AQA

AQA LEVEL 2 CERTIFICATE **FURTHER MATHEMATICS (8365/2)**

Paper 2

Mark scheme

Specimen 2020

Version 2.0

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

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

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
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.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

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Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q	Answer	Mark	Comments
1	x-coordinate of Q = 6 ÷ 2 or 3	M1	may be implied or seen on diagram
	0.5 × 6 × their 3	M1dep	
	9	A1	
	Additional Guidance		
2	$x^2 + y^2 = 100$ or $x^2 + y^2 = 10^2$	B2	B1 radius = 10
	Additional Guidance		
3	$p = 2.5$ or $\frac{5}{2}$ or $2\frac{1}{2}$	B1	
	$r = -5$	B1	
	Additional Guidance		
4(a)	$x > 6$	B1	
	Additional Guidance		
4(b)	$x \leqslant -4$ or $x \geqslant 4$	B1	
	Additional Guidance		
5(a)	(2, 0)	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
5(b)	6	B1	
	Additional Guidance		
6(a)	$4s + 5 = -1$ or $-7s - 10 = t$	M1	oe equation
	$s = -1.5$	A1	
	$t = 0.5$	A1ft	ft $-7 \times$ their $s - 10$
	Additional Guidance		
6(b)	4	A1	
	Additional Guidance		
7	(gradient =) 0.5 or $\frac{1}{2}$	M1	
	0 = their $0.5 \times 4 + c$ or $c = -2$ or $y - 0 =$ their $0.5(x - 4)$	M1	oe
	$y = 0.5x - 2$ or $y = 0.5(x - 4)$	A1	oe simplified equation
	Additional Guidance		

Q	Answer	Mark	Comments
8(a)	$\frac{ab}{cd} \times \frac{ad}{bc}$	M1	oe
	$\frac{a^2}{c^2}$	A1	
	Additional Guidance		
8(b)	Common denominator with at least one numerator correct	M1	eg $\frac{21}{6x^2} + \frac{8x}{6x^2}$ or $\frac{21x}{6x^3} + \frac{8x^2}{6x^3}$
	$\frac{21 + 8x}{6x^2}$	A1	
	Additional Guidance		
9	$x + 62 = 2(2x - 50)$	M1	oe
	$62 + 100 = 4x - x$ or $3x = 162$	M1dep	oe correct expansion and collection of terms
	$x = 54$	A1	
	$\frac{180 - 62 - \text{their } 54}{2}$	M1dep	
	32	A1ft	ft their x with first and third M1 gained
	Additional Guidance		

Q	Answer	Mark	Comments
10	$\frac{6x^9}{2x^4} + \frac{x^8}{2x^4}$ or $3x^5$ or $\frac{1}{2}x^4$	M1	
	$3x^5 + \frac{1}{2}x^4$	A1	
	$15x^4$ or $2x^3$	M1dep	differentiates at least one term correctly
	$60x^3 + 6x^2$	M1dep	differentiates their 2-term $\frac{dy}{dx}$ correctly
	9	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
11	$k^2 = 2(14k + 30)$	M1	oe correct equation with fractions eliminated
	$k^2 - 28k - 60$ (= 0)	M1dep	oe equation
	$(k + 2)(k - 30)$ (= 0) or $\frac{--28 \pm \sqrt{(-28)^2 - 4 \times 1 \times -60}}{2 \times 1}$ or $14 \pm \sqrt{256}$	M1	oe correct attempt to solve their 3-term quadratic equation
	30	A1	30 and –2 is A0
	Additional Guidance		

Q	Answer	Mark	Comments
12(a)	$30x + 20x + 15x + 10x + 15x + y + y = 252$ or $90x + 2y = 252$	M1	oe
	$y = \frac{252 - 90x}{2}$ and $y = 126 - 45x$	A1	must see working for M1
	Additional Guidance		

12(b)	$30x \times 15x + 20x \times (126 - 45x)$ or $15x \times 10x + 20x \times (126 - 45x + 15x)$ or $15x \times 10x + 20x \times (126 - 30x)$	M1	oe
	$450x^2 + 2520x - 900x^2 = 2520x - 450x^2$ or $150x^2 + 2520x - 900x^2 + 300x^2$ $= 2520x - 450x^2$ or $150x^2 + 2520x - 600x^2 = 2520x - 450x^2$	A1	must see correct expansion of brackets
	Additional Guidance		

