WJEC LEVEL 2 CERTIFICATE IN ADDITIONAL MATHEMATICS

MARK SCHEME

	WJEC Level 2 Certificate in Additional Mathematics Specimen Paper	Mark	Comments
1	(a)(i) $\frac{125}{81}$	B2	B1 for either 125 or $\frac{1}{81}$ or $\frac{5^3}{3^4}$
			Answer only, no working shown, B0
	(ii) Sight of 16^{-1} or 2^{-4} or $1/(2^4)$ AND 1/16	B1	*Answer only, no working shown,* B0
	(b) (i) $\frac{20y^{\frac{3}{4}}}{y^{\frac{3}{4}}}$	B1	
	20	B1	CAO
	(ii) $\frac{x^{\frac{1}{3}}(2+5x)}{4x^{\frac{1}{3}}}$	B1	
	$\frac{2+5x}{4}$	B1	CAO
		7	
2	(a) $3(-2)^3 - (-2)^2 + 5(-2) + 42$	M1	Or division method giving $3x^2 - 7x$ …
	$= 4$	A1	
	(b)(i) Substitute $x = 4$	M1	Or division method giving $2x^2 + 5x$ …
	showing $= 0$	A1	
	(ii) $(x-4)(2x^2 + bx + c)$ or intention to divide by $(x-4)$ with $2x^2$ shown	M1	
	$(x-4)(2x^2 + 5x - 3)$	A2	A1 for $+5x$ or -3. Or use of factor theorem A1 $(x+3)$, A1 $(2x-1)$
	$(x-4)(2x-1)(x+3)$	A1	CAO. Penalise further working. *If no marks B1 for* $(x+3)$ *or* $(2x-1)$
		8	
3	(a) $35x^4 + 1$ (+0)	B3	B1 for each term. Accept 5×7 as 35
	(b) $-6x^{-7}$	B1	
	(c) $\frac{2}{3}x^{-1/3}$	B1	Index needs to be simplified
		5	
4	tan30= $5/BF$ or tan 45 = $5/FC$ or $FC = 5$	M1	(F is the foot of the perpendicular from A)
	Sight of tan30 = $1/\sqrt{3}$	B1	
	($BF + FC =$) 5/tan30 + 5/tan45	M1	OR equivalent, 5/tan30 + 5
	$5\sqrt{3} + 5$ (= $5(\sqrt{3}+1)$)	A1	Convincing
		4	
5	($dy/dx=$) $3x^2 - 3$	B1	
	$dy/dx = 0$ or $3x^2 - 3 = 0$	M1	FT their dy/dx form $ax^2 + b$
	$x = 1$ or $x = -1$	A1	
	$y = -4$ or $y = 0$	A1	FT their x substitution *Answer only, no working shown,* M0 A0 A0
	$d^2y/dx^2 = 6x$	M1	Or first derivative test, interpretation of first derivative test. Or alternative.
	$(-1, 0)$: $d^2y/dx^2 < 0$, point is a maximum	A1	
	$(1, -4)$: $d^2y/dx^2 > 0$, point is a minimum	A1	
		7	
6	$x^2 + xy = 198$	B1	
	$6x + 2y = 80$ or $3x + y = 40$	B1	
	$x^2 + x(40 - 3x) = 198$	M1	FT for their equations
	$2x^2 - 40x + 198 = 0$ or $x^2 - 20x + 99 = 0$	A1	CAO or negative of either quadratic
	$(x-9)(x-11) = 0$ or equivalent	M1	Factorising their quadratic or formula method
	$x = 9$ (or 11)	A1	CAO
	Other length 13 (cm)	B1	FT their x or y value for shortest side logic
		7	

