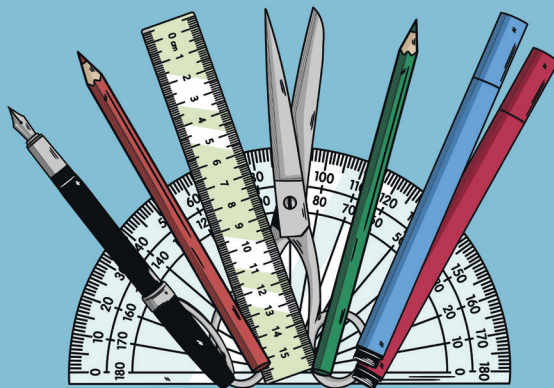




Transitioning to Year 7 Maths

Booklet 2

Important Things to Know When Preparing for KS3 Maths

Order of Operations (BIDMAS)

You may have seen this written as BODMAS. While this is sometimes used in KS3, it is more commonly known as BIDMAS.

- The O in BODMAS stands for 'Order'. You may have heard it referred to as 'Operators', 'Over' or even 'Other'.
- The I in BIDMAS stands for 'Indices'. Indices are the small numbers that other numbers are raised to, for example, 3^2 or 5^3 .

A common misconception about the order of operations is that division is completed before multiplication and, similarly, that addition is completed before subtraction.

In fact, this is not true. The order of operations is:

- First – B (Brackets)
- Second – I (Indices)
- Third – D / M (Division or Multiplication)
- Fourth – A / S (Addition or Subtraction)

If both a multiplication and division appear in the same question, you should always work from the left-hand side of the question. The same goes for addition and subtraction.

Example

$$5 + 2 \times 4 \div 4$$

As there are no brackets or indices in this question, you can jump straight to the third stage of multiplying or dividing.

The first of these we see is $2 \times 4 = 8$.

Now, we have $5 + 8 \div 4$.

Next, we complete the division, $8 \div 4 = 2$.

Leaving us with $5 + 2$.

$$5 + 2 = 7$$

So, our final answer is 7.

Area and Perimeter

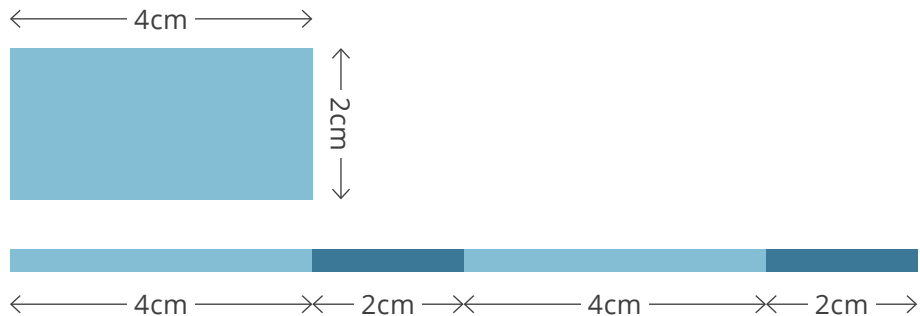
You may have learnt that 'area is inside and perimeter is outside'.

While the area can be referred to as the inside of a 2D shape, it is, in fact, the amount of space taken up by a 2D shape.

The perimeter is not actually the outside of the shape. It is, in fact, the total distance of the edges of the shape.

While area is two-dimensional (2D), perimeter is not. Think of perimeter as a path along the shape's edges.

Example



The perimeter is $4\text{cm} + 2\text{cm} + 4\text{cm} + 2\text{cm} = 12\text{cm}$.

It is only one-dimensional (1D).

The area is $4 \times 2 = 8\text{cm}^2$ as the shape can be split up into eight 1cm by 1cm squares.

It is two-dimensional (2D).

Multiplying and Dividing by Powers of Ten

‘Multiplying and dividing by 10 involves adding a zero or taking off a zero.’

This does not always work!

You may have been shown a ‘shortcut’ that appears to work for certain calculations, such as 55×10 .

You add a zero to get 550.

However, what happens with 5.5×10 ? If we just ‘add a zero’ then this equals 5.50, which is not correct.

Instead, we actually move the digits one column to the left when multiplying by 10.

