



5.7H Expanding and Factorising Quadratics: Higher Tier Practice

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 70 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Expand and simplify fully: $(2x + 3)(x - 5)$.

(Total for Question 1 is 1 mark)

- 2** Expand and simplify fully: $(x + 4)(x + 1) - (x - 2)(x + 3)$.

(Total for Question 2 is 2 marks)

- 3** Factorise fully: $6x^2 - 13x - 5$.

(Total for Question 3 is 3 marks)

- 4** Show that $(x + 2)(x + k)$ expands to $x^2 + (k + 2)x + 2k$. Hence find the value of k if $x^2 + 7x + 10 = (x + 2)(x + k)$.

(a) Show that $(x + 2)(x + k)$ expands to $x^2 + (k + 2)x + 2k$. (1)

(b) Hence find the value of k . (3)

(Total for Question 4 is 4 marks)

5 The quadratic $4x^2 - 12x + p$ is a perfect square trinomial. Find p and write the quadratic as a square of a binomial.

(a) Find p so that $4x^2 - 12x + p$ is a perfect square trinomial. (2)

.....
(b) Write $4x^2 - 12x + 9$ as a square of a binomial. (2)

(Total for Question 5 is 4 marks)

6 Solve the quadratic equation by factorising: $x^2 - x - 30 = 0$. Give answers in exact form.

(Total for Question 6 is 5 marks)

7 Given that $3x^2 + bx - 16 = 0$ has roots $x = 2$ and $x = -8/3$, find the value of b . Show working.

(Total for Question 7 is 5 marks)

8 Show that $x^2 + (m - 3)x + (2 - m)$ is divisible by $x - 1$ for all values of m . Hence find the other (linear) factor.

(a) Show that $x - 1$ is a factor for all m by evaluating the expression at $x = 1$. (2)

(b) Hence find the other linear factor, and write down the full factorisation of the expression. (4)

(Total for Question 8 is 6 marks)

9 Solve the equation $2x^2 - 5x = 3$ by completing the square. Give answers in exact form.

(Total for Question 9 is 6 marks)

Mark scheme · 5.7H Expanding and Factorising Quadratics: Higher Tier Practice

Question 1

- **B1** $2x^2 - 10x + 3x - 15$ simplified to $2x^2 - 7x - 15$ cao
- **Answer:** $2x^2 - 7x - 15$

(Alternatively shown steps with correct simplification.)

Question 2

- **M1** expand both products correctly: $(x^2 + 5x + 4)$ and $(x^2 + x - 6)$ or equivalent
- **A1** $(x^2 + 5x + 4) - (x^2 + x - 6) = x^2 + 5x + 4 - x^2 - x + 6$ simplified to $4x + 10$ cao
- **Answer:** $4x + 10$

Question 3

- **M1** find pair of numbers with product $6 \times (-5) = -30$ and sum -13 , e.g. -15 and 2 , or equivalent method
- **M1** split middle term and factor by grouping to show $(3x + 1)(2x - 5)$ or equivalent
- **A1** $(3x + 1)(2x - 5)$ cao
- **Answer:** $(3x + 1)(2x - 5)$

Question 4

- (a) **B1** expansion shown: $x^2 + kx + 2x + 2k$ leading to $x^2 + (k+2)x + 2k$ oe
- (a) **Answer:** $x^2 + (k+2)x + 2k$
- (b) **M1** equate coefficients: $k + 2 = 7$ and $2k = 10$ or using either equation
- (b) **A1** $k = 5$ from $k + 2 = 7$ cao
- (b) **A1** consistency $2k = 10$ gives $k = 5$ cao
- (b) **Answer:** $k = 5$

Question 5

- (a) **M1** recognise form $(ax)^2 - 2abx + b^2$ or complete the square: $(2x - m)^2$ expands to $4x^2 - 4mx + m^2$
- (a) **A1** match $-4m = -12$ so $m = 3$ then $p = m^2 = 9$ cao
- (a) **Answer:** $p = 9$
- (b) **M1** show rewriting as $(2x - 3)^2$ or equivalent
- (b) **A1** $(2x - 3)^2$ cao
- (b) **Answer:** $(2x - 3)^2$

Question 6

- **M1** factorise to $(x + 5)(x - 6)$ or show factors giving product -30 and sum -1
- **M1** set each factor to zero: $x + 5 = 0$ or $x - 6 = 0$
- **A1** $x = -5$
- **A1** $x = 6$
- **B1** list both solutions as $x = -5, 6$ (exact) cao
- **Answer:** $x = -5$ or $x = 6$

(Exact values)

Question 7

- **M1** use factor form $3(x - r_1)(x - r_2)$ or substitute a root into equation
- **M1** construct factors from roots: factors proportional to $(x - 2)$ and $(x + 8/3)$ or clear fractions to $3(x - 2)(x + 8/3)$
- **M1** expand $3(x - 2)(x + 8/3)$ correctly to get $3x^2 + bx - 16$ or equivalent
- **A1** show $b = -6 + 8 = 2$ or correct evaluation (see working)
- **B1** final answer $b = 2$ cao
- **Answer:** $b = 2$

(Using $3(x - 2)(x + 8/3) \rightarrow$ expand: $3[x^2 + (8/3 - 2)x - 16/3] = 3x^2 + 2x - 16$, so $b = 2$.)

Question 8

- (a) **M1** substitute $x = 1$ into the expression to obtain $1 + (m - 3) + (2 - m)$ or equivalent
- (a) **A1** simplify to 0, independent of m , so $x = 1$ is a root for every value of m and $x - 1$ is always a factor
- (a) **Answer:** $f(1) = 1 + (m - 3) + (2 - m) = 0$ for every value of m , so $x - 1$ is always a factor.
- (b) **M1** attempt polynomial division (or write $x^2 + (m-3)x + (2-m) = (x-1)(x+c)$ and compare coefficients)
- (b) **A1** correct method leading to quotient $x + m - 2$ (e.g. bring down terms of the division, or match coefficients $c - 1 = m - 3$)
- (b) **M1** check the constant term: $-c = 2 - m$ gives $c = m - 2$, consistent with the x coefficient
- (b) **A1** full factorisation $x^2 + (m - 3)x + (2 - m) = (x - 1)(x + m - 2)$ cao
- (b) **Answer:** The other factor is $x + m - 2$. Full factorisation: $x^2 + (m - 3)x + (2 - m) = (x - 1)(x + m - 2)$.

Question 9

- **M1** rearrange to $2x^2 - 5x - 3 = 0$ or isolate quadratic and linear terms: $2x^2 - 5x = 3 \rightarrow 2x^2 - 5x - 3 = 0$
- **M1** divide by 2 to prepare for completing the square: $x^2 - (5/2)x - 3/2 = 0$
- **M1** complete the square: $x^2 - (5/2)x + (25/16) = 3/2 + 25/16$ or show adding $(5/4)^2$
- **M1** write $(x - 5/4)^2 = (24/16 + 25/16) = 49/16$ or equivalent arithmetic
- **A1** take square roots to get $x - 5/4 = \pm 7/4$
- **A1** $x = 3$ or $x = -1/2$ cao
- **Answer:** $x = 3$ or $x = -1/2$

(Exact values)