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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 4301
Specification A

Paper 2 Higher

Mark Scheme

2008 examination - November 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	6, 9, 14	B2	–1 eeoo NB starting at n = 0 gives 5, 6, 9 This is B1
2	4.80 – 1.20 (= 3.60)	M1	
	Their 3.60 ÷ 8	M1	
	45 or £0.45 (p)	A1	SC2 360 ÷ 6 leading to 60 p SC2 3 60 ÷ 9 leading to 40 p Must see working for SC NB 0.45 without £ sign is A0
3(a)	It is $y = –x$ or showing a coordinate on line doesn't work for equation or explaining what coordinates do work for $y = x$	B1	Drawing $y = x$ **NB** Reference to negative or positive gradients must use the word gradient. Slope, diagonal or correlation for example are B0 unless further explanation
3(b)	Plotting two or three points correctly or evidence (eg, table, differencing) of searching for a rule or measuring gradient and intercept	M1	**NB** Any incorrect plot even if two are correct is M0
	$y = x + 1$	A1	oe Must have y =
4	External angle or angle at centre = 360 ÷ 8 (=45)	M1	Angles could be marked on diagram
	(180 – their 45) ÷ 2	M1Dep	(Their 135) ÷ 2
	67.5	A1	

Q	Answer	Mark	Comments
5(a)	$6x - 42$	B1	$6 \times x - 42$
5(b)	$x(x + 6)$	B1	
5(c)	$2x^2 + 3x - 4x^2 + 4$	M1	Allow 1 sign or arithmetic error but must have 2 terms in x^2, 1 terms in x and a constant term
	$-2x^2 + 3x + 4$	A1	oe $3x - 2x^2 + 4$
6(a)	Rectangle, Rhombus, Parallelogram	B2	B1 2 correct
6(b)	Any 2 (or 3) of Rectangle, Parallelogram or Trapezium	B1	
6(c)	Any valid definition for quadrilateral chosen	B1ft	**NB** If 6(c) correctly done then these answers are acceptable Rectangle has angles which are all 90° Rectangle has 2 lines of symmetry Parallelogram angles not same Parallelogram has no lines of symmetry
7	Total for 'Bates' 5.50 + 9.99 (= 15.49)	B1	
	Total for Doyll's 19.48	B1	
	Their 19.48 × 0.80	M1	
	Bates with 15.49 and 15.58(4) seen	A1	

Q	Answer	Mark	Comments
8(a)	300×6.4 or 0.3×6.4	M1	Sight of digits 192 implies M1
	19.20	A1	19.2 A0
8(b)	Correct plots to ±1 mm	B2	–1 eeoo
8(c)	Ruled line within tolerance – see additional sheet	B1	ft Their plots – use judgement on the line.
8(d)	4	B1ft	ft Their line even if curved, discontinuous or non ruled. Accept 4 if all points correct and no LOBF but any other answer without a LOBF must be supported by evidence of interpolation from table
8(e)	The longer the flight the lower the cost per mile	B1	oe **NB** Must refer to cost per miles directly or implicitly
9(a)	In order Identity (Formula) Equation Expression	B2	B1 For 1 correct
9(b)	Any even number or 0 or word even in first box	B1	
	Any odd number including 1 or word odd in second box	B1Dep	

Q	Answer	Mark	Comments
10(a)	$3x + x = 7 + 8$	M1	Allow one error
	3.75	A1	oe
10(b)	$3(x + 4) + 5(x - 2)$	M1	
	$= 4 \times 3 \times 5$ or 4×15 or 60	M1	**NB** Can multiply by any multiple of 15 so all values scaled up. This is OK for both Ms and the equation '$8x + 2$' may also be scaled
	$8x + 2$ (= 60)	A1	Allow one error $8x + 2 = 4$ is M1, A1
	7.25	A1ft	oe fractions do not need to be cancelled eg, $\frac{58}{8}$ or put into mixed number form ft Their equation if first M awarded eg, $8x - 2 = 4 \Rightarrow x = 0.75$ is M1, M0, A0, A1ft
11	$72 \div 6 = 12$	B1	Must show 12
	1.06	B1	
	(Any value $\times$) their '1.06'$^{\text{'their 12'}}$	M1	$1.06^{\text{'their 12'}}$
	1.06 and power 12 > ($2 \times$ original value) or = 2.012	A1	Only award if calculation correct Must give a conclusion for this mark
12(a)	$5^2 - 1.7^2$	M1	$x^2 + 1.7^2 = 5^2$
	$\sqrt{22.11}$	M1Dep	M1 For squaring and subtracting then showing need to square root.
	4.7(…)	A1	**NB** Any alternative methods using trig etc, must be a full method to get M2
12(b)	Appropriate ratio with correct values eg, $\cos y = 1.7 \div 5$ $\sin y = x \div 5$ $\tan y = x \div 1.7$	M2	ft Their x M1 For sight of cos or fraction wrong way round or angle at wall (19.9) calculated
	70 – 70.13	A1	Radians 1.224, Gradians 77.9 NB $\tan^{-1}(5 \div 1.7) = 71.2$ M0

