



# ACHIEVE ACADEMY

## GCSE Maths — Higher Tier

Solving Quadratic Equations · Practice Booklet

NAME: \_\_\_\_\_

CLASS: \_\_\_\_\_

DATE: \_\_\_\_\_

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

### Solving Quadratic Equations

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Total marks available: 122

## ● Solving Quadratic Equations

✓  $a = -6$  or  $a = -1$

Q1 · ● Developing · 4 marks

METHOD

$$a = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 1 \times (6)}}{2 \times 1}$$

$$a = \frac{-(-7) \pm \sqrt{25}}{2} = \frac{-(-7) \pm 5}{2}$$

$$a = -6 \text{ or } a = -1$$

✓  $x = -4$  or  $x = 1$

Q2 · ● Developing · 4 marks

METHOD

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (-4)}}{2 \times 1}$$

$$x = \frac{-(-3) \pm \sqrt{25}}{2} = \frac{-(-3) \pm 5}{2}$$

$$x = -4 \text{ or } x = 1$$

✓  $y = 4$  or  $y = 1/3$

Q3 · ● Developing · 4 marks

METHOD

$$(3y - 1)(y - 4) = 0$$

$$3y - 1 = 0, \text{ so } y = 1/3$$

$$y - 4 = 0, \text{ so } y = 4$$

✓  $y = 6$  or  $y = 8$

Q4 · ● Developing · 4 marks

METHOD

$$y = \frac{-(-14) \pm \sqrt{(-14)^2 - 4 \times 1 \times (48)}}{2 \times 1}$$

$$y = \frac{14 \pm \sqrt{4}}{2} = \frac{14 \pm 2}{2}$$

$$y = 6 \text{ or } y = 8$$

$$\checkmark y = -9 \text{ or } y = 0$$

Q5 · ● Developing · 4 marks

METHOD

$$y = \frac{-(-9) \pm \sqrt{(-9)^2 - 4 \times 1 \times (0)}}{(2 \times 1)}$$

$$y = \frac{-9 \pm \sqrt{81}}{2} = \frac{-9 \pm 9}{2}$$

$$y = -9 \text{ or } y = 0$$

$$\checkmark x = 0 \text{ or } x = 3$$

Q6 · ● Developing · 4 marks

METHOD

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (0)}}{(2 \times 1)}$$

$$x = \frac{3 \pm \sqrt{9}}{2} = \frac{3 \pm 3}{2}$$

$$x = 0 \text{ or } x = 3$$

$$\checkmark a = -9 \text{ or } a = -2$$

Q7 · ● Developing · 4 marks

METHOD

$$a = \frac{-(-11) \pm \sqrt{(-11)^2 - 4 \times 1 \times (18)}}{(2 \times 1)}$$

$$a = \frac{-11 \pm \sqrt{49}}{2} = \frac{-11 \pm 7}{2}$$

$$a = -9 \text{ or } a = -2$$

$$\checkmark a = 1 \text{ or } a = -2/3$$

Q8 · ● Developing · 4 marks

METHOD

$$(3a + 2)(a - 1) = 0$$

$$3a + 2 = 0, \text{ so } a = -2/3$$

$$a - 1 = 0, \text{ so } a = 1$$

$$\checkmark a = 5 \text{ or } a = 2/5$$

Q9 · ● Developing · 4 marks

METHOD

$$(5a - 2)(a - 5) = 0$$

$$5a - 2 = 0, \text{ so } a = 2/5$$

$$a - 5 = 0, \text{ so } a = 5$$

$$\checkmark b = -8 \text{ or } b = 1/2$$

Q10 · ● Developing · 4 marks

METHOD

$$(2b - 1)(b + 8) = 0$$

$$2b - 1 = 0, \text{ so } b = 1/2$$

$$b + 8 = 0, \text{ so } b = -8$$

$$\checkmark x = 8 \pm \sqrt{6}$$

Q11 · ● Secure · 4 marks

METHOD

$$(x + 8)^2 - 64 + 58 = 0$$

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

$$x + 8 = \pm\sqrt{6}$$

$$x = 8 \pm \sqrt{6}$$

$$\checkmark a = -0.37 \text{ or } a = 5.37$$

Q12 · ● Secure · 4 marks

METHOD

$$a = (-(-5) \pm \sqrt{(-5)^2 - 4 \times 1 \times (-2)}) / (2 \times 1)$$

$$a = (5 \pm \sqrt{33}) / 2$$

$$a = -0.37 \text{ or } a = 5.37 \text{ (2 d.p.)}$$

$$\checkmark a = 1 \pm \sqrt{2}$$

Q13 · ● Secure · 4 marks

METHOD

$$(a + 1)^2 - 1 - 1 = 0$$

$$(a + 1)^2 = 2$$

$$a + 1 = \pm\sqrt{2}$$

$$a = 1 \pm \sqrt{2}$$

✓  $a = -3 \pm \sqrt{13}$

Q14 · ● Secure · 4 marks

METHOD

$$(a - 3)^2 - 9 - 4 = 0$$

$$(a - 3)^2 = 13$$

$$a - 3 = \pm\sqrt{13}$$

$$a = -3 \pm \sqrt{13}$$

✓  $n = -0.65$  or  $n = 7.65$

Q15 · ● Secure · 4 marks

METHOD

$$n = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 1 \times (-5)}}{2 \times 1}$$

$$n = \frac{7 \pm \sqrt{69}}{2}$$

$$n = -0.65 \text{ or } n = 7.65 \text{ (2 d.p.)}$$

✓  $b = -1.56$  or  $b = 2.56$

Q16 · ● Secure · 4 marks

METHOD

$$b = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 1 \times (-4)}}{2 \times 1}$$

