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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 4301

Specification A

Paper 2 Higher

Mark Scheme

2008 examination - June series

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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.
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 $\frac{1}{2}$

Paper 2H

Q	Answer	Mark	Comments
1(a)	150	B1	
1(b)	10	B1	
1(c)	Their '150' ÷ 3	M1	ft Their value from (a)
	50	A1ft	**SC** Their 150 ÷ 180 or their 150 ÷ 170 or 150 ÷ 2.83… B1
2	580 ÷ 51 **or** 370 ÷ 32	M1	Allow 'scaling' providing **both** calculations are scaled
	11.3… **or** 11.5…	A1	Accept 11.4 or 11.6 or scaled digits **NB** could compare 11 and 12 after working
	Beryl and both correct answers above	A1	
3(a)	5.52941(17…)	B1	
3(b)	5.5 or 5.53	B1ft	ft Value in (a) if >3 sf and rounded to 2 or 3 sf
4(a)	$4x + 5 = 15$	M1	
	2.5	A1	oe
4(b)	$3y - 2 = 10$	M1	oe $6y - 4 = 20$
	4	A1	
5(a)	Rotation (only)	B1	Any reference to a double transformation do not award this mark
	(0, 0) or origin or O	B1	
	90° (anticlockwise)	B1	Quarter turn or 270° clockwise.
5(b)	Correct reflection	B2	B1 For reflection in $x = -1$ B1 For $y = -1$ drawn B1 For shape A reflected in $y = -1$

Q	Answer	Mark	Comments
6(a)	58	B1	
6(b)(i)	30	B1	
6(b)(ii)	$\frac{64}{200}$, $\frac{32}{100}$, $\frac{16}{50}$, $\frac{8}{25}$, 32%, 0.32	B1	Note % sign needed with 32%
7(a)	$x(x + 3)$, $(x + 0)(x + 3)$	B1	
7(b)	$2a^2b(2 – 3ab)$	B2	B1 For $2ab(2a – 3a^2b)$ $a^2b(4 – 6ab)$ $2a^2(2b – 3ab^2)$ $(2a^2b – 0)(2 – 3ab)$ $–2a^2b(3ab – 2)$ $4a^2b(1 – 1.5ab)$
8(a)	126	B1	
8(b)	$\frac{1}{2} \times 5.5 \times (4 + 12)$	M1	oe
	44	A1	
8(c)	Interior angle 108° or exterior angle 72°	B1	
	360 ÷ exterior angle or (3 × 180 ÷ interior angle)	B1	
	5	B1Dep	This can only be awarded if at least one of previous Bs awarded
9(a)	$7x – 6$	B1	Must be simplified
	$4x + 1$ + their '$7x – 6$'	B1ft	$11x – 5$ Must be simplified
9(b)	$5y$ or $5y – 0$	B1	
	$4y – 1$ + their '$5y$' = 5	M1	$9y – 1 = 5$
	$\frac{2}{3}$	A1ft	oe Decimals 0.66, 0.67 minimum, $\frac{6}{9}$ **NB** ft Decimal answers must be to 2dp or better

Q	Answer	Mark	Comments
10	4	B2	B1 for any number that can be cancelled to the form 1:*n* e.g. 10, 16, 22, …. **NB** If answer seen and ratio quoted as 1:2 and 2 given as answer count this as contradictory further work and give B1 **SC** If clearly indicated that the **final** total of red balls is 12 then give B1 eg, 6:12 with no answer given
11	$x^2 - 3x + 4x - 12$	M1	Allow one sign or arithmetic error but must have 4 terms including x^2, 2 terms in x and a constant term
	$x^2 + x - 12$	A1	
12	$6^2 + 9^2$	M1	$6^2 + 9^2 - 2 \times 6 \times 9 \times \cos 90$
	$\sqrt{117}$	M1Dep	M1 For squaring and adding then showing need to square root **NB** $\sqrt{(12 + 18)} = \sqrt{30}$ is M0
	$3\sqrt{13}$ or 10.8…	A1	Do not accept 11 without working (minimum $6^2 + 9^2$)

