

## Factor(ising)

This is simply the reverse of expanding – so put the brackets back in.  
First check on the number of terms then proceed:

	TWO TERMS	THREE TERMS	FOUR TERMS
Factorise can mean “take out” so look for the common factor <b>first</b> .	$ax + ay = a(x + y)$ $6x^2 - 3x = 3x(2x - 1)$	$ax + ay - az = a(x + y + z)$ $6x^2 - 3x + 12 = 3(2x^2 - x + 4)$	$ap + aq - ar + as$ $= a(p + q - r + s)$
Look for the difference of two squares $\square - \square$	$x^2 - y^2 = (x + y)(x - y)$ Checking this reveals: $(x + y)(x - y) =$ $x^2 + \underline{xy} - \underline{xy} - y^2 = x^2 - y^2$		
Look for a combination of both of the above procedures.	$18x^2 - 8y^2$ $2(9x^2 - 4y^2)$ $2(3x + 2y)(3x - 2y)$		
<p>Recognise a quadratic of the form <math>ax^2 + bx + c</math> and remember this was the result of multiplying two linears.</p> <ul style="list-style-type: none"> <li>Create the blank brackets</li> <li>Put the front in</li> <li>Put the back in depending on the sign of the constant.</li> <li>Make the signs fit so that the middle term is correct.</li> <li>You may need to have a breakdown!</li> </ul>	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 45%;"> <p style="text-align: center;"><math>x^2 - 8x + 12</math></p> <p style="text-align: center;"><b>Blank brackets</b> ( ) ( ) <b>Front part in</b> (x )(x )</p> <p>Note the constant ... <b>+12</b></p> <p>If + ve (<b>+ 12</b>), find two numbers whose multiple is 12 with a sum of 8.     <u>6 and 2</u></p> <p>If - ve (<b>- 20</b>), find two numbers whose multiple is 20 with a difference of 8.     <u>10 and 2</u></p> <p style="text-align: center;">(x - 6)(x - 2)     <b>Back part in</b>     (x - 10)(x - 2)</p> <p style="text-align: center;"><b>Make the signs fit</b></p> <p style="text-align: center;">(x - 6)(x - 2) to get -8 in the middle.     (x + 10)(x - 2) to get +8 in the middle.</p> <p style="text-align: center;">.....</p> <p>If the coefficient of <math>x^2</math> is more than 1.     <u><math>6x^2 - 7x - 5</math></u>     <u><math>3x^2 + 10x + 8</math></u></p> <p>Use the product of a and c as your constant     <b>- 30</b>     <b>+ 24</b></p> <p>Put both fronts in as 6x or 3x and don't panic!     (6x )(6x )     (3x )(3x )</p> <p>Put the back in, based on the sign of the constant.</p> <p style="text-align: center;"><b>-30</b> means difference of 7     <u>10 and 3</u>,     <b>+24</b> means sum of 10     <u>6 and 4</u></p> <p style="text-align: center;"><b>Put the back in and make the signs fit the middle term</b></p> <p style="text-align: center;">(6x - 10)(6x + 3)     (3x + 6)(3x + 4)</p> <p><b>Now have a breakdown!</b>     <b>2</b>     <b>3</b>     <b>3</b>     <b>-</b></p> <p>Break down the brackets by dividing through by anything, which divides into the brackets.</p> <p>Answer:     <u>(3x - 5)(2x + 1)</u>     <u>(x + 2)(3x + 4)</u></p> <p>And check:     <math>6x^2 - 7x - 5</math>     <math>3x^2 + 10x + 8</math></p> </div> <div style="width: 45%; text-align: right;"> <p style="text-align: center;"><math>x^2 + 8x - 20</math></p> </div> </div>		
If there are 4 terms with no Common factor, simply factorise in pairs.			$ac + ad + bc + bd$ $= a(c + d) + b(c + d)$ Now take out (c + d): $(c + d)(a + b)$

All this factorising is very useful for solving Quadratic Equations.

