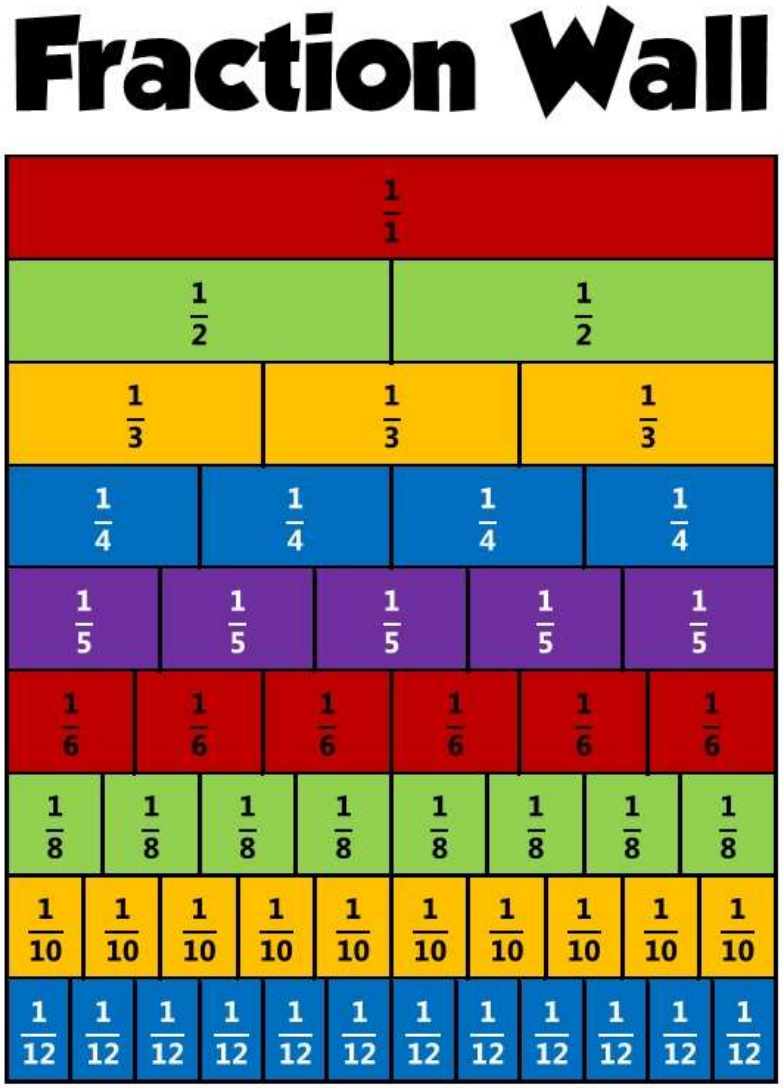
Year 6 SATs

Maths Revision Guide

FRACTION WALL



CONTENTS

ADDITION

1. ADDING IN YOUR HEAD

For simple numbers, you can try to add them in your head.
You can make it easier by:

- Breaking up numbers
  40 + 67 is the same as
  40 + 60 + 7, which is
  107
- Rounding numbers
  42 + 89 is the same as
  (40 + 80) + (2 + 9), which is
  120 + 11, which is
  131

Remember, you can always jot down numbers on paper while you are adding in your head.

2. WRITING IT DOWN

7948 + 1223 =
If the numbers are too high or too difficult to add in your head, write them down in columns. Separate the numbers into units, tens, hundreds and thousands. Always start adding with the units first.

MULTIPLICATION & DIVISION SQUARE

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

HUNDRED SQUARE

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

3. USEFUL TIPS

- Estimate first and check afterwards. It's a good idea to estimate a rough answer first.
  And always check your actual answer.
- Order doesn't matter. 394 + 88 is the same as 88 + 394
- Key words. Look out for these words in problems: total, sum, altogether, more. They
  all indicate an addition calculation.

SUBTRACTION

1. SUBTRACTING IN YOUR HEAD

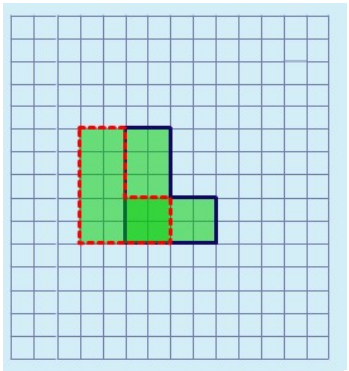
For simple numbers, you can try to subtract them in your head.
You can make it easier by:

- Breaking up numbers
  63 - 37 is the same as 63 - 30 - 7
  63 - 30 = 33
  33 - 7 = 26
- Rounding numbers
  63 - 37 is the same as 63 - 40, then adding 3
  63 - 40 = 23
  23 + 3 = 26
- Counting on
  To work out 63 - 37, count on from 37 to 63
  Count on from 40 to 60 to get 20
  Count on from 60 to 63 to get 3
  3 + 20 + 3 = 26

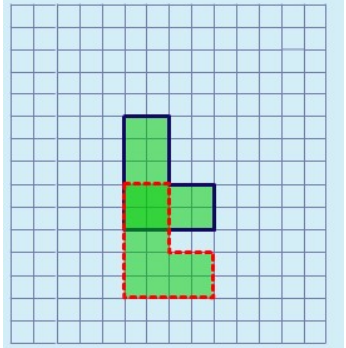
Remember, you can always jot down numbers on paper while you are subtracting in your head.

3. TRANSLATION

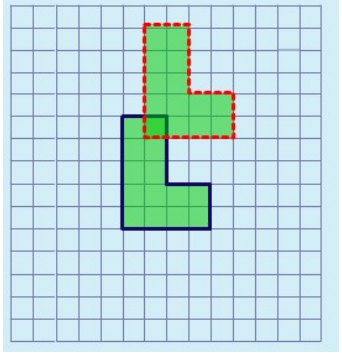
- Translation is when a shape slides from one place to another, without turning.



2 squares to the left



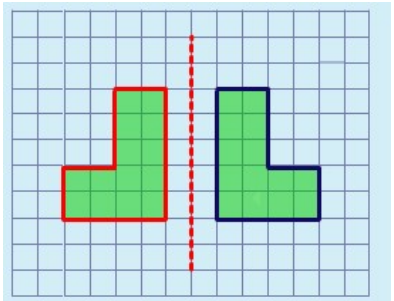
3 squares down



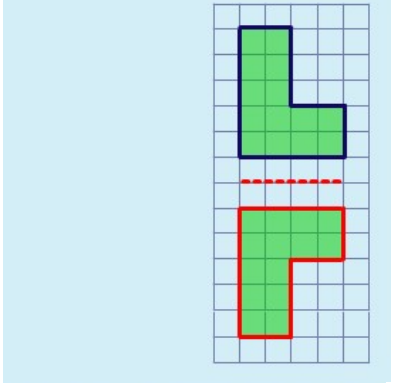
1 square to the right and four squares up

2. REFLECTION

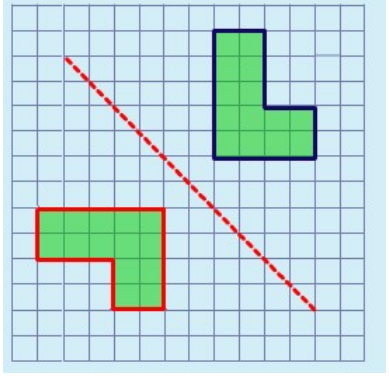
- When a shape is reflected in a mirror line, the reflection is the same distance from the mirror line as the original shape.



Mirror line is vertical



Mirror line is horizontal



Mirror line is diagonal

2. WRITING IT DOWN

If the numbers are too high or too difficult to subtract in your head, write them down in columns. Always start subtracting with the units first.

Th	H	T	U	
6	$^{3}4$	$^{1}1$	8	
1	2	2	3	-
5	1	9	5	

3. USEFUL TIPS

- Estimate first and check afterwards. It's a good idea to estimate a rough answer first. And always check your actual answer.
- Subtraction is the opposite to addition. So subtraction can always be checked by adding. To check that 82 - 37 = 45, add the 45 and the 37 and you should get 82.
  82 - 37 = 45
  37 + 45 = 82
- Key words. Look out for these words in problems: take away, difference, less than, minus, decrease, fewer than, reduce. They all indicate a subtraction calculation.

MULTIPLICATION

1. TIMES TABLES

Memorise all the multiplication tables to 10 x 10. This will help with loads of multiplication problems.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

2. MULTIPLYING IN YOUR HEAD

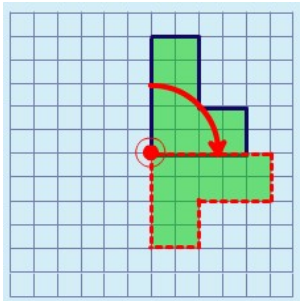
Here are some tips for multiplying in your head.

- 7 x 6 Recall the multiplication fact for 7 x 6 to get the answer 42.
- 12 x 7 Because 12 is 2 x 6, when you work out 12 x 7, you can do it like this:
  2 x 6 x 7
  = 2 x 42
  = 84
- 35 x 8 Because 8 is 2 x 2 x 2, when you work out 35 x 8, you can do it like this:
  35 x 2 x 2 x 2
  = 70 x 2 x 2
  = 140 x 2
  = 280

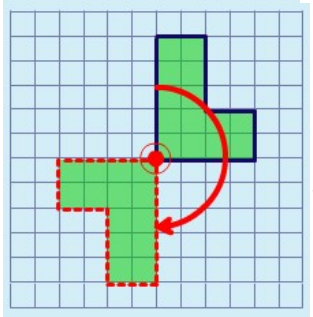
TRANSFORMATION

1. ROTATION

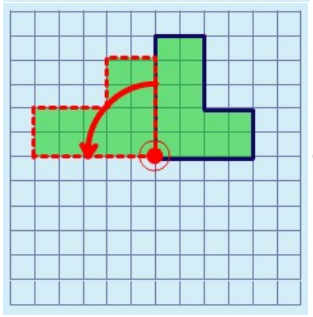
- A shape can be rotated (turned) clockwise or anticlockwise about a point, called the centre of rotation.
- The distance from any point on the shape to the centre of rotation never changes.



