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Paper 2C

Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

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Key to mark types and abbreviations

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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
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.
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.
[a, b)	Accept values $a \leq \text{value} < b$
3.14...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Q	Answer	Mark	Comments
1	$2c + 3d$	B1	

Q	Answer	Mark	Comments
2	5760.1	B1	

Q	Answer	Mark	Comments
3	$x \leq 5$	B1	

Q	Answer	Mark	Comments
4	16	B1	

Q	Answer	Mark	Comments
5	110	B1	

Q	Answer	Mark	Comments
6	$10 \div 1.45$ or $6.8(9\dots)$ or 6.9 or $6 \times 1.45 = 8.7(0)$ or $7 \times 1.45 = 10.15$	M1	oe eg 2.9(0) 4.35 5.8(0) 7.25 8.7(0) 10.15
	6	A1	

Q	Answer	Mark	Comments	
7	$1 + 5 = 2 + 4$	B2	any order as long as each side totals 6 B1 1, 2, 4, 5, 10 and 20 listed with no more than one extra or four or five of 1, 2, 4, 5, 10 and 20 listed with no others or three different factors of 20 used with one other number so that both sides are equal eg $1 + 4 = 2 + 3$	
			Additional Guidance	
			Factors may appear as multiplicative pairs eg 1×20	
			Ignore factors repeated for B1 eg 1×20 20×1 2×10 10×2 4×5 5×4	
			B1	

Q	Answer	Mark	Comments
8	9	B1	
	43	B1ft	ft their $9 \times 4 + 7$
	Additional Guidance		
	30 and 127		B0B1ft
	30 and 148		B0B0ft

Q	Answer	Mark	Comments
9(a)	$3 + 6 \times (5 + 2) = 45$	B1	
	Additional Guidance		
	Condone extra pairs of irrelevant brackets		

Q	Answer	Mark	Comments
9(b)	$(7 - 1 + 9) \div 3 = 5$	B1	
	Additional Guidance		
	Condone extra pairs of irrelevant brackets		

Q	Answer	Mark	Comments
10	Parallelogram $\rightarrow 0$	B1	
	Equilateral triangle $\rightarrow 3$	B1	
	Semicircle $\rightarrow 1$	B1	
	Additional Guidance		
	Two lines from a shape to different numbers is B0 for that shape (but may still score for other shapes)		

Q	Answer	Mark	Comments
11(a)	$25 - (-31)$ or $25 + 31$	M1	oe condone $-31 - 25$
	56	A1	condone -56

Q	Answer	Mark	Comments
11(b)	$(\text{their } 56 \div 8)$ or 7	M1	ft their 56 from part (a)
	7000	A1ft	ft their 56 from part (a) answer must be positive
	Additional Guidance		
	Answer of 6 in (a) and answer of 750 in (b)		M1A1ft
	Answer of -56 in (a) and answer of 7000 in (b)		M1A1
	Answer of -56 in (a) and answer of -7000 in (b)		M1A0

Q	Answer	Mark	Comments
12(a)	Horizontal or vertical chord drawn from B	B1	
	Additional Guidance		
	Chord need not be ruled		

Q	Answer	Mark	Comments
12(b)	Horizontal tangent drawn at the top or the bottom of the circle or both	B1	
	Additional Guidance		
	Mark intention		
	Tangent need not be ruled		

Q	Answer	Mark	Comments
13	$8 \times 1.5 + 2 \times -7$ or $(8x =) 12$ or $(2y =) -14$	M1	oe
	-2	A1	

Q	Answer	Mark	Comments
14	10π cm	B1	

Q	Answer	Mark	Comments
15(a)	South East	B1	

Q	Answer	Mark	Comments
15(b)	$54 \div 6$ or 9 or 1 cm represents 9 km or 1 : 9 or $\frac{4}{6}$ or $\frac{6}{4}$	M1	oe may be seen on diagram
	36	A1	

Q	Answer	Mark	Comments
15(c)	<i>E</i> plotted east of <i>B</i> and north east of <i>C</i>	B2	B1 <i>E</i> plotted east of <i>B</i> or <i>E</i> plotted north east of <i>C</i> or line drawn east of <i>B</i> or line drawn north east of <i>C</i>
	Additional Guidance		
			B2
	Condone missing label for <i>E</i>		

