Recognise place value in numbers with up to seven digits

Write in figures the number three million.

Write the number four million, forty-four thousand, and forty-four in figures.

Look at this number.

3, 1 6 7, 8 1 0
What is the value of the digit 6 in the number? Circle the correct answer.
six thousand six million sixty thousand
six hundred six hundred thousand

Circle the largest number.

4,944,444   4,444,944   4,994,449
444,444   4,949,444

Look at these numbers.

¾ of a million  2,099,999  2,101,999
80,000  2,109,000
What is the largest number?
What is the smallest number?

Mr Jones looks at the prices of 5 mansions. He wants to look at mansions costing between £990,000 and £1,110,000.

Write the letters of the mansions that he looks at.

2019 Paper 2 Question 3
Order the numbers starting with the largest. Match each number with its order.

1,009,909  1st largest
1,023,065  2nd
1,009,099  3rd
1,230,650  4th smallest

2019 Paper 3 Question 2
3,576,219
Which digit is in the ten thousands place?
Round 3,576,219 to the nearest million.

Jack is rounding to the nearest hundred thousand.
Write the smallest whole number that he can round to 3,400,000

Grace is rounding to the nearest hundred thousand.
Write the largest whole number that she can round to 3,400,000

A newspaper reported, ‘6 million people (to the nearest million) watched a football match on television.’
What is the smallest number of people that could have watched the football match on television?

Write the missing numbers.

3,005,400 = [ ] + 5,000 + 400
980,600 = 900,000 + [ ] + 600
2016 Paper 2 Question 16
Write the number that is five less than ten million.

Write the number that is one hundred thousand less than six million.

Write the letter of the arrow that points to the number 50\,000

Here is part of a number line.
Write the number shown by the arrow.

Here is part of a number line.
Write the number shown by the arrow.

Solve problems involving addition and subtraction

Write the missing numbers in the sequence.

_____ 6,742,000  6,842,000  6,942,000 _____

Write the missing numbers.

On Monday all the children at Grange School each play one sport.
They choose either hockey or rounders.
There are 103 children altogether in the school.
27 girls choose hockey.
Write all this information in the table.
Then complete the table.

<table>
<thead>
<tr>
<th></th>
<th>hockey</th>
<th>rounders</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>boys</td>
<td>22</td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>girls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A shop makes 100 sandwiches.
All the sandwiches are either cheese or tuna.
Some of the sandwiches also have salad with the cheese or tuna.
30 sandwiches have cheese with salad.
15 sandwiches have tuna without salad.
75 sandwiches have salad.
How many sandwiches have cheese without salad?

People in a village were asked if they shop in the village, or in the town, or in both. The bar chart shows the results.
Altogether 246 people took part in the survey.
How many people shop in both the village and the town?

KeyStage2Maths.com
Solve problems involving multiplication or division

2016 Paper 3 Question 21
5,542 ÷ 17 = 326
Explain how you can use this fact to find the answer to 18 × 326

There are 25 children in the lunch queue, including Nik.
Nik says, ‘There are twice as many children in front of me as there are behind me’. How many children are in front of Nik?

There are 25 children in the lunch queue, including Nik.
Nik says, ‘There are twice as many children in front of me as there are behind me’. How many children are in front of Nik?

A dragon lived in a cave.
The dragon doubled in size every day.
After 20 days the dragon filled the cave.
After how many days did the dragon half-fill the cave?

A builder needs 7600 bricks to build a wall.
There are 500 bricks in a load.
How many loads must the builder buy?

The price of one load of 500 bricks is £230
What is the cost in pence of one brick?

2019 Paper 2 Question 16
Write the missing number.

6 + 2 × 2 − □ = 6

Write the missing numbers.

48 ÷ (19 − □) = 4
□ + 6 × 8 = 56

Put brackets into this expression to make it correct.

10² ÷ 10 ÷ 10 ÷ 10 ÷ 10 = 100

Write the missing number to make this calculation correct.

(18 + □) × 32 = 777.6

96 pupils and teachers go by minibus to the sports tournament.
How many 15-seater minibuses will be required?

427 children visit a castle.
They go in groups of 15
One group has less than 15
Every group of children has one adult with them.
How many adults will need to go?

272 children and 26 adults from Hill School go on a coach trip.
How many 42-seat coaches does the school need to hire?

Archery is an Olympic sport.
In 2008, two archers called Park and Zhang were in the women’s final.
Both archers shot 12 arrows. Zhang won the final by 1 point.
Complete the table for Zhang below.

Here is information about pupils in a class.
- The total number of pupils is 30
- 26 of the pupils do not wear glasses.
- A quarter of the pupils who do wear glasses are boys.
- There are 2 more boys than girls.
Use the information to fill in the missing numbers in the table below.

<table>
<thead>
<tr>
<th>Name of archer: Park</th>
<th>Name of archer: Zhang</th>
</tr>
</thead>
<tbody>
<tr>
<td>What she scored with her 12 arrows</td>
<td>What she scored with her 12 arrows</td>
</tr>
<tr>
<td>Number of points</td>
<td>Frequency</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number who do wear glasses</th>
<th>Number who do not wear glasses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of boys</td>
<td>Number of girls</td>
<td>Total</td>
</tr>
<tr>
<td>14</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>
Adam is making booklets. Each booklet must have 34 sheets of paper. He has 2 packets of paper. There are 500 sheets of paper in each packet. How many complete booklets can Adam make from 2 packets of paper?

A shop sells sheets of sticky labels. On each sheet there are 36 rows and 18 columns of labels. How many labels are there altogether on 45 sheets?

How many boxes of 40 matches can be filled from 2,688 matches?

Identify negative numbers on number lines

2015 Paper 3 Question 2
Here is part of a number line. Write the missing numbers in the boxes.

Here is part of a number line. Write the missing numbers in the boxes.

Here is part of a number line. Write the missing numbers in the boxes.

Here is part of a number line. It is divided into equal sections. Write the letter of the section where each of these numbers belongs. The number 99 has been done for you.

A and B are two numbers on the number line below. The difference between A and B is 140 Write the values of A and B.
**Complete sequences involving negative numbers**

<table>
<thead>
<tr>
<th>Liam makes a sequence of numbers starting with 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>He subtracts 125 each time.</td>
</tr>
<tr>
<td>Write the next two numbers in Liam’s sequence.</td>
</tr>
<tr>
<td>300 175 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jon makes a sequence of numbers. His rule is to add the same amount each time. Write in the missing numbers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 55 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paulo makes a sequence of numbers. He chooses a starting number and then subtracts equal amounts each time. The third number in his sequence is 45 The tenth number is $-32$ What is the first number in the sequence?</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carol has a rule for a sequence of numbers. Her rule is: ‘The next number is the sum of the two previous numbers.’ Use Carol’s rule to write in the three missing numbers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>, , , 0, 1, 1, 2, 3, 5, 8, ...</td>
</tr>
</tbody>
</table>

**Use knowledge of multiples to identify rules in sequences**

<table>
<thead>
<tr>
<th>The rule for this sequence of numbers is ‘add 3 each time’.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 4 7 10 13 16 ...</td>
</tr>
<tr>
<td>The sequence continues in the same way. Mary says, ‘No matter how far you go there will never be a multiple of 3 in the sequence.’ Is she correct? Explain how you know.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>This sequence of numbers goes up by 40 each time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 80 120 160 200 ...</td>
</tr>
<tr>
<td>This sequence continues. Will the number 2140 be in the sequence? Explain how you know.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The numbers in this sequence increase by 7 each time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 8 15 22 29 ....</td>
</tr>
<tr>
<td>The sequence continues in the same way. Will the number 777 be in the sequence? Explain how you know.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Here is a sequence of patterns made from squares and circles. The sequence continues in the same way. Calculate how many squares there will be in the pattern which has 25 circles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of squares</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A sequence of numbers starts at 11 and follows the rule ‘double the last number and then subtract 3’</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 19 35 67 131...</td>
</tr>
<tr>
<td>The sequence continues. The number 4099 is in the sequence. Calculate the number which comes immediately before 4099 in the sequence.</td>
</tr>
</tbody>
</table>

KeyStage2Maths.com
### Find a fraction of a shape

The diagram shows three regular octagons joined together. There is a dot at the centre of each octagon.