90° clockwise

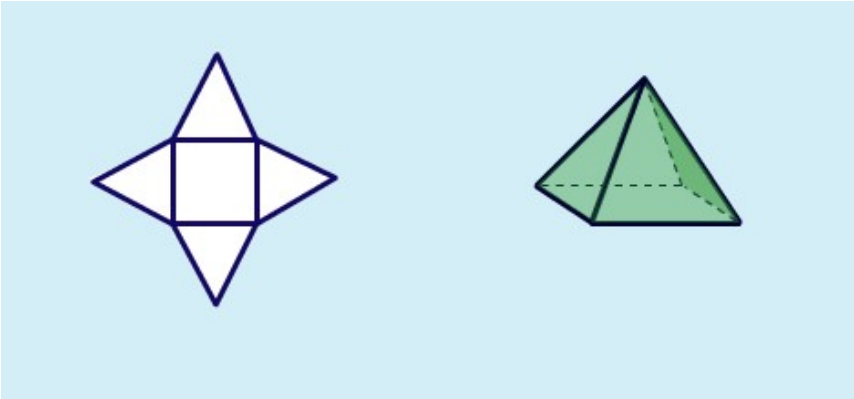


180° (doesn't matter if it is clockwise or anticlockwise)

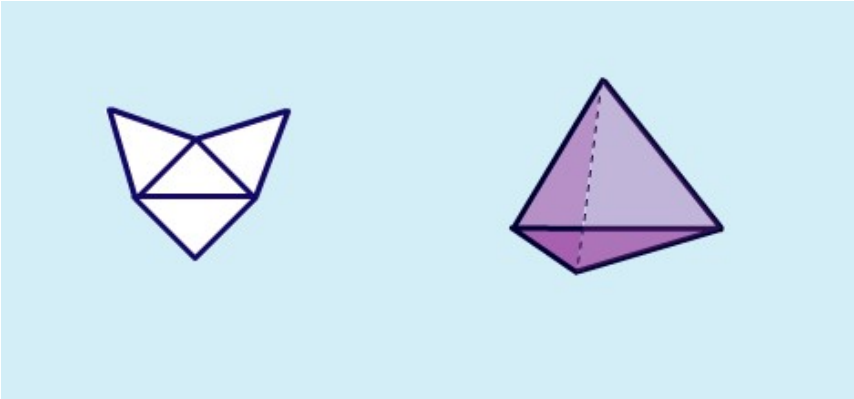


90° anticlockwise

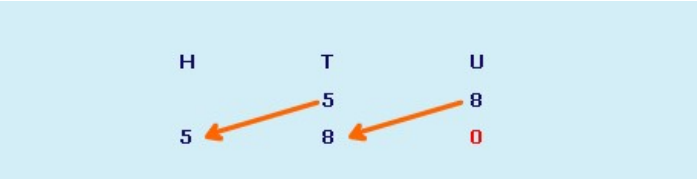
Net of a square-based pyramid



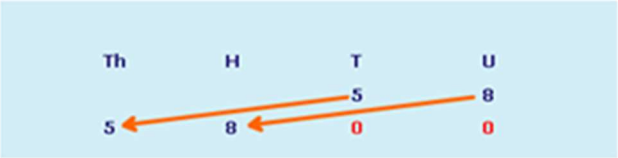
Net of a tetrahedron



- To multiply a number by 10, move the digits one place to the left, adding a zero if necessary.
  58 x 10 = 580



- To multiply a number by 100, move the digits two places to the left, adding zeros if necessary.
  58 x 100 = 5800



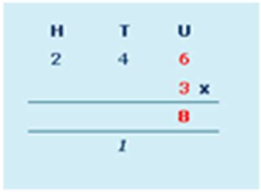
- To multiply by numbers such as 20 or 300, multiply by the 2 or 3 first and then by the 10 or 100.

  33 x 20
  = 33 x 2 x 10
  = 66 x 10
  = 660

  22 x 300
  = 22 x 3 x 100
  = 66 x 100
  = 6600

3. WRITING IT DOWN: THE VERTICAL METHOD

Line up the units, tens and hundreds underneath each other and then multiply each digit, starting with the units.
For example, 246 x 3

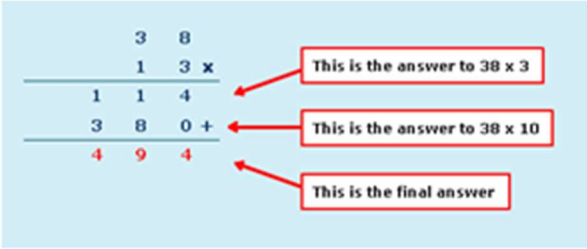


Start by multiplying the 3 by the 6 to give 18.

Then multiply the 3 by the 4 to give 12. Add the 1 carried over to give 13.

Then multiply the 3 by the 2 to give 6. Add the 1 carried over to give 7.
So the answer to 246 x 3 is 738.

If you are multiplying by a number over 10, for example 38 x 13, you use the same method as above but break it down into 2 parts, 38 x 3 and 38 x 10, and then add the two answers together:



4. USEFUL TIPS

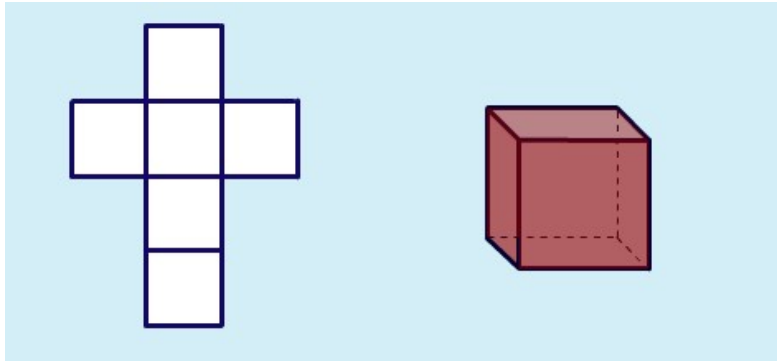
8. NETS OF 3D SHAPES

The net of a 3D shape is what it looks like if it is opened out flat. A net can be folded up to make a 3D shape.

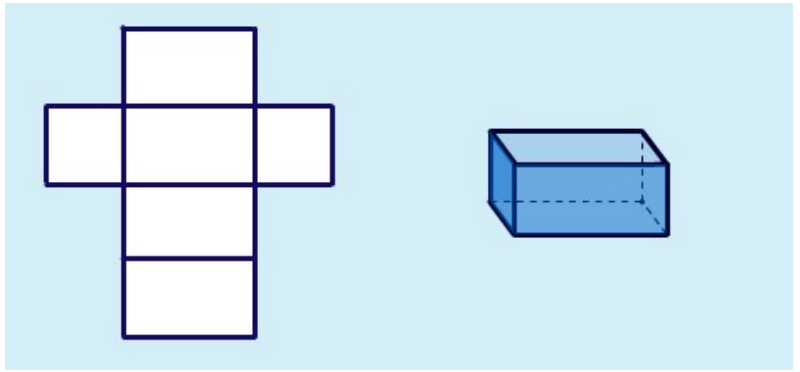
There may be several possible nets for one 3D shape.

Here are some examples.

Net of a cube

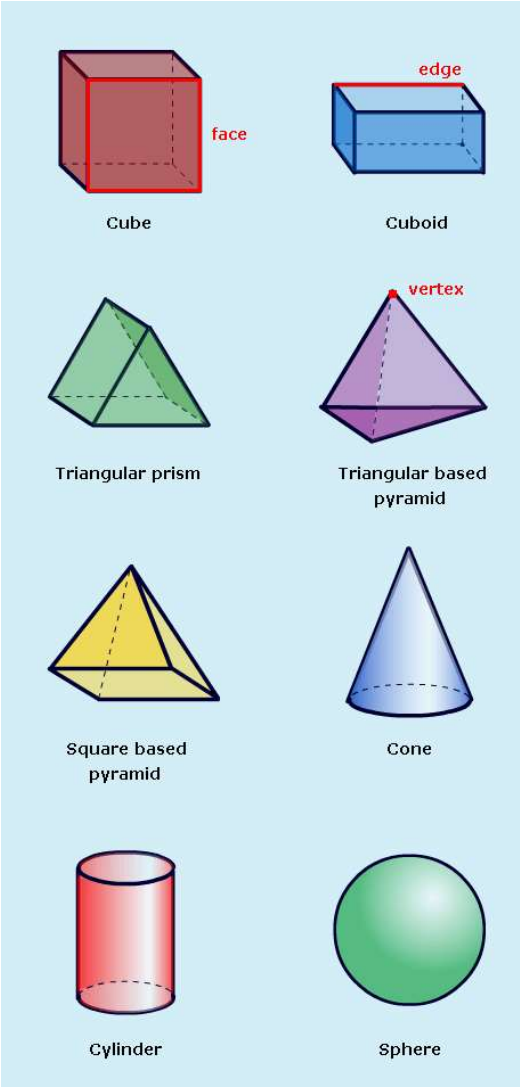


Net of a cuboid



7. 3D SHAPES

3D shapes have faces (sides), edges and vertices (corners).
The exception is the sphere which has no edges or vertices.



- Estimate first and check afterwards. It's a good idea to estimate a rough answer first. And always check your actual answer.
- Multiplication and division are opposites. For example, 8 x 6 = 54 and 54 ÷ 6 = 8.
- The order in which you multiply numbers doesn't matter. 28 x 4 x 16 is just the same as 4 x 16 x 28.

DIVISION

1. DIVIDING IN YOUR HEAD

If you have memorised some division and multiplication tables, you can use them to divide in your head. Here are some examples of how you might solve problems:

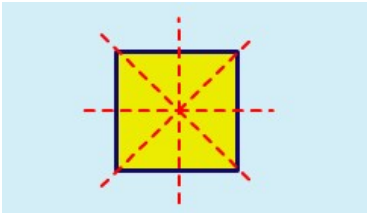
- 42 ÷ 7 You could recall the 7 times table and remember that 7 x 6 = 42 to get the answer 6.
- 47 ÷ 9 You could recall that 45 ÷ 9 = 5 and count on from 45 to 47 to get the answer 5 remainder 2.
- 600 ÷ 8 Because 8 = 2 x 2 x 2, you could divide 600 by 2 and then divide by 2 again, and then divide by 2 again.
  600 ÷ 2 = 300
  300 ÷ 2 = 150
  150 ÷ 2 = 75
- To divide a number by 10, move the digits one place to the right, adding a zero if necessary.
  67 ÷ 10 = 6.7
  4.3 ÷ 10 = 0.43
- To divide a number by 100, move the digits two place to the
  right, adding zeros if necessary.
  290 ÷ 100 = 2.9
  4.3 ÷ 100 = 0.043
- To divide by numbers such as 20 divide by the 2 first and then by the 10.
  24 ÷ 20 = 24 ÷ 2 ÷ 10
  24 ÷ 2 ÷ 10 = 12 ÷ 10
  12 ÷ 10 = 1.2

6. SYMMETRY

A 2D shape is symmetrical if a line can be drawn through it so that either side of the line looks exactly the same. The line is called a line of symmetry.

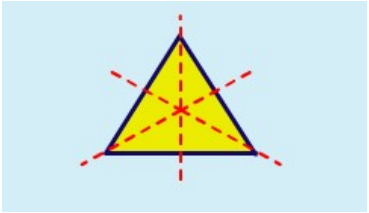
Square

- 4 lines of symmetry



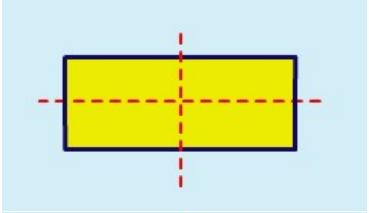
Equilateral triangle

- 3 lines of symmetry.



