Quadratic Expressions and Quadratic Equations

Consider $(x+a)(x+b)$

$$= x^2 + ax + bx + ab$$

$$= x^2 + (a+b)x + ab$$

This is called expanding brackets

Factorising is the reverse of this process

Consider $x^2 + 5x + 6$

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

$+1 \quad +6$
$-1 \quad -6$
$+2 \quad +3$ ✓
$-2 \quad -3$

Why do this?

Suppose we are solving

$$x^2 + 5x + 6 = 0$$

$$(x+2)(x+3) = 0$$

Either $x + 2 = 0$ or $x + 3 = 0$

$\underline{x = -2}$ $\quad$ $\underline{x = -3}$

Example 2

$$x^2 + 6x + 8$$

$$= (x+2)(x+4)$$

$+1 \quad +8$
$-1 \quad -8$
$+2 \quad +4$ ✓
$-2 \quad -4$

We are looking for two numbers which multiply to $+8$ and add to $+6$

Ex 3

$$x^2 + 11x + 24$$
$$= (x+3)(x+8)$$

+1	+24
-1	-24
+2	+12
-2	-12
+3	+8 ✓
-3	-8
+4	+6
-4	-6

Exercise Factorise

1) $x^2 + 9x + 8 = (x+1)(x+8)$

2) $x^2 + 7x + 10 = (x+2)(x+5)$

3) $x^2 + 2x + 1 = (x+1)(x+1)$

4) $x^2 + 13x + 30 = (x+3)(x+10)$

5) $x^2 + 9x + 14 = (x+2)(x+7)$

Ex 4

$$x^2 - 6x + 5$$
$$= (x-1)(x-5)$$

+1	+5
-1	-5 ✓

Exercise

1) $x^2 - 8x + 15 = (x-3)(x-5)$

2) $x^2 - 4x + 3 = (x-1)(x-3)$

Ex 5

$$x^2 + 5x - 14$$
$$= (x-2)(x+7)$$

+1	−14
−1	+14
+2	−7
−2	+7 ✓

Ex 6

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

+1	−12
−1	+12
+2	−6
−2	+6
+3	−4 ✓
−3	+4

Exercise

1) $x^2 - 7x - 8$
$= (x+1)(x-8)$

+1	−8 ✓
−1	+8
+2	−4
−2	+4

2) $x^2 + 3x - 10$
$= (x-2)(x+5)$

+1	−10
−1	+10
+2	−5
−2	+5 ✓

3) $x^2 + x - 2$
$= (x-1)(x+2)$

+1	−2
−1	+2 ✓

4) $x^2 - 8x - 20$
$= (x+2)(x-10)$

+1	−20
−1	+20
+2	−10 ✓
−2	+10
+4	−5
−4	+5

5) $x^2 - 4x - 21$
$= (x+3)(x-7)$

+1	−21
−1	+21
+3	−7 ✓
−3	+7