What fraction of the diagram is shaded?

The same square is used in the diagrams below.

What fraction of this diagram is shaded?

This diagram shows four regular hexagons. Shade in one third of the diagram.

What fraction of this diagram is shaded?

### Complete fraction arithmetic problems

Which is larger, $\frac{1}{3}$ or $\frac{2}{5}$?

Explain how you know.

Anna says $\frac{4}{7}$ is greater than $\frac{5}{9}$

Explain why Anna is correct.

2018 Paper 2 Question 14

Write these fractions in order, starting with the smallest.

Is $\frac{4}{9}$ greater than $\frac{1}{3}$? Show how you know.

Is $\frac{4}{9}$ half of $\frac{8}{18}$? Show how you know.

<table>
<thead>
<tr>
<th>$\frac{6}{5}$</th>
<th>$\frac{3}{5}$</th>
<th>$\frac{3}{4}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{\text{smallest}}{\text{middle}}$</td>
<td>$\frac{\text{middle}}{\text{largest}}$</td>
<td>$\frac{\text{smallest}}{\text{largest}}$</td>
</tr>
</tbody>
</table>
The numbers in this sequence increase by equal amounts each time.
Write in the missing numbers.
\[
2\frac{1}{2} \quad \square \quad 13\frac{1}{2} \quad \square \quad 24\frac{1}{2} \quad \square 
\]

The diagram shows part of a number line.
Two of the fractions are not complete.
Write the missing numerator in each box.
\[
\frac{2}{5} \quad \frac{3}{10} \quad \frac{3}{20} 
\]

Circle the fraction that is bigger than \(\frac{7}{5}\)
\[
\frac{5}{7} \quad \frac{11}{6} \quad \frac{7}{10} \quad \frac{4}{3}
\]

Write the two missing values to make these equivalent fractions correct.
\[
\square = \frac{10}{12} = \frac{30}{30}
\]

Write the correct sign \(<\), \(=\), or \(>\) in each box to make these sentences correct.
\[
\frac{3}{10} \quad \frac{10}{3} \\
\frac{6}{5} \quad \frac{8}{7} \\
\frac{39}{27} \quad \frac{26}{18}
\]

Here are five digit cards.
Use each card once to make these calculations correct.

Write the missing fractions.
\[
\frac{3}{4} \times \square = \frac{9}{20} \\
\frac{3}{4} \times \square = \frac{1}{4}
\]

Complete the number sentences.
\[
\frac{3}{4} \div \square = \frac{3}{12} \\
\square \div 5 = \frac{2}{13}
\]
Grace, Ellie and Alfie bought 5 pizzas to share.
Grace ate 1\(\frac{1}{2}\) pizzas.
Ellie ate 2\(\frac{2}{3}\) pizzas.
And Alfie ate the rest.
How many pizzas did Alfie eat?

What number is exactly halfway between 2\(\frac{3}{4}\) and 3\(\frac{1}{2}\)?

Write the missing fractions.
\[
\begin{align*}
\frac{3}{5} + \frac{3}{10} + \frac{\text{?}}{\text{?}} &= \frac{2}{7} + \frac{\text{?}}{\text{?}} \\
2\frac{3}{4} + \frac{\text{?}}{\text{?}} - \frac{1}{5} &= 3
\end{align*}
\]

Solve word problems involving fractions

Affie did a survey to find which soup was most popular.
The choices were:
- tomato
- chicken
- mushroom
A quarter of the children chose chicken soup.
Four times as many children chose tomato soup as mushroom soup.
What fraction of the children chose tomato soup?

In this circle, each shaded part is \(\frac{1}{5}\) of the area of the circle.
The two white parts have equal areas.
What fraction of the circle is one of the white areas?

Look at the information in these two pie charts.

Annie ate \(\frac{1}{4}\) of a cake.
Four other children shared the remainder equally.
What fraction of the cake did each of the other children get?

2018 Paper 2 Question 23
The length of a day on Earth is 24 hours.
The length of a day on Mercury is \(58\frac{2}{3}\) times the length of a day on Earth.
What is the length of a day on Mercury, in hours?

5 miles is approximately equal to 8 km.
Complete the sentences below:
1 mile is approximately equal to _____km
1 km is approximately equal to _____miles

Ellie had a piece of ribbon that was \(\frac{3}{4}\)m long.
She cut it and gave half to Grace.
What fraction of a metre did she give to Grace?
Here is a number line. Draw an arrow to show the position of \( \frac{13}{32} \)

![Number Line]

Write two fractions, each greater than 0 and less than 1, which have a difference of \( \frac{3}{4} \)

What fraction is exactly half-way between \( \frac{3}{5} \) and \( \frac{5}{7} \)?

Lili and Julian each start with the same number. 
Lili works out half of the number. 
Julian works out three-quarters of the number. 
The sum of their answers is 275 
What was the number they started with?

![Diagram of shaded triangle inside a larger triangle]

The area of the shaded triangle is 52 cm².

The area of the shaded triangle is \( \frac{4}{9} \) of the area of the larger triangle.
Calculate the area of the larger triangle.

This square is divided into three parts.

Part A is \( \frac{1}{3} \) of the area of the square.
Part B is \( \frac{2}{5} \) of the area of the square.
What fraction of the area of the square is part C?

Some children work out how much money two shopkeepers get from selling fruit. They use pie charts to show this.

![Pie Charts]

Mrs Binns gets £350 selling bananas. Estimate how much she gets selling oranges.

Mrs Binns gets a total of £1000 and Mr Adams gets a total of £800
Estimate how much more Mrs Binns gets than Mr Adams for selling peaches.

Sarah makes a pie chart to show the proportion of boys and girls in her class.

<table>
<thead>
<tr>
<th>Number in class</th>
<th>Size of angle on pie chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>144°</td>
</tr>
<tr>
<td>Girls</td>
<td>216°</td>
</tr>
</tbody>
</table>

The next day another boy joins Sarah’s class. She makes a new pie chart.
Calculate the angle for boys on the new pie chart.

80 people were asked if they owned a pet. 
30 had dogs 
25 had cats 
10 had other pets 
15 had no pets 
Complete the pie chart to show this information.
1 gallon is approximately 4.5 litres. Mrs Smith buys 8 gallons of petrol. How many litres of petrol does she buy?

Write the same number in each box to make this correct.

\[ \square + \square + \square = 10.5 \]

2017 Paper 2 Question 20
Adam says, 0.25 is smaller than \( \frac{2}{5} \). Explain why he is correct.

The numbers in this sequence increase by equal amounts each time. Write in the three missing numbers.

\[ 1 \quad \square \quad \square \quad \square \quad 7 \]

Write in the missing number.

\[ 50 \div \square = 2.5 \]

2016 Paper 2 Question 18
Write the missing number.

\[ 70 \div \square = 3.5 \]

2015 Paper 3 Question 14
Here is a number pyramid. The number in a box is the product of the two numbers below it. Write the missing numbers.

In this tower, two numbers are multiplied to give the number above. Write the missing numbers in the tower below to make it correct.

\[ 75 \quad 24 \quad \square \]

In this tower, two numbers are multiplied to give the number above. Write the missing numbers in the tower below to make it correct.

\[ 12 \quad 4 \quad 3 \]

Write the missing numbers in the tower below to make it correct.

\[ 12 \quad 4 \quad 3 \]

In this sequence each number is double the previous number. Write in the missing numbers.

The rule to get each number in a sequence is subtract the previous number from 100, then divide the answer by 2. Here is part of the sequence. Write the two missing numbers.

\[ 40 \quad 30 \quad 35 \quad 32.5 \quad 33.75 \quad \square \]

2015 Paper 2 Question 12
What number is halfway between 1.4 and 2.1?
The number 7.5 is halfway between 5 and 10.

Write in the missing numbers.

Annie swims on average 0.87 km in 30 minutes. If she continues at the same speed, how far will she swim in 2 hours, rounded to one decimal place? Circle your answer.

3.2 km  3.3 km  3.4 km  3.5 km  3.6 km

2018 Paper 2 Question 20
The length of an alligator can be estimated by:
• measuring the distance from its eyes to its nose
• then multiplying that distance by 12
What is the difference in the estimated lengths of these two alligators?

2015 Paper 3 Question 9
The mass of a 10p coin is 6.5g. The mass of a 5p coin is half the mass of a 10p coin. What is the mass of these six coins altogether?