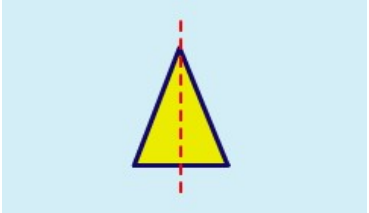
Rectangle

- 2 lines of symmetry



Isoceles triangle

- 1 line of symmetry

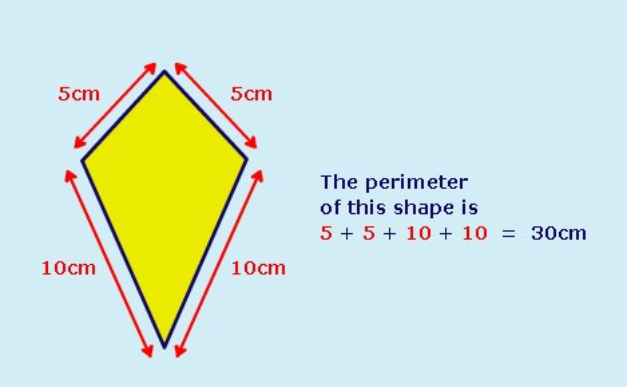


Parallelogram

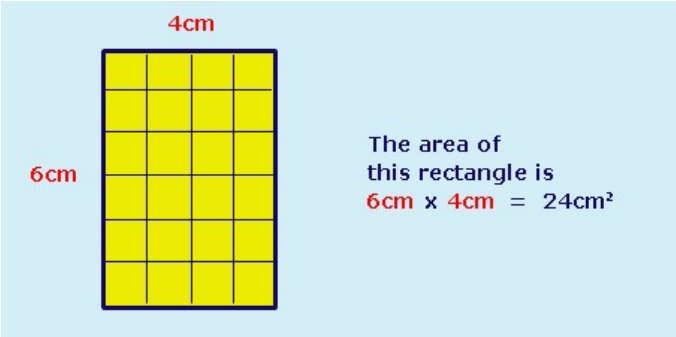
- 0 lines of symmetry

5. PERIMETER AND AREA

- The perimeter is the distance all the way around the outside of a 2D shape.
- To work out the perimeter, add up the lengths of all the sides.

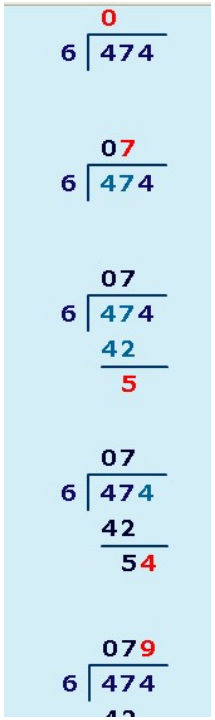


- The area of a 2D shape is the amount of surface it covers.
- The units for area are cm^2 (square centimetres), m^2 (square metres) or km^2 (square kilometres).
- To work out the area of a rectangle, multiply its length (the longer side) by its width (the shorter side).



2. WRITING IT DOWN

If the numbers are too difficult to divide in your head, use a written method such as the example below. This is called long division.



6 doesn't go into 4, so put 0

6 into 47 goes 7 times

7 x 6 = 42. Take 42 away from 47 to get the remainder of 5.

Bring down the next digit, the 4
6 into 54 goes 9 times with no remainder

As there are no more digits to bring down, the division is finished.

The answer to 474 divided by 6 is 79 (with no remainder).

3. USEFUL TIPS

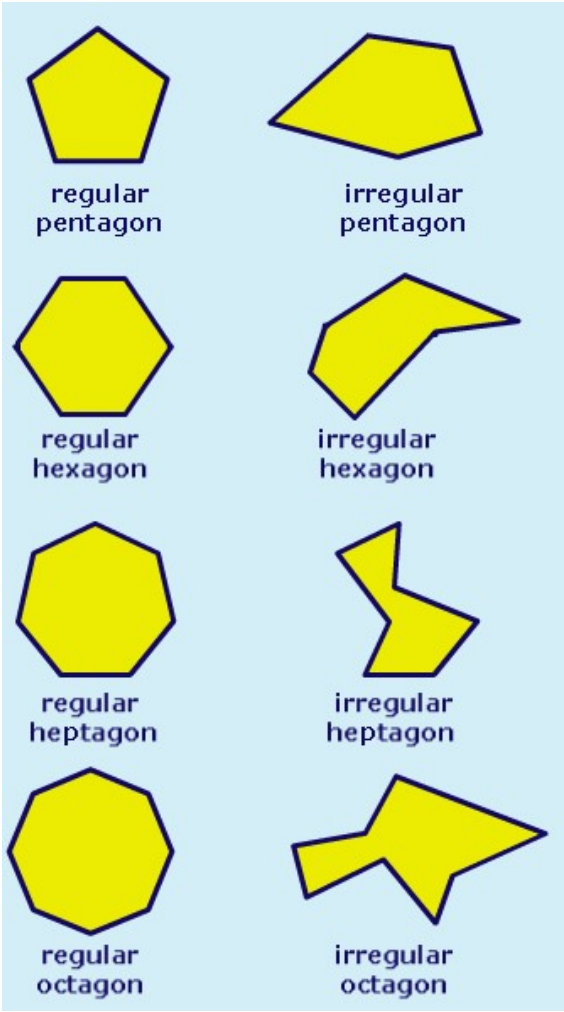
- Estimate first and check afterwards.
  It's a good idea to estimate a rough answer first. And always check your actual answer.
- Division and multiplication are opposites.
  For example, 54 ÷ 6 = 9 and 9 x 6 = 54. So you can use multiplication to check your answer to a division problem.
- A division sum can be shown in different ways.
  You might see 54 divided by 6 shown in any of the ways below.

$6\overline{)54}$ $\qquad$ $54 \div 6$ $\qquad$ $\frac{54}{6}$

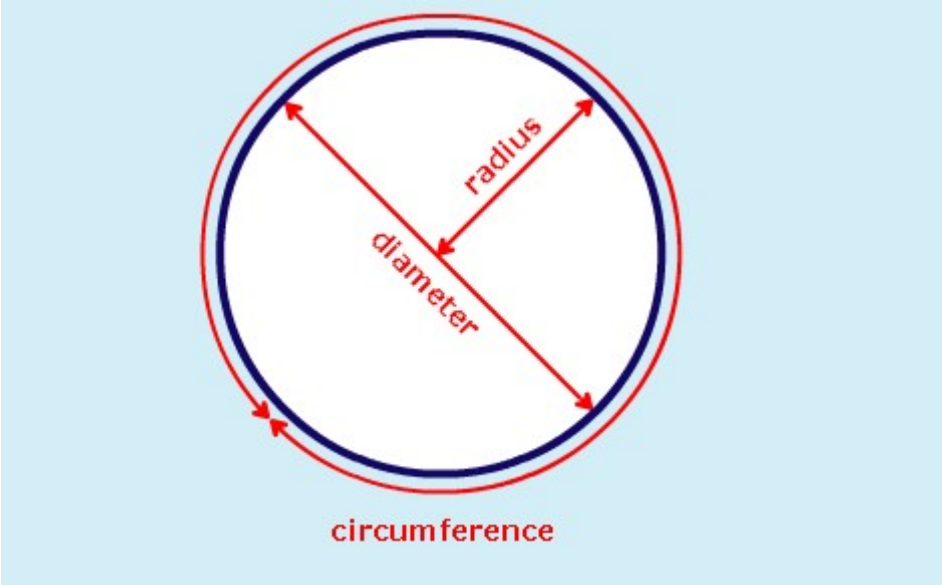
4. POLYGONS

Polygons are shapes with many straight sides. Regular polygons have equal angles and sides of equal length. Irregular polygons have sides of different lengths.

- Pentagons have 5 sides.
- Hexagons have 6 sides.
- Heptagons have 7 sides.
- Octagons have 8 sides.



3. CIRCLES



- The circumference is the distance all the way around a circle.
- The diameter is the distance right across the middle of the circle.
- The radius is the distance halfway across the circle. The radius is always half the length of the diameter.

MENTAL MATHS

1. BREAKING DOWN NUMBERS

Here are two different examples where breaking down numbers can help you add or subtract in your head.

- 40 + 67
  40 + 67 is the same as 40 + 60 + 7, which is 100 + 7, which is 107.
- Find the difference between 38 and 63
  Count on from 38 to 40 and keep that 2 in your head. Now count on from 40 to 60, which is 20, and from 60 to 63, which is 3. Add the 2, 20 and 3 to make 25.
  The difference between 38 and 63 is 2 + 20 + 3 = 25

2. ROUNDING NUMBERS

Rounding numbers to the nearest 1, 10 or 100 can help with lots of mental maths problems. Here are some examples:

- To add 9 to another number, add 10 and then subtract 1
  36 + 9 = 36 + 10 - 1 = 45
- To add 18 to another number, add 20 and then subtract 2
  48 + 18 = 48 + 20 - 2 = 66
- To add 97 to another number, add 100 and then subtract 3
  439 + 97 = 439 + 100 - 3 = 536
- To add 0.9 to another number, add 1 and then subtract 0.1
  3.7 + 0.9 = 3.7 + 1 - 0.1 = 4.6

- To subtract 8 from another number, subtract 10 and then add 2
  46 - 8 = 46 - 10 + 2 = 38
- To subtract 19 from another number, subtract 20 and then add 1
  63 - 19 = 63 - 20 + 1 = 44
- To subtract 0.9 from another number, subtract 1 and then add 0.1
  8.2 - 0.9 = 8.2 - 1 + 0.1 = 7.3

3. DOUBLING

If you are adding together two numbers that are nearly the same, doubling one of them will help.
35 + 35 = 70
35 + 36 = 35 + 35 + 1 = double 35 add 1 = 71

4. USING INVERSES

- Addition and subtraction are inverses (opposites). So subtraction can always be checked by adding:
  To check 82 - 37 = 45, you could add 45 and 37 and see if you get 82.
- Multiplication and division are also inverses. So division can always be checked by multiplication:
  To check 81 ÷ 3 = 27, you could multiply 27 by 3 and see if you get 81.

2. QUADRILATERALS

Quadrilaterals have four sides.

Square
- 4 equal sides
- 4 right angles

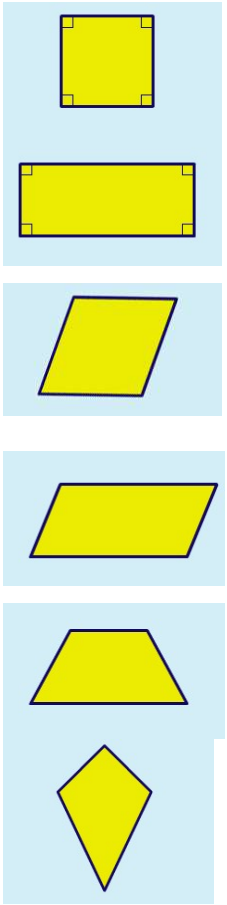
Rectangle
- 2 pairs of equal sides
- 4 right angles

Rhombus (squashed square)
- 4 equal sides
- Opposite sides are parallel
- Opposite angles are equal

Parallelogram (squashed rectangle)
- 2 pairs of equal sides
- Opposite sides are parallel
- Opposite angles are equal

Trapezium
- One pair of parallel sides of different lengths

Kite
- 2 pairs of equal sides next to each other
- No parallel sides.



