



MARKING SCHEME

**LEVEL 2 CERTIFICATE IN ADDITIONAL
MATHEMATICS**

SUMMER 2013

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in LEVEL 2 CERTIFICATE IN ADDITIONAL MATHEMATICS. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Q	Additional Mathematics Summer 2013	Marks	Final
5	$9x^2 - 1 - 1 + x^2 + 3 - 12x^2 (= -199)$ $-2x^2 + 1 (= -199)$ $2x^2 = 200$ or $2x^2 - 200 = 0$ $(x^2 = 100$ or $2(x^2 - 100) = 0$) $x = (\pm)\sqrt{100}$ or (2) $(x + 10)(x - 10) = 0$ Both $x = 10$ AND $x = -10$	M1 A1 M1 m1 A1 5	Allow 1 error. Allow with sight of compensating x terms CAO FT quadratic provided ≤ 2 errors in simplification An answer from working of $x=10$ implies M1 m1 Do not FT to m1 if $\sqrt{\text{of negative value}}$, if quadratic formula used then b^2-4ac must be simplified CAO
6	$x+1 = x^2 + 2x - 3$ $x^2 + x - 4 = 0$ $x = \{-1 \pm \sqrt{(1^2 - 4 \times 1 \times -4)}\} / 2$ $x = \{-1 \pm \sqrt{17}\} / 2$ $x = 1.56$ and $x = -2.56$ $x = 1.56, y = 2.56$ and $x = -2.56, y = -1.56$	M1 A1 m1 A1 A1 A1 6 A1	Must be equate to zero FT provided their quadratic does not factorise and equivalent level of difficulty Use of quadratic formula, allow 1 slip in substitution Alternative using $x = y - 1$: M1 $y = (y-1)^2 + 2(y-1) - 3$ or $y = y^2 - 4$ A1 $y^2 - y - 4 = 0$ (equate to zero) m1 $y = \{1 \pm \sqrt{(1^2 - 4 \times 1 \times -4)}\} / 2$ A1 $y = (1 \pm \sqrt{17}) / 2$ A1 $y = 2.56$ and $y = -1.56$ A1 $x = 1.56, y = 2.56$ and $x = -2.56, y = -1.56$
7	(a) $432x^7$ (b) $3/5 x^5 - 1/(2x^2) + 4x$ + c (constant) (c) $6x^6/6 + 5x$ $[6x^6/6 + 5x]^3$ $=(3^6 + 15) - (2^6 + 10)$ $= 670$	B2 B3 B1 B2 M1 A1 A1 11	B1 for sight of $54x^8$. FT to 2 nd B1 from $dy/dx = kx^n$ B1 for each term. Accept unsimplified $+x^{-2}/-2$ ISW Awarded if at least B1 for integration B1 for $6x^6/6$ or $5x$ FT their integration, not original. Intention to use 3, 2 and subtract FT for correct use of limits CAO, not FT. <i>Answer only, no working shown M0 A0 A0</i>
8	(a) $7(2)^3 - 4(2)^2 + (2) - 2 (= 56 - 16 + 2 - 2)$ $= 40$ (b)(i) Substitute $x = -3$ Showing $f(-3) = 0$ (ii) $(x+3)(x^2 + bx + c)$ or intention to divide by $(x+3)$ with x^2 shown $((x+3) \) (x^2 + x - 20)$ $((x+3) \) (x - 4)(x + 5)$	M1 A1 M1 A1 M1 A2 A1 8	Or division method giving $7x^2 + 10x \dots$ Or division method giving $x^2 + x \dots$ Accept sight of substitution with equate to zero A1 for $+1x$ or -20 . Or use of factor theorem A1 $(x-4)$, A1 $(x+5)$ CAO. Final answer, but ignore sight of “=0”

