

MARKING SCHEME

LEVEL 2 CERTIFICATE IN ADDITIONAL MATHEMATICS

SUMMER 2014

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.

LEVEL 2 CERTIFICATE IN ADDITIONAL MATHEMATICS Mark Scheme - Summer 2014

Q	Additional Mathematics Summer 2014	Marks	Final
1	(a) $30x^4 + 7 (+0)$ (b) $-6x^{-7}$	B3	B1 for 30x ⁴ (not 5×6x ⁴), B1 for +7, and B1 for +0 (or blank) provided at least one other mark awarded. Mark final answer
	(c) $5/2 x^{3/2}$	B1 B1 5	Mark final answer Index needs to be simplified. Mark final answer
2	(a) $(5x + 2)(3x - 4)$ -2/5 or $4/3(b) (x + 5)^2 + \dots -22Least value -22$	B2 B2 B1 B1	B1 $(5x - 2)(3x + 4)$. Ignore sight of "=0" Must be from factorising. STRICT FT for their factors. B1 for each answer Sight of $(x+5)^2$. Ignore sight of '=0' Accept - 25 + 3 if not evaluated, otherwise mark final value. Do not accept '=22' $(x + 5)^2 - 22$, B1, B1 ISW. FT their value but not -25 or +3
3	(Circumference small circle =) $2 \times \pi \times 3.5$ or 7π (Fraction of circle shown =) $2.1/7\pi$ or 34.377° or 34.8° (Circumference of large circle=)	7 M1 M1	Penalise consistent use of radius in place of diameter -1 then FT May be embedded FT 'their 7π' May be embedded
	$2 \times \pi \times (3.5 + 2.4)$ or 11.8π (Arc large circle =) $11.8\pi \times 2.1/7\pi$ or $11.8\pi \times 34.377/360$	M1 A1	FT 'their 7π ' and FT 'their 11.8π ' CAO For information: $7\pi = 21.99$ or 22 $2.1/7\pi = 0.09549$
	= 3.5(4cm)	Al	$11.8\pi = 37.07079$ OR alternative: Use of similar shapes, e.g. sight of $(3.5+2.4)/3.5$ or $\times 1.6857$ M1 $DC/2.1 = (3.5+2.4)/3.5$ or equivalent FT 'their 5.9/3.5' $DC = (3.5+2.4) \times 2.1 \div 3.5$ M1 $DC = 3.54(cm)$ A1
	(Perimeter = 2.4 + 2.4 + 2.1 + 3.54 =) 10.4(4	QWC 2	CAO FT 'their 3.5(4)' + 6.9 evaluated correctly from premature approximation only
	Cm) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	8	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

	Additional Mathematics	Manle	Final
Q	Summer 2014	Marks	Final
4	(20/2-) 15(-7) + 12/2+1)) (/60)	M1	Attempt to use common denominator
	${20(2x) -15(x-7) + 12(3x+1)} (/60)$ ${40x-15x+105+36x+12} (/60)$	B1 B1	Or equivalent B1 for 1 slip (e.g -105)
	(61x + 117)/60 or showing LHS = RHS	A1	Convincing must follow from fully correct working
	(ora 117), oo or showing Eris Turis	111	at each stage
			If no denominator then M0 B1 B1 A0, however if
	2	4	denominator replaced later all marks are allowable
5	(a) $(y+\delta y =)$ $(x+\delta x)^2 + 8(x+\delta x)$	B1	Or alternative notation. Allow if final bracket
	Intention to subtract (y=) $x^2 + 8x$ to find	M1 A1	omitted
	$\delta y \\ (\delta y =) \qquad 2x\delta x + (\delta x)^2 + 8\delta x$	M1	Accept δx^2 as meaning $(\delta x)^2$
	Dividing by δx and $\lim \delta x \rightarrow 0$	A1	FT equivalent level of difficulty
	$dy/dx = \lim \delta y/\delta x = 2x$		CAO. Must follow from correct working and
	+ 8	_	notation
	$\delta x \rightarrow 0$	5	All notation throughout the working must be correct
			in order to award the final A1 Use of dy/dx throughout max 4 marks only, final A0
6	(a) Multiplier $(3-\sqrt{2})/(3-\sqrt{2})$	M1	ose of ayax unoughout max + marks only, final Ao
	Denominator		
	$9 + 3\sqrt{2} - 3\sqrt{2} - 2 \text{ OR } 9 - 2 \text{ OR } 7$	A1	
	$5(3-\sqrt{2})/7$ or $(15-5\sqrt{2})/7$	A1	CAO. Mark final answer
	(b)(i) $6x^{10/4}/x^{3/2}$ or $6x^{5/2}/x^{3/2}$	B1	Unsupported answer is awarded no marks. Or equivalent first stage of working with indices
	$(D)(1) \ OX / X Or OY OX / X$	1 1	Allow incorrect evaluation of 2×3
	=6x	B1	CAO. Accept $6x^1$
	(ii) Correctly extracting a factor of $(7)x^{1/7}$	M1	
	(numerator), or $\frac{28(x^{1/7})}{1} + \frac{x^{2/7}}{1}$ or $\frac{28 + x^{2/7}}{1}$		
	$\frac{28(x^{2}+x^{2}-6)}{7x^{1/7}}$		
	$7(x^{1/7}) x^{1/7}$ 7		
	. 1/7	A1 7	CAO. Mark final answer
7	(a) DE ² = $(-1-5)^2 + (13-5)^2 = (-6^2 + 8^2)$	M1	Or equivalent. Allow 1 slip or error
/	$DE = \sqrt{100} (=10)$ $DE = \sqrt{100} (=10)$	A1	CAO
	(b) Gradient DE (13-5)/(-1-5)	M1	5.15
	= -8/6 (= -4/3 or -	A1	Do not ignore incorrect cancelling, mark final
	1.33)	3.54	answer
	(a) y 12 OD y 5 agusted to 4/2	M1	Allow -1.3 FT their gradient
	(c) $y - 13 = 0$ OR $y - 5 = 0$ equated to $-4/3 = 0$		1.1 men gradient
	or $13 = -4/3 \times -1 + c$ or $5 = -4/3 \times 5 + c$		
		M1	
	3(y-13) = -4(x+1) or $3(y-5) = -4(x-5)$		Implies 1 st M1
	or $(y + 12) = 4/2(y + 1)$ or $z = 25/2$		FT from 1 arithmetical error, and for their gradient from (b)
	(y-13) = -4/3(x+1) or $c = 35/3$	A1	110111 (U)
			OR equivalent correct expansion of brackets,
	3y - 39 = -4x - 4 or $3y - 15 = -4x + 20$		unsimplified. FT from the 1 error and for gradient
	or	A1	from (b)
	y = -4x/3 + 35/3		CAO or a multiple of $4x + 3y = 35$. Must be in this
	4x + 3y = 35		form $Accept 3y + 4x = 35, but do not accept 4x + 3y - 35$
	$M \cdot J_f = JJ$		= 0
		8	Candidates may use the mid-point (2, 9), follow mark
			scheme as given. With evidence of attempting to find mid point, with incorrect mid-point, penalise -1 then
			follow mark scheme as given.
		1	Jonon main seneme as given.

