Factorising and Expanding Quadratics Exam Practice

Q1. a) Factorise: $x^2 + 4x - 21$

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

Answer: $(x+7)(x-3)$

(2 marks)

b) Expand and simplify : $(2x + 3)(x + 5)$

$2x^2+3x+10x+15$

$2x^2+13x+15$

Answer: $2x^2+13x+15$

(2 marks)

Q2. a) Factorise: $x^2 - 15x + 44$

$(x-11)(x-4)$

Answer: $(x-11)(x-4)$

(2 marks)

b) Expand and simplify: $(3x + 4)(x - 7)$

$3x^2+4x-21x-28$

$3x^2-17x-28$

Answer: $3x^2-17x-28$

(2 marks)

Q3. a) Factorise $2a^2 - 9a - 10$

$(2a+1)(a-5)$

Answer: $(2a+1)(a-5)$

(2 marks)

b) Expand and simplify $20 + 2b(4 - 8b)$

$20 + 8b - 16b^2$

Answer: $20 + 8b - 16b^2$

(2 marks)

Q4. a) Expand and simplify $(5c - 2)(8 - 7c)$

$40c - 16 - 35c^2 + 14c$

$-35c^2 + 54c - 16$

Answer: $-35c^2 + 54c - 16$

(2 marks)

b) Factorise: $3c^2 - 2c - 16$

$(3c - 8)(c + 2)$

Answer: $(3c-8)(c+2)$

(2 marks)

Q5. a) Expand and simplify $2(3c-2)(8c-1)$

$2(24c^2-16c-3c+2)$

$=48c^2-32c-6c+4$

$=48c^2-38c+4$

Answer: $48c^2-38c+4$

(2 marks)

b) Factorise: c^2-144

$(c-12)(c+12)$

Answer: $(c-12)(c+12)$

(2 marks)

Q6. a) Expand and simplify $(15x-9)(6x+8)$

$90x^2-54x+120x-72$

$90x^2+66x-72$

Answer: $90x^2+66x-72$

(2 marks)

b) Factorise: $2c^2-72$

$2(c^2-36)$

$2(c-6)(c+6)$

Answer: $2(c-6)(c+6)$

(2 marks)

Q7. a) Expand $(3a - 10)^2$

$(3a-10)(3a-10)$

$= 9a^2 - 60a + 100$

Answer: $9a^2-60a+100$

(2 marks)

b) Factorise: $3c^2 - 30000$

$3(c^2-10000)$

$3(c-100)(c+100)$

Answer: $3(c-100)(c+100)$

(2 marks)

Q8. a) Expand and simplify $(4x + 7)(2x - 3) + (x + 3)^2$

$8x^2+14x-12x-21 + x^2+6x+9$

$9x^2+8x-12$

Answer: $9x^2+8x-12$

(3 marks)

b) Simplify $2x(x - 9) + 5(x - 9)$

$2x^2-18x+5x-45$

$2x^2-13x-45$

Answer: $2x^2-13x-45$

(2 marks)

Applied Mixed Practice Problems

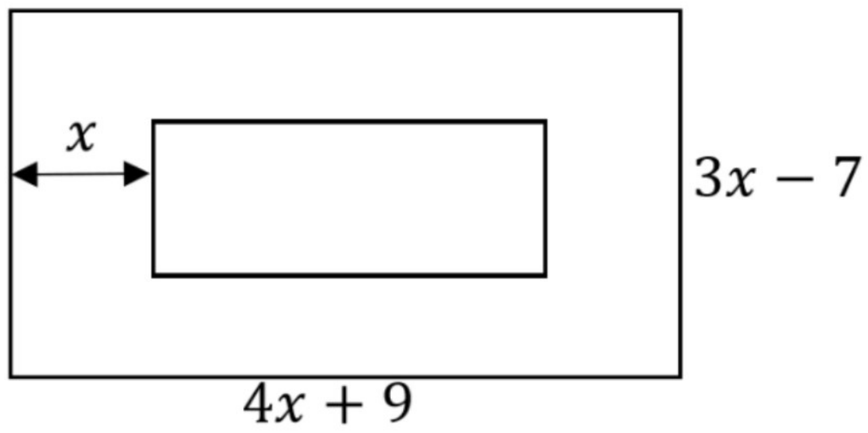
Q9. Let a, b be non-zero numbers. Fill in the table.

