

COLUMN ADDITION

$$\begin{array}{r} 457 \\ +356 \\ \hline 813 \\ \begin{array}{cc} 1 & 1 \end{array} \end{array}$$

Step 1: Line the numbers up, using your knowledge of place value.

Step 2: Starting from the ones column, add the two digits. $7+6$ is 13. The 3 stays in the ones column and the 1 (ten) goes into the tens column, at the bottom.

Step 3: Now the tens column, $5+5 = 10$ then add the 1 from the bottom. This totals 11.

Step 4: The 1 stays in the tens column and the other 1 goes in the hundreds column.

Step 5: Add up the last column.

COLUMN SUBTRACTION

$$\begin{array}{r} 5 12 1 \\ 636 \\ -247 \\ \hline 389 \end{array}$$

Step 1: Line the numbers up, using your knowledge of place value. Make sure the larger number is on the top.

Step 2: Starting from the ones column, subtract the 2 digits. Unfortunately, you cannot take 7 away from 6. You have to borrow from the tens column. Cross out the 3 and write a 2. You then write the borrowed 1 above the 6. This now makes 16. $16 - 7 = 9$.

Step 3: Now the tens column: You can't do $2 - 4$, so you have to borrow from the hundreds column. Cross out the 6 and put a 5. Now the tens column becomes 12. $12 - 4 = 8$

Step 4: Finally, take the 2 away from the 5, which equals 3.

COLUMN MULTIPLICATION (SHORT)

$$\begin{array}{r} 5 6 \\ 457 \\ \times 9 \\ \hline 4113 \end{array}$$

Step 1: Line the numbers up, using your knowledge of place value.

Step 2: Starting from the ones column, multiply 7 by 9. This equals 63. The 3 goes into the ones column and the 6 goes above the tens column.

Step 3: Now do 5 x 9, which equals 45. You now have to add the 6 onto that answer. This answer is now 51. The 1 stays in the tens column, whilst the 5 goes above the hundreds column.

Step 4: Finally, do 4 x 9, which equals 36, and then add on the 5. This equals 41. Place that in your answer row. You will now have your final answer.

COLUMN MULTIPLICATION (LONG)

$$\begin{array}{r} \\ 457 \\ \times 19 \\ \hline 4113 \\ +4570 \\ \hline 8683 \end{array}$$

THERE ARE TWO STAGES TO THIS CALCULATION, THE MULTIPLICATION AND THEN THE ADDING.

Step 1: Line the numbers up, using your knowledge of place value.

Step 2: Starting from the ones column, multiply 7 by 9. This equals 63. The 3 goes into the ones column and the 6 goes above the tens column.

Step 3: Now do 5 x 9, which equals 45. You now have to add the 6 onto that answer. This answer is now 51. The 1 stays in the tens column, whilst the 5 goes above the hundreds column.

Step 4: Then, do 4 x 9, which equals 36, and then add on the 5. This equals 41. You now have your first answer.

Step 5: Insert a place holder (0) in the tens column. You are now multiplying by 10.

Step 6: Using the same method as before, you multiply the 7 x 1, 5 x 1 and then the 4 x 1. Place these answers in the answer row.

Step 7: Finally, use your column addition to add together the two answers you have got. $4113 + 4570 = 8683$

DIVISION (SHORT)

$$\begin{array}{r} 029 \\ 8 \overline{) 232} \end{array}$$

Step 1: Set up your question as follows.

Step 2: To start with, see how many 8's go into 2. The answer is 0, so that is put above the 'bus shelter'.

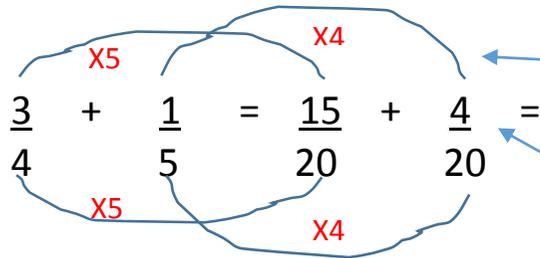
Step 3: The 2 has to be used, so you move it along to the next digit. How many 8's go into 23? The answer is 2 ($2 \times 8 = 16$) with 7 remaining, which gets moved to the next column. The 2 gets put above the 'bus shelter' next to the 0.

Step 4: Now the question is, how many 8's go into 72 (the 7 remainders and the 2, which is already there)? The answer is 9, because $8 \times 9 = 72$.

Step 5: You now have your final answer, which is 29.

ADDING AND SUBTRACTING FRACTIONS

$$\frac{3}{4} + \frac{1}{5} =$$

$$\frac{3}{4} + \frac{1}{5} = \frac{15}{20} + \frac{4}{20} =$$


$$\frac{3}{4} + \frac{1}{5} = \frac{15}{20} + \frac{4}{20} = \frac{19}{20}$$

Step 1: First, you need to find a common denominator (bottom number). This is a number that both the current denominators go into.

