

Factorising Quadratic Expressions

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

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

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

Factorising is the reverse of this process.

Ex 1

$$x^2 + 5x + 6 = (x+2)(x+3)$$

+1	+6
-1	-6
+2	+3 ✓
-2	-3

The numbers in the brackets multiply to give the constant on the end '+6' and add together to give the number of x s '+5'

Ex 2

$$x^2 + 8x + 12 = (x+2)(x+6)$$

+1	+12
-1	-12
+2	+6
-2	-6
+3	+4
-3	-4

Ex 3

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

+1	+10
-1	-10
+2	+5 ✓
-2	-5

Ex 4

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

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

Exercise Factorise

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

+1	+3 ✓
-1	-3

2) $x^2 + 11x + 10$
 $= (x + 1)(x + 10)$

+1	+10 ✓
-1	-10
+2	+5
-2	-5

3) $x^2 + 8x + 15$
 $= (x + 3)(x + 4)$

+1	+15
-1	-15
+3	+5 ✓
-3	-5

4) $x^2 + 9x + 20$
 $= (x + 4)(x + 5)$

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

$$5) \quad x^2 + 2x + 1 = (x + 1)(x + 1)$$

+	+	✓
-	-	

Further Examples

$$1) \quad x^2 - 7x + 6 = (x - 1)(x - 6)$$

+	+	
-	-	✓
+	+	
-	-	

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

+	+	
-	-	✓

Exercise

$$1) \quad x^2 - 7x + 10 = (x - 2)(x - 5)$$

+	+	
-	-	
+	+	
-	-	✓

$$2) \quad x^2 - 13x + 12 = (x - 1)(x - 12)$$

+	+	
-	-	✓
+	+	
-	-	
+	+	
-	-	

$$3) \quad x^2 - 9x + 14 = (x - 2)(x - 7)$$

+	+	
-	-	
+	+	
-	-	✓

Further Examples

$$\begin{aligned} 1) \quad & x^2 + 2x - 15 \\ & = (x - 3)(x + 5) \end{aligned} \quad \begin{array}{l} +1 \quad -15 \\ -1 \quad +15 \\ +3 \quad -5 \\ -3 \quad +5 \checkmark \end{array}$$

$$\begin{aligned} 2) \quad & x^2 - x - 12 \\ & = (x + 3)(x - 4) \end{aligned} \quad \begin{array}{l} +1 \quad -12 \\ -1 \quad +12 \\ +2 \quad -6 \\ -2 \quad +6 \\ +3 \quad -4 \checkmark \\ -3 \quad +4 \end{array}$$

$$\begin{aligned} 3) \quad & x^2 + 5x - 24 \\ & = (x - 3)(x + 8) \end{aligned} \quad \begin{array}{l} +1 \quad -24 \\ -1 \quad +24 \\ +2 \quad -12 \\ -2 \quad +12 \\ +3 \quad -8 \\ -3 \quad +8 \checkmark \end{array}$$

Exercise

$$\begin{aligned} 1) \quad & x^2 + 2x - 8 \\ & = (x - 2)(x + 4) \end{aligned} \quad \begin{array}{l} +1 \quad -8 \\ -1 \quad +8 \\ +2 \quad -4 \\ -2 \quad +4 \checkmark \end{array}$$

$$\begin{aligned} 2) \quad & x^2 - 4x - 5 \\ & = (x + 1)(x - 5) \end{aligned} \quad \begin{array}{l} +1 \quad -5 \checkmark \\ -1 \quad +5 \end{array}$$

$$3) \quad x^2 + 9x - 10 = (x - 1)(x + 10)$$

$$\begin{array}{r} +1 \quad -10 \\ -1 \quad +10 \checkmark \end{array}$$

$$4) \quad x^2 + 5x - 14 = (x - 2)(x + 7)$$

$$\begin{array}{r} +1 \quad -14 \\ -1 \quad +14 \\ +2 \quad -7 \\ -2 \quad +7 \checkmark \end{array}$$

$$5) \quad x^2 + 8x - 9 = (x - 1)(x + 9)$$

$$\begin{array}{r} +1 \quad -9 \\ -1 \quad +9 \checkmark \end{array}$$

$$6) \quad x^2 - 2x - 3 = (x + 1)(x - 3)$$

$$\begin{array}{r} +1 \quad -3 \checkmark \\ -1 \quad +3 \end{array}$$

$$7) \quad x^2 + 14x - 15 = (x - 1)(x + 15)$$

$$\begin{array}{r} +1 \quad -15 \\ -1 \quad +15 \checkmark \end{array}$$

$$8) \quad x^2 - 10x - 11 = (x + 1)(x - 11)$$

$$\begin{array}{r} +1 \quad -11 \checkmark \\ -1 \quad +11 \end{array}$$

$$9) \quad x^2 + 7x - 18 = (x - 2)(x + 9)$$

$$\begin{array}{r} +1 \quad -18 \\ -1 \quad +18 \\ +2 \quad -9 \\ -2 \quad +9 \checkmark \end{array}$$

$$10) \quad x^2 - 4x - 21 = (x - 7)(x + 3)$$

$$\begin{array}{r} +1 \quad -21 \\ -1 \quad +21 \end{array}$$

$$= (x + 3)(x - 7)$$

$$\begin{array}{l} +3 -7 \checkmark \\ -3 +7 \end{array}$$