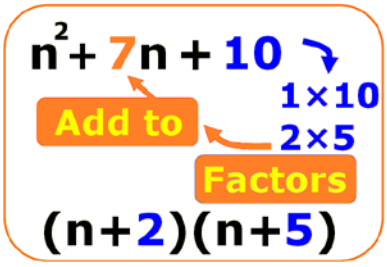
Quadratic Factorisation

To factor a quadratic of the form $x^2 + bx + c$, write it as:

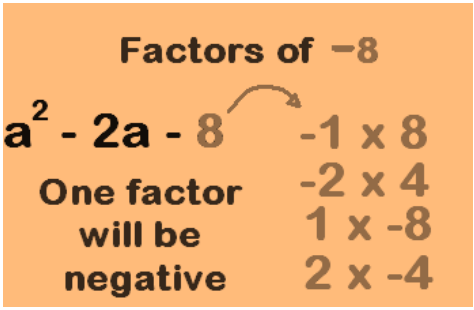
$(x + r_1)(x + r_2)$ where $c = r_1 \cdot r_2$ and $b = r_1 + r_2$.

Quadratic factorisation involves a process of multiplying and adding to determine the values of r_1 and r_2.



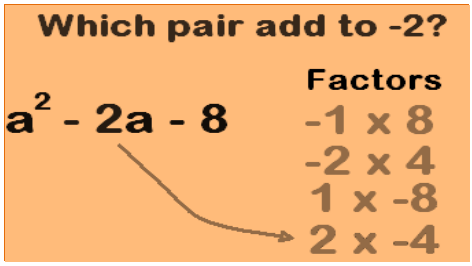
EXAMPLE: Factorise $a^2 - 2a - 8$

The c term in this example is -8, so we need to find a pair of factors with a product of -8. The b term is -2, so you need to find a pair of factors with a sum of -2. Since the product is negative (-8) and the sum is negative (-2), one factor must be negative.



From the pairs of factors which one when added together gives -2?

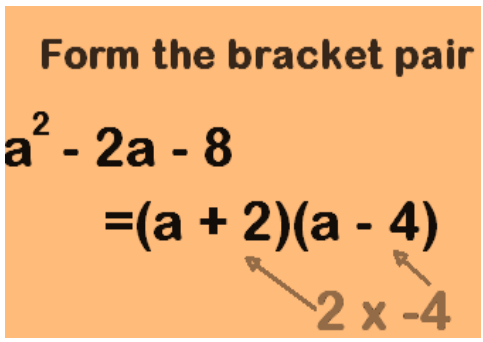
-1 + 8 = 7
-2 + 4 = +2
1 + -8 = -7
2 + -4 = -2



Now insert your brackets with a – ve & + ve (a +)(a -)

Place the 2 and 4 inside the brackets in the right order so when it is expanded we get $a^2 - 2a - 8$

If we inserted them the other way around we would get $a^2 + 2a - 8$ which is not correct.



Picture adapted from maths.nayland.school.nz

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Factorise **$4m^2 + 56m + 132$**

First remove 4 as a factor, the greatest common factor of $4m^2 + 56m + 132$.

$4m^2 + 56m + 132$
$=4(m^2 + 14m + 33)$

To factorise a quadratic of the form $x^2 + bx + c$, write it as $(x + r_1)(x + r_2)$ where $c = r_1 \cdot r_2$ and $b = r_1 + r_2$.

Next look at the quadratic inside the brackets, $m^2 + 14m + 33$.

The c term is 33, so you need to find a pair of factors with a product of 33. The b term is 14, so you need to find a pair of these factors with a sum of 14. Since the product is positive (33) and the sum is positive (14), you need both factors to be positive.

Make a list of the possible factor pairs.

Factor pairs of c = 33	Sum of factor pairs
$1 \cdot 33 = 33$	
$3 \cdot 11 = 33$	

Next see which factor pair has a sum of 14.

Factor pairs of c = 33	Sum of factor pairs
$1 \cdot 33 = 33$	$1 + 33 = 34$
$3 \cdot 11 = 33$	**$3 + 11 = 14$**

The correct factor pair is 3 and 11.
Use those numbers to factor the quadratic inside the brackets, m2 + 14m + 33.

$4(m^2 + 14m + 33)$
$4(m + 3)(m + 11)$

$4(m + 3)(m + 11)$	Finally, check your work.
$4(m^2 + 11m + 3m + 33)$	Multiply, applying the distributive property (F.O.I.L.)
$4(m^2 + 14m + 33)$	Combine like terms
$4m^2 + 56m + 132$	Apply the distributive property
	Yes, 4m2 + 56m + 132 = 4(m + 3)(m + 11)!

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