HIGHER

7.5 Factorising Harder Quadratics: Test Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Factorise $x^2 - 49$

(Total for Question 1 is 1 mark)

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2 Factorise $2x^2 - 11x + 14$

(Total for Question 2 is 2 marks)

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3 Factorise fully $5x^2 - 180$

(Total for Question 3 is 3 marks)

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4 Solve $3x^2 + 4x = 7$

(Total for Question 4 is 4 marks)

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5 Solve $2x^2 - 5x - 3 = 0$ by factorising.

(Total for Question 5 is 3 marks)

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6 Factorise fully $12x^2 - 17x + 6$

(Total for Question 6 is 3 marks)

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7 A rectangle has area $(2x^2 + x - 6)$ cm^2. One side of the rectangle has length $(x + 2)$ cm.

Diagram NOT accurately drawn



$(x + 2)$ cm

$(2x^2 + x - 6)$ cm^2

(a) Show that the length of the other side is $(2x - 3)$ cm. **(2)**

(b) Given that $x = 6$, work out the perimeter of the rectangle. **(2)**

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(Total for Question 7 is 4 marks)

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8 A student is asked to factorise $4x^2 - 16$ fully. The student writes: $4x^2 - 16 = (2x - 4)(2x + 4)$.

(a) Explain why the student's answer is not fully factorised, even though it is mathematically correct. **(1)**

(b) Write down the fully factorised form of $4x^2 - 16$. **(1)**

(Total for Question 8 is 2 marks)

9 n is a positive integer. Two consecutive odd numbers can be written as $(2n + 1)$ and $(2n - 1)$. Prove that the difference of their squares is always a multiple of 8.

(Total for Question 9 is 3 marks)

10 Two positive integers, p and q, with p greater than q, satisfy $p^2 - q^2 = 45$. Given also that $p - q = 3$, find the value of p and the value of q.

(Total for Question 10 is 4 marks)

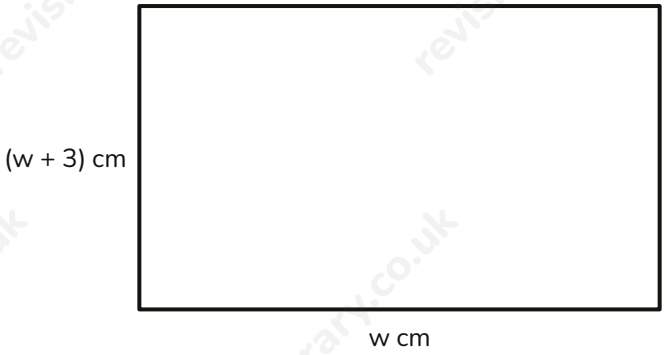
11 Simplify fully $(2x^2 + 7x + 3) / (x^2 - 9)$

(Total for Question 11 is 3 marks)

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12 A rectangle has width w cm and length (w + 3) cm. The area of the rectangle is 40 cm² greater than 6 times its width. Form and solve a quadratic equation to find the width of the rectangle.

Diagram NOT accurately drawn



(Total for Question 12 is 4 marks)

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13 Factorise fully $6x^2 + xy - 12y^2$, giving your answer in terms of x and y.

(Total for Question 13 is 3 marks)

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14 By substituting $y = x^2 - 2x$, or otherwise, solve $(x^2 - 2x)^2 - 5(x^2 - 2x) - 24 = 0$, giving all real solutions for x.

(Total for Question 14 is 4 marks)

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Mark scheme · 7.5 Factorising Harder Quadratics: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

(x - 7)(x + 7) cao **B1**

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

Question 2

(ax + p)(bx + q) with two of the three terms correct when expanded **M1**

(x - 2)(2x - 7) **A1**

Answer: (x - 2)(2x - 7)

Question 3

common factor or difference of two squares identified **M1**

difference of two squares factorised **M1**

5(x - 6)(x + 6) **A1**

Answer: 5(x - 6)(x + 6)