SHAPES

1. TRIANGLES

Equilateral triangle

- 3 equal sides
- 3 equal angles of 60°

Isosceles triangle

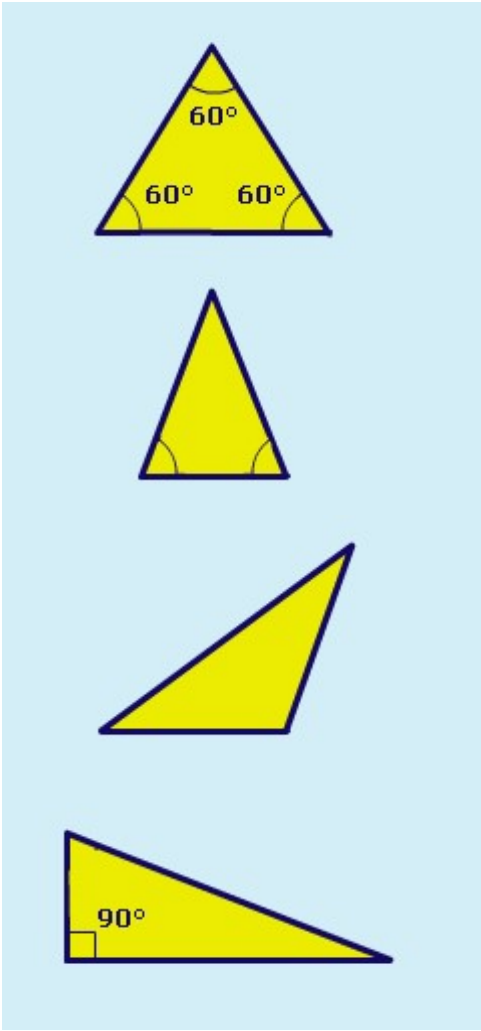
- 2 equal sides
- 2 equal angles

Scalene triangle

- No equal sides
- No equal angles

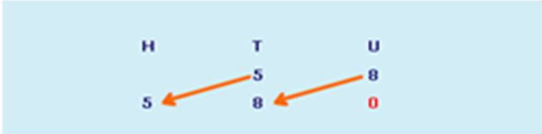
Right-angled triangle

- One of its angles is a right angle (90°)



5. MULTIPLYING AND DIDIVING BY 10 AND 100

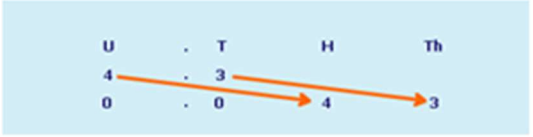
- To multiply a number by 10, move the digits one place to the left, adding a zero if necessary.
  58 x 10 = 580



- To multiply a number by 100, move the digits two places to the left, adding zeros if necessary.
  58 x 100 = 5800

- To divide a number by 10, move the digits one place to the right, adding a zero if necessary.
  4.3 ÷ 10 = 0.43

- To divide a number by 100, move the digits two places to the right, adding zeroes if necessary.
  4.3 ÷ 100 = 0.043



- To multiply or divide by numbers such as 20 or 300, multiply or divide by the 2 or 3 first and then by the 10 or 100.
  To do 24 ÷ 20, you could divide 24 by 2 and then divide that answer by 10.
  24 ÷ 2 = 12
  12 ÷ 10 = 1.2
- To do 22 x 300, you could multiply 22 by 3 and then multiply that answer by 100.
  22 x 3 = 66
  66 x 100 = 6600

- The 24-hour time is the same as the analogue time in the morning (except for the 0 at the beginning for numbers under 10). So 8:45 am becomes 08:45.
- But in the afternoon, you need to add 12 to convert an analogue time to a 24-hour time. So 8.45 pm becomes 20.45.
- Midday on a 24-hour clock is shown as 12:00.
- Midnight on a 24-hour clock is shown as 00:00.

6. UNITS OF TIME

- 1 minute = 60 seconds
- 1 hour = 60 minutes
- 1 day = 24 hours
- 1 week = 7 days
- 1 fortnight = 14 days
- 1 year = 12 months = 52 weeks = 365 days
- 1 leap year = 366 days
- Remember "30 days has September, April, June and November. All the rest have 31. Except for February alone, which has 28 days clear but 29 each leap year."

- am is morning time (all times between 12 midnight and 12 midday).
- pm is afternoon and evening time (all times between 12 midday and 12 midnight).
- This is an analogue or a 12-hour clock. An analogue clock is one with a face and hands. It is showing the time twenty past five.

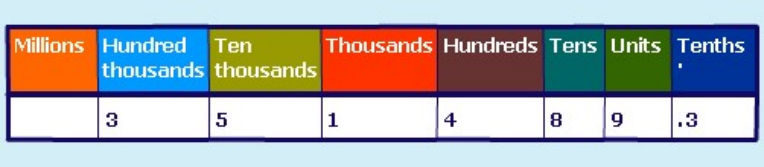
If it were twenty past five in the morning, it would be written as 5:20 am.
If it were twenty past five in the afternoon, it would be written as 5:20 pm.

- These are digital or 24-hour clocks. They are also showing the times twenty past five.

THE NUMBER SYSTEM

1. PLACE VALUE HEADINGS

- A number is made of one or more digits. The number 683, for example, is made of the digits 6, 8 and 3.
- The position of a digit in a number is very important. A digit's value depends on its position in the number.
- Use place value headings to work out the value of each digit in a number.



Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units	Tenths
	3	5	1	4	8	9	.3

So the number 351489.3 is **three hundred and fifty-one thousand, four hundred and eighty nine, and three tenths.**

2. MULTIPLYING BY 10, 100 OR 1000

- When you multiply by 10, move all the digits one place to the left, putting a zero in the empty space.

246 x 10

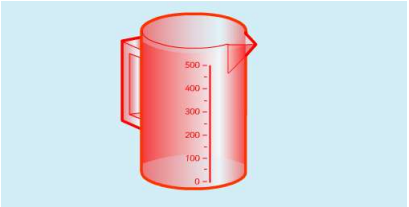
- When you multiply by 100, move all the digits two places to the left, putting a zero in the empty spaces.
- When you multiply by 1000, move all the digits three places to the left, putting a zero in the empty spaces.
- The decimal point always stays in the same place.

3. DIVIDING BY 10, 100 OR 1000

- When you divide by 10, move all the digits one place to the right (the opposite way to multiplying).

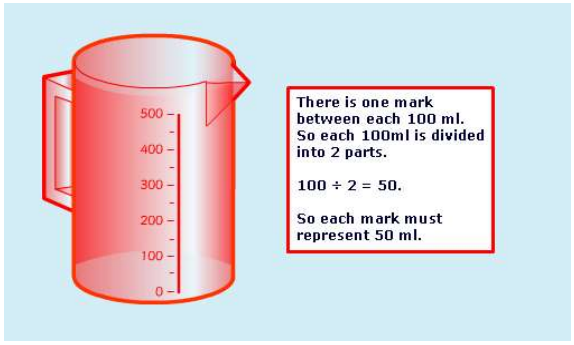
  246 ÷ 10 = 24.6

- When you divide by 100, move all the digits two places to the right.
- When you divide by 1000, move all the digits three places to the right.
- The decimal point always stays in the same place.



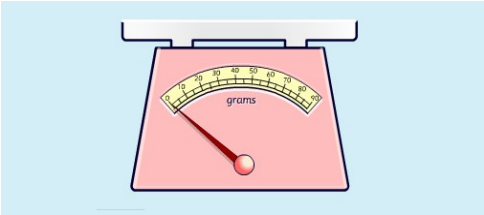
- Capacity or volume is a measure of how much space something takes up. Measuring spoons or measuring jugs can be used to measure capacity.
- Capacity is measured in millilitres (ml) and litres (l).
  1 l = 1000 ml
- Estimating capacity
  5 ml is about the capacity of a teaspoon.
  1 l is about the capacity of a large carton of fruit juice.
- Pints and gallons are old units of capacity (imperial units).
  There are 8 pints in a gallon.
  A pint is equal to just over half a litre.
  A gallon is roughly equal to 4.5 litres.

4. READING SCALES



To read a scale, first work out how much each mark or division on the scale represents.

5. 12-HOUR AND 24-HOUR TIME



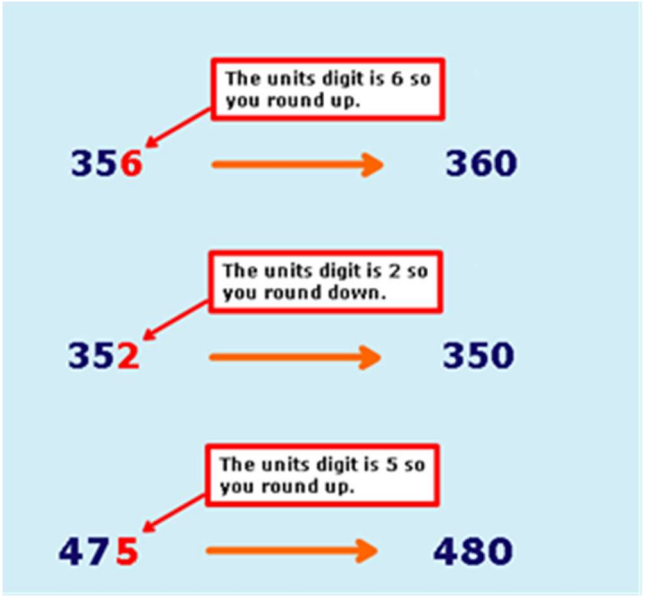
- Mass is a measure of how heavy something is. Scales can be used to measure mass.
- Mass is measured in grams (g), kilograms (kg) and tonnes. These are known as metric units of mass.
  1 kg = 1000 g
  1 tonne = 1000 kg
- Estimating mass
  100g is about the mass of a small apple.
  1 kg is the mass of a bag of sugar or a litre of water.
- Ounces and pounds are old units of mass. These are known as imperial units but are not now commonly used in maths.
  There are 16 ounces in a pound.
  An ounce is roughly equal to 25 grams.
  A pound (454g) is equal to just under half a kilogram (500 g).