Q	Additional Mathematics Summer 2014	Marks	Final
8	$(dy/dx=) 12x^2 - 12$	B1	
	$dy/dx = 0$ or $12x^2 - 12 = 0$	M1	FT their dy/dx form ax ² + b
	x = 1 and $y =$	A1	
	x = -1 and $y = -1$	A1 M1	Answer only, no working shown M0 A0 A0 Or first derivative test, interpretation of first
	x = -1 and y = 15	IVII	derivative test. Or alternative.
	$d^2y/dx^2 = 24x$	A1	FT for their x value
		A1	FT for their other x value provided this does not have
	$(-1, (15))$: $d^2y/dx^2 < 0$, point is a maximum		the same interpretation as the first x value
	$(1, (-1)): d^2y/dx^2 > 0$, point is a minimum		Answer only, no working shown M0 A0 A0 If $d^2y/dx^2 = nx$ where $n \neq 0$ and test applied correctly
			then SC2 instead of final A1, A1 (as M1 has not been
		7	awarded))
9			Alternative method for first 2 marks:
			$DB=AD (=x), hence x^2+x^2=4^2$
	Sight of $\cos 45^\circ = 1/\sqrt{2}$ or $\sqrt{2}/2$	D1	B1 $2x^2 = 16 \text{ or } x^2 = 16/2 \text{ or } x^2 = 8$
	Signt of $\cos 45^\circ = 1/\sqrt{2}$ or $\sqrt{2}/2$ OR $\sin 45^\circ = 1/\sqrt{2}$ or $\sqrt{2}/2$	B1	2x = 10 or x = 10/2 or x = 8
	$\cos 45^\circ = DB/4$ OR $\sin 45^\circ = DB/4$	M1	B0 if not seen, allow embedded sight
	$DB = 4/\sqrt{2} \text{ or } 2\sqrt{2}$	A1	-
	Sight of $\cos 30^\circ = \sqrt{3/2}$	B1	Working must be shown
	$\cos 30^{\circ} = BC/DB$ $BC = \sqrt{3/2} \times 4/\sqrt{2} \text{ OR BC} = \sqrt{3/2} \times 2\sqrt{2}$	M1 A1	B0 if not seen, allow embedded sight
	OR	AI	Working must be shown
	$BC = \sqrt{3}\sqrt{2}$		FT their DB provided working with surd
		A1	
	$BC = \sqrt{6}$ (cm)	7	
			CAO from convincing working involving surds seen. Mark final answer
10	(a) $(3)^3 + 5(3)^2 + 2(3) - 8 = 27 + 45 + 6$	M1	Or division method giving $x^2 + 8x$
	8)	A1	
	= 70	M1	Or division method giving $x^2 + 6x$
	(b)(i) Substitute $x = 1$	A1	Convincing, working shown $(1 + 5 + 2 - 8)$ Allow $1^3 + 5(1)^2 + 2(1) - 8 = 0$
	Showing $f(1) = 0$	M1	Allow 1 + $5(1)$ + $2(1)$ - $8 = 0$
	(ii) $(x-1)(x^2 + bx + c)$	1,11	
	or intention to divide by $(x-1)$ with x^2	A2	A1 for +6x or +8.
	shown		Or use of factor theorem A1 $(x+4)$, A1 $(x+2)$
	$((x-1)) (x^2+6x+8)$	A1 8	CAO. Mark final answer, but ignore attempts to 'solve'
	((x-1))(x+4)(x+2)	0	Soire
11	(a) $\frac{1}{2}$ y(x + x + 4) = 28 or equivalent	B1	Accept $xy + 4y/2 = 28$, do not accept $xy + 2y = 28$
	y(x + y) = 43 or equivalent	B1	
	Expanding and simplifying both	B1	Convincing $xy = 28 - 2y$ AND $xy = 43 - y^2$
	(b) $(xy =)28 - 2y = 43 - y^2$ or equivalent		
	AND $y^2 - 2y - 15 = 0$ or $-y^2 + 2y + 15$	M1	For correct quadratic equated to zero
	= 0	A1	OR from formula method or completing square
	(y-5)(y+3) = 0		$y = (2 + \sqrt{64})/2$
	y = 5 (and $y = -3$)	A1 A1	CAO. Negative value not required, ignore CAO. Must be from positive y only
	y = 3 (and $y = -3$) (x =) 3.6 (cm) and (x+4 =) 7.6 (cm)	7	Trial and improvement methods are not accepted
12	(a) $12x^5 + 3$	B1	
	$60x^4$	B1	FT to 2^{nd} B1 from $dy/dx = kx^n (+ m)$
	(b) $(3/5)$ $x^5 + (6/2)x^2 + (8/-1)x^{-1}$	B3	B1 for each term. Accept unsimplified. ISW
	+ c (constant)	B1 B2	Award if at least B1 given for integration B1 for $4x^2/2$ or x
	(c) $4x^2/2 + x$	M1	FT their integration. Intention to use 5, 2 and
	$[4x^2/2 + x]^5_2$	A1	subtract
	$=(4\times5^2/2+5)-(4\times2^2/2+2) (=55-10)$	A1	FT for correct use of limits
	= 45	11	CAO, not FT.
		<u> </u>	Answer only, no working shown, M0 A0 A0