Example 1

$$5.3 \times 10$$

H T U . $\frac{1}{10}$

$\begin{array}{r} 5 \\ \leftarrow 5 \end{array} . 3 \times 10$ Move the digits one column to the left.

$$5.3 \times 10 = 53$$

If multiplying by 100, you move the digits two columns to the left. If multiplying by 1000, you move the digits three columns to the left and so on.

For division, you move the digits to the right. When dividing by 10, you move the digits one column to the right. When dividing by 100, you move the digits two columns to the right. When dividing by 1000, you move the digits three columns to the right and so on.

Example 2

$$67 \div 100$$

H	T	U	.	$\frac{1}{10}$	$\frac{1}{100}$
---	---	---	---	----------------	-----------------

6	7	0			
$\xrightarrow{\hspace{1cm}}$			$\div 100$	Move the digits two columns to the right.	
	6	.	7	0	

$$67 \div 100 = 6.70$$

Here, we can just write 6.7 as the zero in the hundredths column will not affect the answer.

You might also notice that at secondary school, the ones column is often referred to as 'units'. Ones or units are equally acceptable.

Long Multiplication

You may have only learnt to do long multiplication by one method. We are going to look at three methods and outline the positives and negatives for each one.

The Column Method

This is just like the column method for short multiplication. You just need to remember to add the extra zeros to represent the tens, hundreds and so on.

Example

$$235 \times 26$$

First, you multiply the 235 by 6.

Now, the 2 from the 26 is worth 2 tens so you need to place a 0 on the right of the answer line to represent multiplying by 10. You can then multiply the 235 by 2.

$$\begin{array}{r} 235 \\ \times 26 \\ \hline 14\cancel{3}1\cancel{0} \leftarrow \times 6 \\ 47\cancel{0}0 \leftarrow \times 20 \\ \hline 6110 \\ \cancel{1} \end{array}$$

$$235 \times 26 = 6110$$

You may find this method easy to use when multiplying 2-digit or 3-digit numbers by a 1-digit number but it might become more complicated when multiplying a 3-digit number by a 2-digit number (or multiplying a 3-digit number by another 3-digit number). You may find the following methods easier to use in these cases.

The Grid Method

Here, you partition the numbers in the question and then you multiply each pair of numbers together before adding the products together.

Example

$$235 \times 26$$

	200	30	5
20	4000	600	100
6	1200	180	30

$$4000 + 1200 + 600 + 100 + 180 + 30 = 6110$$

With this method, it is easy to make mistakes when adding so many large numbers and you need to ensure that the numbers are in the correct place value columns. You might find the next method easier to use.

Napier's Bones

This method is like the grid method but each box is split by diagonal lines and it doesn't involve such large numbers. You need to multiply the pairs of digits and put the answers in the box. In each box, the tens are put above the diagonal and the units below the diagonal. If there are no tens, simply place a zero above the diagonal.

You then add the diagonals. If a total for a diagonal is a 2-digit number, you need to carry the tens over into the next diagonal, to be added to that total. The numbers around the edge then form the answer.

Example

$$235 \times 26$$

	2	3	5	×
	0	0	1	
	4	6	0	2
6	1	1	3	6
	2	8	0	
	1	1	0	

$$235 \times 26 = 6110$$

One disadvantage of this method is that it is more complicated to set up the grid and ensure that the diagonals line up.

Division

With division, it is easy to say one thing and mean the opposite. For example, you might say '4 divided by 16' when what you actually mean to say is 'how many times does 4 go in to 16?' This is 16 divided by 4.

16 divided by 4 can be written as $16 \div 4$, $= \frac{16}{4}$ or as a 'bus stop': $4 \overline{)16}$.

The answer to this is 4.

However, $4 \div 16$, $\frac{4}{16}$ or $16 \overline{)4}$ simplifies to 0.25 or $\frac{1}{4}$.

With addition or multiplication, the position of the numbers in the question can be swapped around without making any difference to the answer. This is known as commutative. This is not the case for subtraction or division.

Example 1

$$5 \times 4 = 4 \times 5$$

This is true. The answer to both is 20.

$$4 \div 2 = 2 \div 4$$

This is not true. $4 \div 2 = 2$ while $2 \div 4 = \frac{1}{2}$.