Step 2: In this question, the 4 and the 5 have been multiplied together to make 20. This is the common denominator.

Step 3: The rule when finding the common denominator is that: **Whatever you do to the bottom number (denominator), you have to do to the top number (numerator).**

Step 4: In this case, the denominator of 4 has been multiplied 5 times to get to 20. So, you need to multiply 3 x 5. The answer is 15. So an equivalent fraction to $\frac{3}{4}$ is $\frac{15}{20}$.

Step 5: Do the same for $\frac{1}{5}$. The 5 was multiplied by 4, so the 1 has to be multiplied by 4. So, an equivalent fraction to $\frac{1}{5}$ is $\frac{4}{20}$.

Step 6: Now the denominators are the same, you just have to add the numerators together ($15+4 = 19$), whilst the denominators stay the same.

NOTE: This method is exactly the same for subtracting fractions, however you just have to subtract at the end instead of adding.

MULTIPLYING FRACTIONS

$$\frac{1}{5} \times \frac{5}{7} =$$

***SIMPLE RULE: TOP TIMES TOP OVER BOTTOM TIMES
BOTTOM***

Step 1: $1 \times 5 = 5$; this makes my numerator

$$\frac{1}{5} \times \frac{5}{7} = \frac{5}{35}$$

Step 2: $5 \times 7 = 35$; this makes my denominator.

SIMPLIFYING FRACTIONS

$$\frac{\underline{5}}{35} = \frac{\underline{1}}{7}$$

Like when we were adding and subtracting fractions, we need to always do the same to both the numerator and the denominator.

When simplifying a fraction, you need to find a number that goes into both the numerator and the denominator. In this instance it is 5.

Step 1: How many 5's go into 5? 1. So one becomes the numerator.

Step 2: How many 5's go into 35? 7, so this becomes the denominator.

This means that $1/7$ is equivalent to $5/35$.

DIVIDING FRACTIONS by whole numbers

$$\frac{3}{5} \div 4 =$$

Step 1: Make your whole number into a fraction. So 4 becomes $\frac{4}{1}$.

$$\frac{3}{5} \div \frac{4}{1} =$$

Step 2: Flip the second fraction, so it now becomes $\frac{1}{4}$.

$$\frac{3}{5} \times \frac{1}{4} =$$

Step 3: You now multiply the fractions together, using the method before. **Top times top over bottom times bottom.**

$$\frac{3}{5} \times \frac{1}{4} = \frac{3}{20}$$

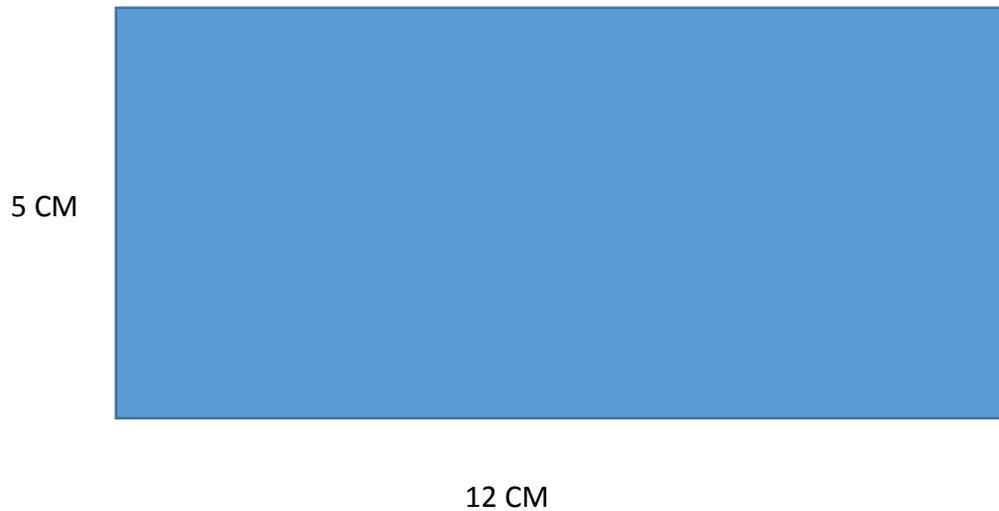
Step 4: Your answer will be $\frac{3}{20}$.

Note: Some children have been multiplying the denominator by the whole number to find the denominator, and then leaving the numerator the same.

So $4 \times 5 = 20$ as the denominator. This then means the 3 stays the same for the numerator.

AREA

L X W (LENGTH X WIDTH)



Step 1: Using your multiplication knowledge, do 12×5 . The length is 12 and the width is 5.