Q	Answer	Mark	Comments
13(a)	(0, –8)	B1	
13(b)	Correct calculation of a value for $2 < x \le 2.49$	M1	$x = 2.4$ gives –1.376 All values to 1dp or better, allow truncation
	Correct calculation of a value for $2.5 \le x < 3$	M1	$x = 2.5$ gives 0.125
	Correct calculation for $x = 2.45$ to 2.49..	M1	$x = 2.45$ gives –0.643875
	(x =) 2.5	A1	Award this if any of Ms above awarded
14(a)	These points correct (3, 2), (15, 10), (25, 20), (32, 30) and (47, 40) ± 1 mm Ignore any lines in between if continuous and positive gradient Ignore any lines before (3, 2) and after (47, 40)	B3	–1 eeoo Missing or incorrect line is one error. Allow (15, 10.25), (25, 20.5), (32. 30.75)
14(b)	0.25	B1	oe
15(a)	2.35	B1	
15(b)	60 × their 2.35 (= 141)	M1	Must be a 'lower' limit 140 ÷ 60 (= 2.33...)
	Yes and 141 seen	A1ft	Yes as 2.33 < 2.35 ft On a incorrect 'lower' limit and a valid conclusion.
16(a)	25	B1	
16(b)	50	B1	
16(c)	UQ = 60 and LQ = 40 seen	M1	60 – 40
	20	A1	NB answer on its own 2 marks but if working check that the 20 has come from 60 – 40, if not 0 marks

Q	Answer	Mark	Comments
17	25^3 or 15625	B1	
	$\pi \times 7^2 \times 25$	M1	Allow 14 as radius
	3846.5 – 3848.95	A1	
	11776 to 11778.5	A1ft	ft On their cylinder volume if M1 awarded ie, 14 as radius 229.2 to 239
18(a)(i)	19.4525127	B1	
18(a)(ii)	19 or 19.5 or 19.45	B1ft	ft Their 18ai if > 4sf and rounded to 2, 3 or 4 sf
18(b)	$\frac{T}{2\pi} = \sqrt{\frac{l}{g}}$ $T^2(1) = \frac{4\pi^2 l}{g}$	M1	Allow 'T' to be 1 and g to be 9.807 and 2π to be 6.28…
	$0.159\ldots = \sqrt{\frac{l}{g}}$ or $0.02528\ldots = \frac{1}{g}$ $1 = 4.0255\,l$	A1	oe **NB** 0.159 or 1.56(08..) implies M1, A1
	$l = g\left(\frac{T}{2\pi}\right)^2$ $l = \frac{1}{4.0255}$	M1	oe
	0.2484…, 0.248, 0.25	A1	T&I must give 0.248 or better accuracy

Q	Answer	Mark	Comments
19(a)	AX **or** BY perpendicular to tangent or right angle symbol on diagram	B1	AX **and** BY vertical
	Both AX and BY perpendicular so two parallel sides	B1Dep	AX and BY parallel implies B2 Two arrows on AX and BY implies B1 unless further explanation.
19(b)	Identifying right angled triangle with both sides correct (8 and 2)	M1	Triangle could be on diagram but 2 and 8 must be seen
	$AB^2 = 8^2 - 2^2$ (= 60)	M1Dep	$7.75^2 + 2^2 = 8^2$
	$\sqrt{60} = 7.7459\ldots$ or 7.746	A1	Must show $\sqrt{60}$ or value greater than 3sf
20(a)	$(AC^2 =)12^2 + 11^2 - 2 \times 11 \times 12 \times \cos 74$	M1	
	$AC^2 = 192.2\ldots.$	M1dep	219.67 if from radians, 160.153 is from Gradians both M2 NB $1 \times \cos 74$ is M0
	$AC = 13.86$ to …, 13.86, 13.9, 14	A1	Radians gives 14.82 and gradians gives 12.65 but do not give the second M for these answers unless the values above are seen
20(b)	$\frac{\sin ACD}{9} = \frac{\sin 46}{10}$	M1	$\frac{9}{\sin ACD} = \frac{10}{\sin 46}$
	$\sin ACD = \frac{\sin 46 \times 9}{10}$ (= 0.647(4058203))	A1	Radians gives answer of 0.8116 Gradians gives answer of 0.5951
	40.346.., , 40.35, 40.3, 40 with working	A1	Gradians gives 40.58 Radians gives 0.9469 These can score M1, A1, A0 if the working above seen

Q	Answer	Mark	Comments
21(a)	$1.6 \times 60/10$	M1	oe eg, $7.2 \times 1.6 \div 1.2$ or $7.2 \div 3 \times 4$
	9.6 minutes	A1	
21(b)	60×7.2 or $70 \times$ their 9.6	M1	
	432 and 672	A1	
	A with justification eg, $450 - 432\ (18) > 0$ but $630 - 672\ (-42) < 0$	E2ft	E1 For partial justification ft Their value from (a) eg, work out their 630 – time in (a) $\times$ 70 and allow a valid conclusion when comparing to 18
22(a)	$(2x - 3)(2x + 1) - (2x - 1)(x - 3)$	M1	Allow ‘invisible’ brackets
	$4x^2 - 6x + 2x - 3 -$ $(2x^2 - x - 6x + 3)$	A2	A1 If one error Omission of brackets is one error
	Given result for numerator	A1	Must deal with minus outside bracket convincingly
22(b)	$2x^2 + 3x - 6 = 2x^2 - 5x - 3$	M1	
	$8x = 3$	A1	
	$\frac{3}{8}$	A1	ft on at most one error either in expanding $(x - 3)(2x + 1)$ or in collecting terms together