



## KS3.M-A14 Introduction to Factorising Quadratics

AQA KS3.M-A14 · Calculators not allowed · about 75 minutes

Name: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Answer ALL questions. Show all your working.**

**1** Factorise the quadratic expression fully:  $x^2 + 5x + 6$

(1)

**2** Factorise:  $x^2 + 2x - 8$

(1)

**3** Factorise:  $x^2 - 7x + 12$

(1)

**4** Factorise fully:  $x^2 + 9x + 20$

(2)

**5** Factorise fully:  $x^2 - x - 6$

(2)

**6** Given that  $(x + 3)(x + 4) = x^2 + bx + c$ , state the values of  $b$  and  $c$ .

(2)

**7** Multiply out  $(x + 5)(x - 2)$  and then factorise your answer to show you get back the original factors.

(2)

**8** Factorise the difference of two squares:  $x^2 - 9$

(2)

**9** Factorise fully:  $4x^2 - 36$

(2)

**10** Factorise  $x^2 + 6x + 5$  and use the factorised form to solve  $x^2 + 6x + 5 = 0$

(3)

**11** Factorise  $x^2 + 11x + 30$  and hence find the values of  $x$  for which the expression equals zero.

(3)

**12** Factorise fully and solve  $x^2 - 5x - 24 = 0$

(3)

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**13** Expand  $(x + 4)(x - 1)$  to form a quadratic. Then find all  $x$  such that this quadratic equals 6.

(4)

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**14** Factorise  $x^2 + 13x + 36$  fully and state the roots of the quadratic equation  $x^2 + 13x + 36 = 0$ .

(4)

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**15** The product of two consecutive integers is 56. Let the smaller integer be  $x$ . (a) Write an equation in  $x$ . (b) Solve the equation to find the positive integer.

(5)

**16** Factorise fully:  $9x^2 - 25$

(3)

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**17** Given  $f(x) = x^2 + 15x + 56$ , (a) factorise  $f(x)$  fully, (b) find  $f(-10)$ .

(a) Factorise  $f(x) = x^2 + 15x + 56$

(2)

(b) Find  $f(-10)$ .

(2)

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**18** Show that  $x^2 + 6x + 9$  can be written as  $(x + 3)^2$ . Use this to explain why  $x^2 + 6x + 9$  is never negative for any real  $x$ . Give the value(s) of  $x$  for which the expression equals 0.

(6)

## Mark scheme · KS3.M-A14 Introduction to Factorising Quadratics

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### Question 1

- **B1** Correct factorisation  $(x + 2)(x + 3)$  cao
- Answer:  **$(x + 2)(x + 3)$**

### Question 2

- **B1** Correct factorisation  $(x + 4)(x - 2)$  cao
- Answer:  **$(x + 4)(x - 2)$**

### Question 3

- **B1** Correct factorisation  $(x - 3)(x - 4)$  cao
- Answer:  **$(x - 3)(x - 4)$**

### Question 4

- **M1** Identify two numbers multiply to 20 and add to 9
- **A1** Correct factorisation  $(x + 4)(x + 5)$  cao
- Answer:  **$(x + 4)(x + 5)$**

### Question 5

- **M1** Find two numbers multiply to -6 and add to -1
- **A1** Correct factorisation  $(x - 3)(x + 2)$  cao
- Answer:  **$(x - 3)(x + 2)$**

### Question 6

- **M1** Multiply out to get  $x^2 + 7x + 12$  or equivalent
- **A1**  $b = 7$  and  $c = 12$  cao
- Answer:  **$b = 7, c = 12$**

### Question 7

- **M1** Correct expansion  $x^2 + 3x - 10$
- **A1** Correct factorisation back to  $(x + 5)(x - 2)$  cao
- Answer: **Expansion:  $x^2 + 3x - 10$ ; Factorised:  $(x + 5)(x - 2)$**

### Question 8

- **M1** Recognise  $9 = 3^2$  and use difference of squares method
- **A1** Correct factorisation  $(x - 3)(x + 3)$  cao
- Answer:  **$(x - 3)(x + 3)$**

### Question 9

- **M1** Factor out common factor 4 to get  $4(x^2 - 9)$
- **A1** Complete factorisation  $4(x - 3)(x + 3)$  cao
- Answer:  **$4(x - 3)(x + 3)$**

### Question 10

- **M1** Correct factorisation  $(x + 1)(x + 5)$  or equivalent
- **A1** Set each factor to zero:  $x + 1 = 0$ ,  $x + 5 = 0$
- **A1** Correct solutions  $x = -1$  and  $x = -5$  cao
- Answer:  **$x = -1, x = -5$**

### Question 11

- **M1** Factorise correctly as  $(x + 5)(x + 6)$  or equivalent
- **A1** Set each factor to zero method shown
- **A1** Correct roots  $x = -5$  and  $x = -6$  cao
- **Answer:  $x = -5, x = -6$**

### Question 12

- **M1** Factorise correctly to  $(x - 8)(x + 3)$  or equivalent
- **A1** Set factors to zero shown ( $x - 8 = 0, x + 3 = 0$ )
- **A1** Correct solutions  $x = 8$  and  $x = -3$  cao
- **Answer:  $x = 8, x = -3$**

### Question 13

- **M1** Correct expansion  $x^2 + 3x - 4$
- **M1** Move 6 to make equation  $x^2 + 3x - 10 = 0$
- **M1** Correct factorisation  $(x + 5)(x - 2)$  or equivalent
- **A1** Correct solutions  $x = -5$  and  $x = 2$  cao
- **Answer:  $x = -5, x = 2$**

### Question 14

- **M1** Identify two numbers multiply to 36 and add to 13
- **M1** Correct factorisation  $(x + 4)(x + 9)$
- **A1** Set factors to zero method shown
- **A1** Correct roots  $x = -4$  and  $x = -9$  cao
- **Answer:  $x = -4, x = -9$**

### Question 15

- **M1** Correct equation  $x(x + 1) = 56$  or equivalent shown
- **M1** Rearrange to  $x^2 + x - 56 = 0$
- **M1** Correct factorisation  $(x + 8)(x - 7)$  or equivalent
- **A1** Correct solutions  $x = 7$  and  $x = -8$
- **A1** State positive integer is 7 cao
- **Answer: 7**

### Question 16

- **M1** Recognise as difference of squares  $9x^2 - 25 = (3x)^2 - 5^2$
- **A1** Correct factorisation  $(3x - 5)(3x + 5)$  cao
- **B1** Both linear factors given in correct order or equivalent
- **Answer:  $(3x - 5)(3x + 5)$**

### Question 17

- (a) **M1** Identify two numbers multiply to 56 and add to 15
- (a) **A1** Correct factorisation  $(x + 7)(x + 8)$  cao
- (a) **Answer:  $(x + 7)(x + 8)$**
- (b) **M1** Substitute -10 into  $x^2 + 15x + 56$  and evaluate method shown
- (b) **A1** Correct value  $f(-10) = 6$  cao
- (b) **Answer: 6**

### Question 18

- **M1** Complete the square or expand  $(x + 3)^2$  showing  $x^2 + 6x + 9$
- **M1** State the identity  $x^2 + 6x + 9 = (x + 3)^2$  explicitly
- **A1** Explain that a square is always  $\geq 0$ , so  $(x + 3)^2 \geq 0$  for all real  $x$
- **M1** Conclude that  $x^2 + 6x + 9$  is never negative by following from the square property
- **A1** State that the minimum value is 0 and it occurs when  $x + 3 = 0$
- **A1** Give the value  $x = -3$  for which the expression equals 0
- **Answer:  $x = -3$**