Alfie says, ‘When you multiply two numbers together, the answer is always greater than either of the numbers you started with.’ Is Alfie correct? Explain how you know.

2018 Paper 3 Question 19
33,630 = 354 × 95
Use this multiplication to complete the calculations below.

354 × 9.5 =
3,540 × 95 =
3,363 ÷ 95 =

Write the missing numbers.

Write the missing number.

Here is part of a number line. Write the numbers shown by the arrows.
<table>
<thead>
<tr>
<th>Write in the missing numbers.</th>
<th>Write the missing digits to make the calculation correct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] 4 • [ ] 5</td>
<td>[ ] 7. [ ] 5</td>
</tr>
<tr>
<td>8) 4 3 8</td>
<td>4 1 5 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is ( \frac{5}{8} ) as a decimal?</th>
<th>Mark with arrows the points –1.5 and 0.45 on the number line.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Write three decimals, each greater than zero, which add together to make a total of 0.01</th>
<th>Write a fraction which is greater than 0.7 and less than 0.71</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] + [ ] + [ ] = 0.01</td>
<td>The sum of two numbers is 5. The difference between the numbers is 0.5. What are the numbers?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complete sequences involving decimals</th>
<th>2015 Paper 3 Question 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy thought of a number. She added 0.5 to her number and then doubled the result. Then she subtracted 0.5 and doubled the new result. Her final answer was 61. What number did Amy start with?</td>
<td>Lara chooses a number less than 100. She divides it by 3 and then subtracts 11. She then divides this result by 2. Her answer is 10.5. What was the number she started with?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2016 Paper 3 Question 13</th>
<th>I’m thinking of a number. I multiply it by 10 and add 25. My answer is 100. What is the number?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lara chooses a number less than 20. She divides it by 2 and then adds 6. She then divides this result by 3. Her answer is 4.5. What was the number she started with?</td>
<td></td>
</tr>
</tbody>
</table>
Solve problems involving percentages

2018 Paper 3 Question 8
Jack has £400
He spends 35% of his money on a new bike.
How much does Jack spend on his new bike?

In a survey people were asked if they like tea and coffee.
The results are in this Venn diagram.

What percentage of people in the survey like both tea and coffee?

What percentage of people in the survey do not like coffee?

200 children went on holiday.
10% of the children went to Wales.
25% of the children went to Scotland.
How many more children went to Scotland than went to Wales?

Liam did a survey of 55 people to see how many were left-handed.
Liam says, ‘The results show that exactly 10% of the people in the survey are left-handed.’
Explain why Liam cannot be correct.

In a survey of how children travel to school, these were the results.

<table>
<thead>
<tr>
<th>Transport</th>
<th>Walk</th>
<th>Cycle</th>
<th>Bus</th>
<th>Car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of children</td>
<td>25%</td>
<td>10%</td>
<td>45%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Abby wants to make a pie chart to show the results.
Complete the table to show the angles of each section of the pie chart.

<table>
<thead>
<tr>
<th>Transport</th>
<th>Walk</th>
<th>Cycle</th>
<th>Bus</th>
<th>Car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of children</td>
<td>25%</td>
<td>10%</td>
<td>45%</td>
<td>20%</td>
</tr>
<tr>
<td>Angle on pie chart</td>
<td>90°</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows Tom’s test results for different subjects.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mark</th>
</tr>
</thead>
</table>
| Arithmetic | \[
| Reasoning | 34 \quad 40 |
| Reading | 63 \quad 70 |
| Grammar and Punctuation | 85% |
| Spelling | \[

In what subject did Tom get the highest mark?
In what subject did Tom get the lowest mark?
In which two subjects did he get the same marks?
Calculate a whole quantity given a percentage

If you know 40% of a number, explain how you could work out the original number.

Write in the missing numbers.

30% of 60 is ___________

30% of ___________ is 60

20% of Megan’s number is 64
What is 50% of Megan’s number?

In a survey of children’s favourite fruit juices, these were the results.

<table>
<thead>
<tr>
<th>Juice</th>
<th>Apple</th>
<th>Orange</th>
<th>Grape</th>
<th>Mango</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of children</td>
<td>25%</td>
<td>14%</td>
<td>30%</td>
<td>31%</td>
</tr>
</tbody>
</table>

20 more children chose grape than chose apple.
How many children took part in the survey?

The pie chart shows the Year groups of children at Woodland Infant School.

There are 56 children in Year 1
How many children are there in Reception?

20% of the children in a sports club play tennis.
25% of the children who play tennis also play rounders.
There are 8 children in the club who play both tennis and rounders.
How many children are there in the sports club altogether?
In Class 6, 80% of the children like crisps. 75% of the children who like crisps also like chocolate. In Class 6, what percentage of the children like both crisps and chocolate?

What is 10% of a half?

What percentage of 20 is 19?

This pie chart shows the lunch choices of year 6 children at a school.

Two of the ingredients of chocolate are cocoa and sugar.
In milk chocolate, 20% of the mass is cocoa, 55% is sugar.
A bar of milk chocolate contains 50 grams of cocoa.
How many grams of sugar does it contain?

28 children in year 6 have a school meal. How many go home for lunch?

Linda buys a pair of trainers. She says, ‘I bought this pair of trainers when there was 20% off the normal price. I paid £18 for them.’ What was the normal price of the trainers?

Chloe and Denise each bought identical T-shirts from the same shop. Chloe bought hers on Monday when there was 15% off the original price. Denise bought hers on Friday when there was 20% off the original price. Chloe paid 35p more than Denise. What was the original price of the T-shirt?
### Solve problems involving money

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jason bought some bags of green apples and some bags of red apples. He spent £4.20</td>
<td>How many bags of each type of apple did he buy?</td>
</tr>
</tbody>
</table>
| Nika and Hassan bought some bags of apples. Nika says, ‘I bought more apples than Hassan, but I spent less money.’ Explain how this is possible. | 2016 Paper 3 Question 20  
Lara had some money.  
She spent £1.25 on a drink.  
She spent £1.60 on a sandwich.  
She has three-quarters of her money left.  
How much money did Lara have to start with? |
| Cost to hire a boat: £4.50 per boat and then £3.50 per hour  
Four friends hire a boat for five hours.  
They share the cost equally.  
How much does each person pay?  
Chen’s family hires a boat and pays a total of £15  
How many hours did they have the boat for? | Cheddar cheese costs £7.50 for 1kg.  
Marie buys 200 grams of cheddar cheese.  
How much does she pay?  
Cream cheese costs £3.60 for 1kg.  
Robbie buys a pot of cream cheese for 90p.  
How many grams of cream cheese does he buy? |
| 1 kilogram of grapes costs £5.80  
Megan buys 700 grams of grapes.  
How much does she pay?  
1 kilogram of cheese costs £13.50  
Megan buys a piece of cheese costing £2.49  
What is the mass of the cheese to the nearest 100 grams? | 2015 Paper 2 Question 19  
One gram of gold costs £32.94  
What is the cost of half a kilogram of gold? |
| This is the cost to visit the waxworks.  
Adults £8.50  
Children £4.50  
On Friday morning 12 adults and 20 children visit the waxworks.  
How much do they pay altogether? | Two families go to the cinema.  
The Smith family buy tickets for one adult and four children and pay £19  
The Jones family buy tickets for two adults and two children and pay £17  
What is the cost of one child's ticket? |
| Shenaz buys a pack of 24 cans of cola for £6.00  
What is the cost of each can? |  

---

KeyStage2Maths.com
Solve scaling problems

Two matchsticks have the same length as three bottle tops. How many bottle tops will have the same length as 50 matchsticks?

Every 100g of brown bread contains 6g of fibre. A loaf of bread weighs 800g and has 20 equal slices. How much fibre is there in one slice?

In a zoo, the adult polar bear weighs three times more than the baby elephant. Together they weigh 700 kilograms. How much does the polar bear weigh?

This photograph shows three Russian dolls.

The real-life height of the largest Russian doll is 13.5cm
What is the real-life height of the smallest Russian doll?

Solve scaling problems involving measurement

A packet contains 1.5 kilograms of guinea pig food.
Remi feeds her guinea pig 30 grams of food each day.
How many days does the packet of food last?