Q	Answer	Mark	Comments
16(a)	30	B1	

Q	Answer	Mark	Comments
16(b)	$\frac{80}{100} \times 120$	M1	oe
	96	A1	

Q	Answer	Mark	Comments
16(c)	Correct statement that the chart shows percentages rather than the number of goals or correct statement that the total number of goals for team A is not known	B1	
	Additional Guidance		
	Team A might have scored more goals than team B		B1
	The chart only shows percentages		B1

Q	Answer	Mark	Comments
17(a)	5.3625	B2	B1 answer as a fraction eg $\frac{429}{80}$ or $5\frac{29}{80}$ or correct value for numerator or denominator seen eg 13.728 or $\frac{1716}{125}$ or $13\frac{91}{125}$ for numerator 2.56 or $\frac{64}{25}$ or $2\frac{14}{25}$ for denominator or 5.36 or 5.362 or 5.363

Q	Answer	Mark	Comments
17(b)	5.4	B1ft	ft their decimal answer from (a) provided it has more than 2 sf
	Additional Guidance		
	5.40		B0

Q	Answer	Mark	Comments
18	$180 \div 3$ or 60 or $180 \times \left(1 - \frac{1}{5}\right)$ or $180 \times \frac{4}{5}$ or 144 or $\frac{1}{3} \times \frac{4}{5}$ or $\frac{4}{15}$	M1	oe eg $180 - \frac{1}{5} \times 180$ or $180 - 36$
	$180 \div 3 - \frac{1}{5}(180 \div 3)$ or $60 - \frac{1}{5} \times 60$ or $\frac{4}{5} \times 60$ or $180 \times \frac{4}{5} \times \frac{1}{3}$ or $180 \times \frac{4}{15}$	M1dep	oe eg $60 - 12$
	48	A1	

Q	Answer	Mark	Comments	
19	$A(1, -3)$ and $B(8, -3)$ or $A(7, -3)$ and $B(0, -3)$	B2	B1 $A(1, -3)$ or $A(7, -3)$ or any answer not scoring B2 of the form $A(a, -3)$ and $B(b, -3)$ where $a - b = \pm 7$ or $A(8, -3)$ and $B(1, -3)$ or $A(0, -3)$ and $B(7, -3)$ or A and B correctly marked on diagram	
	Additional Guidance			
	Condone $A(1, -3)$ and $B(-6, -3)$		B2	
	Condone $A(7, -3)$ and $B(14, -3)$		B2	
	$A(2, -3)$ and $B(9, -3)$		B1	
	$A(1, -3)$ and $B(7, -3)$		B1	
	$A(0, -3)$ and $B(7, -3)$		B1	
	$A(0, -3)$ and $B(8, -3)$		B0	

Q	Answer	Mark	Comments								
20(a)	224 – 159 or 65	M1	Samir's range								
	$\frac{30+1}{2}$ or 15.5 or 182 and 184 indicated or 183	M1	Adam's median may indicate two centre values on diagram								
	65 and 183 correctly positioned in the table	A1									
	Additional Guidance										
	<table><tr><td></td><td>Range</td><td>Median</td></tr><tr><td>Adam</td><td>76</td><td>183</td></tr><tr><td>Samir</td><td>65</td><td>197</td></tr></table>			Range	Median	Adam	76	183	Samir	65	197
	Range	Median									
Adam	76	183									
Samir	65	197									

Q	Answer	Mark	Comments
20(b)	Samir with correct reason	B1ft	eg range is lower ft their range
	Additional Guidance		
	IQR 35 and 26 compared		B1
	Reason relating to medians		B0
	Medians as averages in addition to correct answer		B0

Q	Answer	Mark	Comments
21	$\frac{250}{2}$ or 125	M1	oe
	95 – 53 or 42	M1	55 implies M2
	$\frac{\text{their } 125 - \text{their } 42 - 28}{\text{their } 125} (\times 100)$ or $\frac{55}{125} (\times 100)$ or 0.44 ($\times 100$)	M1dep	oe dep on M2
	44	A1	

