To **factorise an expression** into **single brackets**, you need to find the highest common factor (HCF) of every term within the expression. This is placed outside the bracket. Inside the bracket is the result of dividing each term by this HCF.

Examples:

# 6x+9=3(2x+3)

The HCF of 6 and 9 is 3, meaning this is placed outside the bracket and both the terms are divided by 3 to generate what goes inside the bracket

## $4x^{2} + 10x = 2x(2x + 5)$

The HCF of 4 and 10 is 2, meaning this is placed outside the bracket. With this example we can in addition place x outside (there is minimum one x in common) Next both the terms are divided by 2x to generate what goes inside the bracket.

## $4x^2 \div 2x: 2x$ 10x ÷ 2x: 5

In cases where there are more than 2 different letters, we treat them separately. Questions of this kind can be found on the next page.



#### Questions

Factorise the following...

49-6

6y<sup>2</sup> - 5y

96-362



 $15x^{3} + 3x^{2}y$ 

# 14 x<sup>2</sup> y + 21 x y<sup>2</sup>

**Check your answer!** If you expand the brackets out, then you should end up back at the original question



**Quadratic Equation:** 

Note: foundation level 'a' will always be 1

## $ax^{2}+bx+c$

To **factorise a quadratic equation** into **double brackets**, you need to find a pair of numbers that multiply to **c** but add to **b** 

Examples:



**Check your answer!** If you expand the brackets out, then you should end up back at the original question





Factorise the following...

## $x^{1} + 10x + 9$

## $x^{2} - 9x + 20$



To **solve a quadratic equation** equal to 0, we first need to factorise into double brackets as we saw previously. Next we set each bracket equal to 0 and solve.

Example:

 $x^{2}$ -7x-18=0 -9x2=-18 AND-9+2=-7 (x-9)(x+2)=0 X=9 x=-2



#### Questions

Solve the following by factorising...

### $x^{2} + 8x + 15 = 0$

## $x^{2} - 10x + 16:0$



The solutions to a quadratic equation are also known as the roots, this is where the graph crosses the x axis.

Example:



Here is the graph of

y=x²-2x-3

The roots of the equation

 $x^{2} - 2x - 3 = 0$ 

are **-1** and **3** because the graph crosses the x axis at these points



#### Question



Here is the graph of

y=x2+2x-3

Find the roots of the equation

322723-320



Simultaneous equations are when you have two pairs of equations with two unkown variables to find.

5 x+24=

J 6 x+44

10x+4y

Example:

To solve this type of question, we want to focus on the numbers in front of the letters and think about how can we manipulate them to be the same. In this question, if we multiply the entire first line by 2, we would end up with:

G

:6.5

4-x=26 We then subtracted each equation from each other, this is because we need to eliminate one variable. Then we solved to find x.

x + 4 4 =

The next step carried onto the next page. Here we are substituting 6.5 into either one of the equations from the question and solving to find y.



x = 6.5  $5 \times 6.5 + 2y = 27$  32.5 + 2y = 27 2y = -5.5y = -2.15

**Check your answer!** If you substitute your answers for x and y back into the question, then all your numbers should work out nicely.

Note: Simultaneous equations always have two answers.



#### Question

Solve the simultaneous equations

**CAREFUL OF SIGNS:** with this question as the signs are mixed for the y terms, we would need to add the equations together

3x - 4y = 119x + 2y = 5

> same sign = subtract different sign = add

