

Solving Harder Quadratics Using Factorisation Exam Practice



Q1. a) Factorise: $2x^2 + 19x + 24$

$$(2x + 3)(x + 8)$$

Answer: $(2x + 3)(x + 8)$
(2 marks)

b) Hence solve the equation: $2x^2 + 19x + 24 = 0$

$$(2x + 3)(x + 8) = 0$$

$$2x + 3 = 0, \quad x + 8 = 0$$

$$x = -\frac{3}{2}, \quad x = -8$$

Answer: $x = -\frac{3}{2}, -8$
(2 marks)

Q2. a) Factorise: $3x^2 + 14x - 24$

$$(3x - 4)(x + 6)$$

Answer: $(3x - 4)(x + 6)$
(2 marks)

b) Hence solve the equation: $3x^2 + 14x - 24 = 0$

$$(3x - 4)(x + 6) = 0$$

$$x = \frac{4}{3}, \quad x = -6$$

Answer: $x = \frac{4}{3}, -6$
(2 marks)



Q3. Factorise the following quadratics:

a) $2a^2 - a - 36$

$$(2a - 9)(a + 4)$$

Answer: $(2a - 9)(a + 4)$
(2 marks)

b) $2b^2 - 50$

$$2(b^2 - 25)$$
$$2(b + 5)(b - 5)$$

Answer: $2(b + 5)(b - 5)$
(2 marks)

Q4. a) Factorise: $4c^2 + 12c - 27$

$$(2c - 3)(2c + 9)$$

Answer: $(2c - 3)(2c + 9)$
(2 marks)

b) Hence solve the equation: $4c^2 + 12c - 27 = 0$

$$(2c - 3)(2c + 9) = 0$$

$$c = \frac{3}{2}, c = -\frac{9}{2}$$

Answer: $c = \frac{3}{2}, -\frac{9}{2}$
(2 marks)



Q5. Solve the following equation:

$$5x^2 + 68x = 28$$

$$5x^2 + 68x - 28 = 0$$

$$(5x - 2)(x + 14) = 0$$

$$x = \frac{2}{5}, x = -14$$

Answer: $x = \frac{2}{5}, -14$
(3 marks)

Q6. Solve the following equation:

$$3y^2 - 24y = -48$$

$$3y^2 - 24y + 48 = 0$$

$$y^2 - 8y + 16 = 0$$

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

$$y = 4, y = 4$$

Answer: $y = 4$
(3 marks)



Q7. Solve the following equation:

$$8a^2 = 28a + 16$$

$$8a^2 - 28a - 16 = 0$$

$$2a^2 - 7a - 4 = 0$$

$$(2a + 1)(a - 4)$$

$$a = -\frac{1}{2}, a = 4$$

Answer: $a = -\frac{1}{2}, 4$
(3 marks)

Q8. a) Show that the equation $16 + \frac{12}{x} = 3x$ can be written in the form:

$$3x^2 - 16x - 12 = 0$$

$$16 + \frac{12}{x} = 3x$$

$$\frac{12}{x} = 3x - 16$$

$$12 = 3x^2 - 16x$$

$$0 = 3x^2 - 16x - 12$$

Answer: _____
(3 marks)

b) Hence solve the equation: $16 + \frac{12}{x} = 3x$

$$3x^2 - 16x - 12 = 0$$

$$(3x + 2)(x - 6) = 0$$

$$x = -\frac{2}{3}, 6$$

Answer: $x = -\frac{2}{3}, 6$
(2 marks)



Applied Mixed Practice Problems

Q9. The height h of a ball above the ground in metres, t seconds after it is thrown, is given by the equation, $h = -4t^2 + 22t$. Find the length of time the ball is 24 metres or more above the ground.

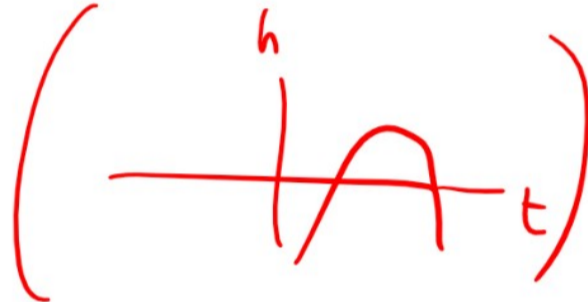
Want $-4t^2 + 22t > 24$

$$4t^2 - 22t + 24 = 0$$

$$2t^2 - 11t + 12 = 0$$

$$(2t - 3)(t - 4) = 0$$

$$t = \frac{3}{2}, 4$$

* By consideration of the graph of h 
the time required is $4 - \frac{3}{2} = 2.5$ seconds

Answer: 2.5 seconds
(5 marks)



Q10. A suspension bridge consisting of 2 vertical towers connected by steel connectors. Each steel connector can be modelled by the quadratic $h = 2d^2 - 13d + 30$ where h is the height of the connector above the driveway; d is the distance from the left vertical tower in 10's of metres.



