Brackets

Multiplying Out(expanding) - a pair of brackets with a single term infront

The term outside the brackets multiplies each of the terms in turn inside the brackets.

example:

$$x(a+b+c)$$
$$= xa + xb + xc$$

further examples:

$$3p(2x-5y)$$
$$= 6px - 15py$$

$$2xy(p+2q)$$
$$= 2xyp + 4xyq$$

$$3x^2(y+4z^2)$$
$$= 3x^2y + 12x^2z^2$$

$$-2x(3p^2-2q^2)$$
$$= -6xp^2 + 4xq^2$$

$$3q^3(5r^3-2p^2)$$
$$= 15q^3r^3 - 6q^3p^2$$

$$2r^2(6x-y)$$
$$= 12r^2x - 2r^2y$$

Multiplying Out(expanding) - two pairs of brackets

Think of the two terms in the first bracket as separate single terms infront of a pair of brackets.

example:

$$(3a-2b)(a+b)$$

Multiply the **contents** of the 2nd bracket by the **1st term** in the 1st bracket.

$$(\underline{3a}-2b)(\underline{a+b})$$
$$3a(a+b)$$
$$=3a^2+3ab$$

Multiply the **contents** of the 2nd bracket by the **2nd term** in the 1st bracket.

$$(3a\underline{-2b})(\underline{a+b})$$
$$-2b(a+b)$$
$$=-2ab-2b^2$$

Add the two results together.

$$\begin{array}{l} 3a^2+3ab \\ \underline{\qquad\;\, -2ab-2b^2} \\ 3a^2+ab-2b^2 \end{array}$$

Example #1

$$\begin{array}{l} (7x-5)(2x-3) \\ 14x^2-21x \\ \underline{\qquad -10x+15} \\ 14x^2-31x+15 \end{array}$$

Example #2

$$\begin{array}{l} (2x-2)(5x+3) \\ 10x^2+6x \\ \underline{\qquad -10x-6} \\ 10x^2-4x-6 \end{array}$$

Example #3

$$\begin{array}{l} (2x+9)(3x-11) \\ 6x^2-22x \\ \underline{\qquad +27x-99} \\ 6x^2+5x-99 \end{array}$$

Squared Brackets

$$\begin{aligned}(x+y)^2 &= (x+y)(x+y)\\ &= x^2 + xy\\ &\quad\;\; + xy + y^2\\ \hline &\;\; x^2 + 2xy + y^2\end{aligned}$$

note: a common mistake

$$(x+y)^2 \neq x^2 + y^2$$

Difference of Two Squares

Brackets - Simple Factorising - This involves taking out a common term from each expression and placing it infront of the brackets.

examples:

$3x^2 - 9x$ $\qquad$ $4x^3 - 6x^2$

$\underline{3x(x-3)}$ $\qquad$ $\underline{2x^2(2x-3)}$

$5x^2y - 10xy^2$ $\qquad$ $8x - 12xy$

$\underline{5xy(x-2y)}$ $\qquad$ $\underline{4x(2-3y)}$

$3xy^3 - 15x^2y$ $\qquad$ $7x^2y^2 - 21xy$

$\underline{3xy(y^2-5x)}$ $\qquad$ $\underline{7xy(xy-3)}$

Factorising Quadratic Expressions

This is best illustrated with an example:

$$x^2 - 7x + 12$$

You must first ask yourself which two factors when multiplied will give **12** ?

The factors of 12 are : ....**1 x 12**, ...**2 x 6**, ...**3 x 4**

Now which numbers in a group added or subtracted will give **7** ?

1 : 12 gives 13, 11 ....2 : 6 gives 8, 4 ....**3 : 4** gives **7**, 1

so

$$x^2 - 7x + 12 = (x \pm 3)(x \pm 4)$$

which of the '+' & '-' terms makes **+12**? ....and when added gives **-7**?

these are the choices: (+3)(+4), (-3)(+4), (+3)(-4) or **(-3)(-4)**

clearly, **(-3)(-4)** are the two factors we want

therefore

$$\underline{x^2 - 7x + 12 = (x - 3)(x - 4)}$$

Example #1

$x^2 - x - 20$

$(x \pm 5)(x \pm 4)$

$\underline{(x-5)(x+4)}$

Example #2

$x^2 + x - 42$

$(x \pm 7)(x \pm 6)$

$\underline{(x+7)(x-6)}$

Example #3

$x^2 - 13x + 30$

$(x \pm 10)(x \pm 3)$

$\underline{(x-10)(x-3)}$