Solving Quadratics by Factorising

Starter

1. **(Review of last lesson)** Factorise $25p^2 - 16q^2$.

   Working: $25p^2 - 16q^2 = (5p)^2 - (4q)^2 = (5p - 4q)(5p + 4q)$

2. **(Review of last lesson)** Without a calculator, find the value of $83^2 - 17^2$.

   Working: $83^2 - 17^2 = (83 - 17)(83 + 17) = 66 \times 100 = 6600$

3. **(Review of Y8 material)**
   Solve: (a) $x + 4 = 0$ (b) $x - 7 = 0$ (c) $2x - 5 = 0$

   Working: (a) $x = -4$

   (b) $x = 7$

   (c) $2x - 5 = 0 \Rightarrow 2x = 5 \Rightarrow x = 2.5$

4. **(Review of Y10 material)**
   Factorise: (a) $x^2 + 18x - 19$ (b) $3y^2 + 17y - 6$

   Working: (a) $1 \times -19 = -19 \Rightarrow$ Multiply: $-19 = 19 \times -1$
   Add: $18 = 19 + -1$
   Split $18x$ ***into*** $19x - x$**:** $x^2 + 18x - 19 = x^2 + 19x - x - 19$
   N.B. The -19 remains the same.
   Factorise by grouping: $x^2 + 18x - 19 = x(x + 19) - 1(x + 19)$
   $= (x + 19)(x - 1)$
   N.B. $18x$ could also be split into $-x + 19x$.

   (b) $3 \times -16 = -18 \Rightarrow$ Multiply: $-18 = 18 \times -1$
   Add: $17 = 18 + -1$
   Split $17y$ ***into*** $18y - y$**:** $3y^2 + 17y - 6 = 3y^2 + 18y - y - 6$
   N.B. The -6 remains the same.
   Factorise by grouping: $3y^2 + 17y - 6 = 3y(y + 6) - 1(y + 6)$
   $= (y + 6)(3y - 1)$
   N.B. $17y$ could also be split into $-y + 18y$.

5. Two numbers, A and B, multiply together to give zero i.e. $A \times B = 0$. What can we say about the two numbers?

   Working: At least one of them must equal zero.

E.g. 1 Solve $x^2 + 3x + 2 = 0$.

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

$1 \times 2 = 2 \quad \Rightarrow$ Multiply: $2 = 1 \times 2$

Add: $3 = 1 + 2$

$$x^2 + 3x + 2 = 0$$
$$x^2 + 2x + x + 2 = 0 \qquad \textit{split up } 3x \textit{ into } 2x + x$$
$$x(x + 2) + 1(x + 2) = 0 \qquad \textit{factorise by grouping (same brackets)}$$
$$(x + 2)(x + 1) = 0$$
$$\therefore x + 2 = 0 \quad \text{or} \quad x + 1 = 0 \qquad \textit{put the brackets } = 0$$
$$\text{So} \quad x = -2 \quad \text{or} \quad x = -1$$

E.g. 2 Solve $3y^2 + 17y - 6 = 0$.

N.B. Use 4(b) from the starter.

Working:

$$3y^2 + 17y - 6 = 0$$
$$(y + 6)(3y - 1) = 0$$
$$\therefore y + 6 = 0 \quad \text{or} \quad 3y - 1 = 0 \qquad \textit{put the brackets } = 0$$
$$\text{So} \quad y = -6 \quad \text{or} \quad y = \frac{1}{3}.$$

E.g. 3 Solve $x^2 - 81 = 0$.

Working:

$x^2 - 81 = 0$ this is the difference of 2 squares

$$(x + 9)(x - 9) = 0$$
$$\therefore x + 9 = 0 \quad \text{or} \quad x - 9 = 0 \qquad \textit{put the brackets } = 0$$
$$\text{So} \quad x = -9 \quad \text{or} \quad x = 9$$

Alternatively:

$$x^2 - 81 = 0$$
$$x^2 = 81$$
$$x = \pm\sqrt{81} = \pm 9$$

E.g. 4 Solve $x^2 + 7x = 0$.

Hint: When factorise the expression, do you need 2 brackets?

Working:

$$x^2 + 7x = 0$$

Factorise: $x(x + 7) = 0$

$$\therefore x = 0 \quad \text{or} \quad x + 7 = 0 \qquad \textit{put the brackets } = 0$$
$$\text{So } x = 0 \quad \text{or} \quad x = -7$$

Video: Solving quadratics by factorising

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p115 M4.10 Qu 1-24 odd
A*-G class textbook:	p104 E4.4 Qu 1-24 odd
9-1 homework book:	p41 M4.10 Qu 1-14
A*-G homework book:	p30 E4.4 Qu 1-14

Homework book answers (only available during a lockdown)