Remainders

If you have a calculation such as $\frac{15}{2}$, remember this means $15 \div 2$. Up to now, you may have answered this as 7 r 1, where r stands for remainder. It is correct that 2 goes into 15 seven times with 1 left over but, at secondary school, you will be expected to write the remainder as a decimal or fraction. In this question, the remainder is worth $\frac{1}{2}$, or 0.5, as we are dividing by two.

$$\frac{15}{2} = 7\frac{1}{2} \text{ or } 7.5$$

Example 2

$$\frac{26}{3} = 8\frac{2}{3}$$

This is because 3 goes into 26 eight times with two left over. As we are dividing by 3, the remainder is out of 3.

Example 3

A farmer has 250 eggs and needs to put them in boxes of 6 to sell. How many boxes can she fill?

Start by dividing 250 by 6. The answer would be 41 with 4 eggs left over. This time, we do not need to write the remainder as a decimal or fraction as we are asked to find how many boxes she can fill. Therefore, we ignore the remainder and our answer is 41 boxes.

Decimals

When adding and subtracting decimals, you need to ensure the numbers are under the correct headings and that the decimal points are lined up.

Example 1

$$2.7 + 12.68$$

You might find it helpful to put a 0 as a place holder in any spaces. Note here that U has been used to represent 'units'. Remember this is the same as 'ones'.

Now that the numbers are lined up correctly, you can just add each column, starting on the right.

	T	U	.	$\frac{1}{10}$	$\frac{1}{100}$
	0	2	.	7	0
+	1	2	.	6	8
	1	5	.	3	8
		1			

The decimal point in your answer is just lined up with the decimal points in the question. The same is true when you are doing subtraction.

However, this will not work for multiplying two decimals or dividing by a decimal.

Example 2

Noel is calculating 0.6×2.1 . His working is shown below. Explain why Noel is incorrect.

$$\begin{array}{r}
 0.6 \\
 \times 2.1 \\
 \hline
 06 \\
 120 \\
 \hline
 12.6
 \end{array}$$

A common mistake when multiplying decimals is to line up the decimal places like in the example above. **This is incorrect.** 0.6×2.1 does not equal 12.6.

Instead, when multiplying decimals, a different method is needed.

Start by working out the product of the digits by ignoring the decimal points, in this case, 6×21 .

$$6 \times 21 = 126.$$

We want to calculate the value of 0.6×2.1 though. To do this, we need to divide 6×21 by 10, twice (or divide by 100).

$$\begin{array}{rcc}
 6 \times 21 = 126 \\
 \downarrow \div 10 \quad \downarrow \div 10 \quad \downarrow \div 100 \\
 0.6 \times 2.1 = 1.26
 \end{array}$$

So, **$0.6 \times 2.1 = 1.26$**

Example 3

Divide 27 by 0.9.

Calculating $\frac{27}{0.9}$, or how many 0.9s go into 27, is complicated. It is easier if we can 'get rid of the decimal'.

To 'remove' the decimal point in 0.9, we need to multiply by 10.

$$0.9 \times 10 = 9$$

The decimal point has gone but, because we multiplied the 0.9 by 10, we must do the same to the 27 so that we do not change the original question.

$$27 \times 10 = 270$$

Now, $\frac{27}{0.9}$ has the same answer as $\frac{270}{9}$, which is easier to calculate.

$$270 \div 9 = 30$$

So,

$$27 \div 0.9 = 30$$

Your Turn

1. Calculate $7 + 4 \times 8$.

2. Evaluate $4 - (10 + 6) \div 2^3$.

3. Calculate $11.45 - 0.246$.

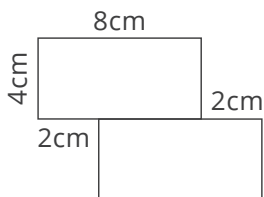
4. Work out 2.4×1.1 .

5. Evaluate 12.5×100 .

6. Calculate $180 \div 1000$.

7. a. Write a sentence to describe the perimeter of a 2D shape.

b. Calculate the perimeter of this shape which consists of two congruent rectangles. You should include the units in your answer.



8. a. Calculate 325×49 using your preferred method.

- b. Now, do the same calculation using one of the other two methods shown in this booklet and then compare your answers.

- c. Use a calculator to check your answer. Which method do you prefer?

9. a. Calculate 7 divided by 35.

- b. Divide 3400 by 1.7.

10. Evaluate $\frac{85}{9}$, leaving your answer as a mixed number.

