

QQQ – Pure Year 1 – Chapter 1 – Expanding & Factorising (Version 1)

Total Marks: 24

(24 = Platinum, 22 = Gold, 19 = Silver, 16 = Bronze)

1. Express $2x(x + 3) + 5x^2 - 2(x - 3)$ in the form $ax^2 + bx + c$, where a , b and c are integers to be determined.

[3]

(Total 3 marks)

OCR MEI June 2024 Paper 2 Q1

2. Expand and simplify fully $(3x - 1)(4 - x)(2x + 5)$

[3 marks]

(Total 3 marks)

AQA June 2024 Paper 2 Q13

3. In the expansion and simplification of $(x - 3)(x^2 + 5x + k)$ the coefficient of x^2 is equal to the coefficient of x .

k is a constant.

Work out the value of k .

[3 marks]

(Total 3 marks)

AQA June 2018 Paper 1 Q5

4. Factorise fully $x^4 - 81$

[2 marks]

(Total 2 marks)

AQA June 2016 Paper 1 Q18

5. Factorise fully $25x - 9x^3$

(3)

(Total 3 marks)

Edexcel C1 June 2014 (R) Q1

6. Solve by factorising $2x^3 - 9x^2 - 5x = 0$

[3 marks]

(Total 3 marks)

AQA June 2024 Paper 1 Q8

7.

(a) Factorise fully $12pq^3r - 18pq^2r^2 + 24pq^2r$ [2 marks]

(b) Factorise fully $6(y + 3)^5 + 4(y + 3)^4$

Give your answer in its simplest form.

Do **not** attempt to expand $(y + 3)^5$ or $(y + 3)^4$ [3 marks]

(c) Factorise fully $48 - 75x^2$ [2 marks]

(Total 7 marks)

Solutions

1.

Scheme	Marks	AO
$7x^2 + 4x + 6$	B1	1.1
	B1	1.1
	B1	1.1
	[3]	

Notes

one mark for each correct term

2.

Answer	Mark	Comments
Alternative method 1: expands $(3x - 1)(4 - x)$ first		
Exactly 4 terms with at least 3 correct from $(+)12x \quad - 3x^2 \quad - 4 \quad (+)x$	M1	oe eg $13x - 3x^2 - 4$ terms may be seen in a grid implied by $13x - 3x^2 + k$ or $13x + px^2 - 4$ where k and p are non-zero constants
Full expansion of their 3 or 4 term quadratic with $(2x + 5)$ with correct multiplication of their 3 or 4 terms by $2x$ or by $(+)5$	M1	eg $24x^2 - 6x^3 - 8x + 2x^2 + 60x - 15x^2 - 20 + 5x$ or $26x^2 - 6x^3 - 8x + 65x - 15x^2 - 20$ terms may be seen in a grid
$-6x^3 + 11x^2 + 57x - 20$	A1	terms in any order

Alternative method 2: expands $(4 - x)(2x + 5)$ first		
Exactly 4 terms with at least 3 correct from $(+)8x \quad (+)20 \quad - 2x^2 \quad - 5x$	M1	oe eg $3x + 20 - 2x^2$ terms may be seen in a grid implied by $3x + 20 + kx^2$ or $3x + p - 2x^2$ where k and p are non-zero constants
Full expansion of their 3 or 4 term quadratic with $(3x - 1)$ with correct multiplication of their 3 or 4 terms by $3x$ or by -1 (corrected from the printed mark scheme: printed as $(3x + 1)$)	M1	eg $24x^2 + 60x - 6x^3 - 15x^2 - 8x - 20 + 2x^2 + 5x$ or $9x^2 + 60x - 6x^3 - 3x - 20 + 2x^2$ terms may be seen in a grid
$-6x^3 + 11x^2 + 57x - 20$	A1	terms in any order
Alternative method 3: expands $(3x - 1)(2x + 5)$ first		
Exactly 4 terms with at least 3 correct from $(+)6x^2 \quad (+)15x \quad - 2x \quad - 5$	M1	oe eg $6x^2 + 13x - 5$ terms may be seen in a grid implied by $6x^2 + 13x + k$ or $px^2 + 13x - 5$ where k and p are non-zero constants
Full expansion of their 3 or 4 term quadratic with $(4 - x)$ with correct multiplication of their 3 or 4 terms by 4 or by $-x$	M1	eg $24x^2 + 60x - 8x - 20 - 6x^3 - 15x^2 + 2x^2 + 5x$ or $24x^2 + 52x - 20 - 6x^3 - 13x^2 + 5x$