3. MEASURING CAPACITY

4. ROUNDING NUMBERS

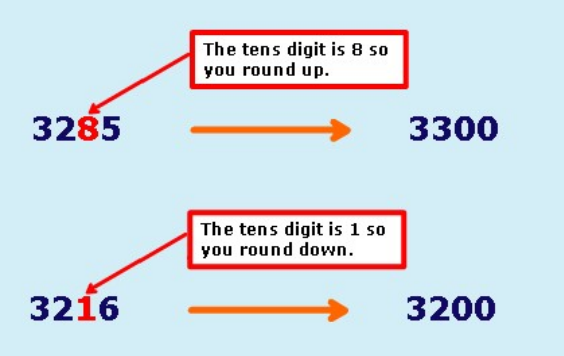
- To round a number to the nearest 10, look at the units digit.
  If the units digit is 5 or more, round up
  If the units digit is 4 or less, round down

  Example: Round 356, 352 and 475 to the nearest 10.



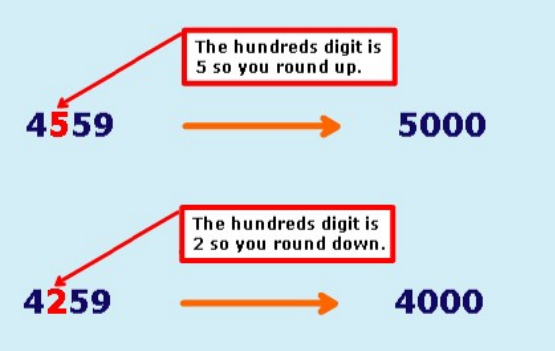
- To round a number to the nearest 100, look at the tens digit.
  If the tens digit is 5 or more, round up
  If the tens digit is 4 or less, round down

Example: Round 3285 and 3216 to the nearest 100.



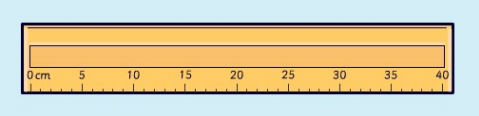
- To round a number to the nearest 1000, look at the hundreds digit.
  If the hundreds digit is 5 or more, round up
  If the hundreds digit is 4 or less, round down

Example: Round 4559 and 4259 to the nearest 1000.



MEASURES

1. MEASURING LENGTH

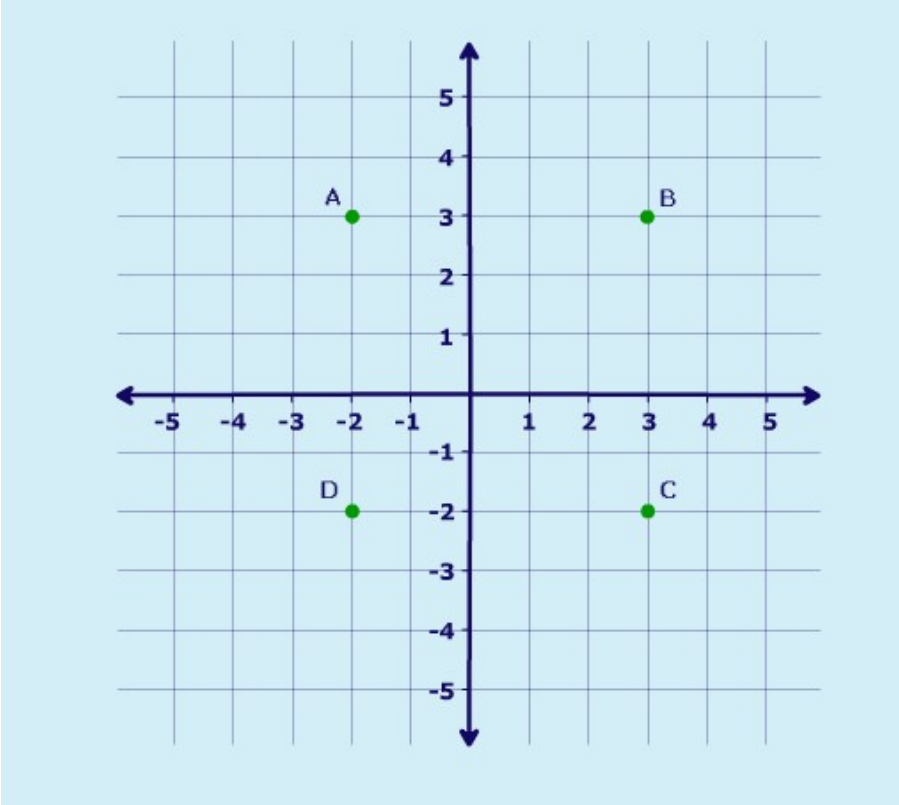


- Length is a measure of how long or wide something is. Rulers and tape measures can be used to measure length.
- Length is measured in millimetres (mm), centimetres (cm), metres (m) or kilometres (km). These are known as metric units of length.
  1 cm = 10 mm
  1 m = 100 cm
  1 km = 1000 m
- Estimating length
  1 cm is about the width of a staple
  1 m is about the width of a single bed
- Miles, feet and inches are old units of length. These are known as imperial units of length but are not now commonly used in maths.
  There are 12 inches in a foot.
  An inch is roughly equal to 2.5 centimetres.
  A foot is roughly equal to 30 centimetres.
  A mile is roughly equal to 1.5 kilometres.

2. MEASURING MASS

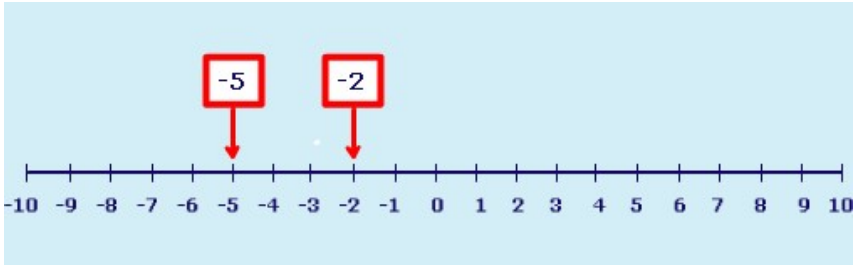
2. GRID WITH FOUR QUADRANTS

The x axis can be extended to the left into negative numbers and the y axis can be extended down into negative numbers. The grid then has four areas called quadrants.



Point A has coordinates of (-2,3)
Point B has coordinates of (3,3)
Point C has coordinates of (3,-2)
Point D has coordinates of (-2,-2)

5. NEGATIVE NUMBERS



- Positive numbers are more than zero.
- Negative numbers are less than zero.
- Use a number line to order negative numbers.
  For instance, it is easy to see that -2 is a higher number than -5 because it is further to the right on the number line.

6. ORDERING NUMBERS

- Ordering numbers means arranging them in order from smallest to biggest or biggest to smallest.
- To order numbers, write them in columns so the units line up. Then compare the digits in each column, starting on the left. Write down place value headings if it helps you.

Example: Which is bigger, 4792 or 4729

Th	H	T	U
4	7	9	2
4	7	2	9

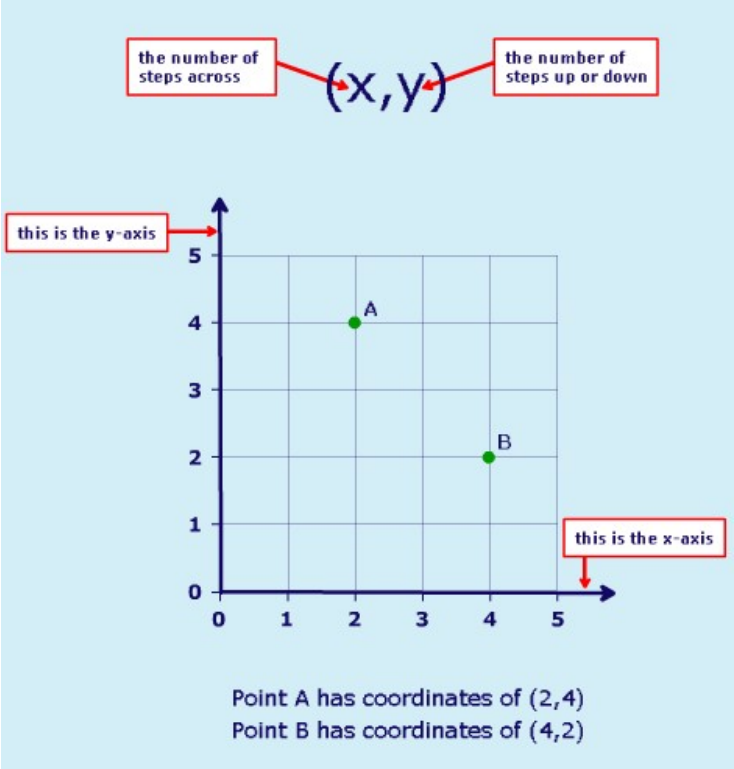
Both numbers have 4 thousands. So look in the hundreds column.
Both numbers have 7 hundreds. So look in the tens column.
4792 has 9 in the tens column whereas 4729 only has 2 in the tens column.
(There is no need in this example to compare the units digits.)

So 4792 is bigger than 4729.

GRIDS

1. COORDINATES

- A grid has an x-axis and a y-axis.
- A point on a grid has two numbers to identify its position. These two numbers are known as the point's coordinates.
- Coordinates are always written as the number of steps across first, then the number of steps up or down.

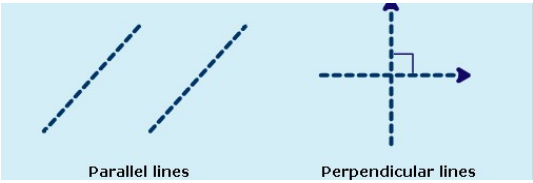


4. USING A PROTRACTOR

- Angles are measured using a protractor
- Always guess the angle first. Is it acute or obtuse?
- Line up the protractor so the 'cross hair' is exactly on the angle.
- Line up one of the lines with the 0 line on the protractor.
- See which numbers the angle comes between. If it is between 30 and 40, the angle must be thirty something degrees.
- Count the small degrees up from 30. In this example, the angle is 35°.

5. PERPENDICULAR AND PARALLEL LINES

- Parallel lines are always the same distance apart
- Perpendicular lines cross at right angles to each other



DECIMALS

1. WHAT IS A DECIMAL?

- A decimal is a way of writing 'in-between' numbers. 5.25, for example, is in between the numbers 5 and 6.
  It is more than 5, but less than 6.
- To find out exactly what a decimal number represents, use place value headings, that is tenths, hundredths etc.

Units	.	tenths	hundredths
2	.	5	6

- The numbers to the left of the decimal point are normal whole numbers.
- The numbers to the right of the decimal point are parts of whole numbers.

2. ADDING AND SUBTRACTING DECIMALS

Line up the decimal points and then add or subtract as normal as if the decimal point wasn't there. Don't forget to put the decimal point in your answer.

3. ORDERING DECIMALS

- Ordering decimals means putting them in order from smallest to largest or from largest to smallest.
- Line up the decimal points.
- Compare the digits in each column, starting on the left. Write down place value headings if it helps you.
- Below we are comparing 0.459 and 0.495 to see which is bigger.

