AQA Qualifications

AQA Level 2 Certificate

FURTHER MATHEMATICS

Level 2 (8360)

Mark Scheme

Worksheet 9

Coordinate Geometry - Calculus

Version 2.0

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Glossary for Mark Schemes

These examinations are marked in such a way as to award positive achievement wherever possible. Thus, for these papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M Dep	A method mark dependent on a previous method mark being awarded.
B Dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$

9 Coordinate Geometry - Calculus

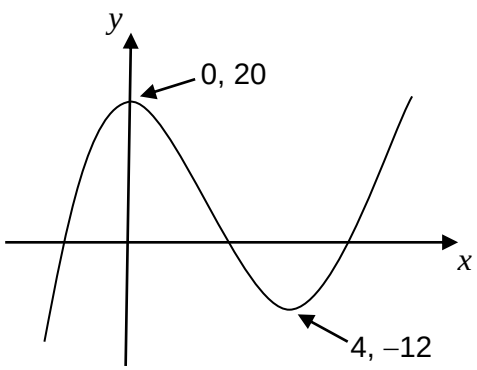
Question	Answer	Mark	Comments
1(a)	5 $-\frac{1}{5}$ -4	B1 B1 ft B1	 ft $\frac{-1}{\text{their } 5}$
1(b)	-2 $\frac{1}{2}$ 3	B1 B1 ft B1	 ft $\frac{-1}{\text{their } -2}$
1(c)	$\frac{2}{3}$ $-\frac{3}{2}$ 4	B1 B1 ft B1	 ft $\frac{-1}{\text{their } \frac{2}{3}}$
1(d)	$\frac{5}{2}$ $-\frac{2}{5}$ $\frac{15}{2}$	B1 B1 ft B1	 ft $\frac{-1}{\text{their } \frac{5}{2}}$
1(e)	$\frac{3}{4}$ $-\frac{4}{3}$ -6	B1 B1 ft B1	 ft $\frac{-1}{\text{their } \frac{3}{4}}$

Question	Answer	Mark	Comments
2(a)	$\left(\frac{1}{2}, -\frac{1}{2}\right)$	B2	B1 For each coordinate
	1	B1	
	$\sqrt{(7^2 + 7^2)}$	M1	
	$\sqrt{98}$ or $7\sqrt{2}$	A1	
2(b)	$(-1\frac{1}{2}, 3)$	B2	B1 For each coordinate
	$\frac{4}{5}$	B1	
	$\sqrt{(5^2 + 4^2)}$	M1	
	$\sqrt{41}$	A1	
2(c)	$(2\frac{1}{2}, 4)$	B2	B1 For each coordinate
	$-\frac{12}{5}$	B1	
	$\sqrt{(5^2 + 12^2)}$	M1	
	13	A1	
2(d)	$(-4, -3)$	B2	B1 For each coordinate
	$-\frac{3}{2}$	B1	
	$\sqrt{(4^2 + 6^2)}$	M1	
	$\sqrt{52}$ or $2\sqrt{13}$	A1	
2(e)	$(5, 1\frac{1}{2})$	B2	B1 For each coordinate
	$-\frac{15}{8}$	B1	
	$\sqrt{(8^2 + 15^2)}$	M1	
	17	A1	

Question	Answer	Mark	Comments
2(f)	(1, –1)	B2	B1 For each coordinate
	$\frac{1}{3}$	B1	
	$\sqrt{(12^2 + 4^2)}$	M1	
	$\sqrt{160}$ or $4\sqrt{10}$	A1	
3(a)	(5, –3)	B2	B1 For each coordinate
3(b)	(4, –6)	B2	B1 For each coordinate
3(c)	(–5, –8)	B2	B1 For each coordinate
3(d)	(9, 7)	B2	B1 For each coordinate
3(e)	(–7, 9)	B2	B1 For each coordinate
4	$x^2 + 7 = 5x + 1$ or $x^2 - 5x + 6 = 0$	M1	
	$(x – 2)(x – 3) = 0$	M1	Attempt to factorise the quadratic
	(2, 11) or (3, 16)	A1 ft	ft Their factors
	(2, 11) and (3, 16)	A1	
5	Gradient of $L = –3$	B1	
	Gradient of $N = \frac{1}{3}$	M1	
	$y – (–1) = \frac{1}{3}(x – 3)$	M1	
	$y = \frac{1}{3}x – 2$	A1	

