer tournament.
Approximately how many children were involved?

A	B	C	D
250	260	270	280



Alice

To be safe, I would round both numbers up. So 160 + 120 = 280. D is the correct answer.

I don't agree; you should round them both down. So 150 + 110 = 260. So B is the answer.



Amber



Jon

You are both wrong. If you round the numbers to the nearest 10, then 160 + 110 = 270. So C is the answer.

8 Who do you think is right? Explain your thinking.



Matthew

A one pound coin has a diameter of 2.2cms. Roughly how many coins would I need to make a continuous line 78cm long if I lined them up edge to edge?

Roughly 80 ÷ 2 = 40, but actually you won't need that many.



Sarah

9 Can you explain Sarah's answer?

Fitness Check



1. Reggie multiplies 18.6 by 5.99. Roughly what should his answer be?
2. Beth is multiplying 1.2 by 62. She says the answer must be more than 60. Explain why she must be right.
3. Josh wants to divide 72.6 by 4.8. Write down a rough approximation for the answer he should get.

How much will my bag cost?



Amber

I'm going to make a shoulder bag in Textiles this term.

My pattern says I will need 2.5 metres^2 of fabric.

Fashion fabrics just £8.69 per metre^2





10 How much will the fabric cost for Amber's bag?

Matthew's solution



Matthew

```
  869    2 dp
 X25     1 dp
-----
17380
 4345
-----
21725    3 dp
```

The fabric will cost £21.725



Sarah

You can't have 3 decimal places with money. You have to round it to the nearest penny. So the material will cost £21.73 or £21.72. It depends if you round up or down.

11 Can you explain how you round decimals?

Fitness Check

Round these numbers to the number of decimal places shown in brackets.

1. 10.43 (1 dp)
2. 9.86 (1 dp)
3. 8.649 (1 dp)
4. 2.055 (2 dp)
5. 19.683 (2 dp)
6. 9.985 (2 dp)

How many children were there?



Alice

My mother's friend Jenny came to visit with her children last week. She's a maths teacher.
She bought 24 chocolate bars and said there was just enough for all of the children to have an equal amount.
Now that sounded like the beginning of an interesting maths puzzle.

12

Can you work out how many children there might have been in the house?



Jon

Well, I suppose there must have been at least two of you.
But there could have been more.
Three would work, but so would ...



Sarah

Sarah's solution

$1 \times 24 = 24$
$2 \times 12 = 24$
$3 \times 8 = 24$
$4 \times 6 = 24$

So there could have been 2, 3, 4, 6, 8, 12 or 24 of you as there must have been at least 2 children.



Matthew

In other words, you just need to find the factors of 24.



Alice

This might help you to solve my puzzle.
The next day, my mum made 30 muffins and said that, once again, there was just enough for all of the children to have an equal amount.
Does that help?

13

Can you find out how many children might be in the house based on the two clues?

Highest common factor (HCF)



Amber

Amber's solution

$1 \times 30 = 30$
$2 \times 15 = 30$
$3 \times 10 = 30$
$5 \times 6 = 30$

So there could have been 2, 3, 5, 6, 10, 15 or 30 of you. So with the other clue, the only possible answers are 2, 3 or 6.



Matthew

Matthew's solution

The factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24.
The factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30.
The common factors are 1, 2, 3 and 6.
So the highest possible number of children is 6.

Matthew is actually describing a method for finding the **highest common factor** (HCF) of two or more positive integers.

Fitness Check

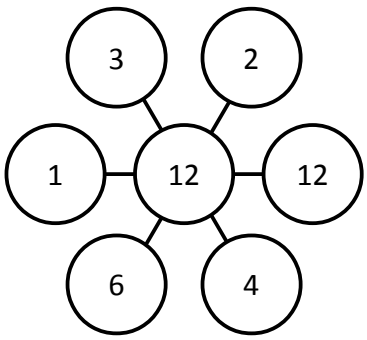


By listing all of the factors, find the HCF of the following:

1. 12 and 20
2. 21 and 56
3. 30 and 45
4. 8, 20 and 24
5. 14, 28 and 42
6. 12, 36 and 60

Factor Wheels

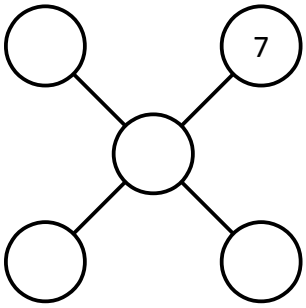
This is the factor wheel of 12.
It shows that 12 is a **composite** number with six factors.

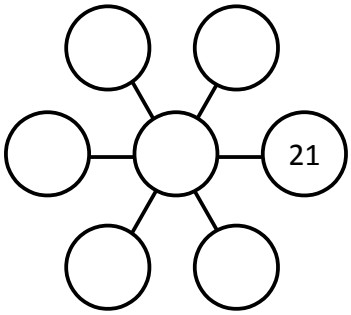


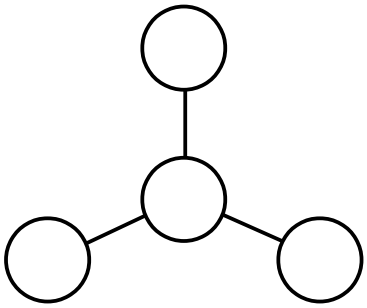
14 Can you find a factor wheel that has 8 spokes?