Units	.	Tenths	Hundredths	Thousandths
0	.	4	5	9
0	.	4	9	5

Both numbers have 0 units. So look in the tenths column.
Both numbers have 4 tenths. So look in the hundredths column.
0.495 has 9 in the hundredths column whereas 0.459 only has 5 in the hundredths column.
(There is no need in this example to compare the thousandths column.)
So 0.495 is bigger than 0.459.

4. CONVERTING TO AND FROM DECIMALS

- To change a decimal to a percentage, multiply it by 100.
- To change a fraction to a decimal, divide the top number (the numerator) by the bottom number (denominator).
- A decimal fraction with one decimal place is written as tenths.
- A decimal fraction with two decimal places is written as hundredths.
- A decimal fraction with three decimal places is written as thousandths

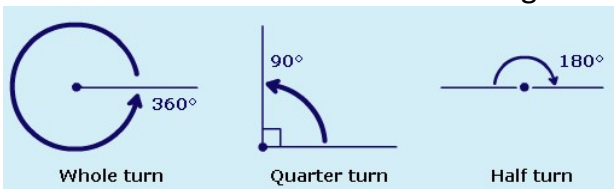
5. USEFUL TIPS

- The numbers 4.2 and 4.20 have the same value. 4.2 means 4 and 2 tenths. 4.20 means 4 and 2 tenths and 0 one-hundredths. The last zero does not need to be there.
- The numbers 4.2 and 4.02 do not have the same value. 4.2 means 4 and 2 tenths. 4.02 means 4 and 0 tenths and 2 one-hundredths.

ANGLES

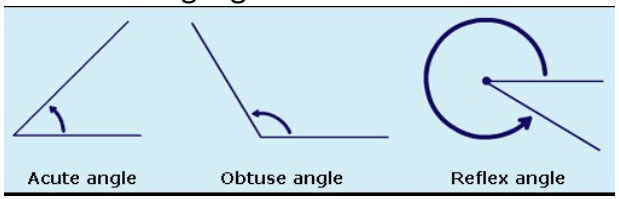
1. ANGLES ARE A MEASURE OF TURN

- Angles are measured in degrees
- One whole turn is 360°
- One quarter turn is 90° or a right angle
- One half turn is 180° or a straight line



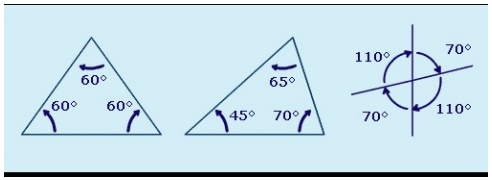
2. TYPES OF ANGLES

- An angle less than 90° is acute
- An angle between 90° and 180° is obtuse
- An angle greater than 180° is reflex



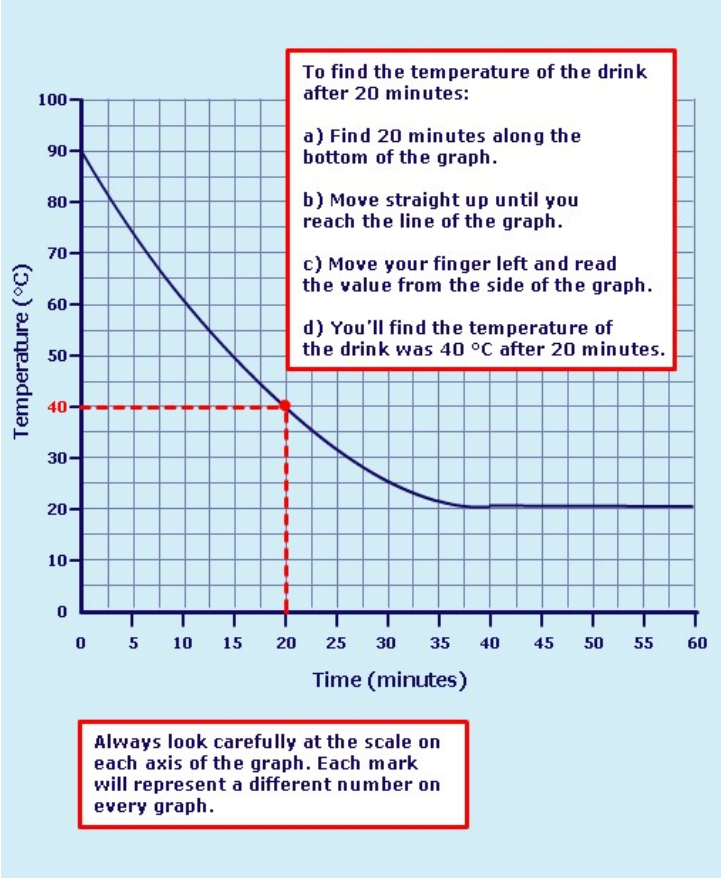
3. ADDING UP ANGLES

- The three angles inside a triangle always add up to 180°
- All angles at a point always add up to 360°



7. LINE GRAPHS

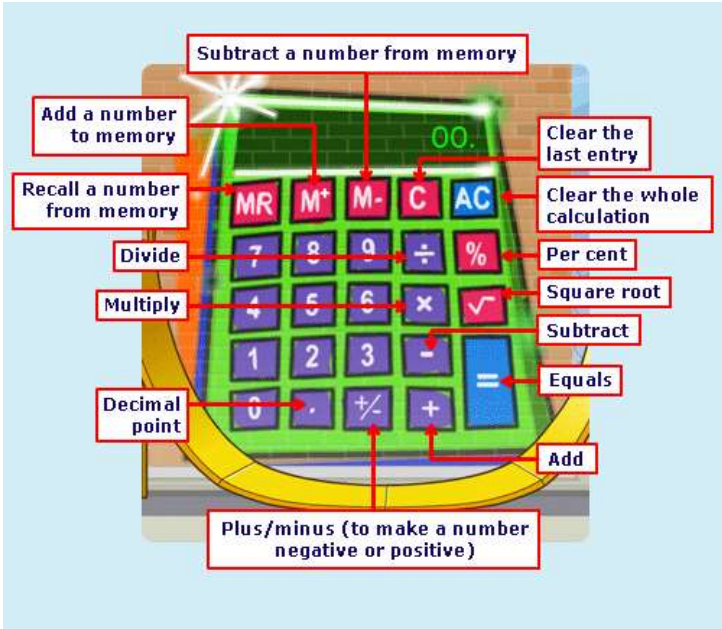
A line graph is used to show how one quantity changes with another. This line graph is showing how the temperature of a hot drink changed over time.



USING A CALCULATOR

1. ALWAYS...

- ... look at the display to make sure you've pressed the right button.
- ... press the equals button at the end of every calculation.
- ... only press the equals button ONCE. Pressing it a second time may repeat the calculation you've just done.



2. CALCULATIONS WITH BRACKETS

- For calculations with brackets, you'll need to work out the parts inside the brackets first. So you'll need to do these calculations in more than one step.

  Example:
  (23 + 75) x (4.85 - 3.05)
  a) Work out 23 + 75 and write the answer down OR store it in the calculator's memory. The answer to this part is 98.
  b) Work out 4.85 - 3.05. The answer to this part is 1.8.
  c) Multiply the two answers together. 98 x 1.8 = 176.4

3. CALCULATIONS WITH MONEY

- When you work out money problems on a calculator, make sure you read the display correctly. You'll sometimes need to add a zero.
- Example: You have £6.53 and you spend £1.73. How much do you have left?
  On the calculator, 6.53 - 1.73 will give the answer 4.8.
  Remember to write this as £4.80.

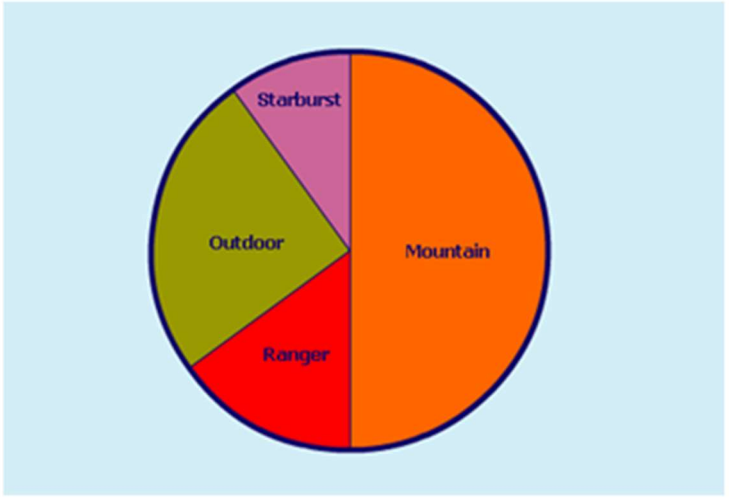
4. CONVERTING FRACTIONS TO DECIMALS

You can use a calculator to turn a fraction into a decimal. Just divide the numerator (the top number of the fraction) by the denominator (the bottom number of the fraction).

$$\frac{3}{4} = 3 \div 4 = 0.75$$

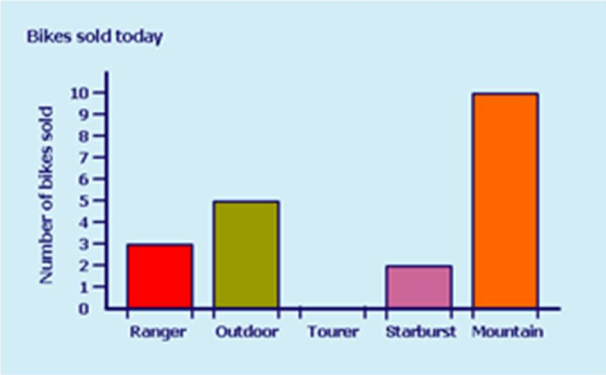
6. PIE CHARTS

Pie charts are circles divided into segments, where each segment represents a fraction of the total amount.
This pie chart shows the 20 bikes sold at the bike shop.
The segment for Mountain bikes is one half of the chart. This is because 10 Mountain bikes were sold, which is exactly half the number of bikes sold in total (20 bikes).



4. BAR CHARTS

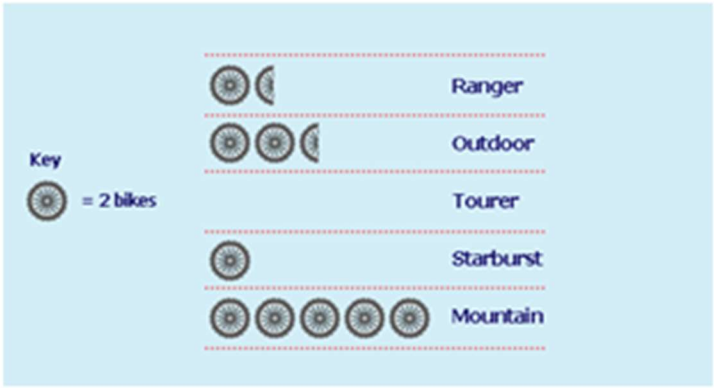
Bar charts are one way of showing the information from a frequency table.



The heights of the bars in this bar chart show how many of each bike were sold.