$$b = \frac{1 \pm \sqrt{17}}{2}$$

$$b = -1.56 \text{ or } b = 2.56 \text{ (2 d.p.)}$$

✓  $b = -0.22$  or  $b = 9.22$

Q17 · ● Secure · 4 marks

METHOD

$$b = \frac{-(-9) \pm \sqrt{(-9)^2 - 4 \times 1 \times (-2)}}{2 \times 1}$$

$$b = \frac{9 \pm \sqrt{89}}{2}$$

$$b = -0.22 \text{ or } b = 9.22 \text{ (2 d.p.)}$$

✓  $n = -6 \pm \sqrt{19}$

Q18 · ● Secure · 4 marks

METHOD

$$(n - 6)^2 - 36 + 17 = 0$$

$$(n - 6)^2 = 19$$

$$n - 6 = \pm\sqrt{19}$$

$$n = -6 \pm \sqrt{19}$$

$$\checkmark x = -1.7 \text{ or } x = 4.7$$

Q19 · ● Secure · 4 marks

METHOD

$$x = (-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times (-8)}) / (2 \times 1)$$

$$x = (3 \pm \sqrt{41}) / 2$$

$$x = -1.7 \text{ or } x = 4.7 \text{ (2 d.p.)}$$

$$\checkmark n = -7 \pm \sqrt{13}$$

Q20 · ● Secure · 4 marks

METHOD

$$(n - 7)^2 - 49 + 36 = 0$$

$$(n - 7)^2 = 13$$

$$n - 7 = \pm \sqrt{13}$$

$$n = -7 \pm \sqrt{13}$$

$$\checkmark x = -0.61 \text{ or } x = 3.28$$

Q21 · ● Greater Depth · 4 marks

METHOD

$$x = (-(-8) \pm \sqrt{(-8)^2 - 4 \times 3 \times (-6)}) / (2 \times 3)$$

$$x = (8 \pm \sqrt{136}) / 6$$

$$x = -0.61 \text{ or } x = 3.28 \text{ (2 d.p.)}$$

$$\checkmark a = -0.11 \text{ or } a = 4.61$$

Q22 · ● Greater Depth · 4 marks

METHOD

$$a = (-(-9) \pm \sqrt{(-9)^2 - 4 \times 2 \times (-1)}) / (2 \times 2)$$

$$a = (9 \pm \sqrt{89}) / 4$$

$$a = -0.11 \text{ or } a = 4.61 \text{ (2 d.p.)}$$

$$\checkmark n = -2.23 \text{ or } n = 0.9$$

Q23 · ● Greater Depth · 4 marks

METHOD

$$n = (-(-4) \pm \sqrt{(-4)^2 - 4 \times 3 \times (-6)}) / (2 \times 3)$$

$$n = (-4 \pm \sqrt{88}) / 6$$

$$n = -2.23 \text{ or } n = 0.9 \text{ (2 d.p.)}$$

✓  $x = -0.41$  or  $x = 2.41$

Q24 · ● Greater Depth · 4 marks

METHOD

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 4 \times (-4)}}{2 \times 4}$$

$$x = \frac{(8 \pm \sqrt{128})}{8}$$

$$x = -0.41 \text{ or } x = 2.41 \text{ (2 d.p.)}$$

✓  $b = -0.66$  or  $b = 2.66$

Q25 · ● Greater Depth · 4 marks

METHOD

$$b = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 4 \times (-7)}}{2 \times 4}$$

$$b = \frac{(8 \pm \sqrt{176})}{8}$$

$$b = -0.66 \text{ or } b = 2.66 \text{ (2 d.p.)}$$

✓  $n = -1.93$  or  $n = 0.93$

Q26 · ● Greater Depth · 4 marks

METHOD

$$n = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 5 \times (-9)}}{2 \times 5}$$

$$n = \frac{(-5 \pm \sqrt{205})}{10}$$

$$n = -1.93 \text{ or } n = 0.93 \text{ (2 d.p.)}$$

✓  $x = 3$

Q27 · ● Greater Depth · 5 marks

METHOD

$$x(x + 4) = 21$$

$$x^2 + 4x - 21 = 0$$

Find two numbers that multiply to -21 and add to 4 -3 and 7

$$(x - 3)(x + 7) = 0$$

$$x = 3 \text{ or } x = -7 \text{ (rejected, } x \text{ must be positive)}$$

$$x = 3$$

✓  $n = -0.36$  or  $n = 0.56$

Q28 · ● Greater Depth · 4 marks

METHOD

$$n = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 5 \times (-1)}}{2 \times 5}$$

$$n = \frac{(1 \pm \sqrt{21})}{10}$$

$$n = -0.36 \text{ or } n = 0.56 \text{ (2 d.p.)}$$

✓  $a = 8$

Q29 · ● Greater Depth · 5 marks

METHOD

$$a(a + 7) = 120$$

$$a^2 + 7a - 120 = 0$$

Find two numbers that multiply to  $-120$  and add to  $7$ :  $-8$  and  $15$

$$(a - 8)(a + 15) = 0$$

$$a = 8 \text{ or } a = -15 \text{ (rejected, } a \text{ must be positive)}$$

$$a = 8$$

✓  $x = -0.31$  or  $x = 1.31$

Q30 · ● Greater Depth · 4 marks

METHOD

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 5 \times (-2)}}{2 \times 5}$$

$$x = \frac{(5 \pm \sqrt{65})}{10}$$

$$x = -0.31 \text{ or } x = 1.31 \text{ (2 d.p.)}$$