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General Certificate of Secondary Education
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Mathematics (Linear) 43062H

(Specification 4306)

Paper 2: Higher Tier

Mark Scheme

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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 $\frac{1}{2}$

Higher Tier: Paper 2

Q	Answer	Mark	Comments
1	360 ÷ 5 with no further working	M1	180 − (540 ÷ 5)
	72	A1	
2	2 km, 2000 m or 20 seen	B1	
	(3.50 +) 20 × 0.3	M1	(350 +) 2 × their conversion if a power of 10 × 30 (0.3 etc)
	9.50	A1	9.5 is A0 unless £9.50 seen in working
3(a)	50	B1	
3(b)	(a =) (15 ÷ 3) – 1 (a +) 1 = 15 ÷ 3	M1	3(1 + a) = 15
	(a =) 4	A1	
	57	A1 ft	ft (15 + their a) × 3 if M awarded If different answers on sequence and answer line, then mark the answer line
4(a)(i)	0.87358(1847 …)	B1	Allow $\frac{539}{617}$
4(a)(ii)	0.874	B1 ft	ft Any value ≥ 4 sf rounded to 3 sf.
4(b)	1.25	B1	$\frac{10}{8}$, $\frac{5}{4}$, $1\frac{1}{4}$, $1\frac{2}{8}$
5	8h – 24 or 2h + 2h + 4(h − 6)	M1	12 + 12 + 32 = 56
	8h − 24 = 56	M1	32 = 8 × 4
	10	A1	4 + 6 = 10
5 Alt 1	4 × 6 (= 24)	M1	
	Their 24 + 56 (= 80)	M1 Dep	
	10	A1	
5 Alt2	56 – 24 (= 32)	M1	12 + 12 + 8(h – 6)
	Their 32 ÷ 8 (= 4)	M1 Dep	
	10	A1	

Q	Answer	Mark	Comments
6	Straight line from (−4, −13) to (4, 11)	B3	B1 For line passing through (0, −1) B1 For line with a gradient of 3 B1 For any coordinate calculated B1 For any other coordinate calculated SC2 $y = 6x - 1$ drawn
7(a)(i)	0.126	B1	oe $\frac{63}{500}$, $\frac{126}{1000}$
7(a)(ii)	Any one of More 3s Fewer 1s Should be about 0.25 Should be about 250 each	B1	oe
7(b)	100	B1	
8(a)	$3\frac{1}{5}$	B1	
8(b)	$\frac{28}{45}$	B1	
8(c)	$1\frac{1}{3}$	B1	
8(d)	$0.18\ldots$, $0.1818\ldots$, $0.\dot{1}\dot{8}$	B1	At least 0.1818 Use of any notation for recurrence
9	Sector for USA = 56° drawn and labelled **or** stated	B1	
	Sector for Spain = 124° drawn and labelled **or** stated	B1	SC B1 If USA + Spain = 180°
	Angle for England 72° drawn and labelled **or** stated	B1	Sector for France = 76° drawn and labelled or stated
	Accurately drawn for correct angles	B1	

Q	Answer	Mark	Comments
10	10.3 × 40 ÷ 100 (4.12)	M1	
	Their 4.12 ÷ 50 × 100	M1 Dep	M2 For 40 ÷ 50 × 10.3
	8.24, 8.2	A1	Accept 8 with working
10 Alt	50 ÷ 10.3 × 100 (485.4)	M1	10.3 ÷ 50 × 100 (20.6)
	40 ÷ Their 485.4 × 100	M1 Dep	Their 20.6 ÷ 100 × 40
	8.24, 8.2	A1	Accept 8 with working
11	80 ÷ 4 (= 20)	M1	
	Their 20 × 8	M1	
	÷ 1000 or ÷ 100	M1	
	0.16	A1	SC3 For 0.08
11 Alt	80 × 15	M1	1200
	Their 1200 × 8	M1	9600
	÷ 1000 or ÷ 100 **and** ÷ 60	M1	
	0.16	A1	
12	Trial using $x \leq 3$ giving answer above 29 with correct answers rounded or truncated to a whole number	M1	Ignore any comments 3 ⇒ 45, 2.5 ⇒ 30.6
	Refined trial with $x \geq 2.4$ giving answer below 29 with correct answers rounded or truncated to 1 dp	M1	2.4 ⇒ 28.2
	Trial to at least 2 dp that shows which 1 dp value is correct with answers rounded or truncated to 1 dp	M1	2.45 ⇒ 29.4, 2.44 ⇒ 29.1, 29.2
	2.4	A1	This can be awarded as long as first two Ms awarded
13	3 × 125 + 6 × 135 + 7 × 145 + 8 × 155 + 6 × 165 (= 4430)	M1	Allow one error in the midpoints **NB** Consistent midpoint error such as 125.5 is one error
	Their 4430 ÷ 30	M1 Dep	
	147.6 to 147.7	A1	Accept 148 with correct working

