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General Certificate Secondary of Education
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Methods in Mathematics (Pilot) 9365

Unit 1 Higher Tier 93651H

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics 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.
Q	Marks awarded for quality of written communication. (QWC)
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 $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
25.3 …	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
Use of brackets	It is not necessary to see the bracketed work to award the marks.

M1 Higher Tier

Q	Answer	Mark	Comments
1(a)	$5x - 10$ (= 35)	M1	$x - 2 = 7$
	$5x = 45$	M1	$x = 7 + 2$
	9	A1 ft	ft For M1M0 or M0M1
1(b)	$9y - 12 = 3y$	M1	or $6y - 9y$ (= $-3y$)
	$13 - 1$ (= 12)	M1	or $1 - 13$ (= -12)
	4	A1 ft	ft For M1M0 or M0M1 with only one rearrangement error
2(a)	$1 - 0.2 - 0.15 - 0.3$	M1	$1 - 0.65$
	0.35	A1	oe
2(b)	200×0.15 or $\frac{30}{200}$	M1	
	30	A1	SC1 170
2(b) Alt	$200 - (200 \times 0.2 + 200 \times 0.3 + 200 \times$ their 0.35)	M1	
	30	A1	SC1 170
3(a)	Circle $A = (b - c)^2$	B1	Any indication
3(b)	Circle $S = \frac{q^3}{\sqrt{r}}$	B1	Any indication
4(a)	3×4 (=12)	M1	$7 = 3x - 6$
	$12 - 6 = 6$	A1	$x = 4.3$
4(a) Alt 1	Correct line from $x = 3$ to $x = 4$	M1	
	Correct line from $x = 3$ to $x = 4$ and plots (4, 7) or writes correct justification	A1	
4(a) Alt 2	3×4 (= 12)	M1	
	Line should be $y = 3x - 5$	A1	

Q	Answer	Mark	Comments
4(b)	$0 = 3x - 6$	M1	
	2, 0	A1	
4(b) Alt	Correct line from $x = 1$ to $x = 2$ or correct line from $x = 2$ to $x = 3$	M1	
	2, 0	A1	
5	$\frac{3}{4} - \frac{1}{8}$ (= $\frac{5}{8}$) oe or $\frac{6}{8}$ seen	M1	
	45(litres) = their $\frac{5}{8}$	M1	
	45 ÷ their 5 (= 9)	M1	Their 5 cannot be 1 or 2
	72	A1	SC2 60
5 Alt 1	Diagram with $\frac{1}{8}$ and $\frac{6}{8}$ indicated	M1	oe
	45 identified between $\frac{1}{8}$ and $\frac{6}{8}$	M1	
	Each section = 9	M1	
	72	A1	SC2 60
5 Alt 2	$\frac{x}{8} + 45 = \frac{3x}{8}$	M1	oe
	$x + 360 = 6x$	M1	oe
	$360 = 5x$	M1	
	72	A1	SC2 60
6	4.5×10^3 or $\frac{45}{10\,000}$	M1	
	0.0045 or $\frac{9}{2000}$	A1	SC1 number given in standard form with negative index and then correctly changed to decimal.

Q	Answer	Mark	Comments
7(a)	0.16 or 200 and 'most trials'	B2	oe B1 0.16 or 200 with no or incomplete reason B1 No relative frequency or number of trials, but 'the most trials' given
7(b)	0.13 × 100 (= 13) or 0.14 × 50 (= 7)	M1	oe
	Their 13 – their 7	M1Dep	
	6	A1	
8	1.1 or 110%	B1	
	517 ÷ 1.1	M1	517 ÷ 110 × 100
	470	A1	
9	$3x - (x - 5)$	M1	Condone omission of brackets
	$2x + 5 = 17$	M1	
	6	A1	SC2 11
9 Alt	$2^{3x} = 2^{17} \times 2^{x-5}$	M1	
	$3x = 12 + x$	M1	
	6	A1	SC2 11
9 Alt 2	Substitutes a value for x and evaluates correctly as a power of 2.	M1	
	Substitutes a different value for x and evaluates correctly as a power of 2 which is closer to 17.	M1	
	6	A1	SC2 11