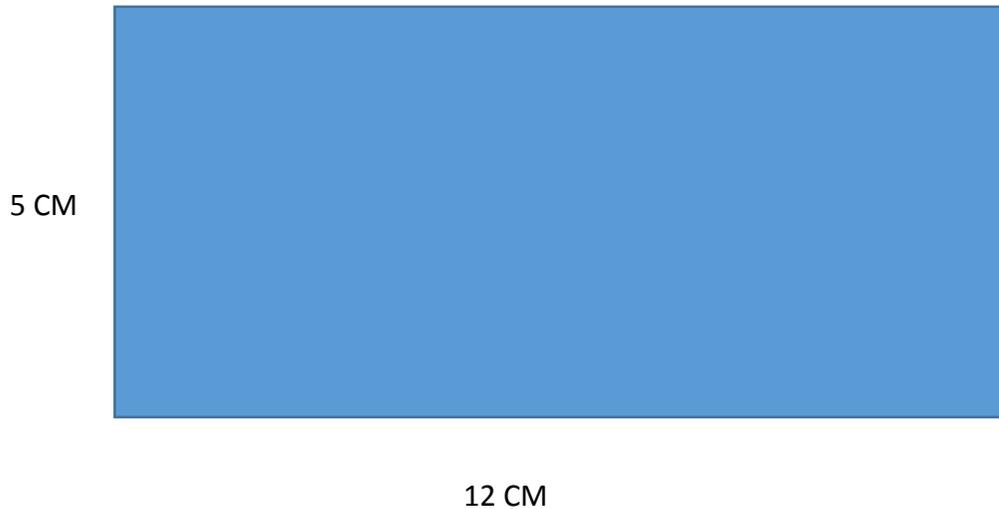
Step 2: You should have answer 60.

Step 3: To finish your answer, you need to add the units. We are measuring in cm and because it is area we have to add squared (2).

So the final answer is 60cm^2

PERIMETER

$$L + L + W + W \quad (\text{Length} + \text{Length} + \text{Width} + \text{Width})$$



Step 1: Find the length of all the sides to your shape.

Step 2: Add up all those measurements in your head, or column addition.

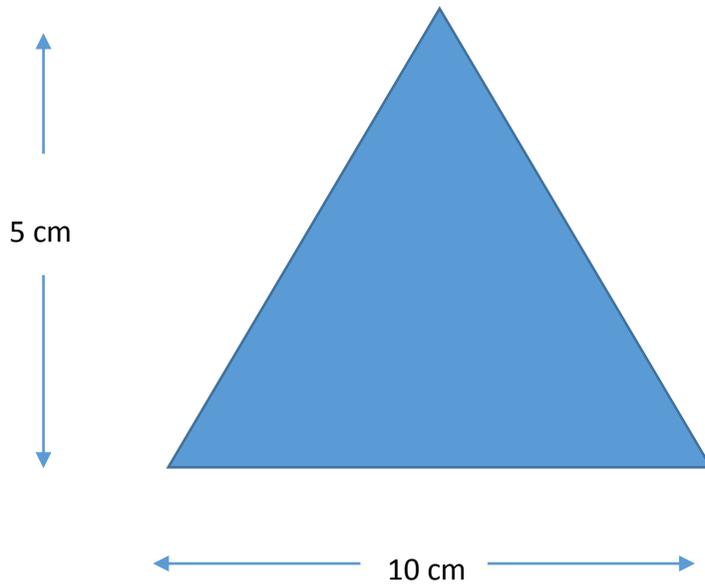
Step 3: You will have the calculation:

$$12+12+5+5 = 34\text{cm}$$

AREA OF A TRIANGLE

1 $B_{\text{ASE}} \times H_{\text{EIGHT}}$

2



Step 1: Find the length of the base – 10cm. Half this measurement. So it is 5 cm.

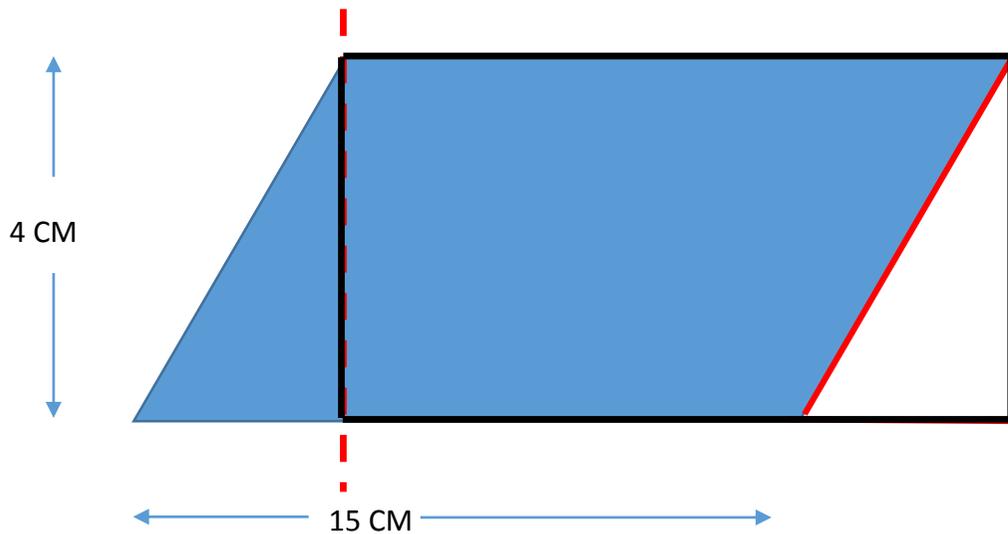
Step 2: Times the 5 cm by the height which is 5cm.