Q	Answer	Mark	Comments
13(a)	Attempt at $\sum xf$ for 5 values $(25 \times 16 + 35 \times 38 + 45 \times 26 + 55 \times 14 + 65 \times 6)$	M1	Allow one numerical or copy error but must show the intention to total 5 values
	All 5 values correct 400, 1330, 1170, 770, 390	A1	The calculated values **must** be seen for this mark **NB** 400, 1730, 2900, 3670, 4060 imply correct values
	Indication that $\sum xf$ (4060) is divided by 100	B1Dep	
13(b)(i)	125	B1	1.25 m (must cross out cm and replace with m)
13(b)(ii)	140.6	B1	
13(c)(i)	Frequency polygon plotted at (125, 16), (135, 38), (145, 26), (155, 14), (165, 6)	B2	Ignore any lines before 125 or after 165 –1 eeoo **SC** Histogram B1
13(c)(ii)	Distributions same or similar Range the same Same spread	B1	oe Accept 'correlation' 'trend' or 'pattern with qualifier' as references to distribution
13(c)(ii)	Boys taller (on average) Boys taller by about 10 cm	B1	oe Must be a comparison
14(a)	Attempt to find gradient	M1	Triangle drawn on graph $\frac{3}{2}$ or $\frac{2}{3}$ 2:3, 3:2 or equivalent
	$\frac{3}{2}$ $((x) - 1)$	A1	1.5 or an equivalent fraction. Condone x
14(b)	$y =$ 'their gradient' $x - 1$	B1ft	$y = \frac{3}{2}x - 1y$ oe must have $y =$
14(c)	Negative reciprocal of their gradient	B1ft	$-\frac{2}{3}$ oe eg, $\frac{1}{1.5}$ ignore any x eg, $\frac{1}{1.5}x$
14(d)	$y =$ 'their 14c' $x + 8$	B1Dep ft	This mark is dependent on 14(c) being awarded but gradient must be given as a rational number, $0.\dot{6}$ or a 2 dp value or better $y = -\frac{2}{3}x + 8$ oe must have $y =$ $y - 8 = -\frac{2}{3}(x - 0)$, $3y = -2x + 24$

Q	Answer	Mark	Comments
15(a)	$-2x \geq 2$	M1	$-2 \geq 2x$ Allow one sign/rearrangement error eg, $6x \geq 2$, $-2x \geq 8$ etc Allow > or < at this stage for M1 but take it as one error Only allow = if 'recovered' by putting an inequality (≥, ≤, > or <) back in answer correctly
	$x \leq -1$	A1	$-1 \geq x$ or $x = \leq -1$ but not $x = < -1$. Do not accept if inequality replaced with > or <
15(b)	$y > -3$, $y \geq -3$, $-3 < y$, $-3 \leq y$	B1	
15(c)	Any area above line shaded **and** reference/clear demonstration to testing point	B1	eg, 'I tested a point' or $2 \times 0 - 3 \times 0 = 0 < 12$
16	Sight of 0.89 and **used** correctly as a multiplier	B1	**NB** Allow rounding up/down or truncation ie, values should be within ±10 of the actual value **NB** To make marking easy if final value for 10 years is in range 77945 - 77890 and/or final value for 11 years is in range 69370 - 69400 assume values have been evaluated to a sufficient accuracy.
	250 000 x 0.89^n	M1	Any value of $n > 1$
	$n = 10$ (2018) gives 77945 - 77980	A1	
	$n = 11$ (2019) gives 69370 - 69400, so 11 years	A1	Accept references to almost 11 years, 10 years 11 months with values seen. **NB** Accept 10 years on answer line if **all** working seen as it does 'take' 10 years before level falls below 70000
17	Sight of sine	M1	Use of cos if 17° clearly marked
	13 ÷ sin 73	M1	13 ÷ cos 17
	13.6, 13.59….	A1	Allow 14 with working

Q	Answer	Mark	Comments
18	Circles drawn centre A with radii 5 cm and 7 cm (±1 mm)	B1	B1 for one arc and one ray within tolerance
	Bearings of 060 and 070 drawn from B (±1°)	B1	
	Correct region identified	B1	
19	Multiplying by 100, 10000 etc.	M1	7.27272….
	$x = \frac{7.2}{99}$	A1	oe
	$\frac{4}{55}$	A1	
20	$\frac{-(3) \pm \sqrt{(3)^2 - (4)(2)(-7)}}{2(2)}$	M1	oe Allow sign error for –4*ac* only
	$\frac{-3 \pm \sqrt{65}}{4}$	A1	
	1.27 or –2.77	A1	**SC** If formula used with only positive square root leading to 1.27 B1
21	$10^2 + 12^2 - 2 \times 10 \times 12 \times \cos 78$	M1	
	194.1…	A1	$4 \times \cos 78$ is A0
	13.9…	A1	Accept 14 if working seen.