Q	Answer	Mark	Comments
10	$x^{-\frac{2}{3}}$ or $a = -\frac{2}{3}$	B3	B2 $(x^{\frac{-1}{3}})^2$ or $(x^2)^{\frac{-1}{3}}$ or $(x^{\frac{2}{3}})^{-1}$ or $(x^{-2})^{\frac{1}{3}}$ or $(x^{\frac{1}{3}})^{-2}$ or $\frac{1}{x^{\frac{2}{3}}}$ or $-\frac{2}{3}$ B1 $(\sqrt[3]{x})^{-2}$ or $(\sqrt[3]{x^2})^{-1}$ or $(\frac{1}{x^2})^{\frac{1}{3}}$ or $\frac{1}{(x^2)^{\frac{1}{3}}}$ or $(\frac{1}{\sqrt[3]{x}})^2$ or base x with any negative index.
11	$abx^2 + a^2x + b^2x + ab$ or $ab = 10$	M1	
	Identifies 1 and 10 or 2 and 5	M1	
	29 or 101	A1	
	29 and 101	A1	Correct answer gets all 4 marks
11 Alt	$(x + 10)(10x + 1)$	M1	$(2x + 5)(5x + 2)$
	$10x^2 + 100x + x + 10$	M1	$10x^2 + 4x + 25x + 10$
	29 or 101	A1	
	29 and 101	A1	Correct answer gets all 4 marks
12	$(6800 \div 10) + (6800 \div 100) \times 2$ (= 816)	M1	$680 + 2 \times 68$ 6800×0.12
	6800 + their 816	M1 dep	6800×1.12 gets M2
	7616	A1	

Q	Answer	Mark	Comments
13	0.84	B1	oe $\frac{84}{100}$
	17 ÷ 20 attempted	M1	$\frac{17 \times 5}{20 \times 5}$
	0.85	A1	$\frac{85}{100}$
	$\frac{17}{20}$ selected and 0.84 and 0.85	Q1	oe QWC - strand (ii) - writing both as decimals or both as percentages or both as fractions with same denominator and correct decision for their working
13	0.84	B1	oe $\frac{84}{100}$
	$\frac{\textit{their}\ 84 \div 5}{20}$	M1	
	$\frac{16.8}{20}$	A1ft	ft from B0M1
	$\frac{17}{20}$ selected and $\frac{16.8}{20}$	Q1	QWC - strand (ii) - writing both as a fraction with 20 as denominator and correct decision for their working
14(a)	$\frac{6}{15}$	B1	oe $\frac{2}{5}$
14(b)	$\frac{5}{15}$	B1	oe $\frac{1}{3}$
14(c)	$\frac{7}{10}$	B2	oe B1 correct numerator with incorrect denominator or incorrect numerator with correct denominator

Q	Answer	Mark	Comments
15	$3 \leqslant n$	B1	
	$n < 7$	B1	
	3, 4, 5, 6	B1 ft	ft their double-sided inequality Correct answer gets 3 marks ft their inequality SC2 3, 4, 5, 6 with one incorrect answer or any three of 3, 4, 5, 6 with no incorrect answers SC1 any two of 3, 4, 5, 6 with no incorrect answers or any three of 3, 4, 5, 6 with one incorrect answer
16(a)	$x + 10$	Q1	QWC Strand (i) – Correct notation
16(b)	$3x + 2 \times$ their $(x + 10) = 95$	B1ft	oe $3x + 2x + 20 = 95$ $5x + 20 = 95$ ft their $x + 10$
16(c)	Their $(5x + 20) = 95$	M1	Simplification of their equation(from at least two terms in x) May be in part (b)
	(95 – their 20) ÷ their 5	M1	Their 5 cannot be 1
	15	A1	
17	$(c =) - 2$	B1	Correct y values identified or plotted for $x =$ 0, 2 and 3
	Plots or identifies at least two correct points	B1 ft	from (–3,7) (–2, 2) (–1, –1) (0, –2) (2, 2) (3, 7) ft their c
	Plots all correct points	B1 ft	ft their c
	Joins points with smooth curve	B1 ft	Within 1 small square of each point ft their points
18	$(x + 2)(x + 7)$	B2	Either order B1 for $(x + a)(x + b)$ where $a + b = 9$ or $ab = \pm 14$