Q	Additional Mathematics	Marks	Final
	Summer 2014	Marks	Filigi
13	(a) $2x + 4y = 7$ and $x + 2y = 7$ selected	B1	
	Explanation, e.g. showing or sight of m= -	E1	Depends on B1
	1/2 for both		
	(b) Either $2x + 4y = 7$ and $4x - 2y = 7$, or $x + 2y = 7$ and $4x - 2y = 7$	B1	
	Explanation, e.g. showing or sight of	E1	Depends on B1
	$m_1 = -1/2 \& m_2 = 2$		Depends on D1
	Showing $-1/2 \times 2 = -1$ or states 'one	E1	Depends on B1
	(gradient) is the negative reciprocal of the		•
	other (gradient)' or similar	5	
14	Method to solve simultaneously, e.g. use	M1	$4 - x = x^2 - 7x + 12$ or $y = (4 - y)^2 - 7(4 - y) + 12$
	of		
	y = 4 - x or $x = 4 - y$ into the first	A1	
	equation	m1	OR $x = (6 \pm \sqrt{4})/2$. FT from their quadratic
	$x^2 - 6x + 8 = 0$ or $y^2 - 2y = 0$	A1	CAO
	(x-4)(x-2) (=0) or $y(y-2)$ (=0)		Need not be in this form, accept $x=4$, $y=0$ with $x=2$,
	(4,0) and $(2,2)$		y=2
			y values must be given
			Accept unsupported correct responses for all 4
		4	marks, or from trials if coordinates of both points are
15	(a) Intention to substitute $x=2$ and $x=5$	M1	given and no others OR substituting either value and showing y = 0
13	(a) Intention to substitute $x=2$ and $x=3$ into $y = -x^2 + 7x - 10$	IVII	OR substituting either value and showing $y = 0$ OR attempt to factorise as a pair of brackets $(x 2)(x$
	Into $y = -x^{2} + 7x - 10$		5)
			Do not accept $(-2)^2 + 7 \times 2 - 10$ and $(-5)^2 + 7 \times 2 \times - 10$
	Showing $y = 0$ for both values	A1	Accept $-2^2 + 7 \times 2 - 10$ and $-5^2 + 7 \times 5 - 10$
	Showing y = 0 for both values	711	OR factorised as $(-)(x-2)(x-5)$ or equivalent
	(b)	M1	or factorised as ()(A 2)(A 3) or equivalent
		1,11	Intention to integrate (manipulated given, hence not
	$=-x^3/3+7x^2/2-10x$	A2	using given or differentiated)
	Use of correct limits 5 & 2 in correct order	m1	A1 one term correct.
	and intention to subtract		
	4.5	A1	
		7	CAO. Answer only gets no marks
			No marks for use of the trapezium rule

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