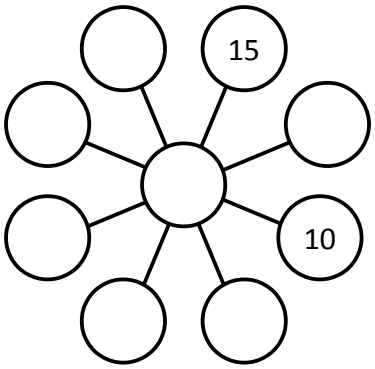
More Factor Wheels

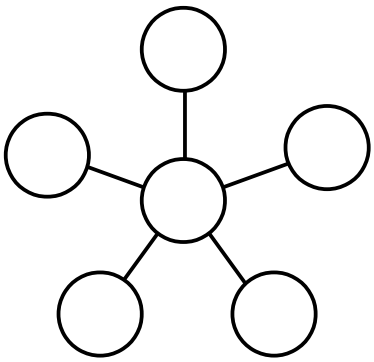
Can you complete the following factor wheels with a central number below 100?

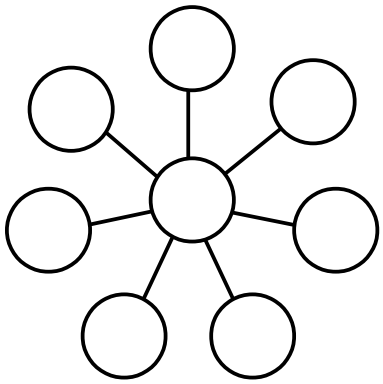


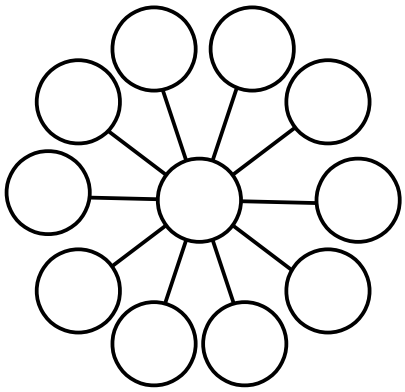


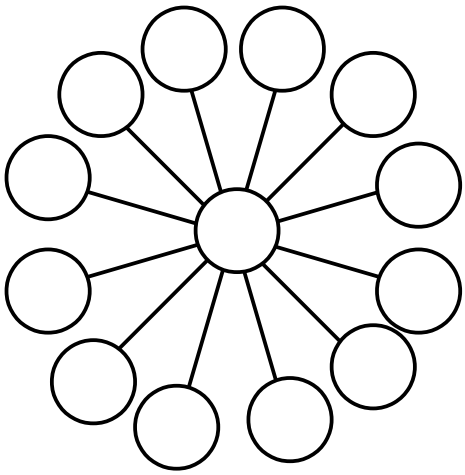












Lowest common multiple (LCM)

What is the smallest number that has 3 and 4 as factors?



Evie

Evie's solution

The multiples of 3 are 3, 6, 9, 12.
The multiples of 4 are 4, 8, 12.
So the LCM of 3 and 4 is 12.



Jon

Jon's solution

To find the LCM of 3 and 4, just work out 3 x 4 = 12
So the LCM of 3 and 4 is 12.

15 Does Jon's method always work? If not, can you explain when his method does works and when it doesn't?

Fitness Check



Find the LCM of the following

1. 6 and 9
2. 5 and 7
3. 9 and 12
4. 2, 3 and 4
5. 6, 8 and 10
6. 9, 12 and 15

Puzzle Corner

1. Three consecutive numbers add up to a number between 100 and 120. What might the numbers be?

2. I am thinking of a number. If I divide it by 3 there is a remainder of 1. If I divide it by 4, there is also a remainder of 1. What might my number be?

3. I halved a whole number five times. My answer was a whole number. What number might I have started with?

Number 2a: Mastery

In questions 1 – 12, four possible answers are given. Only one of them is correct. Record the letter which you think indicates the correct answer. You must be able to give reasons for your choice.

1. How many 0.01 is 5.12 made up of altogether?

A	12	B	512	C	2	D	0.02

2. Put these numbers in order, smallest first

5.3, 5.4, 5.26, 5.205, 5.37

A	5.3, 5.4, 5.26, 5.37, 5.205	B	5.26, 5.3, 5.37, 5.4, 5.205
C	5.4, 5.37, 5.3, 5.26, 5.205	D	5.205, 5.26, 5.3, 5.37, 5.4

3. What is 2.84 + 1.5?

A	3.89	B	3.34	C	4.34	D	2.99

4. What is 6.34 – 4.7?

A	1.64	B	2.64	C	2.27	D	1.36

5. What is 4.63 x 20?

A	8.126	B	9.26	C	80.126	D	92.6

6. What is 14.8 ÷ 20?

A	7.4	B	0.74	C	1.48	D	2.96

7. What is 7.34 x 6?

A	44.04	B	42.204	C	44.22	D	42.04

8. What is 58.1 ÷ 7?

A	8.03	B	8.3	C	0.83	D	8.21

Number 2a: Mastery

In questions 1 – 12, four possible answers are given. Only one of them is correct. Record the letter which you think indicates the correct answer. You must be able to give reasons for your choice.

9. Cartons of orange juice cost 48p. What is the best estimate for the cost of 36 cartons?

A	£20	B	£200	C	£1728	D	£2000

10. Round 27.629 to 2dp.

A	27.72	B	27.73	C	27.63	D	276.29

11. What is the highest common factor (HCF) of 42 and 56?

A	2	B	24	C	10	D	12

12. What is the lowest common multiple (LCM) of 4 and 6?

A	7	B	2	C	8	D	14