Question 4

rearranges to $3x^2 + 4x - 7 = 0$ **M1**

factorises correctly **M1**

one correct solution **A1**

x = -7/3 or x = 1 **A1**

Answer: x = -7/3 or x = 1

Question 5

finds two numbers with product -6 (2 x -3) and sum -5 (-6 and 1) **M1**

(2x + 1)(x - 3) = 0 seen, or ft their factorisation **M1**

x = -1/2 and x = 3 oe, both values required **A1**

Answer: x = -1/2 or x = 3

Question 6

finds two numbers with product 72 (12 x 6) and sum -17 (-8 and -9) **M1**

splits middle term correctly, e.g. $12x^2 - 8x - 9x + 6$, and groups into two pairs **M1**

(3x - 2)(4x - 3) cao **A1**

Answer: (3x - 2)(4x - 3)

Question 7

(a) factorises $2x^2 + x - 6$ as (x + 2)(2x - 3), or divides $2x^2 + x - 6$ by (x + 2) **M1**

(a) cso: correctly shows the other side is (2x - 3) cm, no errors seen **A1**

(a) Answer: 2x - 3 cm (shown)

(b) substitutes x = 6 into both (x + 2) and (2x - 3) to find 8 cm and 9 cm, or uses P = 2(x + 2) + 2(2x - 3) with x = 6 **M1**

(b) 34 cm cao **A1**

(b) Answer: 34 cm

Question 8

(a) identifies that each bracket, (2x - 4) and (2x + 4), still has a common factor of 2 that has not been taken out, oe **B1**

(a) Answer: Each bracket has a common factor of 2, so the expression has not been factorised fully.

(b) 4(x - 2)(x + 2) oe cao **B1**

(b) Answer: 4(x - 2)(x + 2)

Question 9

writes the difference of two squares $(2n+1)^2 - (2n-1)^2$ and factorises as [(2n+1)-(2n-1)][(2n+1)+(2n-1)] **M1**

simplifies brackets correctly to (2)(4n) **M1**

cso: concludes = 8n, which is a multiple of 8 for all integer n, fully justified **A1**

Answer: $(2n+1)^2 - (2n-1)^2 = 8n$, a multiple of 8 (proven)

Question 10

uses the difference of two squares to write $p^2 - q^2 = (p - q)(p + q)$ **M1**

substitutes p - q = 3 into 3(p + q) = 45 to obtain p + q = 15 **M1**

solves the simultaneous equations p - q = 3 and p + q = 15 **M1**

p = 9 and q = 6, both values required **A1**

Answer: p = 9, q = 6

Question 11

factorises numerator: (2x + 1)(x + 3) **M1**

factorises denominator: (x - 3)(x + 3) **M1**

(2x + 1) / (x - 3) cao, after cancelling the common factor (x + 3) **A1**

Answer: (2x + 1) / (x - 3)

Question 12

forms the equation w(w + 3) = 6w + 40 oe **M1**

rearranges to $w^2 - 3w - 40 = 0$ oe **M1**

factorises and solves to obtain w = 8 or w = -5 **M1**

w = 8 cm cao, with the negative solution rejected since width cannot be negative **A1**

Answer: w = 8 cm

Question 13

attempts to factorise into two linear brackets in x and y, e.g. finds a factor pair for 6 and a factor pair for -12 that combine to give a coefficient of 1 for xy **M1**

writes down brackets with correct x and y terms, allowing at most one sign error, e.g. (2x + 3y)(3x - 4y) **M1**

(2x + 3y)(3x - 4y) cao **A1**

Answer: (2x + 3y)(3x - 4y)

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Question 14

substitutes $y = x^2 - 2x$ to rewrite the equation as $y^2 - 5y - 24 = 0$	**M1**
factorises and solves to obtain $y = 8$ or $y = -3$	**M1**
forms $x^2 - 2x - 8 = 0$ from $y = 8$ and factorises/solves it, dependent on both previous M marks	**dM1**
$x = 4$ and $x = -2$ only cao, with the $y = -3$ branch correctly rejected since $x^2 - 2x + 3 = 0$ has discriminant $4 - 12 = -8$, which is negative, so gives no real solutions	**A1**

Answer: x = 4 or x = -2

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