Q	Answer	Mark	Comments
19	$8x + 4y$ (= $11 + 7y$)	M1	$2x + y = \frac{11 + 7y}{4}$
	$8x = 11 + 7y - 4y$	M1	$8x = 11 + 3y$ $2x = \frac{11 + 7y}{4} - y$ Separates variables
	$x = \frac{11 + 3y}{8}$	A1ft	ft M1M0 or M0M1 and only one error in expansion or rearrangement SC2 $\frac{11 + 3y}{8}$
20	$8x^{15}y^{3}$	B2	B1 For any two correct
21	$x^2 \quad x \quad \sqrt{x} \quad x^0 \quad \frac{1}{x}$	B2	B1 for only one out of place B1 correct evaluation of at least two of first four terms with $0<x<1$ SC1 reverse order
22(a)	$\sqrt{2 \times 32}$ or $\sqrt{64}$ or $(\sqrt{2} \times)4\sqrt{2}$ or $2\sqrt{16}$ or $(\sqrt{2} \times)\sqrt{2}\sqrt{16}$	M1	
	8	A1	
22(b)	$\frac{21\sqrt{7}}{\sqrt{7}\sqrt{7}}$ or $\frac{21\sqrt{7}}{7}$ or $\frac{21\sqrt{7}}{\sqrt{49}}$	M1	
	$3\sqrt{7}$	A1	

Q	Answer	Mark	Comments
23	$\frac{7}{11}$ (×) $\frac{6}{10}$ $\left(=\frac{42}{110}\right)$ or $\frac{4}{11}$ (×) $\frac{3}{10}$ $\left(=\frac{12}{110}\right)$	M1	oe Can be on tree diagram
	$\frac{7}{11} \times \frac{6}{10}$ $\left(=\frac{42}{110}\right)$ and $\frac{4}{11} \times \frac{3}{10}$ $\left(=\frac{12}{110}\right)$	M1	
	Their $\frac{42}{110}$ + their $\frac{12}{110}$	M1 Dep	Dep on M2
	$\frac{54}{110}$	A1	oe $\frac{27}{55}$ SC2 $\frac{54}{121}$ or $\frac{65}{110}$ $\left(=\frac{13}{22}\right)$ SC1 $\frac{65}{121}$
Alt 23	$\frac{7}{11}$ (×) $\frac{4}{10}$ $\left(=\frac{28}{110}\right)$ or $\frac{4}{11}$ (×) $\frac{7}{10}$ $\left(=\frac{28}{110}\right)$	M1	oe Can be on tree diagram
	$\frac{7}{11} \times \frac{4}{10}$ $\left(=\frac{28}{110}\right)$ and $\frac{4}{11} \times \frac{7}{10}$ $\left(=\frac{28}{110}\right)$	M1	$\frac{28}{110} \times 2$ $\left(=\frac{56}{110}\right)$
	1 – (their $\frac{28}{110}$ + their $\frac{28}{110}$)	M1 Dep	Dep on M2
	$\frac{54}{110}$	A1	oe $\frac{27}{55}$ SC2 $\frac{54}{121}$ or $\frac{65}{110}$ $\left(=\frac{13}{22}\right)$ SC1 $\frac{65}{121}$