GCSE MARKING SCHEME

ADDITIONAL MATHEMATICS (PILOT)

SUMMER 2010

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2010 examination in GCSE ADDITIONAL MATHEMATICS (PILOT). 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.

GCSE Additional Mathematics - Paper 1

	Additional Mathematics Pilot 2010 - Paper 1 (non calculator)	Mark	Comments
1	x+2y=11 AND 3x+8y=40 or equivalent (double) Equate coeffs. e.g. 4x+8y=44 and 3x+8y=40 x = 4 (cm) Method to find second variable y = 3.5 (cm)	B2 M1 A1 M1 A1 6	B1 for either OR for x+2y=22 AND 3x+8y=80 *FT provided B1 awarded* Method to solve for one variable, allow 1 slip Accept unsimplified FT from their first variable Accept unsimplified *x+2y=22 AND 3x+8y=80 gives x=8 and y=7*
2	(a) $(x+10)^2 \pm \ldots$ $\ldots\ldots$ $-10^2 (+3)$ Least value – 97 (b) $(x+f)^2 \ldots\ldots$ $-f^2 (+h=0)$ $(x+f)^2 = f^2 - h$ $x + f = (\pm) \sqrt{(f^2-h)}$ $x = -f \pm \sqrt{(f^2-h)}$	B1 B1 B1 B1 B1 B1 B1 B1 8	Sight of $(x+10)^2$ Sight of -100, or implied (e.g by =100 or -97) CAO. Needs to be stated, $(x+10)^2$ -97 gets B1 B1 only unless -97 stated *FT until second error, completing the square method*
3	(a) $24x^3 + 3 (+0)$ (b) $-8x^{-9}$ (c) $3/5 x^{-2/5}$	B3 B1 B1 5	B1 for each term. Accept 6x4 as 24. B2 for $24x^3$ - 2 ISW Index needs to be simplified
4	(a) $0.7 \times \ldots\ldots = 0.56$ P(pizza for dinner) = 0.8 (b) $(1-0.7) \times (1-0.8)$ $= 0.06$	M1 A1 M1 A1 4	Or alternative form, seen or implied FT their 1 - P(pizza for dinner) from (a) **CAO**
5	(dy/dx=) 6x - 18 dy/dx = 0 or 6x - 18 = 0 (Stationary point:) x = 3 y = 5 $d^2y/dx^2 = 6$ (Positive means) minimum	B2 M1 A1 A1 M1 A1 7	B1 for 6x or -18 FT their dy/dx form ax+b throughout FT their x substitution Or first derivative test, interpretation of first derivative test. Or alternative.
6	(a) $x^2 + 6x + 8 = 0$ $(x+4)(x+2) = 0$ or $x = (-6 \pm \sqrt{4})/2$ x = -4 AND x = -2 (b) $x + y = xy$ $y+5 + y = (y+5)y$ OR $x + x - 5 = x(x-5)$ $y^2 + 3y - 5 = 0$ OR $x^2 - 7x + 5 = 0$ Correct substitution into quadratic formula Conclusion, e.g evaluated using formula with statement	B1 B1 B1 B1 M1 A1 B1 E1 8	Equate to zero FT from **one** error in forming their quadratic **CAO** Understanding of equating sum and product Idea to change to one variable OR equivalent equate to zero Or e.g. by looking at all factors of 5 attempt to make +3 Convincing statement related to all factors and middle term
7	(a) 5 miles = 8 km 48 (kmph) Sign should be 45 (b) $3/48 \times 100$ $= 6(.25\%)$	B1 B1 B1 M1 A1 5	Or equivalent **CAO from correct working** **Do not FT for simplified question, e.g. 5/30 ×100** FT from consistent (a) for their "48-45" and "48"

	Additional Mathematics Pilot 2010 - Paper 1 (non calculator)	Mark	Comments
8	(a) $2(3)^3 - 2\times3 + 1$ $\qquad\qquad = 49$ (b)(i) Substitute x = -4 $\qquad$ showing = 0 (ii) $(x+4)(2x^2 + bx + c)$ $\qquad$ or intention to divide by (x+4) with $2x^2$ $\qquad$ shown $\qquad$ $(x+4)(2x^2- 3x -2)$ $\qquad$ $(x+4)(2x+1)(x-2)$	M1 A1 M1 A1 M1 A2 A1 8	Or division method giving $2x^2 +6x$ … Or division method giving $2x^2 - 3x$ … $\qquad\qquad\qquad$ (-128 + 80 + 56 -8) Or use of factor theorem A1 for -3x or -2. Or use of factor theorem A1 (x-2), A1 (2x+1) CAO. Penalise further working.
9	(a) (1 , a) where a > -3 $\qquad\qquad\qquad$ (1 , 2) (b) Sketch $\qquad$ (1 , b) where b > 0 $\qquad\qquad\qquad$ (1 , 3)	M1 A1 B1 M1 A1 5	Ignore missing brackets CAO Must intersect x-axis correctly Ignore missing brackets CAO
10	(a) Entire 5, 11, 30 (b) Explanation, e.g. "plots more widely $\qquad$ spread"	B2 E1 3	B1 for any two correct, or incorrect but differences correct, 6 and 19 Accept "less steep". Do not accept contradictions in the explanation
11	(a)(i) 4n $\qquad$ (ii) Sight of 3n $\qquad\qquad$ 3n + 1 (b)(i) 4xy $\qquad$ (ii) Strategy, e.g. simplify then extend or look at vertical and horizontal Method leading to correct answer, e.g. notices 1 more row to dimension comparison (x+1)y + x(y+1) ISW (2xy+x+y)	B1 B1 B1 B1 B1 M1 A1 7	*Accept unsimplified answers throughout*
12	(a) Sight or use of sin60 = $\sqrt{3}$ / 2 $\qquad$ ½ x (x + 3) sin60 = $\sqrt{300}$ $\qquad$ x (x + 3) $\sqrt{3}$ = 4$\sqrt{300}$ $\qquad$ $x^2 + 3x - 40 = 0$ (b) x = 5 $BA^2 = 8^2 + 5^2 - 2 \times8\times5$ cos60 Sight of cos60 = ½ BA = 7 (cm)	B1 M1 A1 A1 B1 M1 B1 A1 8	*Accept in (a), (b) or by diagram* Allow missing brackets Or similar progress Convincing Accept x=5 shown in (a) Accept $BA^2 = (x+3)^2 + x^2$ -2×x× (x+3)cos60. Allow missing brackets *Accept in (a), (b) or by diagram*
13	$\dfrac{10 - 7(x+1)}{10\,(x+1)} = \dfrac{3 - 2x}{3x - 2}$ (3x-2)(3-7x) = 10(x+1)(3-2x) $9x-6 -21x^2+14x = 30x +30 -20x^2 -20x$ $x^2 - 13x +36 = 0$ (x-9)(x-4) = 0 x=9, x = 4	 B1 B1 B1 B1 M1 A1 6	*Allow 1 slip with brackets* 1st step multiply through by any 2 of(x+1), 10 or (3x-2) *For first 3 marks FT until 2nd error* Clear fractions, equivalent to ×10(x+1)(3x-2) Or equivalent Fresh start, FT equivalent difficulty: Collect of terms and equate to zero Or correct substitution into quadratic formula

