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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 $\frac{1}{2}$

M1 Higher Tier

Q	Answer	Mark	Comments
1(a)(i)	$\frac{3}{8}$	B1	oe 0.375 37.5%
1(a)(ii)	$\frac{5}{8}$	B1	oe 0.625 62.5% SC1 For $\frac{3}{11}$ in (a)(i) and $\frac{5}{11}$ in (a)(ii) or 2/5 in (a)(i) and 3/5 in (a)(ii) or '3 in 8' oe in (a)(i) and '5 in 8' oe in (a)(ii)
1(b)	$\frac{2}{3}$	B2	oe B1 2 out of 3 identified or 4/11
2	$x + x + 4 + x + 8 + x + 12$ (= 100)	M1	Any letter
	$4x + 24 = 100$	M1	Correct simplification of their four algebraic terms
	19	A1	
2 Alt 1	Trial with four numbers in correct pattern with correct total	M1	eg 10 + 14 + 18 + 22 = 64
	Trial with a different four numbers in correct pattern with correct total, which is closer to 100	M1	eg having tried 10 + 14 + 18 + 22 = 64, tries 20 + 24 + 28 + 32 = 104
	19	A1	
2 Alt 2	4 + 8 + 12 (= 24)	M1	6 × 4 (= 24)
	(100 – their 24) ÷ 4	M1	76 ÷ 4
	19	A1	
2 Alt 3	(100 ÷ 4 =) 25	M1	
	Their 25 – 6	M1	
	19	A1	
2 Alt 4	Trial with four numbers in correct pattern with correct total	M1	eg, 1 0 + 14 + 18 + 22 = 64
	(100 – sum of their four numbers) ÷ 4 + their lowest number	M1	eg, (100 – 64) ÷ 4 + 10
	19	A1	

Q	Answer	Mark	Comments
3(a)(i)	16	B1	
3(a)(ii)	–8	B1	
3(b)	Any expression including r, s and t (and a constant) which equals 18	M1	For example, $7r - 2s + 2(r + t)$ $4(r + t) - \frac{1}{4}(7r - 2s)$ $7r - 2s + r + t + 5$
	Any simplified expression including r, s and t (and a constant) which equals 18	A1	For example, $9r - 2s + 2t$ $9r - 2(s - t)$ $\frac{9r}{4} + 4t + \frac{s}{2}$ $8r - 2s + t + 5$
4(a)	2200 – 1600 (= 600)	M1	
	$\frac{\text{their } 600}{1600} \times 100$	M1 Dep	
	37.5	A1	
Alt 4(a)	$\frac{2200}{1600}$ (= 1.375)	M1	
	(Their 1.375 – 1) × 100	M1 Dep	(Their 1.375 × 100) – 100
	37.5	A1	
4(b)	100 – 35 (= 65) or 1 – 0.35 (= 0.65)	M1	5200 calculated for first year
	8000 × (their 0.65)^n for any $n \geq 2$	M1 Dep	oe 3380 or 2197 seen
	1428 (.05) calculated for year 4 or 928 (…) calculated for year 5	A1	
	5 years stated **and** 1428 (.05) **and** 928 (…) seen	Q1	QWC - Strand (iii) - Correct values or fully correct method (successive multiplications by 0.65 oe) and correct decision from their working, even if there are errors in calculation

Q	Answer	Mark	Comments
5	31 – 13 + 3 or 62 – 26 + 3	M1	
	21	A1	
	39	A1	SC1 62 and 26 seen
6(a)	Change in y divided by change in x over same period	M1	
	$\frac{1}{2}$	A1	oe SC1 $y = \frac{1}{2}x$ ...
6(b)	Perpendicular from (1, 6) (A) to (2, 4) (within $\frac{1}{2}$ square)	M1	Point marked on grid at (3, 2)
	(3, 2)	A1	x coordinate [2.9, 3.1] y coordinate [1.9, 2.1]
7(a)	$6x - 2x - 5 > 7$	M1	$6x > 2x + 7 + 5$ $4x - 5 > 7$ $6x > 2x + 12$ $4x > 12$ $-12 > -4x$ $-4x < -12$
	$x > 3$	A1	SC1 3 or $x > 1.5$ or $x > 0.5$
7(b)	–1	B1	Condone $n = -1$ but not $n > -1$