Q	Answer	Mark	Comments
14(a)	$\frac{1}{3}$, $0.\dot{3}$	B1	oe
14(b)	$5y - 3y = -1 - 2$	M1	Allow one arithmetic or rearrangement error
	$2y = -3$	A1	
	-1.5	A1 ft	ft on **one** arithmetic or rearrangement error
14(c)	$5(2w - 3) - 2(3w + 1)$	M1	
	$4w - 17$	A1	
	Their $4w - 17 = 10$	M1	
	6.75	A1	ft If both Ms awarded and at most one arithmetic or rearrangement error
14 (c) Alt	$w - \frac{3}{2} - \frac{3}{5}w - \frac{1}{5}$	M1	
	$\frac{2}{5}w - \frac{17}{10}$	A1	
	Their $\frac{2}{5}w = 1 + \frac{17}{10}$	M1	
	6.75	A1	ft If both Ms awarded and at most one arithmetic or rearrangement error.

15(a)	Values such that $(a + b) \times h = 60$, with a and b different	B2	B1 If 60 seen or a and b same
15(b)	$2A = (a + b)h$ $\frac{A}{\frac{1}{2}} = h(a + b)$	M1	$\frac{A}{h} = \frac{1}{2}(a + b)$ $A - \frac{1}{2}ah = \frac{1}{2}bh$
	$\frac{2A}{h} = a + b$ $\frac{A}{\frac{1}{2}h} = a + b$	M1 Dep	$\frac{A - \frac{1}{2}ah}{\frac{1}{2}h} = b$ $b = \frac{\frac{A}{h} - \frac{1}{2}a}{\frac{1}{2}}$
	$b = \frac{2A}{h} - a$ $b = \frac{2A - ha}{h}$	A1	**NB** Must have $b =$

Q	Answer	Mark	Comments
16	(763 + 1020 + 733 + 452) ÷ 4	M1	2968 ÷ 4
	742	A1	
	(x + 863 + 1212 + 853) ÷ 4 = 862 or 4 × 862 – (863 + 1212 + 853) [(x + 2928) ÷ 4 = 862]	M1	(x + 831 + 1108 + 809) ÷ 4 = 817 or 4 × 817 – (831 + 1108 + 809) or (x + 1108 + 809 + 863) ÷ 4 = 825 or 4 × 825 – (863 + 1108 + 809) or (x + 863 + 1212 + 809) ÷ 4 = 851 or 4 × 851 – (863 + 1212 + 809)
	520, 520.00	A1	Allow 520.0
17	1.065 seen	B1	
	Any attempt at 3000 × 1.065^n where $n > 2$	M1	1.065^n where $n > 2$
	3000 × 1.065^{11} = 5997 …	M1 Dep	1.065^{11} = 1.99915 …
	11 years, 12 years	A1	Accept just over 11 years
17 Alt	Using the 'work out the interest and add it on' method for at least 3 years 3195, 3402.68, 3623.85	M1	Values can be rounded or truncated
	Correct calculations for at least 7 years	M1	3859.40, 4110.26, 4377.43, 4661.96 Values can be rounded or truncated
	Correct values to n = 11 (see table below)	M1 Dep	4964.99, 5287.71, 5631.41, 5997.45
	11 years, 12 years	A1	Accept just over 11 years
17 SC	3000 ÷ (3000 × 0.065) 3000 ÷ 195 or 15 years = 5925 or 2925 16 years = 6120 or 3120	M1	1 ÷ 0.065
	15.38 years	A1	Conclusion such as just over 15 or 16 years

Q	Answer	Mark	Comments
18	$(x + a)(x + b)$	M1	$ab = \pm 5$
	$(x + 5)(x - 1)$	A1	
	−5 and 1	A1 ft	ft Their brackets if M awarded.
18 Alt 1	$\frac{-(4) \pm \sqrt{(4^2) - 4(1)(-5)}}{2(1)}$	M1	Allow 1 error from: Wrong $-b$, wrong b^2, -20 for $-4ac$
	$\frac{-4 \pm \sqrt{36}}{2}$	A1	
	-5 or 1	A1ft	ft Only on wrong $-b$ (5 or -1)
18 Alt 2	$(x + 2)^2 - 9$	M1	$(x + 2)^2 = 9$
	$x + 2 = \pm 3$	A1	
	-5 or 1	A1ft	
19	$\frac{60}{360} \times \pi r^2 = 24\pi$	M1	oe
	$r^2 = 6 \times 24$ (= 144)	A1	$r^2 = 24 \div$ their $\frac{1}{6}$
	12	A1	
19 SC	$\frac{60}{360} \times \pi r^2 = 24$	M1	Must do both steps.
	$r^2 = \frac{6 \times 24}{\pi} = \left(\frac{144}{\pi}\right)$		
	6.77	A1	