Step 3: Complete the calculation, $5\text{cm} \times 5\text{cm} = 25\text{cm}^2$

NOTE: This method will work for any triangle.

AREA OF A PARALLELOGRAM

$$H \times W \text{ (Height x Width)}$$



If you are comfortable with working out the area of a rectangle, then you will be able to work out the area of a parallelogram. You have to remember that a parallelogram is a rectangle on a slant.

Step 1: You have to just multiply the height x the width.

For example: $4\text{cm} \times 15\text{cm} = 60\text{cm}^2$

Remember the answer is squared because we are finding the area inside of the shape.

BODMAS

Brackets ()

BODMAS is the order we carry out a calculation that includes more than one operation. For example:

Other ^{2, 3}

$$(12+6) \times 2 =$$

Division ÷

Step 1: Brackets – look inside the brackets and see what needs to be carried out.

$$12 + 6 = 18$$

Multiplication x

Step 2: Now you can work out what is left, which is $18 \times 2 =$

Addition +

Step 3: The answer is 36.

Subtraction -

ALGEBRA

$$26 + b = 30$$

$$b = 4$$

$$3c + 8 = 29$$

$$c = 7$$

$$(m + 5) \times 2 = 22$$

$$m = 6$$

Algebra is when numbers are replaced by letters within a sum or calculation.

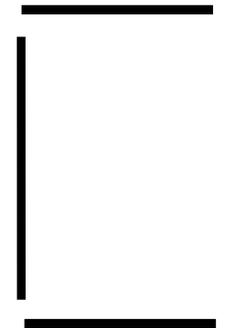
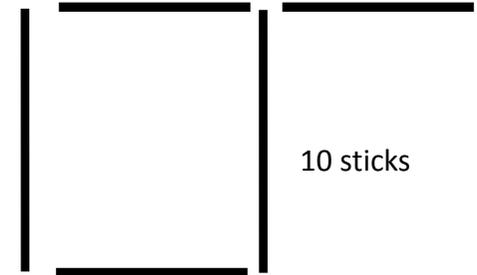
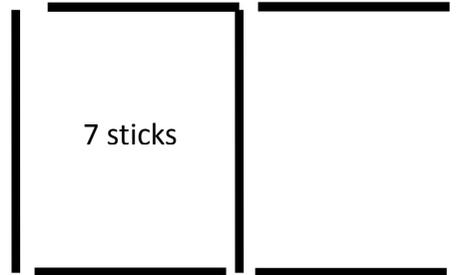
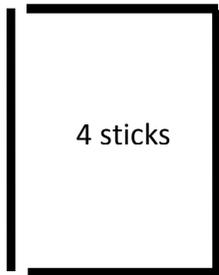
When working out the missing number, you need to work backwards.

When working out $26 + b = 30$. You need to work out $30 - 26$ (using the inverse). The answer is 4.

When you have a number next to a letter, without a symbol, you need to multiply those together. So $3c$ is actually $3 \times c$.

Finally, you may have to use your BODMAS knowledge to help you with algebra, but no need to worry - it works exactly the same as before.

FINDING the n^{th} TERM



The n^{th} term is involved when we talk about number sequences. It is the formula that a certain sequence will follow so you are able to find the 100th, 500th, and even 1245th number in the sequence.

Here is an example of a sequence of sticks.

If it was in numbers, it would go as follows: 4, 7, 10.

To find the n^{th} term, follow these steps:

Step 1: Find the difference between each of the numbers; in this case it is 3.

Step 2: This automatically becomes the start of the formula, '3n' because we are adding three each time, just like you do in the 3x table.

Step 3: As it is the formula for finding a number in a sequence, we can use the first pattern number to help us. Remember n is the number in the sequence, so $3n = 3 \times 1$, which equals 3.

Step 4: Now we have to work out what else we need to do to get 3 to 4; using simple addition we know it is 1.

Step 5: We can now make the formula $3n+1$ to find the n^{th} term.

