AQA LEVEL 2 CERTIFICATE **FURTHER MATHEMATICS (8365/1)**

Paper 1

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(a)	3	B1	
	Additional Guidance		
1(b)	0	B1	
	Additional Guidance		
1(c)	c^{5p} or c^{12} or $5p = 12$	M1	
	2.4 or $\frac{12}{5}$ or $2\frac{2}{5}$	A1	oe
	Additional Guidance		
2	$7x - 13 = 2^3$ or $7x - 13 = 8$	M1	oe
	3	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
3	**Alternative method 1**		
	$6ax - 3a + 4ax + 20$	M1	both brackets expanded correctly
	$6a + 4a = 60$ or $-3a + 20 = b$	M1	either coefficient equated correctly
	$a = 6$	A1	
	$b = 2$	A1	
	Alternative method 2		
	Correct substitutions leading to two correct equations in a and b	M1	
	A correct attempt to eliminate either a or b	M1	any valid method
	$a = 6$	A1	
	$b = 2$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
4	**Alternative method 1**		
	$5 + \frac{2}{5}$ x (5 – 3)	M1	oe
	$5.5 – \frac{2}{5}$ x (7 – 5.5) or 4.9	M1	oe
	5.8 or 4.9	A1	oe
	(5.8, 4.9)	A1	oe.
	Alternative method 2		
	$\frac{x-3}{x-5} = \frac{5+2}{2}$	M1	oe
	$\frac{7-y}{5.5-y} = \frac{5+2}{2}$	M1	oe
	5.8 or 4.9	A1	oe
	(5.8, 4.9)	A1	oe.
	Alternative method 3		
	$\frac{2\times3+5\times x}{2+5} = 5$	M1	oe
	$\frac{2\times7+5\times y}{2+5} = 5.5$	M1	oe
	5.8 or 4.9	A1	oe
	(5.8, 4.9)	A1	oe
	Additional Guidance		

Q	Answer	Mark	Comments
5	$-3x^{-2}$	M1	
	$20x^{9}$ or $+ 6x^{-3}$	M1	
	$20x^{9} + 6x^{-3}$	A1	no additional terms
	Additional Guidance		
6	$5xy(3x - y)$	M1	
	$4(3x - y)$	M1	
	$\frac{5xy}{4}$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
7	**Alternative method 1**		
	$\frac{1}{2} \times 8 \times 8 \times \sin 60$ or $\frac{1}{2} \times 8 \times 8 \times \sin (180 - 60)$	M1	oe area of triangle *ABC* or area of triangle *ADC*
	2 × their area of triangle *ABC* or 2 × their area of triangle *ADC*	M1dep	oe fully correct method for area
	$32\sqrt{3}$	A1	
	Alternative method 2		
	2 × 8 × sin 30 or $\sqrt{8^2 + 8^2 - 2 \times 8 \times 8 \times \cos 60}$ or 8 or 2 × 8 × cos 30 or $\sqrt{8^2 + 8^2 - 2 \times 8 \times 8 \times \cos 120}$ or $8\sqrt{3}$	M1	oe diagonal *AC* or diagonal *BD*
	$\frac{1}{2}$ × their *AC* × their *BD*	M1dep	oe fully correct method for area
	$32\sqrt{3}$	A1	
	Additional Guidance		
	Any fully correct method for the area of the rhombus scores M1M1 eg 8 × 8 × sin 60		M1M1

8	Correct shape curve crossing x-axis twice for $x > 0$ crossing x-axis once for $x < 0$ maximum point L labelled minimum point M labelled N (0, 6) labelled	B3	B2 Correct shape curve crossing x-axis twice for $x > 0$ crossing x-axis once for $x < 0$ with incomplete labelling B1 Identifies N as (0, 6)
	Additional Guidance		

Q	Answer	Mark	Comments
9	$x + 2x + 3x + 4x = 180$ or $10x = 180$	M1	oe
	$x = 18$ or $5x = 90$	M1dep	must see working for first M1
	$\angle ABC = 90$ or $\angle ADC = 90$ and (converse of) angle in a semicircle and AC is a diameter	A1	must see working for M1M1
	(sum of) opposite angles of a cyclic quad = 180 and angle sum of a triangle = 180	A1	must see working for M1M1
	Additional Guidance		
	The final A1 is likely to be seen within the working for M1M1A1		

10	$\frac{9}{2} \times \frac{1}{3}$ or $\frac{3}{2}$ or $\frac{2}{9x}$	M1	oe
	$\frac{2}{3}$	A1	

	their $\frac{2}{3} = \sqrt{1 - p \times \left(\frac{1}{3}\right)^3}$	M1dep	oe
	$\left(\text{their}\frac{2}{3}\right)^2 = 1 - p \times \left(\frac{1}{3}\right)^3$	M1dep	oe
	15	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
11	(x-coordinate of C =) $\frac{5+1}{2}$ or 3 or (radius =) $\frac{5+1}{2}$ or 3	M1	may be implied
	(y-coordinate of C =) 2	M1	may be implied
	$(x-3)^2 + (y-2)^2 = 9$	A1	allow $(x-3)^2 + (y-2)^2 = 3^2$
	Additional Guidance		

12	$4^2 + 7^2 - 2 \times 4 \times 7 \times \left(-\frac{2}{7}\right)$	M1	oe
	81	A1	
	9	A1	
	Additional Guidance		