Q	Answer	Mark	Comments
20(a)	$(x^2 =)\ 11^2 + 12^2 - 2 \times 11 \times 12 \times \cos 98$	M1	Sight of 228.2 ... implies M1
	301.74 …	A1	
	17.4, 17.37	A1ft	17 with working ft On 228.2 to give 15.11 or 15.108 or 15.1 or 15
20(b)	$\frac{\sin x}{7} = \frac{\sin 112}{13}$	M1	$\frac{7}{\sin x} = \frac{13}{\sin 112}$
	$(\sin x =)\ \frac{\sin 112 \times 7}{13}$	A1	0.4992528448
	29.9 to 30	A1	
21	Identifying possible totals as 7 and 9 and 8 and 9	M1	Ignore repeats 8 and 8, and 9 and 9 for M1
	P(7 and 9) + P(9 and 7) + P(8 and 9) + P(9 and 8)	M1	Allow just one '7 and 9' or '8 and 9' for M1 but not two errors
	$(4 \times)\ \frac{1}{9} \times \frac{1}{8}$	A1	
	$\frac{1}{18}$, $\frac{2}{36}$, 0.055..., 5.5%	A1ft	ft $\frac{1}{24}$ if just one '7 and 9' or '8 and 9' identified scores 3/4 SC2 For $\frac{4}{81}$ or $\frac{1}{36}$ SC1 For $\frac{2}{81}$

Q	Answer	Mark	Comments
21 Alt 1	Identifying possible totals as 7 and 9 and 8 and 9	M1	Ignore repeats and 8 and 8 for M1
	Attempt to list how many possible combinations there are eg sample space diagram, 1 – 8, 2 – 7, 3 – 6 etc	M1	36 or 72 possibilities
	4 alternatives identified out of 72	A1	2 alternatives identified out of 36
	$\frac{1}{18}$, $\frac{2}{36}$, 0.055…, 5.5%	A1	
21 Alt 2	Tree diagram with at least 2 branches for first pick marked as 7, 8 and 9 and at least 2 branches for 2nd pick marked as 7, 8 and 9	M1	
	Probs on relevant branches marked as 2/9, 1/9 and 1/8, 2/8	M1	
	$\frac{2}{9} \times \frac{1}{8} + \frac{1}{9} \times \frac{2}{8}$	A1	oe
	$\frac{1}{18}$, $\frac{2}{36}$, 0.055…, 5.5%	A1	
22(a)	0.5 to 0.6 inclusive	B1	
22(b)	$(x^2 + 3x - 2) - (x^2 + 2x - 4)$	M1	oe Accept the lines $y = x - 2$, $y = -x - 2$ or $-y = -x + 2$ as evidence for M1
	$(y =)\ x + 2$ drawn or stated	A1	
	−3.2 to −3.3 inclusive and 1.2 to 1.3 inclusive	A1ft	ft Their line if M1 awarded Answers must come from a line drawn on graph

Q	Answer	Mark	Comments
23	11.5 or 12.5 (12.4999 … or recurring notation) **AND** 29.5 or 30.5 (30.4999 … or recurring notation)	B1	Ignore incorrect limits. Award the mark if there is one correct limit for base and area. Minimum required if recurrence notation used is 30.49 …
	Their upper area = $\frac{1}{2}$ × their lower base × h	M1	oe $30.5 = \frac{1}{2} \times 11.5 \times h$
	(h =) $\frac{2 \times 30.5}{11.5}$	A1	Minimum required if recurrence notation use is 30.49 ...
	5.304, 5.30, 5.3	A1	
24(a)	$\frac{5(-1)+9}{6(-1)^2-7(-1)-3} = \frac{-5+9}{6+7-3}$	M1	This mark is for substituting –1 into top and bottom expressions
	$= \frac{4}{10}$	A1	Do not award for sight of $\frac{4}{10}$ alone There must be evidence of substitution
24(b)	$5(5x + 9) = 2(6x^2 - 7x - 3)$	M1	
	$0 = 12x^2 - 39x - 51$ ($= x^2 - 13x - 17$)	A1	Mentions or implies cancelling factor of 3
24(c)	($4x^2 - 13x - 17$ =) $(x + 1)(4x - 17)$	M1	Allow a sign error in factorisation If using formula must get to $\frac{13 \pm \sqrt{441}}{8}$ for M1
	(-1) and 4.25	A1	oe

Q	Answer	Mark	Comments
25(a)	$\overrightarrow{AC} = -\mathbf{r} - \mathbf{s} + 2\mathbf{r}$	M1	$\overrightarrow{BA} + \overrightarrow{AF} + \overrightarrow{FC}$
	$\mathbf{r} - \mathbf{s}$	A1	oe
25(b)	$\overrightarrow{AC} = 2\mathbf{r} - \mathbf{s}$	B1	
	$\overrightarrow{CG} = -\mathbf{s} + 2\mathbf{r}$	B1	oe
	$\overrightarrow{AC}$ and $\overrightarrow{CG}$ are parallel	B1 Dep	$\overrightarrow{AC} = \overrightarrow{CG}$ is B2
	Share a common point	B1 Dep	Must mention common point
25(b) Alt	$\overrightarrow{AC} = 2\mathbf{r} - \mathbf{s}$	B1	
	$\overrightarrow{AG} = -2\mathbf{s} + 4\mathbf{r}$	B1	oe
	$\overrightarrow{AG} = 2AC$ is B2	B1	$\overrightarrow{AG} = 2\overrightarrow{AC}$ is B2
	Share a common point	B1	Must mention common point