Q	Answer	Mark	Comments
22(a)	D	B1	

Q	Answer	Mark	Comments
22(b)	Alternative method 1 – works with perimeters		
	$3x + 1 + 2 - x + 3x + 1 + 2 - x$ or $2(3x + 1) + 2(2 - x)$ or $2(3x + 1 + 2 - x)$ or $6x + 2 + 4 - 2x$	M1	oe correct expression for the sum of the edges of the first rectangle
	$x + 4 + x - 1 + x + 4 + x - 1$ or $2(x + 4) + 2(x - 1)$ or $2(x + 4 + x - 1)$ or $2x + 8 + 2x - 2$	M1	oe correct expression for the sum of the edges of the second rectangle
	Simplifies both perimeters to $4x + 6$ or $2(2x + 3)$ with M2 awarded or correctly subtracts both perimeters to show 0 with M2 awarded	A1	SC1 $4x + 6$ or $2(2x + 3)$ seen with no supporting working
	Alternative method 2 – works with semi-perimeters		
	$3x + 1 + 2 - x$	M1	oe correct expression for the sum of the two perpendicular sides of the first rectangle
	$x + 4 + x - 1$	M1	oe correct expression for the sum of the two perpendicular sides of the second rectangle
	Simplifies both semi-perimeters to $2x + 3$ with M2 awarded or correctly subtracts both semi-perimeters to show 0 with M2 awarded	A1	SC1 $2x + 3$ seen with no supporting working
	Additional Guidance		
	Ignore further working		
	Only substituting values in dimensions and calculating perimeters		M0M0A0

Q	Answer	Mark	Comments
23(a)	2, 3, 5, 6, 7, 8	B1	any order
	Additional Guidance		
	{2, 3, 5, 6, 7, 8}		B1

Q	Answer	Mark	Comments
23(b)	1, 2, 3, 4, 5, 7, 9	B1	any order
	Additional Guidance		
	{1, 2, 3, 4, 5, 7, 9}		B1

Q	Answer	Mark	Comments
24	$315 \div 7$ or 45	M1	oe
	$(400 - 315) \div 8\frac{1}{3}$ or 10.2	M1	oe
	55.2	A1	oe

Q	Answer	Mark	Comments
25	-1 and $\frac{2}{3}$	B1	

Q	Answer	Mark	Comments
26	$5x + 40 = 2x + 55$	M1	
	$5x - 2x = 55 - 40$ or $3x = 15$	M1dep	
	$x = 5$ or angle of 65 seen	A1	may be on diagram
	$180 - 2 \times (5 \times \text{their } 5 + 40)$ or $180 - 2 \times (2 \times \text{their } 5 + 55)$ or $180 - (5 \times \text{their } 5 + 40 + 2 \times \text{their } 5 + 55)$	M1dep	dep on first M1
	50	A1ft	ft their x provided M1 awarded and $0 < x < 180$ SC1 $85 - 7x$ seen

Q	Answer	Mark	Comments
27	$\frac{5}{4}$ or 1.25 or $\frac{4}{5}$ or 0.8 or $\frac{6}{4}$ or 1.5 or $\frac{4}{6}$ or 0.66... or 0.67	M1	oe
	$6 \times \frac{5}{4}$ or 7.5 or $5 \times \frac{6}{4}$ or 7.5 or $7 \times \frac{4}{5}$ or 5.6	M1dep	oe eg $6 \div \frac{4}{5}$
	$w = 7.5$ and $y = 5.6$	A1	oe
	Additional Guidance		
	Answers may be on diagram but answer line takes precedence		
	$6 \times 5 \div 4$ or $7 \times 4 \div 5$		M1M1
	$7.5 : 6$ or $6 : 7.5$ or $5.6 : 7$ or $7 : 5.6$		M1M1
	$w = 5.6$ and $y = 7.5$		M1M1A0
	$\frac{w}{6} = \frac{5}{4}$ or $4w = 30$		M1
	$\frac{y}{7} = \frac{4}{5}$ or $5y = 28$		M1
	$6 : w = 4 : 5$ or $y : 7 = 4 : 5$ (oe) with no further working		M0

