

WEEK: 22

Week Beginning: (17/08/20)

Subject: MATHS

Year: 8

Lesson Objective:

- To develop our knowledge on changing the subject
- To expand this onto working with Quadratics

Class Worksheets

- Pages 1 to 6 from the Learning Pack – see below

Homework

- Page 7 from the Learning Pack – see below

Additional Notes

- All lesson worksheets and **homework for next week (due Week 21)** worksheets can be found below
- Week 19 homework will be marked in lesson hence make sure it is fully complete

Please print 2 a page or open this document during the lesson to save paper!

Solving through Factorising $a = 1$

We can solve quadratics through factorising by following these 4 easy steps.

Example: Solve the quadratic equation, $x^2 - 3x = -2$ by factorisation.

- **Step 1:** Rearrange the given quadratic so that it is equal to zero, $x^2 - 3x + 2 = 0$
- **Step 2:** Factorise the quadratic $(x - 2)(x - 1) = 0$
- **Step 3:** Form two linear equations

Since the right-hand side of the equation is zero, the result of multiplying the two brackets together on the left-hand side must be zero. Therefore, at least one of the brackets must be equal to zero. So, in summary,

if $(x - 2)(x - 1) = 0$, then either $(x - 2) = 0$ or $(x - 1) = 0$.

- **Step 4:** Solve the equations to find the roots of the equation

Equation 1:

$$\begin{aligned} (+2) \quad x - 2 &= 0 \\ x &= 2 \end{aligned}$$

Equation 2:

$$\begin{aligned} (+1) \quad x - 1 &= 0 \\ x &= 1 \end{aligned}$$

The final roots are:

$$x = 2 \quad \text{and} \quad x = 1$$

Solving through Factorising ($a > 1$)

Solve the following quadratic equation through factorising $2x^2 - 3x - 9 = 0$

Step 1: Rearrange the given quadratic so that it equal to zero ($= 0$)

This quadratic is already equal $= 0$ so there is nothing more to do.

Step 2: Factorise the quadratic,

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

Step 3: Form two linear equations

$$2x + 3 = 0 \text{ and } x - 3 = 0$$

Step 4: Solve the equations to find the roots of the equation

Equation 1:

$$(-3) \quad 2x + 3 = 0$$

$$(\div 2) \quad 2x = -3$$

$$x = -\frac{3}{2}$$

Equation 2:

$$(+3) \quad x - 3 = 0$$

$$x = 3$$

So, the 2 solutions to the equation are $x = 3$ and $x = -\frac{3}{2}$.

Quadratic Equations and Sketching Graphs

It is possible to use factorisation to allow you to sketch a quadratic graph.

Example: Use factorisation to find the roots of $x^2 - 2x - 3 = 0$, using this sketch the quadratic.

Like always, the equation needs to be $= 0$

Step 1: First we need to factorise the left hand side of the equation

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

Step 2: Solve the quadratic as show in the above examples

$$\begin{aligned} (+3) \quad x - 3 &= 0 \\ x &= 3 \end{aligned}$$

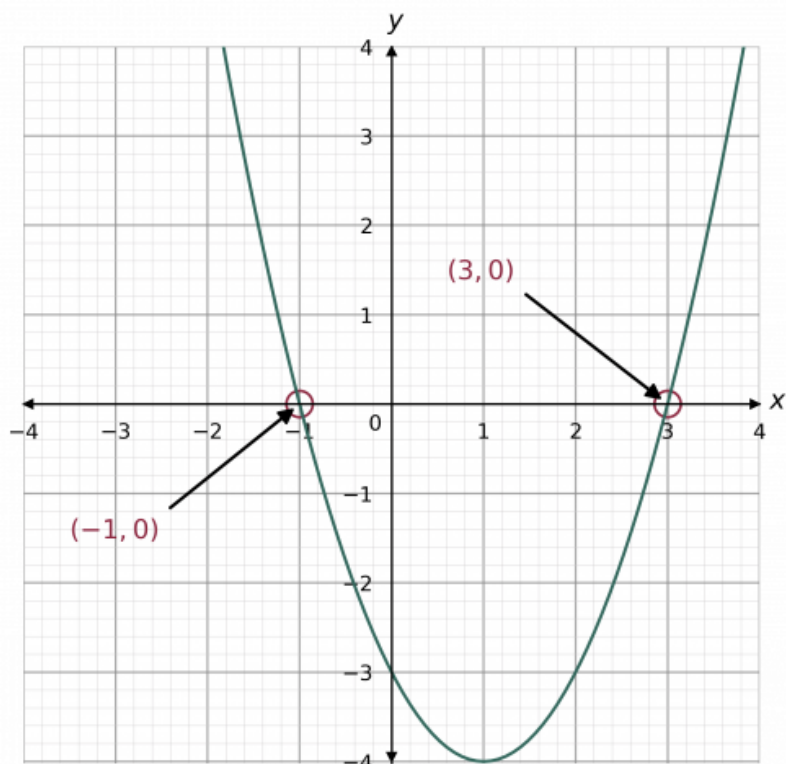
$$\begin{aligned} (-1) \quad x + 1 &= 0 \\ x &= -1 \end{aligned}$$