Factorised form	Expanded form
$(x-b^2)(x+b^2)$	$x^2 - b^4$
$(2x - 5b)(4x - 3b)$	$8x^2 - 26bx + 15b^2$
$(x+b)(x-a)$	$x^2 + (b - a)x - ab$

Answer: _____

(3 marks)

Q10. Below is a rectangular painting surrounded by a rectangular border.
The width of the border is x cm all the way around.



a) Find an expression for the area of the border.

Total area $= (4x+9)(3x-7)$

$= 12x^2 - x - 63$

Painting area $= (3x+9)(2x-7)$

$= 6x^2 - 3x - 63$

Border $= 12x^2 - x - 63 - (6x^2 - 7x - 63)$

$= 6x^2 + 2x$

Answer: $6x^2 + 2x$

(3 marks)

b) The area of the border is 28 cm^2. Find the width of the border.

$6x^2 + 2x = 28$

$6x^2 + 2x - 28 = 0$

$(6x + 14)(x - 2) = 0$

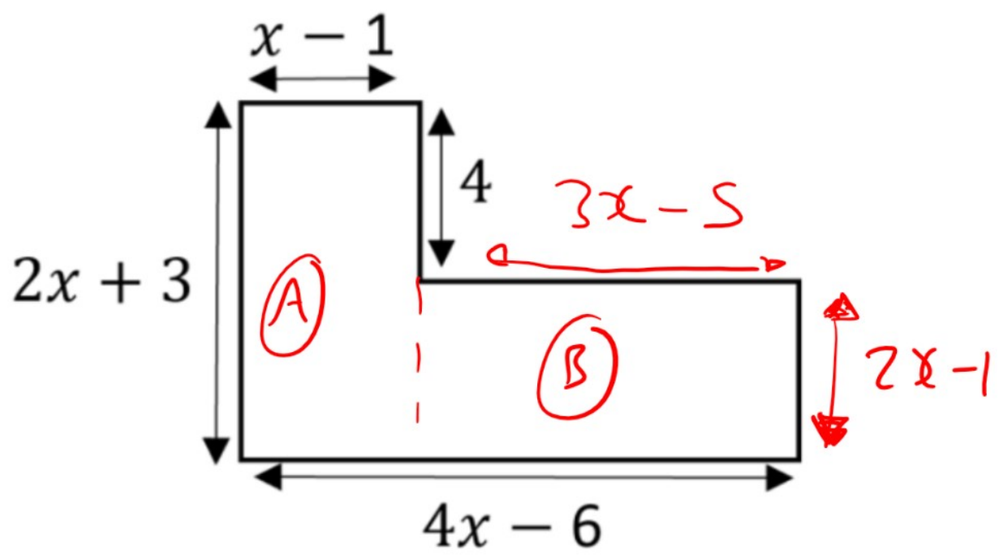
$x = -\frac{7}{3}, 2$

(ring) (accept)

Answer: 2 cm

(2 marks)

Q11. The area of the shape below is 38 cm^2.



Show that $8x^2 - 12x - 36 = 0$, and hence find the value of x.

(A) $(2x+3)(x-1) = 2x^2 + x - 3$

(B) $(3x-5)(2x-1) = 6x^2 - 13x + 5$

Total: $2x^2 + x - 3 + 6x^2 - 13x + 5 = 38$

$8x^2 - 12x + 2 = 38$

$8x^2 - 12x - 36 = 0$

$(8x + 12)(x - 3) = 0$

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

(wired) (accept)

Answer: $x = 3$

(4 marks)

Q12. A right-angled triangle has perpendicular sides of lengths $y + 3$ cm and $2y - 5$ cm.
If the area of the triangle is 10.5 cm^2, show that $2y^2 + y - 36 = 0$ and hence find the dimensions of the triangle.

$\frac{1}{2}(y+3)(2y-5) = \frac{21}{2}$

$2y^2 + y - 15 = 21$

$2y^2 + y - 36 = 0$

$(2y + 9)(y - 4) = 0$

$y = -\frac{9}{2}$, $y = 4$

(reject) (accept)

- Dimensions are $4 + 3$, $2(4) - 5$

7, 3

Answer: 7cm by 3 cm

(5 marks)