Q	Answer	Mark	Comments
28(a)	$\frac{1}{6}$	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore attempts to simplify or convert a correct fraction		
	Ignore probability words		
	Accept 0.16... or 0.17		B1
	1 out of 6 or 1 in 6 alone on the answer line with a correct answer in working		B1
	1 out of 6 or 1 in 6 together with a correct answer on the answer line		B1
	1 : 6 together with a correct answer on the answer line		B0

Q	Answer	Mark	Comments
28(b)	No with correct explanation relating to uncertainty or randomness	B1	eg the theoretical probability doesn't tell you what will actually happen eg it might not be exactly half heads and tails eg you can't predict exactly
	Additional Guidance		
	Accept a correct statement with a non-contradictory or irrelevant statement		
	25 heads and tails are the theoretical results		B1
	She could get 50 heads (and no tails)		B1
	She cannot be sure		B1
	It will only be around 25 heads		B1
	She could get a lot of heads together then a lot of tails		B0
	The probability is only approximately 0.5		B0
	Probabilities are not accurate		B0
	She can't get 25 heads and 25 tails		B0
	The coin has not been tossed enough times		B0
	She tosses the coin differently every time		B0

Q	Answer	Mark	Comments
29(a)	y^7	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
29(b)	y^5	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
30	$\frac{4x}{12}$ or $\frac{6x}{12}$ or $\frac{2x}{6} + \frac{3x}{6}$ or $\frac{5x}{6}$	M1	oe $\frac{4x}{12}$ and $\frac{6x}{12}$ must be using a denominator that is a multiple of 12 $\frac{2x}{6} + \frac{3x}{6}$ or $\frac{5x}{6}$ must be using a denominator that is a multiple of 6
	$\frac{11x}{12} - \left(\frac{4x}{12} + \frac{6x}{12} \right)$ or $\frac{11x}{12} - \frac{4x}{12} - \frac{6x}{12}$ or $\frac{11x}{12} - \frac{10x}{12}$ or $\frac{7x}{12} - \frac{6x}{12}$	M1dep	must be using a denominator that is a multiple of 12
	$\frac{x}{12}$ or $\frac{1}{12}x$	A1	SC2 $\frac{13x}{12}$ or $\frac{13}{12}x$
	Additional Guidance		
	$\frac{6x}{72}$		M1M1A0
	Allow multiplication signs in fractions for M marks eg $\frac{4 \times x}{12}$		M1

Q	Answer	Mark	Comments
31(a)	$30 \div 0.15 = 200$ or $0.15 \times 200 = 30$ or $15(\%) \times 20 \div 3 = 100(\%)$ and $30 \times 20 \div 3 = 200$ or $(200 - 30) \div (1 - 0.15) = 200$ or $30 + 30 \div 0.15 \times (1 - 0.15) = 200$	B1	oe eg $30 \div 15 \times 100 = 200$ eg $\frac{30}{200} = 0.15$

Q	Answer	Mark	Comments
31(b)	Alternative method 1		
	$30 + n + 50 + 3n + 2n = 200$ or $n + 50 + 3n + 2n = 170$ or $6n = 200 - 30 - 50$ or $6n = 170 - 50$	M1	oe
	$6n = 120$ or $n = 20$	M1dep	
	their 20×2 or 40	M1dep	
	$\frac{40}{200}$	A1	oe fraction, decimal or percentage
	Alternative method 2		
	$200 - 30 - 50$ or 120	M1	
	their $120 \div 6$ or 20	M1dep	
	their 20×2 or 40	M1dep	
	$\frac{40}{200}$	A1	oe fraction, decimal or percentage
	Alternative method 3		
	$0.15 + r + 0.25 + 3r + 2r = 1$ or $r + 0.25 + 3r + 2r = 0.85$ or $6r = 1 - 0.15 - 0.25$ or $6r = 0.85 - 0.25$	M1	oe r stands for relative frequency – accept any letter and condone n
	$6r = 0.6$ or $r = 0.1$	M1dep	oe
	their 0.1×2	M1dep	
	0.2	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore an incorrect simplification or conversion following a correct answer seen		