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7	$\int (2x - x^2)\,dx$ $= x^2 - x^3/3$ Use of correct limits in order 4/3	M1 A2 m1 A1 5	Intention to integrate Do not penalise dx omitted. Limits not required A1 for each CAO *No marks for use of trapezium rule*
8	Attempt to clear fractions $2(x-2) + 4(2x+3)(x-2) = 4x(2x+3)$ $-28 = 14x$ $x = -2$	M1 A1 A1 A1 4	For initial correct idea, including expressing all terms over common denominators (allow a slip) FT the one slip
9	(a)$(4x-3)(3x+5)$ ¾ or –5/3 (b) $(x+8)^2 \underline{+} \ldots$ …….. –64 (+ 3) Least value –61	B2 B2 B1 B1 B1 7	B1 for $(4x-3)$, B1 for $(3x+5)$ FT for their factors. B1 for each answer Sight of $(x+8)^2$ Sight of –64, or implied (e.g by = 64) CAO
10	Area square base = x^2 Area triang. side = $\frac{1}{2}x^2 \sin 60$ or $\frac{1}{2}x\sqrt{(x^2 - (x/2)^2)}$ $x^2/2. \sqrt{3}/2$ or $\frac{1}{2}x\sqrt{(3x^2/4)}$ Total surface area = $x^2 + \frac{4(x^2\sqrt{3})}{4}$ $= x^2(1 + \sqrt{3})$	B1 M1 A1 B1 A1 5	Or equivalent, e.g. tan to find height, tan60.x/2 followed by ½ x. tan60.x/2 Or equivalent, e.g. ½ x. $\sqrt{3}.x/2$ FT their $x^2 + 4 \times$ area of triangular side CAO
11	Attempt dy/dx, one term correct $dy/dx = 3x^2 - 6x$ at $x = -1$ gradient = 9 when $x = -1$ $y = -2$ Equation $(y - -2) = 9(x - -1)$ $y + 2 = 9(x+1)$ ISW $(y = 9x + 7)$	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
12	(a) $PQ^2 = (14-2)^2 + (19-3)^2$ $(=12^2 + 16^2)$ $PQ = \sqrt{400}$ (=20) (b) Grad. PQ (19 – 3) / (14 – 2) = 16/12 Grad. perpendicular –12/16	M1 A1 M1 A1 B1 5	Allow 1 slip or error CAO Ignore incorrect cancelling throughout (b) FT –1/grad PQ. Do not accept fraction of fraction
13	(a) $y + \delta y = (x + \delta x)^2 - (x + \delta x)$ Intention to subtract $(y =)\ x^2 - x$ to find δy $\delta y = 2x\delta x + (\delta x)^2 - \delta x$ $\delta y/\delta x = 2x + \delta x - 1$ **and** lim $\delta x \to 0$ $dy/dx = 2x - 1$ (b) $2x - 1 = 3$ $x = 2$	M1 m1 A1 M1 A1 M1 A1 7	Or alternative notation. Allow if final bracket omitted Accept δx^2 as meaning $(\delta x)^2$ FT equivalent level of difficulty CAO. Must follow from correct working *Use of dy/dx throughout max 4 marks only, final A0* FT from their response in (a)

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14	(a) General sine curve through (0,0), y values ± 2 Period clearly 120° (b) 70°, 110° only	B1 B1 B3 5	 B2 for any 1 correct, B1 for indication of 2 values on their graph or sight of –10° or 210° or 330°
15	Grad. given line = – 4 so perpendicular grad. = ¼ Equation $y = \frac{1}{4}x$ OR $4y = x$ Clues needed 1 and 3	B1 B1 B1 QWC2 5	 FT –1/their gradient, or their perpendicular gradient (with slip) with c = 0 Implied in working or embedded in strategy QWC2 Presents material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents 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 and grammar.
16	 $\{6(2x) + 5(x-1) + 3(3x+5)\}/30$ $\{12x + 5x - 5 + 9x + 15\}/30 = \{26x + 10\}/30$ **and** $(13x + 5)/15$ or showing LHS ≡ RHS	M1 A1 A2 4	Attempt to use common denominator Or equivalent (e.g. all/60) A1 for 1 slip or no conclusion
17	(a) $\frac{3}{5}x^5 + \frac{2}{3}x^{\frac{3}{2}} - \frac{1}{x}$ + c (constant) (b) $\frac{x^4}{4} + 2x$ $\left[\frac{x^4}{4} + 2x\right]_1^2$ $\left(\frac{2^4}{4} + 2(2)\right) - \left(\frac{1^4}{4} + 2(1)\right)$ $= \frac{23}{4}$ $(= 5\frac{3}{4})$	B3 B1 B2 M1 m1 A1 9	B1 for each term (Accept unsimplified + – x^{-1} ISW) B1 for $\frac{x^4}{4}$ or $2x$ FT their integration. Intention to use 2, 1 and subtract FT for correct use of limits CAO, not FT *Answer only, no working,* M0 m0 A0