Question	Answer	Mark	Comments
6(a)	$\frac{dy}{dx} = 7$	B1	
6(b)	$\frac{dy}{dx} = 2x - 5$	B2	B1 For each term
6(c)	$\frac{dy}{dx} = 9x^2 + 4$	B2	B1 For each term
6(d)	$\frac{dy}{dx} = 3x^2 - 14x + 10$	B2	B1 For two terms correct
6(e)	$y = 4x^3 + 8x^2 - 12x$ $\frac{dy}{dx} = 12x^2 + 16x - 12$	B1 B2 ft	 B1 For two terms correct ft Their y = ...
6(f)	$y = 3x^2 + 19x - 40$ $\frac{dy}{dx} = 6x + 19$	B1 B2 ft	 B1 For one term correct ft Their y = ...
6(g)	$y = 42x - 20x^2 + 2x^3$ $\frac{dy}{dx} = 42 - 40x + 6x^2$	B1 B2 ft	 B1 For two terms correct ft Their y = ….
6(h)	$y = x^3 - 4x^2 - 15x + 18$ $\frac{dy}{dx} = 3x^2 - 8x - 15x$	B2 B2 ft	B1 For four terms, three of which are correct B1 For two terms correct ft Their y = ...

7	$\frac{dy}{dx} = 3x^2 + 2x + 2$	M1	
	(when $x = -2$) gradient tgt = 10	A1	
	(when $x = -2$) $y = -12$	B1	
	$y - (-12) = 10(x - (-2))$	M1	oe
	$y = 10x + 8$	A1 ft	ft Their m and c

Question	Answer	Mark	Comments
8	$\frac{dy}{dx} = 3x^2 + 4x - 9$	M1	
	(when $x = 1$) gradient tgt $= -2$	A1	
	(when $x = 1$) gradient nl $= \frac{1}{2}$	A1 ft	ft Their -2
	$y - (-3) = \frac{1}{2}(x - 1)$	M1	oe
	$x - 2y - 7 = 0$	A1ft	ft Their m and c
9(a)	$\frac{dy}{dx} = 3x^2 - 12x$	M1	
9(b)	$3x^2 - 12x = 0$ or $3x(x - 4) = 0$	M1	
	$x = 0$ and $x = 4$	A1	
	(0, 20) and (4, –12)	A1	
	Testing the sign of $\frac{dy}{dx}$ for values of x either side of 0 and 4	M1	
	Maximum at (0, 20) Minimum at (4, –12)	A1	If previous M1 earned
9(c)		B2	B1 For correct general shape B1 ft For labelling the stationary points

Question	Answer	Mark	Comments
10(a)	$\frac{dy}{dx} = 3x^2 - 2x + k$	B1	
10(b)	$3(2)^2 - 2(2) + k = 0$ $k = -8$	M1 A1	
10(c)	$3x^2 - 2x - 8 = 0$ $(3x + 4)(x - 2) = 0$ Maximum at $x = -\frac{4}{3}$	M1 A1 A1	
11(a)	$\frac{dy}{dx} = \frac{1}{2}x - 1$ (when $x = 3$) $\frac{dy}{dx} = \frac{3}{2} - 1 = \frac{1}{2}$ $y - (-\frac{3}{4}) = \frac{1}{2}(x - 3)$ $y = \frac{1}{2}x - 1\frac{1}{2} - \frac{3}{4}$	M1 A1 M1 A1	Clearly shown since $y = \frac{1}{2}x - \frac{9}{4}$ answer given
11(b)	Gradient tangent at $B = -2$ $\frac{1}{2}x - 1 = -2$ $x = -2$ $B = (-2, 3)$	B1 M1 A1 ft A1	ft Their tangent gradient
12(a)	$-6x^{-3}$	B1	
12(b)	$-5x^{-2} + 4x$	B2	B1 for each term
12(c)	$-9x^{-4} + 20x^{-6}$	B2	B1 for each term
12(d)	$-10x^{-3} - x^{-2}$	B2	B1 for each term
12(e)	$x^3 + 2 - 4x^{-1}$ $3x^2 + 4x^{-2}$	B1 B2ft	B1ft for each term

12(f)	$\frac{3}{4}x^{-2} + \frac{1}{2}x^3$ $-\frac{3}{2}x^{-3} + \frac{3}{2}x^2$	B1 B2ft	 B1ft for each term

13(a)	Hypotenuse $10x$ $2y = 84 - 36x$ $y = 42 - 18x$	M1 A1	
13(b)	$A = 16x(42 - 18x) + ½ \times 16x \times 6x$ $A = 672x - 288x^2 + 48x^2$ $= 672x - 240x^2$	M1 A1	
13(c)	$\frac{dA}{dx} = 672 - 480x$ $= 0$ when $x = \frac{672}{480}$ or 1.4 470.4	M1 M1 A1	

14	$\frac{x}{4} + 8x^{-2}$ or $\frac{dy}{dx} = \frac{1}{4}$ .....seen $\frac{dy}{dx} = \frac{1}{4} - \frac{16}{x^3}$ $= 0$ when $\frac{1}{4} = \frac{16}{x^3}$ or $x^3 = 64$ or $x = 4$ 1.5	M1 M1 M1 A1	 oe