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9	<p>Strategy: e.g. need to use 14° and 6.3cm AND 3D visualised $EC = 6.3/\tan 14$</p> <p>$EC = 25(.2679\dots\text{cm})$</p> <p>$\tan ECH = 17.3/EC$ $\angle ECH = \tan^{-1} 0.68\dots$ $34(.39\dots^\circ)$</p>	<p>S1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>7</p>	<p>Properties of a kite and visualising where height is</p> <p>M1 for $\tan 14 = 6.3/EC$ <i>OR Alternative method</i> M1 for $12.6/\sin 28 = DC/\sin 76$ ($DC = 26(.04\dots\text{cm})$) and then M1 for $\sin 76 = EC/\text{their } DC$</p> <p>If 12.6 allow SC1 for answer 50.5</p> <p>FT their EC</p> <p><i>If 12.6 used then max mark is SC1, M1, M1, A1(18.9)</i></p> <p><i>NOTES for other alternative methods:</i> <i>Do not credit $17.3^2 + 6.3^2$ until seen as part of an overall strategy.</i></p>
10	<p>$y + \delta y = (x + \delta x)^2 - 4(x + \delta x)$ Intention to subtract $(y =) x^2 - 4x$ to find δy $\delta y = 2x\delta x + (\delta x)^2 - 4\delta x$ Dividing by δx and $(\lim) \delta x \rightarrow 0$ $dy/dx = \lim_{\delta x \rightarrow 0} \delta y/\delta x = 2x - 4$</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>5</p>	<p>Or alternative notation. Allow if final bracket omitted</p> <p>Accept δx^2 as meaning $(\delta x)^2$</p> <p>FT equivalent level of difficulty</p> <p>CAO. Must follow from correct working</p> <p><i>Use of dy/dx throughout max 4 marks only, final A0</i></p>
11	<p>$\int (10x - x^2) dx$ $= 5x^2 - x^3/3$ Use of correct limits 10 & 0 in correct order 500/3 or equivalent</p>	<p>M1</p> <p>A2</p> <p>m1</p> <p>A1</p> <p>5</p>	<p>Intention to integrate</p> <p>A1 for each. Accept 10/2 as 5</p> <p>CAO. Accept 166.6(66..) or 166.7</p> <p><i>Answer only gets no marks</i></p> <p><i>No marks for use of the trapezium rule.</i></p>

Q	Additional Mathematics Summer 2013	Marks	Final
12	$(dy/dx=) 9x^2 - 36$ $dy/dx = 0$ or $9x^2 - 36 = 0$ $x = 2$ and $y = -37$ $x = -2$ and $y = 59$ $d^2y/dx^2 = 18x$ At $(2, -37)$ $d^2y/dx^2 > 0$, point is a minimum At $(-2, 59)$: $d^2y/dx^2 < 0$, point is a maximum	B1 M1 A1 A1 M1 A1 A1 7	FT their dy/dx form $ax^2 + b$ <i>Answer only, no working shown M0 A0 A0</i> <i>Method for determining min or max MUST be shown, final answer only is M0 here, then A0,A0</i> Or first derivative test, interpretation of first derivative test. Or alternative. FT for their x value FT for their other x value provided this does not have the same interpretation as the first x value <i>SC1 for correct FT from $d^2y/dx^2 = ax$, $a > 0$</i>
13	When $x = 2$, finding $y = 20$ $dy/dx = 6x + 4$ when $x = 2$ gradient is 16 Use of $y - y_1 = m(x - x_1)$ or $y = mx + c$ $y - 20 = 16(x - 2)$ or $20 = 16 \times 2 + c$, $c = -12$ $16x - y - 12 = 0$ or $-16x + y + 12 = 0$	B1 M1 A1 M1 A1 A1 6	Method to form equation FT their y value, but not $y=16$ and their derived gradient CAO. Must be in this form, accept equivalents written as 3 terms not with whole number coefficients
14	(a) 2500 (b)(i) $(12)x^{2/4}/x^{3/2}$ or equivalent first stage of work evaluated correctly with simplification of indices $12x^{-1}$ or $12/x$ (ii) Correctly extracting a factor of $x^{1/6}$ (numerator), OR correct alternative method with one correct step towards simplification $3 + x^{1/6}$	B1 B1 B1 M1 A1 5	<i>e.g. $(\sqrt{50})^4 = 50^2 = 2500$, or $50^2 = 2500$</i> <i>Answer only, no working shown, B0</i> CAO. Mark final answer Must be correct, but could be $4x^{1/6}$, $2x^{1/6}$ or $x^{1/6}$. For an alternative method, need sight of the two terms and $3 + \dots$ or $\dots + x^{1/6}$ for M1 CAO. Mark final answer
15	(a) General sine curve through $(0,0)$, $(180,0)$ and $(360,0)$ only Correct, sketch with 4 and -4 on y -axis (b) 0° , 180° and 360° only	B1 B1 B1 3	



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