Q	Answer	Mark	Comments
12(c)	$2520 - 900x$	M1	
	their $(2520 - 900x) = 0$ or $x = 2.8$	M1dep	oe
	3528	A1	
	Additional Guidance		
13(a)	$3 \times 4^2 + 6$ or $3 \times 16 + 6$ or 54 or $\sqrt{3x^2 + 6 - 5}$ or $\sqrt{3x^2 + 1}$	M1	oe
	7	A1	
	Additional Guidance		
13(b)	$3(x - 5) + 6$	M1	oe
	$3x - 9 = 3(x - 3)$	A1	
	Additional Guidance		
14	$\frac{\sin x}{2y} = \frac{\sin 18}{y}$	M1	oe
	$\sin x = 2 \sin 18$ or $\sin x = [0.61, 0.62]$ or $\sin^{-1}[0.61, 0.62]$ or 38.(17…) or 38.(2)	M1dep	oe eliminates y
	141.8… or 142	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
15	$a = 3$	B1	
	0.48 = their 3 × b^{-2}	M1	oe
	$b^2 = \frac{\text{their 3}}{0.48}$ or $b^2 = 6.25$ $\sqrt{\frac{\text{their 3}}{0.48}}$ or $\sqrt{6.25}$	M1dep	oe
	$b = 2.5$	A1ft	ft B0M2
	Additional Guidance		
16	(numerator =) $2x(4x^2 - 25)$ or $\frac{4x^2 - 25}{6x^2 - x - 35}$	B1	
	(numerator =) $2x(2x + 5)(2x - 5)$ or $\frac{(2x + 5)(2x - 5)}{6x^2 - x - 35}$	B1	
	$(ax + b)(cx + d)$ where $ac = 6$ and $bd = \pm 35$	M1	
	$(3x + 7)(2x - 5)$	A1	
	$\frac{2x + 5}{3x + 7}$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
17	$2x^2 - 3x = 7$	M1	at least two terms correct
	$2x^2 - 3x - 7$ (= 0)	A1	oe 3-term quadratic equation
	$\frac{--3 \pm \sqrt{(-3)^2 - 4 \times 2 \times -7}}{2 \times 2}$ or $\frac{3}{4} \pm \sqrt{\frac{65}{16}}$	M1	oe correct attempt to solve their 3-term quadratic equation
	2.77	A1	2.77 and – 1.27 is A0
	Additional Guidance		
18	18	B3	B2 identifies there are 3 choices for first digit and 3 choices for second digit B1 identifies there are 3 choices for first digit or identifies there is 1 choice for last digit
	Additional Guidance		
19(a)	Identifies (x =) $-\frac{1}{3}$	M1	may be implied
	$3\left(-\frac{1}{3}\right)^3 - 2\left(-\frac{1}{3}\right)^2 - 7\left(-\frac{1}{3}\right) - 2 = 0$ or $-\frac{1}{9} - \frac{2}{9} + \frac{7}{3} - 2 = 0$	A1	oe must show four terms and equate to 0
	Additional Guidance		

Q	Answer	Mark	Comments
19(b)	**Alternative method 1**		
	$(3x + 1)(x^2 - x \ldots)$ or $3x + 1 \overline{)3x^3 + 4x^2 - 2x - 1}$ $x^2 - x \ldots$	M1	
	$(3x + 1)(x^2 - x - 2)$ or $3x + 1 \overline{)3x^3 + 4x^2 - 2x - 1}$ $x^2 - x - 2$	A1	
	$(3x + 1)(x + 1)(x - 2)$	A1	
	Alternative method 2		
	f(– 1) = 0 or f(2) = 0	M1	
	f(– 1) = 0 and f(2) = 0	A1	
	$(3x + 1)(x + 1)(x - 2)$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
20	$(VM^2=)\ 10^2 - 3^2$ or $100 - 9$ or 91	M1	oe
	$(DM^2=)\ 8^2 + 3^2$ or $64 + 9$ or 73	M1	oe
	10^2 = their 91 + their 73 $-2 \times \sqrt{\text{their 91}} \times \sqrt{\text{their 73}} \times \cos VMD$	M1dep	oe dep on M2 may be implied
	$(\cos VMD =)\ \dfrac{\text{their 91} + \text{their 73} - 10^2}{2 \times \sqrt{\text{their 91}} \times \sqrt{\text{their 73}}}$	M1dep	oe dep on M3
	[66.8, 66.9] or 67	A1	

Q	Answer	Mark	Comments
21	$4n^2 + 6n + 6n + 9$ or $4n^2 + 12n + 9$	M1	allow one error implied by $4n^2 + 12n + k$ or $an^2 + 12n + 9$
	$8n^3 + 12n^2 + 24n^2 + 36n + 18n + 27$	M1dep	oe ft their $4n^2 + 6n + 6n + 9$ allow one error
	$8n^3 + 36n^2 + 54n + 27$ or $9n^3 + 36n^2 + 54n + 27$	A1	
	$9n^3 + 36n^2 + 54n + 27$ and $9(n^3 + 4n^2 + 6n + 3)$	A1	oe eg $(9n^3 + 36n^2 + 54n + 27) \div 9$ $= n^3 + 4n^2 + 6n + 3$ or $9n^3 + 36n^2 + 54n + 27$ and all coefficients are divisible by 9