There are 60g of rice in one portion. How many portions are there in a 3 kg bag of rice?

A box contains 2.6 kg of washing powder.
Jack uses 65 grams of powder for each wash. He uses all the powder. How many washes did Jack do?

A packet contains 1.5 kg of oats.
Every day Maria uses 50 g of oats to make porridge. How many days does the packet of oats last?

A machine pours 250 millilitres of juice every 4 seconds. How many litres of juice does the machine pour every minute?

The distance from Calais to Paris is 320 kilometres.
5 miles is approximately 8 kilometres. Calculate the approximate distance in miles from Calais to Paris.

The International Space Station orbits the Earth at a height of 250 miles.
What is the height of the International Space Station in kilometres? Use 8 kilometres equals 5 miles.

A shop sells rolls of wire.
Two rolls, A and B, each have 45 metres of wire on them.
The wire on roll A is cut into 1.25 m lengths.
The wire on roll B is cut into 2.25 m lengths.
How many more lengths of wire are cut from roll A than roll B?

A 5p coin has a diameter of 1.8 centimetres.
Holly makes a straight line of 5p coins worth £10.
How long is Holly’s line? Give your answer in metres.

A 5p coin has a diameter of 1.8 centimetres.
Holly makes a straight line of 5p coins worth £10.
How long is Holly’s line? Give your answer in metres.
Use the notation of ratio

2017 Paper 2 Question 22
Here are two similar right-angled triangles.

Write the ratio of side a to side b.
\[ a : b = \underline{\hspace{2cm}} : \underline{\hspace{2cm}} \]

These patterns are drawn on square grids.

In pattern A, the ratio of black squares to grey squares is 1 : 2.
What is the ratio of black squares to grey squares in pattern B?

Children were asked to choose between a safari park and a zoo for the school trip. They had a vote. The result was a ratio of 10:3 in favour of going to a safari park.
130 children voted in favour of going to a safari park.
How many children voted in favour of going to the zoo?

Shortcrust pastry is made using flour, margarine and lard. The flour, margarine and lard are mixed in the ratio 8 : 3 : 2 by weight.
How many grams of margarine and lard are needed to mix with 200 grams of flour?

Two numbers are in the ratio 4 : 5.
One of the numbers is 60.
There are two possible values for the other number. What are the two possible values?

There are 90 children in Year 6 at Woodland Junior School. They are split into three classes.

<table>
<thead>
<tr>
<th>Class</th>
<th>Number in class</th>
</tr>
</thead>
<tbody>
<tr>
<td>6M</td>
<td>27</td>
</tr>
<tr>
<td>6P</td>
<td>33</td>
</tr>
<tr>
<td>6T</td>
<td>30</td>
</tr>
</tbody>
</table>

Each child chose football or netball or hockey.
- In 6M, 13 children chose hockey. The rest of the class were split equally between football and netball.
- In 6P, 9 children chose netball. Twice as many children chose football as chose hockey.
- In 6T, the ratio of children who chose football to netball to hockey was 1:2:3.

Complete this table.

<table>
<thead>
<tr>
<th>Class</th>
<th>Number in class</th>
<th>Football</th>
<th>Netball</th>
<th>Hockey</th>
</tr>
</thead>
<tbody>
<tr>
<td>6M</td>
<td>27</td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>6P</td>
<td>33</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6T</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alfie asks some boys and girls about their favourite hobby.
He shows the results on a graph.

The graph shows that 44% of boys chose sport.
Estimate the percentage of girls who chose sport.

120 boys chose reading.
Estimate the number of boys who chose cinema.
**Tom was born in 1988**
Ben was born in 2000
Tom and Ben have the same birthday. The ratio of Tom’s age to Ben’s age on their birthday in 2001 was 13 : 1
What was the ratio of Tom’s age to Ben’s age on their birthday in 2003? Write the ratio in its simplest form.
In what year was the ratio of Tom’s age to Ben’s age 3 : 1?

In a class the ratio of boys to girls is 7:4
There are 9 more boys than girls.
How many children are in the class?

In a survey, the ratio of the number of people who preferred milk chocolate to those who preferred plain chocolate was 5 : 3
46 more people preferred milk chocolate, to plain chocolate.
How many people were in the survey?

**Solve money problems involving ratios with a decimal scaling factor**

<table>
<thead>
<tr>
<th>These are the prices of fruit in a shop.</th>
<th>These are the prices of fruit in a shop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oranges 5 for 90p</td>
<td>Cheddar cheese: 82p for 100 grams</td>
</tr>
<tr>
<td>Cherries 80p for 100 grams</td>
<td>Edam cheese: 66p for 100 grams</td>
</tr>
<tr>
<td>Emma buys 15 oranges. How much does she pay?</td>
<td>Cottage cheese: 45p for 100 grams</td>
</tr>
<tr>
<td>Reshma buys some cherries. They cost £1.20</td>
<td>Mina buys 200g of Cheddar cheese and 150g of Edam cheese.</td>
</tr>
<tr>
<td>How many grams of cherries does she buy?</td>
<td>How much does she pay altogether?</td>
</tr>
<tr>
<td>Peanuts cost 60p for 100 grams.</td>
<td>Seb buys some Cottage cheese for £1.35</td>
</tr>
<tr>
<td>What is the cost of 350 grams of peanuts?</td>
<td>How many grams of cottage cheese does he get?</td>
</tr>
<tr>
<td>Raisins cost 80p for 100 grams.</td>
<td></td>
</tr>
<tr>
<td>Jack pays £2 for a bag of raisins.</td>
<td></td>
</tr>
<tr>
<td>How many grams of raisins does he get?</td>
<td></td>
</tr>
</tbody>
</table>

**Solve measurement problems with a decimal scaling factor**

<table>
<thead>
<tr>
<th>Recipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 strawberries</td>
</tr>
<tr>
<td>½ litre of orange juice</td>
</tr>
<tr>
<td>250ml yogurt</td>
</tr>
<tr>
<td>1 banana</td>
</tr>
<tr>
<td>Makes two smoothies</td>
</tr>
</tbody>
</table>

Here is a recipe for fruit smoothies. Stefan uses the recipe to make smoothies. He uses 1 litre of yogurt.
How many strawberries does he use?

Amir wants to make 5 smoothies.
He has 1 litre of orange juice.
How many more millilitres of orange juice does he need?

This is Kirsty’s recipe for breakfast cereal.
50 grams of oats
30 grams of raisins
40 grams of nuts
If she uses 125 grams of oats, how many grams of raisins does she need?

Here is a recipe for raspberry ice cream.
Raspberry ice cream for 8 people:
½ litre of cream
1kg raspberries
250g sugar
This recipe is for 8 people. Josie makes enough raspberry ice cream for 12 people. How much cream does she use?

Fred makes raspberry ice cream in the same way. He uses 2½ kg of raspberries. How much sugar does he use?
### 2015 Paper 3 Question 18
Here are the ingredients for chocolate ice cream.
- cream: 400 ml
- milk: 500 ml
- egg yolks: 4
- chocolate: 120 g
- sugar: 100 g

Stefan has only 300 ml of cream to make chocolate ice cream. How much chocolate should he use?

### 2017 Paper 2 Question 21
On a map, 1 cm represents 20 km.

The distance between two cities is 250 km. On the map, what is the distance between the two cities?

### 2017 Paper 2 Question 11
Here is a rule for the time it takes to cook a chicken.
Cooking time = 20 minutes plus an extra 40 minutes for each kilogram

How many minutes will it take to cook a 3 kg chicken?

What is the mass of a chicken that takes 100 minutes to cook?

### 2015 Paper 2 Question 8
Maria bakes cakes and sells them in bags. She uses this formula to work out how much to charge for one bag of cakes.
Cost = number of cakes × 20p + 15p for the bag

How much will a bag of 12 cakes cost?

Olivia buys a bag of cakes for £5.15. Use the formula to calculate how many cakes are in the bag.

### 2018 Paper 3 Question 15
A shop prints designs on T-shirts. They use this formula to work out the price for printing a design.
price = 60p × number of colours + £1.25

What is the price for printing a design that has 3 colours in it?