5. PICTOGRAMS

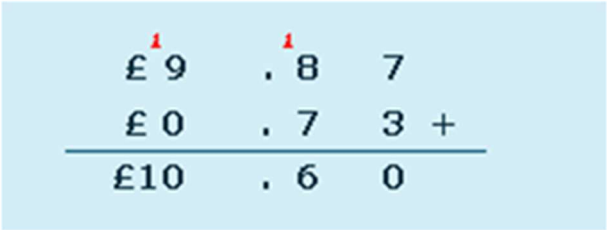
Pictograms are another way of showing the information from a frequency table.
The key shows that 2 bikes are represented by a picture of a wheel. So half a wheel must represent 1 bike.



PROBLEM SOLVING

1. MONEY PROBLEMS

- Read the words of the problem carefully to decide whether to use adding, subtracting, multiplying or dividing.
- If some of the prices in the problem are in pence and some are in pounds, change some of them so they are either ALL in pounds or ALL in pence.
- Treat money problems just like normal number calculations, but remember to put the decimal point and pound symbol in the right place.
  Example: You buy a talking robot for £9.87 and a magazine for 73p. How much will you spend altogether?
  a) First make sure both amounts are in the same units.
  73p = £0.73.
  b) Then add the two amounts by lining up the decimal points.



  c) So the total you will spend is £10.60. (If you had worked this out on a calculator, you would have got 10.6.
  Remember to write this as £10.60.)

- Read the words of a money problem carefully to work out which calculations you need to do.
  Example: You can buy a 4-can pack of lemonade for £1.00 or individual cans for 28p. Which is better value for money?
  a) Work out how much one can in the 4-can pack costs by dividing the price by the number of cans. £1.00 ÷ 4 = £0.25 or 25p.
  b) So the 4-can pack is better value because each can costs 25p, which is 3p cheaper than individual cans.

2. MEASURES PROBLEMS

- Read the words of the problem carefully to decide whether to use adding, subtracting, multiplying or dividing.
- It's really important to change the units of quantities so that ALL are in the same units before you start working out the answer.
  Example: Sophie is 1.29 m tall. Her little brother, Josh, is 32 cm shorter. How tall is Josh?
  a) This is a subtraction problem. You need to take away 32 cm from Sophie's height.
  b) You shouldn't work out 1.29 - 32 because the 1.29 is in metres and the 32 is in centimetres.
  c) Change so both are in the same units. 1.29 m = 129 cm.
  d) Then carry out the subtraction. 129 - 32 = 97 cm.
  e) So Josh is 97 cm tall.

3. TIME PROBLEMS

- Read the words of the problem carefully to decide whether to use adding, subtracting, multiplying or dividing.

3. TALLY MARKS AND FREQUENCY TABLES

Tally marks are used for counting things.

The manager of the bike shop could add another mark to the table below every time a bike was sold.

Bikes sold today

Bike	Tally
Ranger	𝍸
Outdoor	𝍸
Tourer	
Starburst	II
Mountain	𝍸 𝍸

Every 5th mark is drawn across the last 4 marks. That makes the tally marks easier to count as they build up in blocks of 5.

Frequency tables show the totals of the tally marks.

Total bikes sold today

Bike	Tally	Total
Ranger	𝍸	3
Outdoor	𝍸	5
Tourer		0
Starburst	II	2
Mountain	𝍸 𝍸	10
Total bikes sold		20

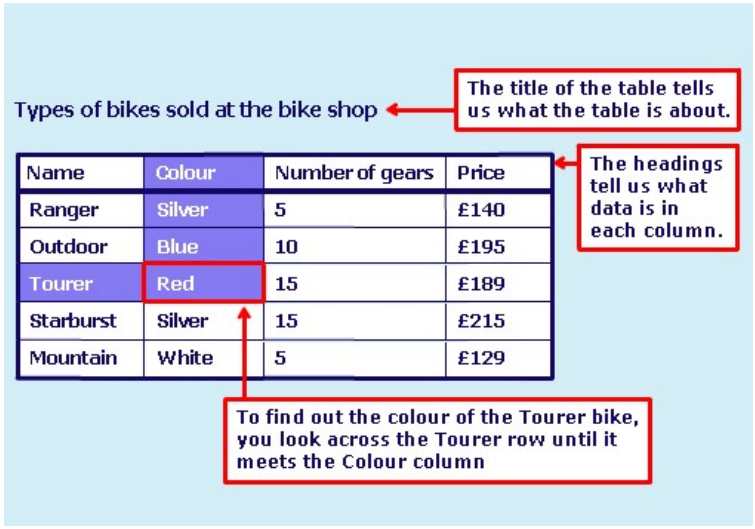
INTERPRETING DATA

1. WHAT IS 'INTERPRETING DATA'?

- Data means information. So interpreting data just means working out what information is telling you.
- Information is sometimes shown in tables, charts and graphs to make the information easier to read.
  It is important to read all the different parts of the table, chart or graph.

2. TABLES

- A table is used to write down a number of pieces of data about different things.



Name	Colour	Number of gears	Price
Ranger	Silver	5	£140
Outdoor	Blue	10	£195
Tourer	Red	15	£189
Starburst	Silver	15	£215
Mountain	White	5	£129

- If some of the times in the problem are in seconds, some in minutes and some in hours, change some of them so they are either ALL in seconds, ALL in minutes or ALL in hours.
- When reading timetables, make sure you know what type of information is in each column and row.
  Example: How long does it take the 11.55 train from Normington to get to Kirfield?

Normington	09:47	10:39	11:55
Baskwell	10:33		12:30
Kirkfield	10:49	11:20	12:44
Ladywick	11:08	11:34	13:12

The empty space in the table means the 10:39 train from Normington doesn't stop at Baskwell.

a) Look along the Normington row until you reach the column that starts with the 11.55.
b) Look down that column until you get to Kirfield and read off the time, 12.44.
c) Now you need to find the difference between 11.55 and 12.44. A good way to do this is to break up the time into smaller steps.

d) 5 + 44 = 49 minutes. So the 11.55 train from Normington takes 49 minutes to get to Kirfield.

NUMBER PATTERNS

1. ODD AND EVEN NUMBERS

- Even numbers can be divided exactly by 2. The sequence of even numbers is:
  2, 4, 6, 8, 10, 12, 14 ... and so on. Even numbers always end with a 2, 4, 6, 8 or 0. You can tell 3788, for example, is an even number because it ends with an 8.
- Odd numbers cannot be divided exactly by 2. The sequence of odd numbers is:
  1, 3, 5, 7, 9, 11, 13 ... and so on. Odd numbers always end in 1, 3, 5, 7 or 9. You can tell 4399, for example, is an odd number because it ends with a 9.

2. MULTIPLES

Multiples are really just extended times tables.

- The multiples of 2 are all the numbers in the 2 times table: 2, 4, 6, 8, 10 and so on.
  Multiples of 2 always end with a 2, 4, 6, 8 or 0. You can tell 2286, for example, is an even number because it ends with a 6.
- The multiples of 5 are all the numbers in the 5 times table: 5, 10, 15, 20, 25 and so on. Multiples of 5 always end with a 5 or a 0. You can tell 465, for example, is a multiple of 5 because it ends with a 5.
- The multiples of 10 are all the numbers in the 10 times table: 10, 20, 30, 40, 50 and so on. Multiples of 10 always end with a 0. You can tell 3780, for example, is a multiple of 10 because it ends with a 0.

3. FACTORS

b) Divide the answer by how many numbers there are.
There are 9 numbers.
72 ÷ 9 = 8
So the mean value is 8.
Note: sometimes, you do not get a whole number.

4. RANGE

- The range is the difference between the biggest and the smallest number.
- To work out the range:
  a) Put the numbers in order.
  3 6 6 6 7 9 11 11 13
  b) Subtract the smallest number from the biggest number.
  13 - 3 = 10
  So the range of this set of numbers is 10.

MODE, MEDIAN AND MEAN

1. MODE

- The mode is the value that appears the most.
- To work out the mode:
  a) Put the numbers in order.
  3 6 6 6 7 9 11 11 13
  b) Look for the number that appears the most.
  6 appears more than any other number.
  So the mode value is 6.

2. MEDIAN

- The median is the middle value.
- To work out the median:
  a) Put the numbers in order.
  3 6 6 6 7 9 11 11 13
  b) The number in the middle of the list is the median
  7 is in the middle. So the median value is 7.
- If there are two middle values, the median is halfway between them. For example, if the set of numbers were
  3 6 6 6 7 8 9 11 11 13
  There are two middle values, 7 and 8. The median is halfway between 7 and 8. The median is 7.5.

3. MEAN

- The mean is the total of the numbers divided by how many numbers there are.
- To work out the mean:
  a) Add up all the numbers.
  7 + 9 + 11 + 6 + 13 + 6 + 6 + 3 + 11 = 72

- Factors are numbers that divide exactly into another number.
- The factors of 12, for example, are 1, 2, 3, 4, 6 and 12.
- Factors can be shown in pairs. The factors of 12 can be shown:

  1 and 12 1 x 12 = 12
  2 and 6 2 x 6 = 12
  3 and 4 3 x 4 = 12

  Each pair multiplies to make 12.

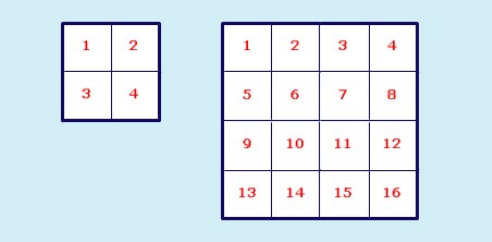
4. PRIME NUMBERS

- Prime numbers are special numbers that have exactly two factors (themselves and 1).
- 19 is a prime number. It can only be divided by 1 and 19.
- 9 is not a prime number. It can be divided by 3 as well as 1 and 9.
- The prime numbers below 20 are:
  2, 3, 5, 7, 11, 13, 17, 19
  (1 is not a prime number because it only has one factor: 1!).

5. SQUARE NUMBERS

- A square number is a number multiplied by itself (a number 'squared'; the symbol for squared is ^{2}):

  $1^2 = 1 \times 1 = 1$
  $2^2 = 2 \times 2 = 4$
  $3^2 = 3 \times 3 = 9$
  $4^2 = 4 \times 4 = 16$
- They're called square numbers because they can be made into square shapes.



- The square numbers up to 100 are:
  1, 4, 9, 16, 25, 36, 49, 64, 81, 100
- The square root of a number is the number you must multiply by itself to get to it. The symbol for square root is $\sqrt{}$.

  To find the square root of 49 ($\sqrt{49}$)
  think, "What number multiplied by itself gives 49?"
- The answer is 7, because 7 x 7 = 49.

3. WORKING OUT PROBABILITY

To work out the probability of something, for example, throwing an even number on a dice:

a) Count up the total number of possible results.
   When throwing a dice, for example, there are 6 possible numbers the dice can land on.
b) Then count up the number of results you are interested in.
   In this example, you are only interested in throwing a 2, 4 or 6 (all the even numbers on a dice). So you are interested in 3 numbers.
c) The probability of getting an even number on a dice is 3 chances out of 6 chances which you write as 3/6. 3/6 is the same as ½.