		terms may be seen in a grid
$-6x^3 + 11x^2 + 57x - 20$	A1	terms in any order

Additional guidance

M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts	
Condone one transcription error for A1 after fully correct answer seen	
Alt 1 $12x + 3x^2 - 5 + x$ only 2 terms correct $(12x + 3x^2 - 5 + x)(2x + 5)$ $= 24x^2 + 6x^3 - 10x + 2x^2 + 17x + 15x^2 + 25 + 5x^2$ 8 terms (full expansion) with correct multiplication of their 4 terms by $2x$	M0 M1
Alt 2 $3x + 20 + 2x^2$ implied 4 terms with 3 correct $(3x - 1)(3x + 20 + 2x^2)$ $= 6x^2 + 60x + 5x^3 - 3x - 20 - 2x^2$ 6 terms (full expansion) with correct multiplication of their 3 terms by -1	M1 M1
If the 1st M1 is scored with a 4-term expansion but this is then incorrectly simplified to 3 terms, the 2nd M1 can still be scored using their 3 terms	
Accept eg $+ - 3x^2$ as a correct term for M marks but not for A1	
M2A1 response followed by further work eg1 $-6x^3 + 11x^2 + 57x - 20$ in working with answer $x(-6x^2 + 11x + 57) - 20$ eg2 $-6x^3 + 11x^2 + 57x - 20$ in working with answer $-(6x^3 - 11x^2 - 57x + 20)$	M2AO M2AO
One single expansion is full marks or zero	

3.

Answer	Mark	Comments
$(x^3) + 5x^2 + kx - 3x^2 - 15x (-3k)$	M1	allow one sign error in the x^2 or x terms
their $(5 - 3) =$ their $(k - 15)$	M1dep	$5x^2 - 3x^2 = kx - 15x$ on its own, is not enough for M1dep
17	A1	

Additional guidance

For the first M1, we do not need to see the x^3 term or the $-3k$ term, but we do need to see the other 4 terms (3 terms, if they combine the x^2 terms).

The terms of the expansion might appear in a grid, which can score the first M1

Mark positively ... terms in a grid might differ from terms written as a string of terms ... mark the better version.

4.

Answer	Mark	Comments
$(x^2 - 9)(x^2 + 9)$ or $(x + 3)(x^3 - 3x^2 + 9x - 27)$ or $(x - 3)(x^3 + 3x^2 + 9x + 27)$	M1	
$(x + 3)(x - 3)(x^2 + 9)$	A1	Do not award A1 if further working

5.

Scheme	Marks
$25x - 9x^3 = x(25 - 9x^2)$	B1
$(25 - 9x^2) = (5 + 3x)(5 - 3x)$	M1
$25x - 9x^3 = x(5 + 3x)(5 - 3x)$	A1
	(3)

Notes

B1: Take out a common factor, usually x , to produce $x(25 - 9x^2)$. Accept $(x \pm 0)(25 - 9x^2)$ or $-x(9x^2 - 25)$ Must be correct.

Other possible options are $(5 + 3x)(5x - 3x^2)$ or $(5 - 3x)(5x + 3x^2)$

M1: For factorising their quadratic term, usually $(25 - 9x^2) = (5 + 3x)(5 - 3x)$ Accept sign errors
If $(5 \pm 3x)$ has been taken out as a factor first, this is for an attempt to factorise $(5x \mp 3x^2)$

A1: cao $x(5 + 3x)(5 - 3x)$ or any equivalent with three factors

e.g. $x(5 + 3x)(-3x + 5)$ or $x(3x - 5)(-3x - 5)$ etc including $-x(3x + 5)(3x - 5)$

isw if they go on to show that $x = 0, \pm \frac{5}{3}$

6.