Amina has £5 to spend on printing a design. What is the greatest number of colours she can have in the design?
Find numbers that meet conditions

\[ n \] stands for a number between 50 and 60
Complete these statements.
One has been done for you.
\[ n + 10 \] stands for a number between 60 and 70.
\[ 10 \times n \] stands for a number between ___ and ___
\[ n - 5 \] stands for a number between ___ and ___

\[ m \] stands for a whole number greater than 10 and less than 20
\[ n \] stands for a whole number greater than 2 and less than 10
What is the smallest number that \( m \times n \) could be?
What is the largest number that \( m - n \) could be?

\[ p \] and \[ q \] each stand for whole numbers.
\[ p + q = 1000 \]
p is 150 greater than \[ q \].
Calculate the numbers \[ p \] and \[ q \].

\[ k, m \] and \[ n \] each stand for a whole number.
They add together to make 1500
\[ k + m + n = 1500 \]
\[ m \] is three times as big as \[ n \].
\[ k \] is twice as big as \[ n \].
Calculate the numbers \[ k, m \] and \[ n \].

\[ k \] stands for a whole number.
\[ k + 7 \] is greater than 100
\[ k - 7 \] is less than 90
Find all the numbers that \[ k \] could be.

\[ j \] and \[ k \] stand for two numbers.
Double \[ j \] equals half of \[ k \].
Write numbers to complete the sentence below.
When \[ j \] is __ then \[ k \] is __

2017 Paper 3 Question 23

<table>
<thead>
<tr>
<th>( a )</th>
<th>( b )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>39</td>
</tr>
</tbody>
</table>

Here is a pattern of number pairs.
Complete the rule for the number pattern.
\[ b = \boxed{\_\_\_\_\_} \times a + \boxed{\_\_\_\_\_} \]

Here are three equations.
\[ a + b + c = 30 \]
\[ a + b = 24 \]
\[ b + c = 14 \]
What are the values of \( a, b \) and \( c \)?

Write rules using algebraic notation

2019 Paper 3 Question 3

Dev says, 'I had £10. I gave some money away.'
Which expression shows how much money Dev has left?
\[ a \] is the amount of money, in pounds, that Dev gave away.

\[ 10 + a \]
\[ 10 \div a \]
\[ a - 10 \]
\[ 10 - a \]
\[ a \times 10 \]

\[ k \] stands for a number.
Complete the number sentences below.
One has been done for you.

5 more than \( k \) is \[ k + 5 \]
2 less than \( k \) is ___________
3 more than twice \( k \) is ___________
6 more than half of \( k \) is ___________
There are \(n\) counters in Alfie’s bag. Alfie puts 3 more counters in the bag. Write an expression for the number of counters that are in the bag now.

Megan has two boxes. There are \(m\) counters in each box. She puts all her counters together in a pile, then removes 5 of them. Write an expression for the number of counters that are in the pile now.

Look at these equations.

\[
\begin{align*}
  a &= 2b \\
  b &= 3c
\end{align*}
\]

Which equation below is also true? Put a ring round the correct one.

- \(b = 2a\)
- \(a = 2b + 3c\)
- \(a = 5c\)
- \(a = 6c\)
- \(a + b = 5\)

Find values given rules expressed with algebraic notation

\(n\) stands for a number.

- \(n + 7 = 13\) What is the value of \(n + 10\)?

\(g\) stands for a number on a grey card.
\(w\) stands for a number on a white card.
Join all pairs of numbers that match this rule:

\[
2g + w = 10
\]

One is done for you.

Find all numbers that \(n\) stands for.

\(m\) – \(2n\) = 10

When \(n = 20\) what is the value of \(m\)?

When \(m = 20\) what is the value of \(n\)?
**n stands for a number.**

Complete this table of values.

<table>
<thead>
<tr>
<th>(n)</th>
<th>(5n - 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>38</td>
</tr>
</tbody>
</table>

**2016 Paper 2 Question 12**

n = 22

What is 2n + 9?

\(2q + 4 = 100\)

Work out the value of q.

\(2x + y = 20\)

when \(x = 6\), \(y = \) ______

when \(y = 2\), \(x = \) ______

---

\(x\) is a whole number.

40 < \(x\) < 45

\(x\) could be 41, 42, 43 or 44

\(k\) is a whole number.

29 < 2\(k\) < 35

\(k\) could be __________

\(w\) is a whole number.

18 < 3\(w\) + 1 < 24

\(w\) could be __________

---

Here is a sequence of shapes.

Each time a square is added to a shape, two more circles are added.

The sequence of shapes continues.

The formula for the sequence is \(c = 2s + 2\)

Calculate the number of circles when the number of squares in a shape is 150

How many squares are there in a shape that has 100 circles?

---

\(a\) and \(b\) each represent a whole number between 1 and 10

2\(a\) + \(b\) = 8

Write the three possible combinations of \(a\) and \(b\)

One is done for you.

when \(a = 1\), \(b = 6\)

when \(a = \) ______, \(b = \) ______

when \(a = \) ______, \(b = \) ______

---

Here is an equation.

\(k = 100 - 4n\)

Find the value of \(k\) when \(n = 60\)

Find the value of \(n\) when \(k = 99\)

---

Look at this expression.

10\(y\) + 2

When \(y = 0.4\), the value of 10\(y\) + 2 is an even number because 10 \(\times 0.4 + 2 = 6\)

Write a value for \(y\) so that 10\(y\) + 2 is a prime number.

Now write a value for \(y\) so that 10\(y\) + 2 is a square number.
Use an algebraic formula

Here is a sequence of shapes made from squares.

<table>
<thead>
<tr>
<th>shape number (n)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of squares (s)</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>11</td>
</tr>
</tbody>
</table>

There is a formula which connects the number of squares (s) used in a shape, with the shape number (n). Tick the correct formula.

- \( s = 3n + 2 \)
- \( s = 3n + 1 \)
- \( s = 2n + 3 \)
- \( s = 5n - 3 \)
- \( s = 2n + 5 \)

Alfie has some photographs printed. The cost is £2.50 for postage and 12 pence for each print. Alfie uses this formula for the total cost (C) in pence.

\[ C = 250 + 12n \]

\( n \) stands for the number of photographs.
The total cost for Alfie is £6.70

How many photographs does he have printed?

Here are some picture frame sizes.

<table>
<thead>
<tr>
<th>height in cm</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>length in cm</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
</tr>
</tbody>
</table>

For each frame, the length is twice the height, subtract 4
What is the length of a frame which has a height of 36 cm?

For each frame, the length (L) is twice the height (H), subtract 4
Write this in symbols.

Print charges:
3p per page
75p for the cover
Jon pays £4.35 for his book, including the cover.
How many pages are in his book?

Write a formula for the total cost of printing a book with cover.
\( t \) stands for the total cost in pence.
Use \( n \) for the number of pages.

\[ t = \ldots \]

Ann makes a pattern of L shapes with sticks.

Shape–number: 1 2 3
Number of sticks: 7 11 15
Ann says, ‘I find the number of sticks for a shape by first multiplying the shape–number by 4, then adding 3.’
Work out the number of sticks for the shape that has shape–number 10
Ann uses 59 sticks to make another L shape in this pattern. What is its shape–number?
Write a formula to work out the number of sticks for any L shape. Use \( S \) for the number of sticks and \( N \) for the shape–number.

Javed makes rectangular frames with grey centimetre squares.

\( n \) stands for the number of grey centimetre squares in a frame.
Javed has a formula for working out \( n \).
\[ n = 2 (l + w) - 4 \]
Javed makes a frame with \( l = 28 \) and \( w = 15 \)
Use the formula to work out how many grey squares he uses.
Javed makes a square frame with 84 grey squares.
Use the formula to find how many grey squares are in each side of the square frame.
Here is a sequence of shapes made from squares and circles.

The sequence continues in the same way. The formula for the number of circles \((c)\) in shape number \((n)\) is

\[
c = 3n - 1
\]

Use the formula to work out the shape number which has 104 circles.

Write the formula for the number of squares \((s)\) in shape number \((n)\).

\[
S = \quad\quad
\]

Here is a sequence of patterns made from octagons and squares.

The sequence continues.

How many squares will there be in the pattern that has 40 octagons?

\(q\) represents the number of squares.
\(n\) represents the number of octagons.

What is the rule connecting \(q\) and \(n\)?

In this pattern white hexagons surround shaded hexagons.

How many white hexagons are needed to surround a line of 100 shaded hexagons?