13	$t(w^3 - 2) = 3w^3 + a$	M1	
	$tw^3 - 2t = 3w^3 + a$	M1dep	

	$tw^3 - 3w^3 = a + 2t$	M1dep	
	$w^3(t-3) = a + 2t$ or $w^3 = \frac{a+2t}{t-3}$	M1dep	
	$w = \sqrt[3]{\frac{a+2t}{t-3}}$	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
14	Multiplies numerator and denominator by $\sqrt{3} - 1$	M1	
	(denominator =) 2	A1	
	(numerator =) $3 - \sqrt{3} - 7\sqrt{3} + 7$ or $10 - 8\sqrt{3}$	M1dep	
	$5 - 4\sqrt{3}$	A1	
	Additional Guidance		
15(a)	$(-4)^2 + 5 \times -4 + 8$ or 4	M1	oe
	$2x + 5$	M1	$\frac{dy}{dx}$
	$2 \times -4 + 5$ or -3	M1dep	gradient of tangent
	$-\frac{1}{\text{their} - 3}$ or $\frac{1}{3}$	M1dep	dep on 2nd and 3rd M1
	$y - 4 = \frac{1}{3}(x + 4)$ and $3y = x + 16$	A1	must see correct working leading to $3y = x + 16$
	Additional Guidance		

Q	Answer	Mark	Comments
15(b)	$x + 16 = 3(x^2 + 5x + 8)$	M1	oe
	$3x^2 + 14x + 8\ (= 0)$	A1	
	$(3x + 2)(x + 4)\ (= 0)$ or $\frac{-14 \pm \sqrt{14^2 - 4 \times 3 \times 8}}{2 \times 3}$ or $-\frac{7}{3} \pm \sqrt{\frac{25}{9}}$	M1	oe correct attempt to solve their 3-term quadratic
	$-\frac{2}{3}$	A1	
	Additional Guidance		
16	$15(2x)^4(a)^2$	M1	
	$15 \times 16a^2 = 60$ or $240a^2 = 60$	M1dep	oe
	$\sqrt{\frac{\text{their } 60}{\text{their } 240}}$ or $\frac{1}{2}$ or $-\frac{1}{2}$	M1dep	oe
	$\frac{1}{2}$ and $-\frac{1}{2}$	A1	oe
	Additional Guidance		

Q	Answer	Mark	Comments
17	**Alternative method 1**		
	Correct attempt to eliminate two variables from left hand side	M1	eg $2(2a + b – c) – (4a – 3b – 2c)$
	Correct attempt to eliminate two variables	M1dep	eg $2(2a + b – c) – (4a – 3b – 2c)$ $= 2 \times 8 – (– 9)$ or $5b = 25$
	Solves their equation	M1dep	eg $b = 25 \div 5$ or $b = 5$
	Substitutes their value into two equations and correct method to eliminate a variable	M1	eg $2a + 5 – c = 8$ and $6a + 15 + c = 0$ and $8a + 20 = 8$
	$a = -\frac{3}{2}$ and $b = 5$ and $c = –6$	A1	oe
	Alternative method 2		
	Two correct attempts to eliminate same variable from left hand side	M1	eg $3(2a + b – c) + (4a – 3b – 2c)$ and $4a – 3b – 2c + 6a + 3b + c$
	Two correct attempts to eliminate same variable	M1dep	eg $3(2a + b – c) + (4a – 3b – 2c)$ $= 24 – 9$ and $4a – 3b – 2c + 6a + 3b + c = 0 – 9$ or $10a – 5c = 15$ and $10a – c = –9$
	Correct attempt to eliminate a variable from their two equations	M1dep	eg $10a – 5c – (10a – c) = 15 – 9$ or $–4c = 24$ or $c = –6$
	Substitutes their value into two equations and correct method to eliminate a variable	M1	eg $2a + b + 6 = 8$ and $4a – 3b + 12 = –9$ and $2(2a + b + 6) – (4a – 3b + 12)$ $= 2 \times 8 – (–9)$

	$a = -\frac{3}{2}$ and $b = 5$ and $c = -6$	A1	oe
	Additional Guidance		

Q	Answer	Mark	Comments
18	$(x^{-\frac{2}{3}} =) \frac{49}{4}$ or $x^{\frac{2}{3}} = \frac{4}{49}$	M1	
	$\left(\frac{49}{4}\right)^{\frac{3}{2}}$ or $\left(\frac{4}{49}\right)^{\frac{3}{2}}$	M1dep	oe
	$\frac{8}{343}$	A1	
	Additional Guidance		
19	$6x^2 - 24x + 25$	M1	allow one error
	$6(x^2 - 4x)$ …	M1dep	ft their $6x^2 - 24x + 25$ must have 3 term quadratic
	$6(x - 2)^2$ …	M1dep	ft their $6(x^2 - 4x)$ …
	$6(x - 2)^2 + 1$ and valid argument that this is > 0	A1	
	Additional Guidance		

Q	Answer	Mark	Comments
20(a)	$2(1-\sin^2\theta) = 2-2\sin^2\theta$	B1	
	Additional Guidance		

20(b)	$2\sin^2\theta - 3\sin\theta + 1 \quad (=0)$	M1	
	$(\sin\theta - 1)(2\sin\theta - 1) \quad (=0)$	M1dep	
	$\sin\theta = 1$ or $\sin\theta = \frac{1}{2}$	M1dep	
	30^o and 90^o and 150^o	A1	
	Additional Guidance		