Answer	Mark	Comments
$x(2x^2 - 9x - 5)$ or $(2x^2 + x)(x - 5)$ or $(2x + 1)(x^2 - 5x)$ or states $x = 0$ and $(2x^2 - 9x - 5)$	M1	
$x(2x + 1)(x - 5)$ or states $x = 0$ and $(2x + 1)(x - 5)$	M1dep	do not accept $x(2x + 1)(2x - 10)$ unless recovered by correct solutions
$(x =) 0, 5, -0.5$	A1	oe but must come from factorising in M1dep

Additional guidance

$(2x + 1)(x - 5)$ if no other marks scored	SC1
$(x =) 0, 5, -0.5$ without working or by using factor theorem to find solutions without writing it as a product of factors or by using quadratic formula (must be all 3 correct answers)	SC1

7.

Mark scheme (a)

Answer	Mark	Comments
$6pq^2r(2q - 3r + 4)$	B2	B1 correct factorised expression with a common factor involving at least two variables eg $pq(12q^2r - 18qr^2 + 24qr)$ or $2q^2r(6pq - 9pr + 12p)$ or common factor $6pq^2r$ with two out of the three terms in the bracket correct eg $6pq^2r(2q - 3r + 4p)$

Additional guidance

B2 answer followed by further work	B1
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$6pq^2r(2q - 3r + 4)$ in working with $6qp^2r(2q - 3r + 4)$ on answer line	B1
B1 answer followed by further work	B1
$2q^2r(6pq - 9pr + 12p)$ in working with $2p^2r(6pq - 9pr + 12p)$ on answer line	B1
Use of multiplication signs scores a maximum of B1	
$qpq(12qr - 18r^2 + 24r)$	B1
$6pqrq(2q - 3r + 4)$	B1

Mark scheme (b)

Answer	Mark	Comments
Correct factorised expression with a common factor	M1	eg $(y + 3)[6(y + 3)^4 + 4(y + 3)^3]$ or $2[3(y + 3)^5 + 2(y + 3)^4]$ or $2(y + 3)^2[3(y + 3)^3 + 2(y + 3)^2]$
$2(y + 3)^4[3(y + 3) + 2]$ or $2(y + 3)^4(3y + 9 + 2)$ or $(y + 3)^4[6(y + 3) + 4]$ or $(y + 3)^4(6y + 18 + 4)$ or $(y + 3)^4(6y + 22)$	A1	
$2(y + 3)^4(3y + 11)$	A1	

Additional guidance

Use of multiplication signs scores a maximum of M1A1A0	
Any combination of bracket shape may be used	
Correct answer followed by further work	M1A1A0
Incorrect notation eg $(y + 3)^4 2(3y + 11)$	M1A1A0
$(2)(y + 3)^4(3y + 11)$ or $(2(y + 3)^4)(3y + 11)$	M1A1A1
Allow substitution eg $n = (y + 3)$ for M1A1 but must revert to $(y + 3)$ for final mark	
Missing brackets must be recovered eg $(y + 3)^4 6y + 22$ with M1 not seen	Zero

Mark scheme (c)

Answer	Mark	Comments
$3(4 + 5x)(4 - 5x)$ or $3(-4 - 5x)(5x - 4)$ or $-3(4 + 5x)(5x - 4)$ or $-3(-4 - 5x)(4 - 5x)$	B2	B1 Partial factorisation eg $3(16 - 25x^2)$ or $-3(25x^2 - 16)$ or $(12 + 15x)(4 - 5x)$ or $(12 - 15x)(4 + 5x)$

Additional guidance

Brackets in either order for B2 or B1	
$-(75x^2 - 48)$	B0
$(-5x + 4)$ is equivalent to $(4 - 5x)$ etc	
Incorrect notation eg $(4 + 5x)3(4 - 5x)$	B1
Use of surds eg $(\sqrt{48} + \sqrt{75}x)(\sqrt{48} - \sqrt{75}x)$ or $(4\sqrt{3} + 5\sqrt{3}x)(4\sqrt{3} - 5\sqrt{3}x)$	B1
Use of multiplication signs scores a maximum of B1 eg $3 \times (4 + 5x)(4 - 5x)$	B1
B2 answer followed by further work	B1
B1 answer followed by further work	B1
Missing brackets must be recovered eg $3 \times 16 - 25x^2$	B0