\(W\) represents the number of white hexagons.
\(S\) represents the number of shaded hexagons.

What is the rule connecting \(W\) and \(S\)?

Find missing values to calculate length

Josh has some tiles.
Each tile is 10 cm long.

Two tiles fitted together are 18 cm long.

Calculate the length of five tiles fitted together.

2017 Paper 3 Question 22

In this diagram, the shaded rectangles are all of equal width \((w)\).

Calculate the width \((w)\) of one shaded rectangle.
Kate has some rectangles. Each one is 4 centimetres by 9 centimetres. She makes a design with them. Calculate the width and height of her design.

Joe has two strips of card. Each strip is 36 centimetres long. One strip is divided into three equal parts. The other strip is divided into four equal parts. Joe uses the two strips to make this shape. What is the total length of Joe’s shape?

This design has one large square and two identical small squares. The design measures 36 centimetres by 28 centimetres. Calculate the length of a side of the large square.

Solve ratio problems involving length

Four large circles and five small circles fit exactly inside this rectangle. The diameter of a large circle is 17.5 centimetres. Calculate the diameter of a small circle.

Kate has some rectangles. They each measure 16 centimetres by 50 centimetres. She makes this design with four of the rectangles. Work out the lengths x and y.

Mr Jones has two sizes of square paving stones. He uses them to make a path. The path measures 1.55 metres by 3.72 metres. Calculate the width of a small paving stone.
Six identical right-angled triangles are arranged to make a rectangle.

Calculate the length of the rectangle.

Here is a rectangle with six identical shaded squares inside it. The width of the rectangle is 7.2 centimetres.

Calculate the length of the rectangle.

Solve problems involving perimeter

The perimeter of a square is 72 centimetres.

The square is cut in half to make two identical rectangles.

What is the perimeter of one rectangle?

This plan of a garden is made of rectangles and triangles. The perimeter of the garden is 34 metres.

What is the length of the longest side of each triangle?

Here are an equilateral triangle and a regular pentagon.

Each side of the triangle is 10 cm. Each side of the pentagon is d cm. The perimeter of the pentagon is 4 centimetres more than the perimeter of the triangle. What number does d represent?

The area of this square is 36 cm².

The square is cut into quarters to create 4 identical rectangles.

What is the perimeter of one of the small rectangles?
Solve ratio problems involving perimeter

Triangle ABC is isosceles and has a perimeter of 20 centimetres. Sides AB and AC are each twice as long as BC. Calculate the length of the side BC.

Rectangle ABCD has a perimeter of 24 centimetres. Sides AB and DC are twice as long as sides AD and BC. Calculate the length of side AD.

Calculate area and recognise that area can be divided

Here is a T-shape made from 3 identical rectangles. The area of the T-shape is $90 \text{ cm}^2$. Work out the value of $x$.

The diagram shows a square of side length 12 cm. Inside the square are 8 congruent trapeziums and a shaded square. The side length of the shaded square is 6 cm. What is the area of one of the trapeziums?

Twelve rectangles, all the same size, are arranged to make a square, as shown in the diagram.

Here is a flag. What is the area of this flag?

20% of the flag is a hexagon. What area of the flag is a hexagon?

Calculate the area of one of the rectangles.
Calculate the area of a triangle

Note: Questions have been scaled down, so measurements given in cm are not to scale.

Work out the area of each shape.
Rectangle:
Triangle:

Here is a triangle on a 1 cm square grid.

What is the area of the triangle?

Calculate the area of each shape.

Rectangle:
Triangle:

Calculate the area of this triangle.

Calculate the area of the triangle.

2016 Paper 3 Question 17
Here are five triangles on a square grid. Four of the triangles have the same area. Which triangle has a different area?

The diagram shows a shaded triangle inside a rectangle. What is the area of the shaded triangle?

Here is a trapezium with a height of 10 centimetres. The parallel sides are 5.5 cm long and 10.5 cm long.

Find the area of the trapezium.

The diagram shows 4 identical shaded triangles in a rectangle. The rectangle measures 36 centimetres by 24 centimetres.

Calculate the area of one shaded triangle.
Relate the area of triangles and rectangles

Note: Questions have been scaled down, so measurements given in cm are not to scale.

The triangle and rectangle below have the same area.

Here is a triangle drawn on a square grid. Draw a rectangle on the grid with the same area as the triangle.

Work out the value of w.

Draw a triangle of a given area

Note: Questions have been scaled down, so measurements given in cm are not to scale.

On the centimetre square grid, draw a triangle that has an area of 5 cm².

Draw two more lines to complete the triangle with an area of 10 cm².

On the grid draw a triangle with the same area as the shaded rectangle.

This is a centimetre grid. On the grid draw a triangle which has an area of 7.5 cm² and which has an obtuse angle.

Here is a centimetre grid. Draw two more lines to make a quadrilateral with an area of 18 cm².
Calculate the area of a parallelogram

Note: Questions have been scaled down, so measurements given in cm are not to scale.

Here is a parallelogram on a 1 cm square grid.

What is the area of the parallelogram?

Calculate the area of the parallelogram.

Draw a parallelogram of a given area

Note: Questions have been scaled down, so measurements given in cm are not to scale.

On the centimetre square grid, draw a parallelogram that has an area of 8 cm².

This is a centimetre grid. Draw 3 more lines to make a parallelogram with an area of 10 cm².

Draw three more lines to complete the parallelogram with an area of 24 cm².
Solve problems involving area

The diagram shows a shaded square inside a larger square.

Calculate the area of:
   a) the larger square
   b) the shaded square

Here is a flag.

Calculate the area of the shaded cross.
Apply knowledge of angles with isosceles triangles

Here is an isosceles triangle.

Calculate the size of angle x.

2015 Paper 2 Question 15
A shaded isosceles triangle is drawn inside a rectangle.
Calculate the size of angle a.

Anna has four different triangles.
Complete the table to show the size of the angles in each triangle.

<table>
<thead>
<tr>
<th>Type of triangle</th>
<th>Angle 1</th>
<th>Angle 2</th>
<th>Angle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isosceles</td>
<td>90°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right-angled</td>
<td>80°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isosceles</td>
<td>70°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isosceles</td>
<td>70°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The diagram shows an isosceles triangle and a square on a straight line. Calculate angle a.

This shape has been made from two isosceles triangles.

What is the size of angle p?

The diagram shows three identical isosceles triangles.

What are the sizes of angles r and t?

F is the centre of a regular pentagon.

Work out the value of angle x.
Apply knowledge of angles and lengths in equilateral triangles

Here is an equilateral triangle inside a rectangle.

Calculate the value of angle $x$.

The diagram shows two shaded equilateral triangles.

Calculate the size of the angle $x$ and angle $y$.

Here is an equilateral triangle inside a square.
The perimeter of the triangle is 48 centimetres.

Calculate the perimeter of the square.

Lauren has three small equilateral triangles and one large equilateral triangle. The small triangles have sides of 7 centimetres.

Lauren makes this shape.

Calculate the perimeter of the shape.

Apply knowledge of angles in quadrilaterals (360) and pentagons (540)

Triangle $ABC$ is equilateral.

Calculate the size of angle $x$.

The dotted line is a diagonal of this rhombus.

If angle $a = 80^\circ$, what is angle $b$?

If angle $b = 80^\circ$, what is angle $a$?

The diagram shows a pentagon. Each side of the pentagon is the same length.

Is the shape a regular pentagon? Explain your answer.

Work out the size of angle $a$. 
Recognise vertically opposite angles and Z angles

Here is a rectangle.

Calculate the size of angles a and b.

This is a rectangle with its two diagonals.

Angle $x = 58^\circ$
Circle the two angles that are the same size as angle $x$

In this diagram AB is parallel to CD.

Work out the value of angle $x$.
Calculate the value of angle $y$.

Solve problems involving angles

2016 Paper 2 Question 17
Calculate the size of angles a and b.

The diagram shows two overlapping squares and a straight line.

Calculate the value of angles x and y.

The diagram shows a right-angled triangle and three parallel lines.

Calculate the size of angle $x$ and angle $y$.

The shape ABCD is a rectangle.
BD is parallel to EF.

Calculate the sizes of the angles x and y.
Here is a regular decagon, with two diagonals drawn in.

