Algebra - Class 3
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:

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

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

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

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 $2 x$ to generate what goes inside the bracket.

$$
4 x^{2} \div 2 x=2 x \quad 10 x \div 2 x=5
$$

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.

Factorise the following...

$$
4 a-6
$$

$$
6 y^{2}-5 y
$$

$$
9 b-3 b^{2}
$$

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

$$
14 x^{2} y+21 x y^{2}
$$

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

Quadratic Equation:
Note: foundation level

$$
a x^{2}+b x+c
$$

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:

$$
\begin{aligned}
& x^{2}+5 x+6=(x+3)(x+2) \\
& 63 \times 2=6 \text { AND } 3+2=5 \\
& x^{2}-10 x+21=(x-7)(x-3) \\
& -7 x-3=21 \text { AND }-7+-3=-10 \\
& x^{3}+3 x-18=(x+6)(x-3) \\
& 6 x-3=-18 \text { AND } 6 t-3=3
\end{aligned}
$$

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

Algebra - Class 3
Questions
Factorise the following...

$$
x^{2}+10 x+9
$$

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

Algebra - Class 3
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:

$$
\begin{aligned}
& x^{2}-7 x-18=0 \\
& -9 \times 2=-18 \text { AND }-9+2=-7 \\
& (x-9)(x+2)=0 \\
& x=9 \quad x=-2
\end{aligned}
$$

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

$$
x^{2}-10 x+16=0
$$

Algebra - Class 3
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

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

The roots of the equation $x^{2}-2 x-3=0$
are -1 and 3 because the graph crosses the $x$ axis at these points

Algebra - Class 3
Question


Here is the graph of $y=x^{2}+2 x-3$

Find the roots of the equation

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

Algebra - Class 3
Simultaneous equations are when you have two pairs of equations with two unkown variables to find.

Example:

$$
\begin{aligned}
& 5 x+2 y=27 \\
& 6 x+4 y=28
\end{aligned}
$$

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:

$$
\begin{aligned}
& 10 x+4 y=54 \\
& 6 x+4 y=28 \\
& 4 x=26 \rightarrow x=6.5
\end{aligned}
$$

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

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 $y$.

Algebra - Class 3
$x=6.5$

$$
\begin{gathered}
5 \times 6.5+2 y=27 \\
32.5+2 y=27 \\
2 y=-5.5 \\
y=-2.75
\end{gathered}
$$

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.

Algebra - Class 3
Question

Solve the simultaneous equations
$3 x-4 y=11$
$9 x+2 y=5$

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