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GCSE Additional Mathematics - Paper 2

	Additional Mathematics Pilot 2010 Paper 2 (calculator allowed)	Mark	Comments
1	$\Pi \times 70$ (= 219.91….) $3 \times$ … / 70Π Sight or use of 1km = 100000 cm or equivalent Answers in the range 1364 to 1365	M1 M1 B1 A1 4	Distance / their circumference including Π Or implied in calculation **CAO**
2	(a) $y + \delta y = 6 (x + \delta x)^2 + 5$ Subtracting y from above to find δy $\delta y = 12x \delta x + 6(\delta x)^2$ Dividing by δx AND letting $\delta x \to 0$ $\frac{dy}{dx} = \lim_{\delta x \to 0} \frac{\delta y}{\delta x} = 12x$ (b) $12x = -36$ $x = -3$ $y = 59$	B1 M1 A1 M1 A1 M1 A1 A1	Idea. Accept missing brackets after "-" symbol Idea Not a FT from (a) FT $6x^2 + 5$ evaluated for their x. Provided M1 awarded
3	(a) (i) $PQ^2 = (15 - 3)^2 + (11 - 6)^2$ $(=12^2 + 5^2)$ $PQ = \sqrt{169}$ (=13) (ii) Grad. PQ (11 - 6) / (15 − 3) = 5/12 Grad. perpendicular -12/5 (b) $y = 2/5 x - 3$ or equivalent	M1 A1 M1 A1 B1 B2 7	Allow 1 slip **CAO** FT -1/grad PQ. Do not accept fraction of fraction B1 for m = 2/5 or c = -3
4	(x ….) (x^2 … x …x ….) (x-1)(x^2+x-6)OR (x+3)(x^2-3x+2)OR(x-2)(x^2+2x-3) Correct expansion, not collected $x^3 - 7x + 6$ therefore LHS ≡ RHS	M1 A1 A1 A1 4	Attempt expand of a pair of brackets Allow missing brackets if intention shown Accept $x^3 - 7x + 6 = x^3 - 7x + 6$ as a conclusion. Needs a conclusion
5	Overall strategy, circle thm. & trig Sin40= ½ BC/3 OR $BC^2 = 3^2+3^2-2\times 3\times 3\times \cos80$ ½ BC = 3 × sin40 $BC^2 = 14.874…$ BC = 3.85… <CAB = 40^0 sinACB/5.6 = sinCAB/BC Answers in the range 67.3 to 69.6	S1 M1 A1 A1 B1 M1 A1 7	Or equivalent Rounded or truncated Maybe indicated on the diagram FT their BC & <CAB **CAO**
6	Attempt dy/dx, one term correct dy/dx = $3x^2 + 8x$ at x=1 **gradient** = 11 when x=1 y= -2 Equation (y- -2) = 11 (x - 1) y+2 = 11 (x-1) ISW (y = 11x - 13)	M1 A1 A1 B1 m1 A1 6	 FT equivalent level of difficulty Or alternative method of setting up the equation FT their value of gradient & point only if M1 awarded. Depends on use of calculus **CAO**. Any form
7	Attempt to solve simultaneous equations $x^2 + 3x - 18 = 0$ (x − 3) (x+6) = 0 x =3, y = -6 AND x = -6, y = 12	M1 A1 M1 A1 4	 Equate to zero FT their quadratic. Or correct sub. into formula FT their pair of brackets *If no marks awarded then SC1 for either (3,-6) or (-6,12). Both answers all 4 marks*
8	Suitable diagram for at least 1 mast tan36=88/x x = 88/ tan36 = 121.(1216… metres) 350 - x (= 228.878….) height shorter mast = tan 14 ×(350 – x) = 57.(…….. metres)	B1 M1 M1 A1 B1 M2 A1 8	*Penalise premature approximation once only PA-1* For the strategy that is required. FT their x M1 for tan14 = height/(350-x). M0 for tan14× 350

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