Calculate the sizes of angles \(a\), \(b\) and \(c\)

\[
a = \quad b = \quad c =
\]

Draw shapes by measuring angles

Here is a sketch of a triangle. It is not drawn to scale.

Draw the full-size triangle accurately below.
Use a protractor (angle measurer) and a ruler.
One line has been drawn for you.
Here is a sketch of a quadrilateral. It is not drawn to scale.

Draw the full-size quadrilateral accurately below. Use a protractor (angle measurer) and a ruler. Two of the lines have been drawn for you.
Here is a sketch of a triangle. It is not drawn to scale.

Draw the full-size triangle accurately below. Use a protractor (angle measurer) and a ruler. One line has been drawn for you.

2019 Paper 2 Question 13

Here is a sketch of a triangle. It is not drawn to scale.
Draw the full-size triangle accurately below.
Use an angle measurer (protractor) and a ruler.
One line has been drawn for you.
This is a design for an arrowhead.

Below is part of a larger scale drawing of the arrowhead. The drawing has the same size angles as the design. Draw two more lines to complete the arrowhead accurately. Use an angle measurer (protractor).
Here is the start of a spiral sequence of right-angled triangles. Draw accurately the next right-angled triangle on the diagram.

Use an angle measurer to find the size of angle A.

Here is a sketch of a triangle. It is not drawn to scale. Draw the full size triangle accurately, below. Use an angle measurer (protractor) and a ruler. One line has been done for you.
### Recognise parts of a circle

#### 2017 Paper 3 Question 11
A bicycle wheel has a diameter of 64 cm. What is the radius of the bicycle wheel?

#### Use these measurements to complete the sentences below.

<table>
<thead>
<tr>
<th>8 cm</th>
<th>25 cm</th>
<th>4 cm</th>
</tr>
</thead>
</table>

The radius of a circle is _____ cm;
its diameter is _____ cm and
its circumference is approximately _____ cm.

#### 2017 Paper 3 Question 12
A circle has a diameter of 22 cm. What is the length of its radius?

The diagram shows a right-angled triangle inside a circle.
The circle has a radius of 5 centimetres.

Calculate the area of the triangle.

### Solve problems involving nets of 3D shapes

#### Here are three nets of a cube. On each net draw one more dot so that each cube will have dots on opposite faces.

#### 2018 Paper 3 Question 17
On a dice, the sum of the dots on opposite faces is always 7.
Draw dots on the three empty faces of the net so that it could fold up to make a dice.

Here is a cube. The cube is shaded all the way round so that the top half is grey and the bottom half is white.
Here is the net of the cube.

Complete the shading.

#### A cube has shaded triangles on three of its faces.
Here is the net of the cube.

Draw in the two missing shaded triangles.
A cube has shaded shapes on three of its faces. Here is a net of the cube. Draw in the two missing shaded shapes.

Here is a cube. The top half of the cube has been shaded all the way round.

Here is a net for the cube. One square has been shaded for you. Shade more of the net so that it could fold to make the cube above.

Calculate volume

This cuboid is made from centimetre cubes. It is 4 centimetres by 3 centimetres by 2 centimetres.

What is the volume of the cuboid?

a) The diagram shows a cuboid. What is the volume of this cuboid?

b) The volume of a different cuboid is half the volume of the cuboid in part a. What could the dimensions of this different cuboid be?

Jon has 20 centimetre cubes. He wants to make a cube with edges that are 3 cm long. How many more centimetre cubes does he need?

Calculate the volume of the prism.

Calculate the volume of the prism.
Cleo has 24 centimetre cubes. She uses all 24 cubes to make a cuboid with dimensions 6 cm, 2 cm and 2 cm. Write the dimensions of a different cuboid she can make using all 24 cubes.

A cuboid is made from centimetre cubes. It has a volume of 30 cubic centimetres. What could the length, height and width be?

You can make only four different cuboids with 16 cubes. Complete the table to show the dimensions. Two have been done for you.

<table>
<thead>
<tr>
<th>Cuboid</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 1 16</td>
</tr>
<tr>
<td>B</td>
<td>1 2 8</td>
</tr>
<tr>
<td>C</td>
<td>1 4 4</td>
</tr>
<tr>
<td>D</td>
<td>2 2 4</td>
</tr>
</tbody>
</table>

Which cuboid has the largest volume? Tick the correct answer below.

A cuboid is made from centimetre cubes. It has a volume of 30 cubic centimetres. What could the length, height and width be?

You can make only six different cuboids with 24 cubes. Complete the table to show the dimensions. Two have been done for you.

<table>
<thead>
<tr>
<th>Cuboid</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>1 1 24</td>
</tr>
<tr>
<td>F</td>
<td>1 2 12</td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td></td>
</tr>
</tbody>
</table>

Calculate missing lengths given volume

**2017 Paper 3 Question 24**

Cube A and cuboid B have the same volume. Calculate the missing length on cuboid B.

The two cuboids have the same volume. Calculate the length x.

A cuboid has a square base. It is twice as tall as it is wide. Its volume is 250 cubic centimetres. Calculate the width of the cuboid.
Calculate volume from nets

2018 Paper 2 Question 22
This is the net of a cube.

What is the volume of the cube?

2019 Paper 2 Question 23
Amina made this cuboid using centimetre cubes.

Stefan makes a cuboid that is 5 cm longer, 5 cm taller and 5 cm wider than Amina's cuboid. What is the difference between the number of cubes in Amina’s and Stefan’s cuboids?

Amit has some small cubes. The edge of each cube is 1.5 centimetres. He makes a larger cube out of the small cubes. The volume of this larger cube is 216 cm$^3$. How many small cubes does he use?

The diagram shows a cuboid. What is the volume of this cuboid?
The volume of a different cuboid is half the volume of the cuboid above. What could the dimensions of this different cuboid be?

What is the volume of this standard size box of salt?

What is the volume of this special offer box of salt, which is 20% bigger?

The standard size box contains enough salt to fill up 10 salt pots. How many salt pots may be filled up from the special offer box of salt?

Do the cuboids have the same volume? Show calculations to explain how you know.

Solve problems involving volume of cubes and cuboids

This is the net of a cube.

What is the volume of the cube?

The squared paper shows the nets of cuboid A and cuboid B.

For the cuboids to have the same volume, the bases must have the same area and the heights must be the same, therefore, the lengths of the sides of cuboid A must be the same as the lengths of the sides of cuboid B.

The volume of cuboid A is $6 	imes 6 	imes 6 = 216$ cm$^3$.

The volume of cuboid B is $3 	imes 3 	imes 8 = 72$ cm$^3$.

The cuboids do not have the same volume.
Solve ratio problems involving co-ordinates on a simple co-ordinate grid

The dots on the line are equally spaced.

What are the coordinates of the point A?

Megan says, 'The point B has coordinates (11,5).’ Use the graph to explain why she cannot be correct.

In this diagram R is an equal distance from P and Q.

What are the coordinates of R?

Here is a line on coordinate axes.

Points O, P, Q and R are equally spaced. The coordinates of P are (25,12). What are the coordinates of R?

The points A, B and C are equally spaced. What are the co-ordinates of point B?

Point D is directly below point C. What are the co-ordinates of the point D?
A is the point (10, 60). B is the point (20, 20). M is the midpoint of line AB. Write the coordinates of M.

C is on the x-axis, directly below B. Write the coordinates of C.

Identify and plot points on a full co-ordinate grid

For each of these points, put a tick to show if it is inside the square. (50, 70) (60, -30) (-10, 50) (-30, -30)

2017 Paper 2 Question 17

The vertices of a quadrilateral have these coordinates:
(1, 5) (5, 4) (1, -3) (-3, 4)
One side of the quadrilateral has been drawn on the grid. Complete the quadrilateral.
ABCD is a rectangle drawn on coordinate axes. The sides of the rectangle are parallel to the axes. What are the coordinates of D and E?

2018 Paper 3 Question 10
Layla draws a square on this coordinate grid. Three of the vertices are marked. What are the coordinates of the missing vertex?

The two shaded squares below are the same size.
A is the point (17, 8). B is the point (7, -2). What are the co-ordinates of the point C?

Here is a square on coordinate axes.
C is the centre of the square. Find the coordinates of P and Q.