METRIC CONVERSIONS

1 litre (l) = 1000 millilitres (ml)

1 tonne = 1000 kilograms (kg)

1 kilogram (kg) = 1000 grams (g)

1 kilometre (km) = 1000 metres(m)

1 metre (m) = 100 centimetres (cm)

1 centimetre (cm) = 10 millimetres (mm)

1 mile = 1.6 kilometre (km) = 1600 metre (m)

Sometimes you may get asked what is 2.4kg in grams.

To do this you need to understand all the conversions to the left.

Step 1: In a kilogram there is 1000g, and you have two of them.
So 2000g

Step 2: 0.4kg is the same as 400g.

Step 3: Overall it will be 2400g

LONG DIVISION

With a remainder

$$\begin{array}{r}
 031 \text{ r } 2 \\
 12 \overline{) 374} \\
 \underline{-36} \\
 14
 \end{array}$$

With a decimal

$$\begin{array}{r}
 031.1\dot{6} \\
 12 \overline{) 374.00} \\
 \underline{-36} \\
 14 \\
 \underline{-12} \\
 20 \\
 \underline{-12} \\
 80 \\
 \underline{-72} \\
 8
 \end{array}$$

Long division can be seen as very tricky; however once you have mastered the method, you will become confident and able to do it at any opportunity.

Step 1: How many 12's go into 3? You cannot do this so you write 0 above the bus stop.

Step 2: How many 12's go into 37? 3, so this goes next to the zero. Now you have to put the answer to 3×12 under the 37. You now subtract 36 from 37 to find the remainder. In this case it is 1.

Step 3: You now have to bring down the next number, 4. How many 12's go into 14? 1 with a remainder of 2. If the answer doesn't require a decimal remainder, you can stop here. You will have the answer 31 remainder 2.

Step 4: To finish with a decimal remainder, you continue the method going down the page, creating a series of subtractions as you go down. Remember you need to add the decimal points in and the zeros.

Step 5: Sometimes your number can be recurring, when the same number continues. For this you place a dot on top of the number. You can see it in the example above the 6.

X10, X100, X1000

Hundreds	Tens	Ones	.	Tenths
		1	.	1
1	1	0	.	0

When multiplying by 10, 100 and 1000, you must remember the number is going to get bigger. There are a few easy ways to remember the rules to do this.

When multiplying, the numbers move to the left, making the number get bigger.

For example: $1.1 \times 100 =$

In this question, because we are multiplying by 100, we move the number 2 places on the place value chart.

The decimal point stays in the same place meaning the answer is 110, as we have to include a place holder in the ones column.

Other information you will need to know:

X1000 = move the number 3 places on the place value chart

X 10 = move the number 2 places on the place value chart

$\div 10, \div 100, \div 1000$

Hundreds	Tens	Ones	.	Tenths
1	1	0	.	
	1	1	.	

When dividing by 10, 100 and 1000, you must remember the number is going to get smaller. There are a few easy ways to remember the rules to do this.

When dividing the numbers, move to the right, making the number get smaller.

For example: $110 \div 10 =$

In this question, because we are dividing by 10, we move the number 1 place on the place value chart.

The decimal point stays in the same place meaning the answer is 11

Other information you will need to know:

$\div 1000 =$ move the number 3 places on the place value chart

$\div 100 =$ move the number 2 places on the place value chart

RATIO

A ratio says how much of one thing there is compared to another thing.



This has a ratio of 3:1. There are 3 parts blue to one-part yellow.

Ratio in its simplest form

Like fractions, ratio can be put into its simplest form. However, you need to make sure you do the same to both numbers.

e.g. 12:8

Both numbers have a factor of 4, so $12 \div 4 = 3$ and $8 \div 4 = 2$.

The simplified ratio is 3:2

When given a question involving ratio, you need to see the ratio as a collective. So, 3:1 is 4 whole parts.

EXAMPLE QUESTION

To make some green paint, you need to mix blue and yellow paint together. The ratio is 3:1.

This means you need 3 lots of blue paint to 1 lot of yellow paint.

How much blue paint will you need to make 12 litres of green paint?