Q	Answer	Mark	Comments
8(a)	$n - 20$	B1	
	$2n - 20$ (+ 0) or $\frac{n + n - 20}{3}$ (+ 0), then $\frac{2n - 20}{3}$	B1	Condone $n + n - 20$ (+ 0) ÷ 3 = $\frac{2n - 20}{3}$
8(b)	$n - \frac{2n - 20}{3}$	M1	
	$n - \frac{2n}{3} + \frac{20}{3}$	M1	$\frac{3n}{3} - \frac{2n - 20}{3}$ $(= \frac{3n - 2n + 20}{3})$
	$\frac{n}{3} + \frac{20}{3}$	A1	$\frac{n + 20}{3}$
Alt 8(b)	$n - x = \frac{2n - 20}{3}$ **and** $3(n - x) = 2n - 20$ or $3n - 3x = 2n - 20$	M1	Sets up an equation with an unknown standing for the amount required
	$n + 20 = 3x$	M1	
	$(x =) \frac{n + 20}{3}$	A1	$(x =) \frac{n}{3} + \frac{20}{3}$
9(a)	$y \propto x^2$ or $y = kx^2$	M1	$28 = k \times 2^2$
	$k = 7$	A1	
	$y = 7x^2$	Q1	oe QWC - Strand (i) - Correct notation
9(b)	Fourth box ticked	B1	If no box is ticked, accept only the correct statement rewritten on the working lines
10	(0.4×0.4) or $(0.4 \times 0.6 \times 0.4)$ or $(0.6 \times 0.4 \times 0.4)$	M1	0.16 or 0.096 oe
	$(0.4 \times 0.4) + (0.4 \times 0.6 \times 0.4) + (0.6 \times 0.4 \times 0.4)$	M1	0.16 + 0.096 + 0.096 oe
	0.352	A1	oe $\frac{44}{125}$

Q	Answer	Mark	Comments
11(a)	$9 \times \frac{5}{11}$	M1	
	$\frac{45}{11}$	A1	oe fraction
	$4\frac{1}{11}$	B1ft	Correctly changes their improper fraction to a mixed number
11(b)	Yes with correct comparison $\frac{100}{220}$ and $\frac{99}{220}$	B1	oe $0.\dot{4}\dot{5}$ or 0.454(…) or 0.455 and 0.45 45.4…% or 45.5% and 45% $\frac{100}{220} > \frac{99}{220}$ or 9/20 < 5/11 oe implies Yes
12(a)	$2(6x - 5)$	B1	
12(b)	$x(x - 7)$	B1	Condone $(x \pm 0)(x - 7)$ or $(x - 7)(x \pm 0)$
12(c)	$(4p =)\ r - 3$	M1	$-4p = 3 - r$ $\quad r/4 = p + \frac{3}{4}$
	$(p =)\ \frac{r - 3}{4}$ or $(3 - r)/-4$	A1	oe SC1 $(p =)\ (r + 3)/4$
13	(4 small =) 3 large	M1	4 : 3 $8 \times \frac{3}{4}$ $\quad 9 \times \frac{2}{3}$ $\quad 9 \div 1.5$
	6	A1	