Q	Answer	Mark	Comments
22(a)	Calculation of frequency densities At least 4 correct	M1	eg, 1.4, 2.7, 8.2, 11.6, 7, 0.9 Accept values in proportion e.g 14, 27, 82 etc
	Correct histogram with heights in proportion and widths correct and correctly labelled	A1	Label on vertical axis of fd, frequency density or frequency per unit width or frequency/class width or a 'key' showing an area equal to a frequency. ie, 1 (cm) square = 10
		A1	Correct plotting
22(b)	56 or 57 or 58	B1	
23	$\pi rl + \pi r^2$ **or** $4\pi r^2$	M1	SA cylinder $2\pi r^2 + \pi r^2 + \pi r^2$ **NB** Use of h in SA of cylinder is M0
	$\pi rl + \pi r^2 = 4\pi r^2$	M1	
	$l = 3r$	A1	
24(a)	$BC = 13$	B1	$DF = \sqrt{208}$
	$BD = \sqrt{(8^2 + (BC)^2)}$ $(=\sqrt{233})$	M1	$BD = \sqrt{(5^2 + (DF)^2)}$
	$BD = 15.3$ or 15.26…	A1	
24(b)	Angle $BDF = \sin^{-1}(5 \div BD)$ $\sin BDF = (5 \div BD)$	M1	$DF = 14.4(2\ldots)$ and Angle $BDF = \tan^{-1}(5 \div DF)$ $\tan BDF = (5 \div DF)$
	19, 19.1…,	A1ft	**NB** If their values used in cos rule or other trig ratios then check accuracy by working out angle $BDF = \sin^{-1}(5 \div$ their $BD)$ to an accuracy of 1 dp. If not accurate A0

Q	Answer	Mark	Comments
25(a)	10.5, 10.499… $10.4\dot{9}$	B1	Note that for the 99 dot dot dot answer at least 2 nines and 2 dots required ie, 10.49.. or 10.499. are B0
25(b)	$(2.35 <) u \leq 2.45$ $(9.5 <) t \leq 10.5$ or their value in (a) $(0.45 <) a \leq 0.55$	B2	B1 2 out of 3 correct (only upper limits needed) Do not count as errors not seeing or incorrect lower limits **NB** Their value from (a) must be an attempt at an upper limit **NB** Recurring values are OK eg, $2.44\dot{9}$ or 2.4499… (minimum for recurrence is two 9s and dot dot..)
	$(2.45) \times (10.5) + (0.5)(0.55)(10.5)^2$	M1	M1 For **their** upper limits eg, $(2.44)(10.4) + (0.5)(0.54)(10.4)^2$ is M1 M0 If formula used incorrectly eg, $(0.5 \times a \times t)^2$ or $0.5 \times (at)^2$
	56, 56.0, 56.04…	A1ft	ft On 2 correct upper limits only from 2.45, 10.5 and 0.55 ft Answers must be to at least 3 sf
26(a)	$\frac{n+1}{n+2}$	B1	oe $\frac{n+1}{n+1+1}$
26(b)	$\frac{n+1}{n+2} - \frac{n}{n+1}$ or their (a) if in terms of $n - \frac{n}{n+1}$	M1	oe $\frac{n}{n+1} - \frac{n-1}{n}$ **NB** As this is a difference this can be reversed
	$\frac{(n+1)(n+1) - n(n+2)}{(n+2)(n+1)}$	A1	oe $\frac{n^2 - (n+1)(n-1)}{n(n+1)}$ **NB** As this is a difference this can be reversed
	Clear demonstration that numerator can be simplified to 1 eg, $(n^2 + 2n + 1) - (n^2 + 2n) = 1$	A1	$n^2 - (n^2 - 1) = 1$ **NB** If reversed must be recovered, not fiddled, for this mark