Step 3: Find the coordinates of the roots. We know this equations has the solutions $x = 3$ and $x = -1$

When we set the equation to 0 then $y = 0$. This means we can form the two coordinates

$$(3, 0) \text{ and } (-1, 0)$$

Once you have found these values, you can sketch the graph, see below.



Factorising Quadratic Expressions 3

Section A: Simplify then factorise the following quadratic expressions.

1) $x^2 - 6x - 2x + 12$

2) $d(d - 5) - 84$

3) $b^2 + 2(b - 4)$

4) $x^2 - 3(2x + 9)$

5) $c(c + 8) - 48$

6) $3a(a - 2) - 4a + 3$

7) $5w(w - 2) - 4w - 3$

8) $3(6 - 5s) + s^2 + s^2$

9) $3 - 2y(4y + 5)$

10) $9x^2 - (x - 3)^2$

Section B: Factorise the following algebraic expressions.

1) $x^2 - 4$

2) $s^2 - 25$

3) $t^2 - 64$

4) $9 - y^2$

5) $49 - p^2$

6) $4q^2 - 121$

7) $81 - 25k^2$

8) $1 - 400d^2$

9) $600v^2 - 6$

10) $a^2 - b^2$

11) $x^2 - 9y^2$

12) $4c^2 - d^2$

13) $16s^2 - 9t^2$

14) $49w^2 - 100v^2$

15) $32p^2 - 18q^2$

16) $48x^2 - 12y^2$

17) $45a^2 - 125b^2$

18) $72x^2 - 242y^2$

19) $a^2b^2 - c^2$

20) $9s - 4s^3$

21) $(xy)^2 - 4z^2$

22) $64t^4 - 16s^4$

23) $(4x^2)^2 - 36y^2$

24) $27a^4 - 12b^2$

Extension: Using the difference of two squares factorise the following expressions.