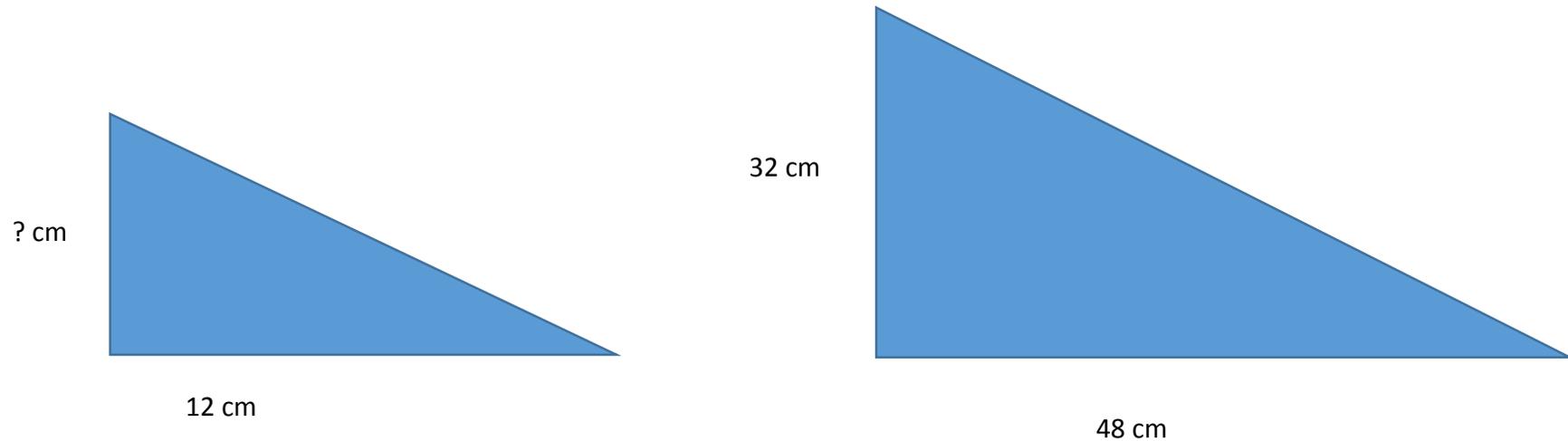
Step 1: Identify how many times 4 (3+1) goes into 12. The answer is 3.

Step 2: You now need to look back at the ratio, 3:1. Using the 3 you have just found, you need to multiply each side of the ratio. *Note: this is just like fractions. You have to do the same to both sides.*

Step 3: $3 \times 3 = 9$, and $3 \times 1 = 3$ so the overall ratio is 9:3. You need 9 litres of blue paint to make 12 litres of green paint.

To check, you can add your final ratio up to see if it equals 12. $9 + 3 = 12$

SCALE FACTORS



The scale factor links to ratio. You need to find how one side corresponds to another side in order to find out what has happened to it.

For example, 12cm has been multiplied by 4 to get to 48cm. That MUST mean that ? has been multiplied by 4 as well to get to 32cm.

From my multiplication facts I know that $8 \times 4 = 32$. The missing height is 8 cm.

MEAN (average)

Here are the children in a family:

Ben, 10 yrs old

Felix, 12 yrs old

Millie, 14 yrs old

Bonnie, 8 yrs old

Oscar, 6 yrs old

What is the average age of the children?

To find the mean (average) follow these simple steps:

Step 1: Add up the numbers you have available to you, using column addition to help you with this.

Step 2: Once you have a total, divide by how many numbers you had in the first place.

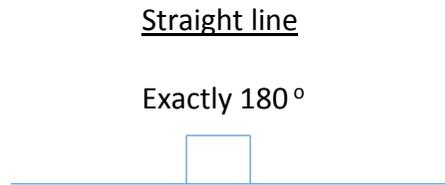
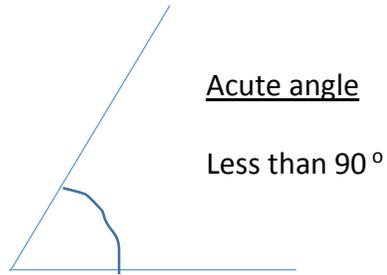
For example:

$$12 + 8 + 6 + 14 + 10 = 50$$

$$50 \div 5 = 10$$

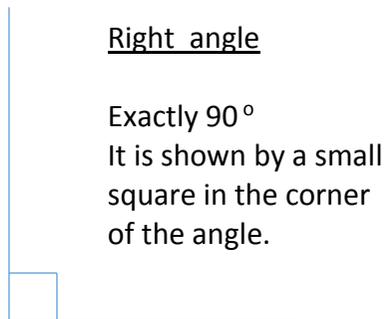
The average age is 10 years old.