Q	Answer	Mark	Comments
14(a)	$12y + 33$ (= 24)	M1	Allow one arithmetic or sign error eg, $12y + 22 = 24$ or $12y - 33 = 24$
	$12y = -9$	A1	oe
	$-\frac{3}{4}$	A1ft	oe ft if M1A0 awarded
Alt 14(a)	$4y + 11 = 24 \div 3$	M1	$4y + 11 = 8$
	$4y = -3$	A1	oe
	$-\frac{3}{4}$	A1ft	ft If M1A0 awarded
14(b)	Substitutes $x = 5$ into equation	M1	$2a$ (=) $20 - b$
	A correct pair of values	A1	eg, (0, 20) (1, 18) (2, 16) (3, 14) etc Allow negative integers for either value
	A second pair of correct values	A1	
15(a)	$1 - (0.15 + 0.1 + 0.1 + 0.3 + 0.15)$ (= 0.2)	M1	
	200 × their 0.2	M1 Dep	oe
	40	A1	
Alt 15(a)	200 × 0.15 (+) 200 × 0.1 (+) 200 × 0.1 (+) 200 × 0.3 (+) 200 × 0.15	M1	30 (+) 20 (+) 20 (+) 60 (+) 30 (= 160) Allow one arithmetic error or incorrect value, which may be repeated for equal values
	200 – their 160	M1 Dep	Can be implied by correct evaluation
	40	A1	
15(b)	Ticks 'No' with correct explanation eg, different experiments usually lead to different results	B1	Explains that the outcome is just chance, or that it is (very) unlikely that the results would be the same
15(c)	Ticks 'Yes' with idea that increasing number of trials leads to better results	B1	

Q	Answer	Mark	Comments
16(a)	4 000	B1	
16(b)	1.6×10^7	B2ft	ft their (a) squared, then put into standard form B1 16×10^6 or 16 000 000 or their (a) squared or their 16 000 000 correctly written in standard form if power of 10 > 3
16(c)	$\frac{1}{4 \times 10^3}$	M1	$\frac{1}{4000}$ or 1/their 4000
	0.25×10^{-3}	M1	0.00025 1/their 4000 as a decimal number or in the form $p \times 10^q$
	2.5×10^{-4}	A1 ft	ft their 4000 Correct change of their 0.00025 into standard form if M1 awarded and power of 10 is negative
17(a)	7	B1	
17(b)	Marks all 5 points correctly	B1 ft	$\pm \frac{1}{2}$ square ft their (a)
	Joins their points with smooth curve	B1 ft	On or above (–1.5, 5.5) **and** on or below (0.5, 3.8)
18	x^{-2} $\frac{1}{x}$ $x^{\frac{1}{2}}$ x^3	B2	B1 For 1 out of order or correct substitution of number greater than 1 eg, for 2, $\frac{1}{2}$, $\frac{1}{4}$, $\sqrt{2}$, 8
19	$\sqrt{36} + \sqrt{9} = 6 + 3 = 9$ or $\sqrt{36} + 3 = 6 + 3 = 9$ or $\sqrt{3}(2\sqrt{3} + \sqrt{3}) = \sqrt{3} \times 3\sqrt{3} = 9$ or $\sqrt{3}(2\sqrt{3} + \sqrt{3}) = 2 \times 3 + 3 = 6 + 3 = 9$ or $\sqrt{3}(2\sqrt{3} + \sqrt{3}) = 2\sqrt{3}\sqrt{3} + 3 = 6 + 3 = 9$	B2	B1 for $(\sqrt{3} \times \sqrt{12}) = \sqrt{36}$ or $(\sqrt{3} \times \sqrt{3} =) \sqrt{9}$ or $(\sqrt{3} \times \sqrt{3} =) 3$ or $(\sqrt{12} =) 2\sqrt{3}$

Q	Answer	Mark	Comments
20	$c = 5$	B1	(0, 5) identified
	$x^2 + (2x + 5)^2 = 25$	M1	Substitution of their line into the equation Allow $x^2 + (2x + c)^2 = 25$
	$5x^2 + 20x = 0$	A1 ft	$x^2 + 4x = 0$ ft their equation $5x^2 + 4cx + c^2 = 25$
	$5x(x + 4) = 0$	M1	Allow $x(5x + 20) = 0$ Allow correct method for solving their quadratic
	$x = -4$ (or 0)	A1	Must have both method marks if $y \neq -3$
	$(-4, -3)$	A1	