A. $4x^2 - (x - 2)^2$

B. $(2x + 1)^2 - (x - 4)^2$

1) Factorise

(a) $x^2 + 5x + 6$

(b) $x^2 + 6x + 9$

(c) $x^2 + 8x + 7$

(d) $x^2 + 8x + 15$

(e) $x^2 + 4x + 3$

(f) $x^2 + 12x + 20$

2) Factorise

(a) $x^2 - 6x + 5$

(b) $x^2 - 2x + 1$

(c) $x^2 - 7x + 10$

(d) $x^2 - 2x + 1$

(e) $x^2 - 8x + 15$

(f) $x^2 - 11x + 18$

3) Factorise

(a) $x^2 - x - 6$

(b) $x^2 - 2x - 15$

(c) $x^2 - 3x - 18$

(d) $x^2 - 2x - 24$

(e) $x^2 - 8x - 20$

(f) $x^2 - 6x - 5$

4) Factorise

(a) $x^2 + x - 6$

(b) $x^2 + x - 30$

(c) $x^2 + 3x - 40$

(d) $x^2 + x - 20$

(e) $x^2 + 7x - 18$

(f) $x^2 + 4x - 60$

5) Factorise

(a) $2x^2 + 5x + 2$

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

(c) $3x^2 + 5x + 2$

(d) $2x^2 - 3x - 2$

(e) $3x^2 + 8x + 4$

(f) $5x^2 - 17x + 6$

1. Factorise Fully:

- a) $x^2+3x+2=(\quad + \quad)(\quad + \quad)$
- b) $x^2+6x+9=(\quad + \quad)(\quad + \quad)$
- c) $x^2+6x+8=(\quad + \quad)(\quad + \quad)$
- d) $x^2+13x+22=(\quad + \quad)(\quad + \quad)$
- e) $x^2+7x+10=(\quad + \quad)(\quad + \quad)$
- f) $x^2+8x+15=(\quad + \quad)(\quad + \quad)$
- g) $x^2+7x+12=(\quad + \quad)(\quad + \quad)$
- h) $x^2+7x+6=(\quad + \quad)(\quad + \quad)$

2. Factorise Fully:

- a) $x^2-7x+10=(\quad - \quad)(\quad - \quad)$
- b) $x^2-8x+12=(\quad - \quad)(\quad - \quad)$
- c) $x^2-13x+12=(\quad - \quad)(\quad - \quad)$
- d) $x^2-12x+20=(\quad - \quad)(\quad - \quad)$
- e) $x^2-11x+24=(\quad - \quad)(\quad - \quad)$
- f) $x^2-13x+36=(\quad - \quad)(\quad - \quad)$
- g) $x^2-14x+40=(\quad - \quad)(\quad - \quad)$
- h) $x^2-10x+21=(\quad - \quad)(\quad - \quad)$

3. Factorise Fully:

- a) $x^2+x-20=(\quad + \quad)(\quad - \quad)$
- b) $x^2+3x-18=(\quad + \quad)(\quad - \quad)$
- c) $x^2+5x-24=(\quad + \quad)(\quad - \quad)$
- d) $X^2-6x-40=(\quad + \quad)(\quad - \quad)$
- e) $X^2-x-42=(\quad + \quad)(\quad - \quad)$
- f) $X^2-13x-30=(\quad + \quad)(\quad - \quad)$
- g) $X^2+3x-24=(\quad + \quad)(\quad - \quad)$
- h) $X^2-7x-18=(\quad + \quad)(\quad - \quad)$

4. Factorise Fully:

- a) $x^2+x+1=$
- b) $x^2+7x+10=$
- c) $x^2+8x-20=$
- d) $X^2-7x-30=$
- e) $X^2-9x+20=$
- f) $X^2-8x+12=$
- g) $X^2+3x-40=$
- h) $X^2-6x-7=$

Question 1: Factorise each of the following

- (a) $x^2 + 7x + 12$ (b) $x^2 + 6x + 8$ (c) $x^2 + 5x + 6$ (d) $x^2 + 8x + 7$
(e) $x^2 + 4x + 4$ (f) $x^2 + 8x + 15$ (g) $x^2 + 6x + 9$ (h) $x^2 + 11x + 28$
(i) $x^2 + 10x + 25$ (j) $x^2 + 12x + 20$ (k) $x^2 + 25x + 24$ (l) $x^2 + 11x + 24$
(m) $x^2 + 9x + 14$ (n) $x^2 + 23x + 60$ (o) $x^2 + 29x + 100$ (p) $x^2 + 20x + 51$

Question 2: Factorise each of the following

- (a) $x^2 + x - 12$ (b) $x^2 + 5x - 6$ (c) $x^2 + 3x - 10$ (d) $x^2 + 3x - 4$
(e) $x^2 + 2x - 48$ (f) $x^2 + 4x - 32$ (g) $x^2 + 2x - 35$ (h) $x^2 + 8x - 33$

Question 3: Factorise each of the following

- (a) $x^2 - 3x - 10$ (b) $x^2 - x - 20$ (c) $x^2 - 6x - 27$ (d) $x^2 - 2x - 3$
(e) $x^2 - x - 12$ (f) $x^2 - 4x - 12$ (g) $x^2 - 4x - 21$ (h) $x^2 - 6x - 55$