ANGLE RULES



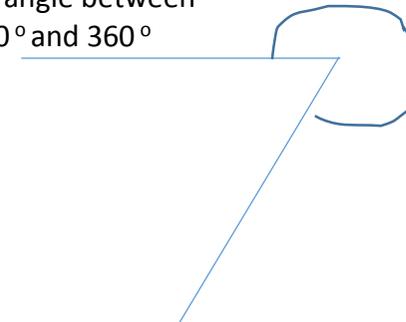
Obtuse angle

More than 90°
But less than 180°

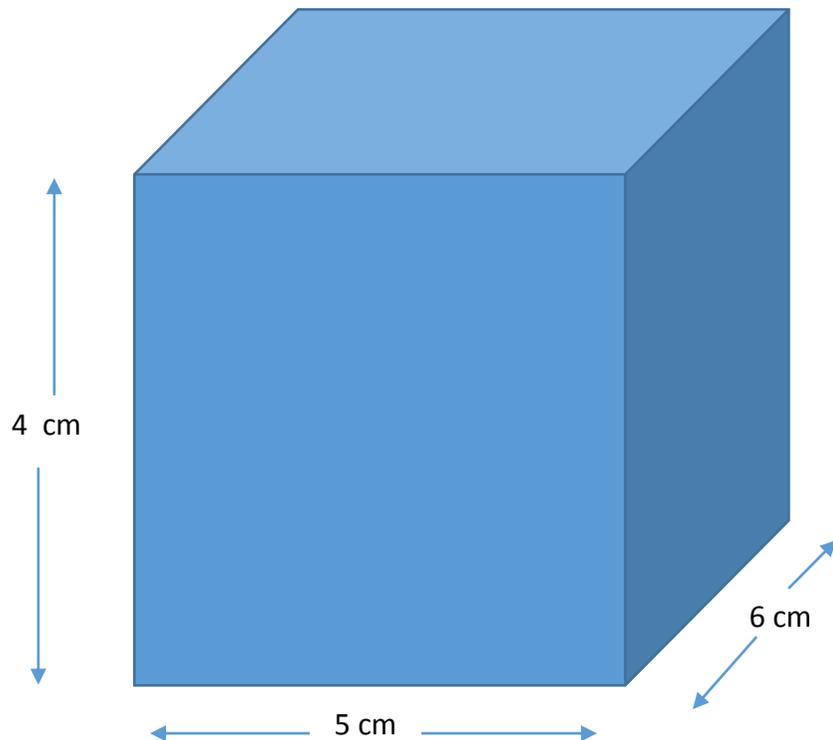


Reflex angle

An angle between
 180° and 360°



VOLUME



H x W x L

Height x Width x Length

Here the you have to follow the formula above.
Using it we can work out the volume of the cuboid.

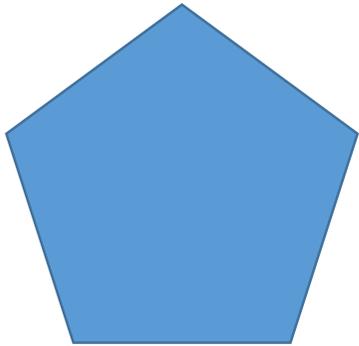
Step 1: Find your measurements and set out the
calculation. $4\text{cm} \times 5\text{cm} \times 6\text{cm} =$

$$4 \times 5 = 20$$

$$20 \times 6 = 120 \text{ cm}^3$$

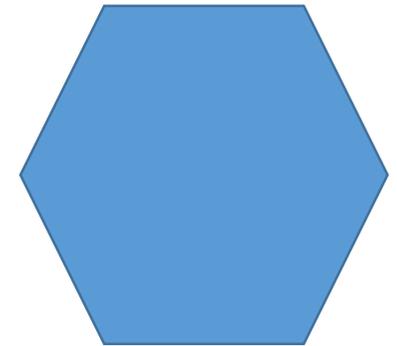
We use cm^3 as we are dealing with centimetres and
the it is cubed because we are finding the volume.

PROPERTIES OF A SHAPE



Shapes are made up of of many different properties. Here are some you will need to know:

Vertices = corners of where the edges meet
Edges = the edges on a 3D shape (the folds)
Faces = the faces on a 3D shape (the flat parts)



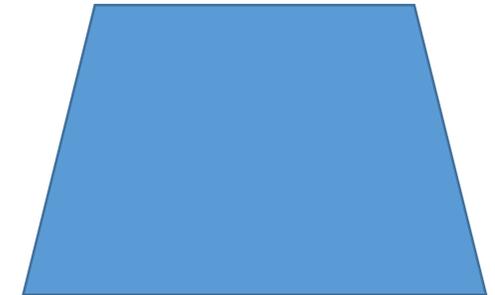
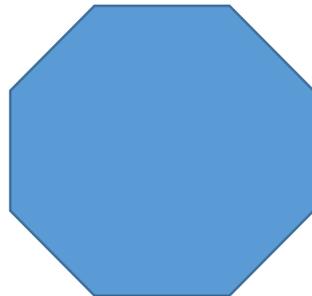
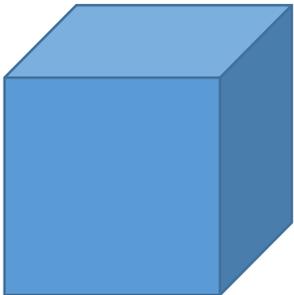
Facts about shapes:

All angles in a triangle add up to 180°

All angles in a square add up to 360°

All angles in a pentagon add up to 540°

NOTE: The angle sum increases by 180° each time you add another side



ROMAN NUMERALS (UP TO 1000)

$$1 = I$$

$$5 = V$$

$$10 = X$$

$$50 = L$$

$$100 = C$$

$$500 = D$$

$$1000 = M$$

Things to remember when making roman numerals.