Find the distance from the left tower when the steel connectors are 12m above the driveway.

$$12 = 2d^2 - 13d + 30$$

$$2d^2 - 13d + 18 = 0$$

$$(2d - 9)(d - 2) = 0$$

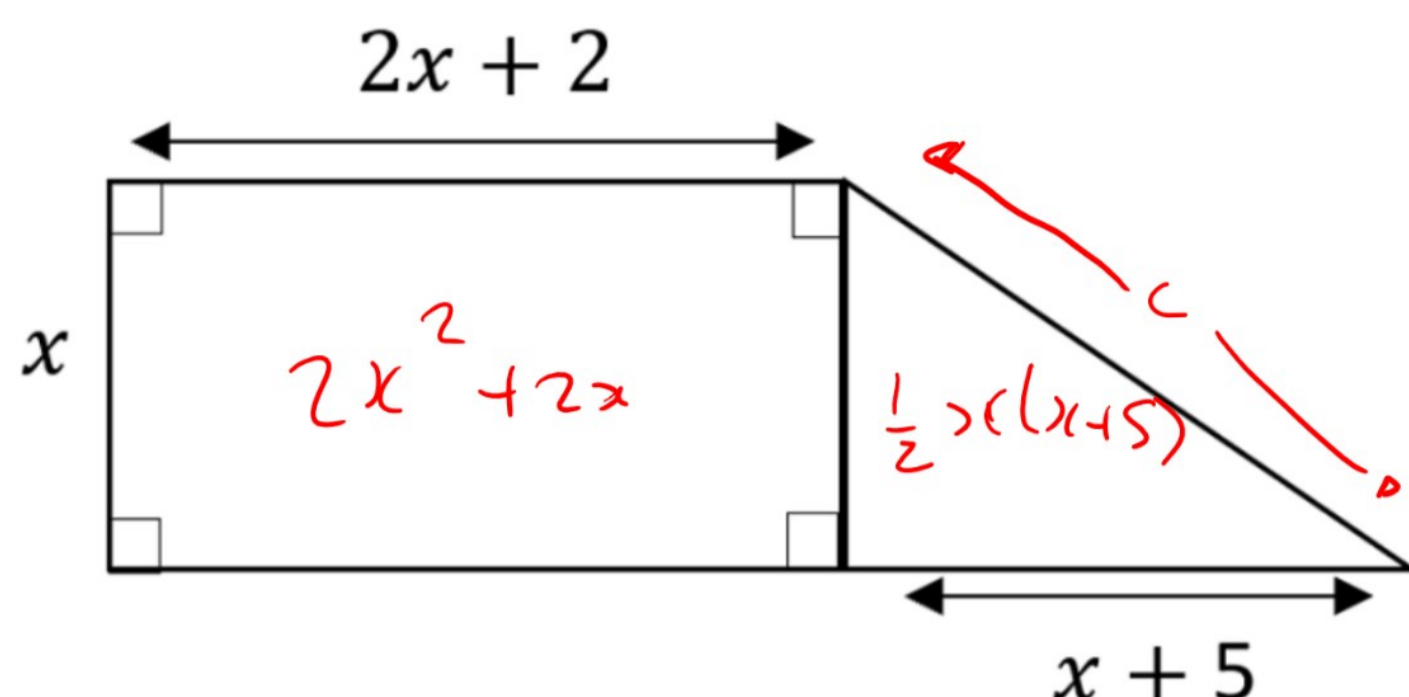
$$d = \frac{9}{2}, 2$$

\Rightarrow the connectors are 12m above the driveway
at 4.5×10 and 2×10 from the left tower.
(45m) (20m)

Answer: 20m, 45m
(5 marks)



Q11. The area of the entire shape below is 40 cm^2 .



a) Show that $5x^2 + 9x - 80 = 0$

$$\text{Total area} = 2x^2 + 2x + \frac{1}{2}x^2 + \frac{5}{2}x$$

$$\frac{5}{2}x^2 + \frac{9}{2}x = 40$$

$$5x^2 + 9x = 80$$

$$5x^2 + 9x - 80 = 0$$

Answer: _____
(5 marks)

b) Find the perimeter of the triangle.

$$5x^2 + 9x - 80 = 0$$

$$(5x - 16)(x + 5) = 0$$

$$x = \frac{16}{5}, -5$$

(accept) (reject)

\Rightarrow perimeter of triangle is $x + x + 5 + c$

$= 11.4 + c$. For c , use Pythagoras:

$$c = \sqrt{3.2^2 + 8.2^2}$$

$$c = 8.80$$

Answer: 20.2 cm
(4 marks)



Q12. Factorise the following expressions fully:

a) $4x^2 + 2xy - 12y^2$

$$(4x - 6y)(x + 2y)$$

Answer: $(4x - 6y)(x + 2y)$
(2 marks)

b) $x^4 - 81$

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

Answer: $(x^2 + 9)(x + 3)(x - 3)$
(2 marks)

