

Solving Quadratics Requiring Rearranging

Starter

1. **(Review of last lesson)** Solve $3x^2 - 11x + 6 = 0$.

Working: Firstly, factorise $3x^2 - 11x + 6$.

$3 \times 6 = 18$	\Rightarrow Multiply:	$18 = -9 \times -2$
	Add:	$-11 = -9 + -2$

$$3x^2 - 11x + 6 = 0$$

$$3x^2 - 9x - 2x + 6 = 0$$

split up $-11x$ into $-9x - 2x$

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

factorise by grouping (same brackets)

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

put the brackets = 0

$$\therefore 3x - 2 = 0 \quad \text{or} \quad x - 3 = 0$$

$$\text{So } x = \frac{2}{3} \quad \text{or} \quad x = 3$$

2. Solve $x^2 + 2x = 3$.

Working: $x^2 + 2x - 3 = 0$ *make sure the equation equals zero*

Factorise $x^2 + 2x - 3$.

$1 \times -3 = -3$	\Rightarrow Multiply:	$-3 = 3 \times -1$
	Add:	$2 = 3 + -1$

$$x^2 + 2x - 3 = 0$$

$$x^2 + 3x - x - 3 = 0$$

split up $2x$ into $3x - x$

$$x(x + 3) - 1(x + 3) = 0$$

factorise by grouping (same brackets)

$$(x + 3)(x - 1) = 0$$

put the brackets = 0

$$\therefore x + 3 = 0 \quad \text{or} \quad x - 1 = 0$$

$$\text{So } x = -3 \quad \text{or} \quad x = 1$$

- E.g. 1** Solve $x^2 = 6x - 8$.

Working: $x^2 = 6x - 8$

$$x^2 - 6x + 8 = 0$$

make sure the equation = 0 and x^2 is positive

M:	$8 = -4 \times -2$	
A:	$-6 = -4 + -2$	

$$x^2 - 4x - 2x + 8 = 0$$

split $-6x$ into $-4x - 2x$

$$x(x - 4) - 2(x - 4) = 0$$

factorise by grouping (same brackets)

$$(x - 4)(x - 2) = 0$$

$$\therefore x - 4 = 0 \quad \text{or} \quad x - 2 = 0$$

$$\text{So } x = 4 \quad \text{or} \quad x = 2$$

E.g. 2 Solve $12 - x^2 = x$.

Working:

$$12 - x^2 = x$$
$$x^2 + x - 12 = 0 \quad \text{make sure the equation} = 0 \text{ and } x^2 \text{ is positive}$$
$$\text{M: } -12 = 4 \times -3$$
$$\text{A: } 1 = 4 + -3$$
$$x^2 + 4x - 3x - 12 = 0 \quad \text{split } x \text{ into } 4x - 3x$$
$$x(x + 4) - 3(x + 4) = 0 \quad \text{factorise by grouping (same brackets)}$$
$$(x + 4)(x - 3) = 0$$
$$\therefore x + 4 = 0 \quad \text{or} \quad x - 3 = 0$$
$$\text{So } x = -4 \quad \text{or} \quad x = 3$$

E.g. 3 Solve $x^2 + 21x = 11 - x^2$.

Working:

$$x^2 + 21x = 11 - x^2$$
$$2x^2 + 21x - 11 = 0 \quad \text{make sure the equation} = 0 \text{ and } x^2 \text{ is positive}$$
$$\text{M: } -22 = 22 \times -1$$
$$\text{A: } 21 = 22 + -1$$
$$2x^2 + 22x - x - 11 = 0 \quad \text{split } 21x \text{ into } 22x - x$$
$$2x(x + 11) - 1(x + 11) = 0 \quad \text{factorise by grouping (same brackets)}$$
$$(x + 11)(2x - 1) = 0$$
$$\therefore x + 11 = 0 \quad \text{or} \quad 2x - 1 = 0$$
$$2x = 1$$
$$\text{So } x = -11 \quad \text{or} \quad x = \frac{1}{2}$$

E.g. 4 Solve $(x + 3)(x + 9) + 9 = 0$.

Working:

$$(x + 3)(x + 9) + 9 = 0$$
$$x^2 + 9x + 3x + 27 + 9 = 0 \quad \text{expand the brackets}$$
$$x^2 + 12x + 36 = 0 \quad \text{collect like terms}$$
$$\text{M: } 36 = 6 \times 6$$
$$\text{A: } 12 = 6 + 6$$
$$x^2 + 6x + 6x + 36 = 0 \quad \text{split } 12x \text{ into } 6x + 6x$$
$$x(x + 6) + 6(x + 6) = 0 \quad \text{factorise by grouping (same brackets)}$$
$$(x + 6)(x + 6) = 0$$
$$\therefore x + 6 = 0$$
$$\text{So } x = -6 \text{ repeated}$$

E.g. 5 Solve $x + 1 = \frac{6}{x}$.

Working:

$$x + 1 = \frac{6}{x}$$
$$x(x + 1) = 6 \quad \text{multiply by } x$$
$$x^2 + x - 6 = 0 \quad \text{expand the brackets and make sure } = 0$$
$$\text{M: } -6 = -2 \times 3$$
$$\text{A: } 1 = -2 + 3$$
$$x^2 - 2x + 3x - 6 = 0 \quad \text{split } x \text{ into } -2x + 3x$$
$$x(x - 2) + 3(x - 2) = 0 \quad \text{factorise by grouping (same brackets)}$$
$$(x - 2)(x + 3) = 0$$
$$\therefore x - 2 = 0 \quad \text{or} \quad x + 3 = 0$$
$$\text{So } x = 2 \quad \text{or} \quad x = -3$$

Video: [Solving quadratics by factorising](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:

p114 M4.10 Qu 25-33, p116 E4.4 Qu 16-25

A*-G class textbook:

p105 E4.4 Qu 25-33, 48-56

9-1 homework book:

p42 M4.10 Qu 15-22, p42 E4.4 Qu 8, 11, 13, 17

A*-G homework book:

p30 E4.4 Qu 15-21, 26, 29, 32

[Homework book answers \(only available during a lockdown\)](#)