1. You have to build the 10s first, then the ones.
e.g. 19 = XIX = 10 and then 9
2. To make 9 or 4, you need to do one less than 10 or 5.
e.g.
9 = IX
4 = IV
3. 90 follows the same pattern, but it is 10 before 100, so it looks like XC.
4. Finally, in Roman numerals they don't use zeros, for example 501 is DI.

Have a go at playing around with Roman Numerals and try and make different numbers.

Can you make your date of birth?

FACTORS

32

Factors are the numbers that go into another number. They are basically multiplication facts.



The factors of 32 are:

$$1 \times 32$$

$$2 \times 16$$

$$4 \times 8$$

To show these you would write:

1,2,4,8,16,32

Prime Numbers

Prime numbers are when a number doesn't have any factors, except one and itself. An example of this is 17 because it doesn't appear in any times tables.

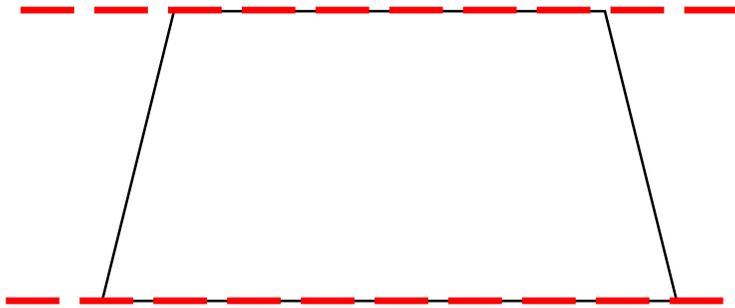
Other prime numbers you should know:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29

Can you find any more up to 50?

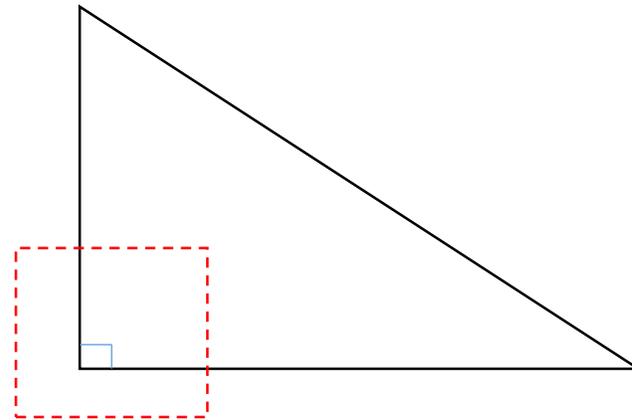
PARALLEL and PERPENDICULAR

Parallel



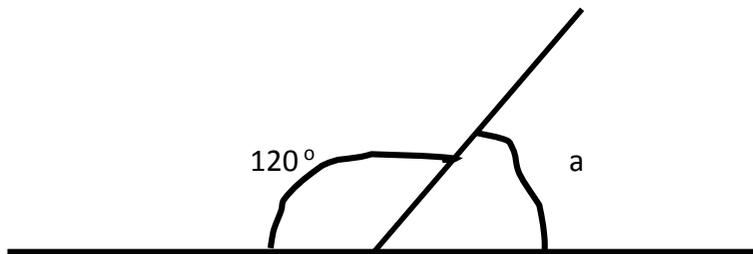
Parallel lines are always the same distance apart from one another and are never going to meet. This trapezium has one pair of parallel lines.

Perpendicular



Perpendicular lines are lines that meet at a 90° angle. A right angled triangle has perpendicular lines.

FINDING THE MISSING ANGLES

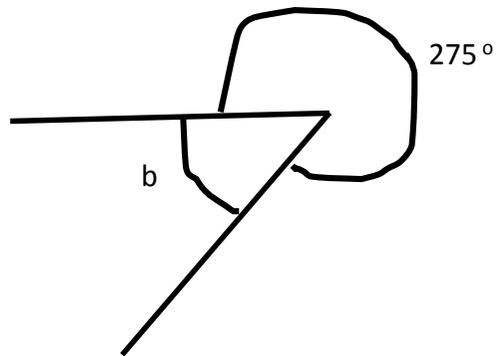


When finding missing angles, we have to use our angle facts from our previous learning. We know that on a straight line there are 180°.

Using the measurements given to us, we can write the calculation:

$$180^\circ - 120^\circ = 60^\circ$$

$$a = 60^\circ$$



Here, I already know that there are 360° in a circle. So my calculation is:

$$360^\circ - 285^\circ = 75^\circ$$

$$b = 75^\circ$$