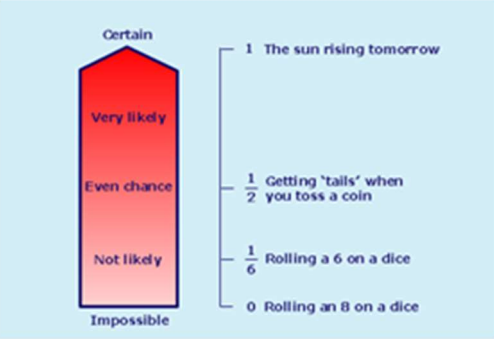
PROBABILITY

1. PROBABILITY IS HOW LIKELY SOMETHING IS TO HAPPEN

- If something has a low probability, it is unlikely to happen.
- If something has a high probability, it is likely to happen.
- Probabilities are usually shown as fractions.
  The probability of getting 'tails' when you toss a coin is a 1 in 2 chance, or ½
  The probability of getting a 3 when you roll a dice is a 1 in 6 chance, or 1/6
- Probabilities can also be shown as decimals or percentages.
  A probability of ½ can also be shown as 0.5 or 50%
  A probability of ¾ can also be shown as 0.75 or 75%
- The results of an experiment can give different probabilities to those you expect. If you throw a dice 6 times, you would expect to get one six as the probability of throwing a six is 1 in 6. But in fact you might get more than one six or no sixes at all!

2. PROBABILITY SCALES

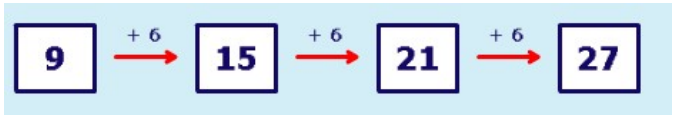
Probabilities can be shown on a scale between 0 (impossible) and 1 (certain).



6. NUMBER SEQUENCES

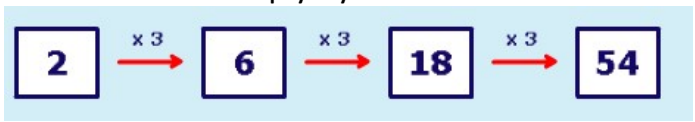
A number sequence is a list of numbers that are linked by a rule. If you work out the rule, you can work out the next numbers in the sequence. Below are some examples:

a) The rule is to add 6 each time.



So the next number would be 27 + 6 = 33

b) The rule is to multiply by 3 each time.



So the next number would be 54 x 3 = 162

PERCENTAGES

1. PER CENT MEANS 'OUT OF 100'

- The sign % stands for 'per cent' which means 'out of 100'.
- So 40% means 40 out of 100 and 11% means 11 out of 100.

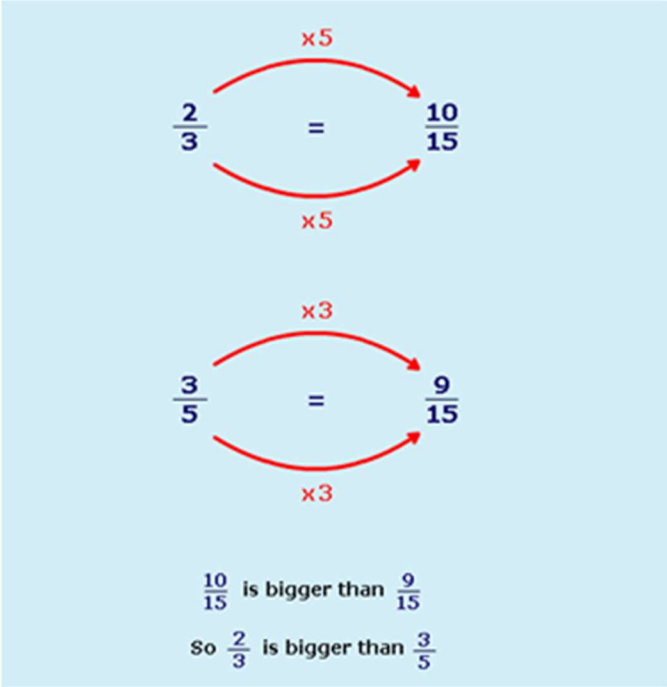
2. PERCENTAGE OF A SHAPE

- 40% of this shape is shaded because the shape is divided into 100 equal parts and 40 of those 100 parts are shaded (it wouldn't matter which 40 parts were shaded).

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- To work out the percentage of this shape that is shaded, you must first work out what each part represents.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20



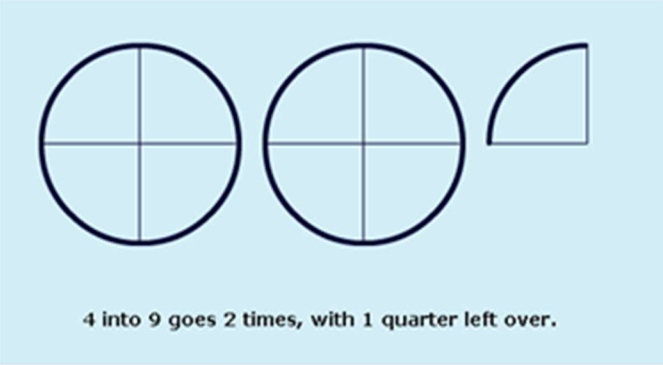
6. FRACTIONS OF QUANTITIES

- To find a fraction of a quantity:
  a. Divide the quantity by the denominator
  b. Multiply the answer you get by the numerator
- To find 2/5 of £15, for example:
  a. Divide 15 by 5 (the denominator). 15 ÷ 5 = 3
  b. Multiply the answer, 3, by 2 (the numerator). 3 x 2 = 6
  c. So 2/5 of £15 is £6

4. IMPROPER AND MIXED FRACTIONS

- An improper fraction has a numerator that is bigger than its denominator, for example $\frac{9}{4}$

  is an improper fraction. It means nine quarters. If you think of this as cakes, nine quarters are more than two whole cakes. It is 2 ¼ cakes.
- 2 ¼ is a mixed fraction because it has a whole number and a fraction together.



4 into 9 goes 2 times, with 1 quarter left over.

5. COMPARING FRACTIONS

To compare fractions, you must first change them so they have the same denominator.
To compare 2/3 and 3/5

- First look at the denominators (the bottom numbers).
- Decide which number they both go into. They both go into 15.
- Change both numbers into 15ths.

There are 20 equal parts, so each part represents 5%.
100% (the whole) ÷ 20 = 5%
6 of the parts are shaded, so 30% of the total shape is shaded.
6 x 5% = 30%

3. CONVERTING BETWEEN PERCENTAGES AND DECIMALS

- To change a percentage to a decimal, divide by 100.
  Change 48% to a decimal: 48 ÷ 100 = 0.48
- To change a decimal to a percentage, multiply by 100.
  Change 0.67 to a percentage: 0.67 x 100 = 67%

4. CONVERTING BETWEEN PERCENTAGES AND FRACTIONS

- Write the percentage as a fraction over 100 and then simplify:

60% means $\frac{60}{100}$ $\frac{60}{100} = \frac{6}{10} = \frac{3}{5}$

- Learn these equivalent fractions and percentages:

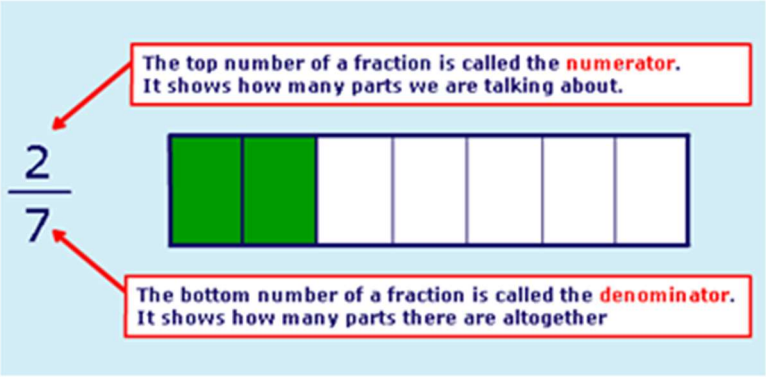
$\frac{1}{2} = 50\%$
$\frac{1}{4} = 25\%$
$\frac{1}{10} = 10\%$
$\frac{3}{4} = 75\%$
$\frac{1}{5} = 20\%$

- One way to find 20% of 30 is to first find 10% of 30 and then multiply by 2.
  10% of 30 is 30 ÷ 10 = 3
  2 x 3 = 6
- Or another way would be to recognise that 20% is equivalent to one fifth, and so just divide 30 by 5.
  30 ÷ 5 = 6

FRACTIONS

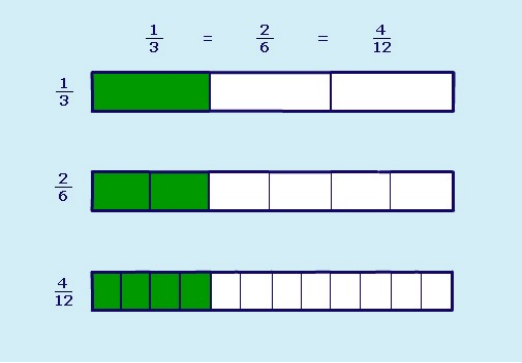
1. WHAT IS A FRACTION?

A fraction is a part of a whole. There are two numbers to every fraction:

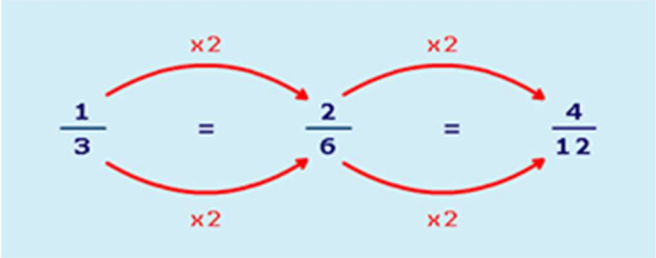


2. EQUIVALENT FRACTIONS

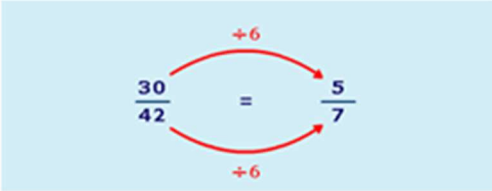
- Equivalent fractions are fractions that look different but show exactly the same amount.



- You can make equivalent fractions by multiplying or dividing the numerator and denominator by the same number.



- You can simplify fractions by dividing the numerator and denominator by the same number. This is called cancelling. Sometimes fractions will cancel more than once.



3. CONVERTING A FRACTION TO A DECIMAL

You can use a calculator to turn a fraction into a decimal. Just divide the numerator by the denominator.

$$\frac{3}{4} = 3 \div 4 = 0.75$$