The diagram shows three identical shaded triangles on co-ordinate axes.
What are the co-ordinates of A and B?

The diagram shows 6 shaded squares.
K is the point (20, 10). What are the coordinates of L and M?
2017 Paper 3 Question 7
Here is a triangle drawn on a coordinate grid. The triangle is translated 7 right and 5 up. Draw the triangle in its new position.

2019 Paper 3 Question 10
On the grid there are three points joined by two lines. Lara plots another point on the grid at (–1, 2). She joins the points to make a quadrilateral. Complete Lara’s quadrilateral on the grid. Then Lara translates the quadrilateral 4 squares to the right. Draw the quadrilateral in its new position on the grid.

2015 Paper 3 Question 20
Here are two identical shaded triangles on coordinate axes. Write the coordinates of points A and B.
Reflect a shape on a full co-ordinate grid

The shaded triangle is a reflection of the white triangle in the mirror line. Write the co-ordinates of point A and point B.

2016 Paper 2 Question 20
Here are two triangles drawn on coordinate axes.

Triangle B is a reflection of triangle A in the x-axis.
Two of the new vertices of triangle B are (10, −10) and (20, −30).
What are the coordinates of the third vertex of triangle B?
Identify co-ordinates from equations on a line graph

A and B are two points on the graph of \( y = x + 5 \)

Write the missing co-ordinates of A and B.

A \((?, 9)\)  \ B \((-8, ?)\)

Write the co-ordinates of the point where the graph of \( y = x + 5 \) crosses the x-axis.

The points \((-5, -2)\) and \((4, 7)\) lie on the same line.

If the line were extended, would it pass through point \((-100, -103)\)?

Explain how you know.

Use \( x \) and \( y \) to write the equation of the line.

The diagram shows the graph of \( y = x - 7 \)

Write the coordinates of one point on the line between A and B.
Estimate values on a line graph to use in calculations

Carol went on a 40-kilometre cycle ride. This is a graph of how far she had gone at different times.

How many minutes did Carol take to travel the last 10 kilometres of the ride?

Use the graph to estimate the distance travelled in the first 20 minutes of the ride.

Carol says, ‘I travelled further in the first hour than in the second hour.’ Explain how the graph shows this.

500 children started a 20 kilometre sponsored cycle ride. This graph shows how far they cycled.

At what distance were exactly half of the children still cycling?

Estimate how many children completed the 20 kilometre cycle ride.

This graph shows the number of people living in a town.

How many people lived in the town in 1985?

In which year was the number of people the same as in 1950?

Find the year when the number of people first went below 20 000

A hot liquid is left to cool in a science experiment. This graph shows how the temperature of the liquid changes as it cools.

Read from the graph how many minutes it takes for the temperature to reach 40°C

Read from the graph how many minutes the temperature is above 60°C
Use the graph to find the time when the temperature was 25°C.

Use the graph to find the difference between the temperature at 2pm and the temperature at 4pm.

Emily is 1.38m tall. She is the average height for her age. How old is she?

Zoe is 9½ years old. She is also 1.38m tall. How much taller than average is she? Give your answer in centimetres.

Estimate how much higher rocket A reaches than rocket B.

Estimate the time after the start when the two rockets are at the same height.

Jim says, ‘The graph shows that rocket A was more than 200 m above the ground for about 23 seconds.’ Explain how the graph shows this.
Two telephone companies, Supertalk and Quickline, have different charges for long distance calls. This graph shows the charges for different lengths of calls.

Estimate from the graph how many seconds longer a £2 call lasts with Supertalk compared to Quickline.

Estimate from the graph the length of a call when Quickline becomes cheaper to use than Supertalk. Give your answer to the nearest 10 seconds.

This chart gives the cost of showing advertisements on television at different times.

An advertisement lasts 25 seconds. Use the graph to estimate how much cheaper it is to show it in the daytime compared with the evening.

An advertisement was shown in the daytime and again in the evening. The total cost was £1200. How long was the advertisement in seconds?

150 people take part in a walk. This chart shows the number of people still walking at different times.

Use the chart to estimate the time when two-thirds of the people are still on the walk.
Estimate decimals or negative numbers on a line graph to use in calculations

This graph shows how the weight of a baby changed over twelve months.

From the graph, what was the weight of the baby at 10 months?

How much more did the baby weigh at 5 months than at birth?

This graph shows how the temperature changed in Liam’s room one afternoon.

Estimate the temperature at 3:15pm.

Estimate the time when the temperature was highest.

How much did the temperature change from 2pm to 2:30pm? Give your answer to the nearest degree.

This graph shows the height of a candle as it burns.

What is the height of the candle after 2 hours?

How long does the candle take to burn down from 16cm to 4cm?

This graph shows the outside temperature from 4pm to 10pm on a day in winter.

At what time was the temperature -2°C?

How many degrees did the temperature drop from 5pm to 7pm?
This graph shows the temperature in °C from 2 am to 3 pm on a cold day.

How many degrees warmer was it at 3 pm than at 3 am?

At 6 pm the temperature was 4 degrees lower than at 3 pm.
What was the temperature at 6 pm?

Solve problems involving information presented in line graphs

Two companies sell toys online. They charge to deliver. Describe the delivery cost of the second company.
The first company is done for you.

How fast you can type accurately is called your typing speed. The regions of the graph show information about different typing speeds.

Darren's level of typing is elementary. In 20 minutes he should be able to type between 500 and 700 words.

Jo's level of typing is intermediate. How many words should she be able to type in 20 minutes? Between _____ and _____

Kath's typing speed is 30 words per minute.
What level is Kath’s typing? Explain how you know.
Alfie and his brother walked from home to their school. Their school is 2 kilometres from home. The graph shows information about Alfie’s journey.

How does the graph show that Alfie walked at a constant speed for all of his journey?

Alfie’s brother left home 10 minutes before Alfie. He arrived at school 20 minutes after Alfie. He walked at a constant speed for all of his journey.

At what time did Alfie overtake his brother?
Calculate the mean

2015 Paper 2 Question 17
Seven children measured their heights.

<table>
<thead>
<tr>
<th>Children</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stefan</td>
<td>144</td>
</tr>
<tr>
<td>Lara</td>
<td>136</td>
</tr>
<tr>
<td>Olivia</td>
<td>142</td>
</tr>
<tr>
<td>Chen</td>
<td>143</td>
</tr>
<tr>
<td>Maria</td>
<td>152</td>
</tr>
<tr>
<td>Dev</td>
<td>148</td>
</tr>
<tr>
<td>Sarah</td>
<td>150</td>
</tr>
</tbody>
</table>

What is the mean height of the children?

2018 Paper 2 Question 18
Last year, Jacob went to four concerts.
- Three of his tickets cost £5 each.
- The other ticket cost £7
What was the mean cost of the tickets?

Here are five number cards. Write the missing number so that the mean is 2

[1 4 1 1 __]

Three apples have a mean (average) mass of 100 grams. The largest apple is removed. The mean mass of the remaining two apples is 70 grams. What is the mass of the largest apple?

2016 Paper 2 Question 19
The arrow below points to the mean of the three numbers shown by crosses.

Draw an arrow that points to the mean of the three numbers shown below.

The arrow below points to the mean of three numbers.
One of the numbers is missing. Draw a cross to show the position of the missing number.

2019 Paper 2 Question 22
This graph shows the maximum temperature for five days.

For what fraction of the five days was the maximum temperature below 10 °C?

What was the mean maximum temperature, to one decimal place?

Megan goes on a walking holiday for five days. The table shows how far she walked on the first four days.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
</tr>
</thead>
<tbody>
<tr>
<td>14km</td>
<td>23km</td>
<td>13km</td>
<td>13km</td>
</tr>
</tbody>
</table>

Megan says, ‘My average for the first four days is more than 15km.’
Explain why Megan is correct.

Friday is her last day. She wants to increase her average to 17km.
How many kilometres must she walk on Friday?

Vicki puts 10 books on a shelf. The 10 books take up 28 centimetres.
What is the mean (average) thickness of her books?

Carol counts the matches in 10 boxes. She works out that the mean number of matches in a box is 51.
Here are her results for 9 boxes.

<table>
<thead>
<tr>
<th>1st January</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 49 50 51 52 53 54</td>
</tr>
</tbody>
</table>

Calculate how many matches are in the 10th box.