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Paper 1C

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	27	B1	
	Additional Guidance		
2	likely	B1	
	Additional Guidance		
3	0.08	B1	
	Additional Guidance		
4	4	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
5	1 2 5 10 25 50	B2	B1 6 or 5 factors correct with up to 2 incorrect or 4 factors correct with 0 or 1 incorrect or 3 factors correct with 0 incorrect
	Additional Guidance		
	Use of products is B1 for all three correct ie 1×50 , 2×25 , 5×10		B1
	Factors must be identified if given in a factor tree		
	1 2 5 10 25 50 seen but answer 6		B1
	1 2 5 10 25 50 with answer 6 factors		B2
6	A isosceles triangle B trapezium C scalene triangle D kite	B4	B1 for each
	Additional Guidance		
	Condone incorrect spelling if intention clear		

Q	Answer	Mark	Comments
7	Alternative method 1		
	$420 \div 18$ or $23(.3\dots)$ or 24	M1	implied by 23×18
	their 24×18 or 432	M1dep	their 24 must be the answer to $420 \div 18$ rounded up to the nearest integer
	12	A1	
	Alternative method 2		
	$420 \div 18$ or $23(.3\dots)$ or 24	M1	
	their 23×18 or 414	M1dep	their 23 must be the answer to $420 \div 18$ rounded down to the nearest integer
	12	A1	
	Alternative method 3		
	$420 \div 18$ or $23(.3\dots)$ or 24	M1	
	$(1 - \text{their } 0.3\dots) \times 18$ or their $0.3\dots \times 18$ or 6	M1dep	their 0.3... must be the decimal part of their answer to $420 \div 18$
	12	A1	
	Alternative method 4		
	integer $[20, 30] \times 18$	M1	
	23×18 or 414 or 24×18 or 432	M1dep	
	12	A1	
	Additional Guidance		
	23×18 or 414 or 24×18 or 432	M1M1	
	$20 \times 18 = 360$ or $21 \times 18 = 378$ or $22 \times 18 = 396$ $25 \times 18 = 450$ or $26 \times 18 = 468$ or $27 \times 18 = 486$ $28 \times 18 = 504$ or $29 \times 18 = 522$ or $30 \times 18 = 540$	M1	

Q	Answer	Mark	Comments
8	Alternative method 1		
	$\sqrt{36} = 6$ or $\sqrt{64} = 8$	M1	oe may be seen in correct positions on diagram
	$\sqrt{36} + \sqrt{64}$ or $6 + 8$ or 14	M1dep	
	196	A1	
	Alternative method 2		
	$\sqrt{36} = 6$ or $\sqrt{64} = 8$	M1	oe may be seen in correct positions on diagram
	$\sqrt{36} \times \sqrt{64}$ or 6×8 or 48	M1dep	implied by 96
	196	A1	
	Additional Guidance		
9	At least two of $(31 - x =) 26$ $(6x =) 30$ $(x^2 =) 25$	M1	
	All three correct evaluations seen and smallest x^2 $31 - x$ largest $6x$	A1	allow correct values instead of expressions
	Additional Guidance		
	If all three correct evaluations seen and smallest is x^2 and largest is $6x$ then allow a blank middle answer line to imply $31 - x$ for full marks		
	Correct order with two correct evaluations and one incorrect evaluation		M1A0
	Correct order with two or three incorrect evaluations		M0A0

Q	Answer	Mark	Comments
10	(5, -4) and (-1, 2)	B2	B1 one correct coordinate pair or both points plotted but coordinates not stated SC1 (-4, 5) and (2, -1)
	Additional Guidance		
11(a)	15	B1	
	Additional Guidance		
11(b)	-2 1 6	B2	B1 one or two correct or $1^2 - 3$ $2^2 - 3$ $3^2 - 3$ oe
	Additional Guidance		
12	$\frac{4.32}{4.80}$ or 0.9 or $\frac{1000}{4.80} \times 4.32$	M1	oe allow 208(.33...) for $\frac{1000}{4.80}$
	900	A1	
	Additional Guidance		
	Do not award A1 if premature approximation for 900 seen eg $208.3 \times 4.32 = 900$ $208.3 \times 4.32 = 899.856$ Answer 900		M1A1 M1A0

Q	Answer	Mark	Comments
13(a)	13452	B2	B1 any five-digit number using all of the digits 1 to 5 ending 12 or 24 or 32 or 52
	Additional Guidance		
	14532		B1
13(b)	573	B2	B1 542 + 31 or 541 + 32 or 531 + 42 or 532 + 41 or 546 or 555 or 564
	Additional Guidance		
	531 + 42 with no or incorrect answer		B1
	543 + 21 = 564		B1
	543 + 21		B0
13(c)	$13 \times 4 = 52$	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
14(a)	$x = 2 \quad y = 8$ or $x = 3 \quad y = 7$ or $x = 9 \quad y = 4$ or $x = 23 \quad y = 2$ or $x = 51 \quad y = 1$	B1	must be in this order
	Additional Guidance		
	Including operations is B0 in this part eg $x = +2 \quad y = \times 8$		B0
14(b)	Different pair to their answer to (a) from $x = 2 \quad y = 8$ or $x = 3 \quad y = 7$ or $x = 9 \quad y = 4$ or $x = 23 \quad y = 2$ or $x = 51 \quad y = 1$	B1	must be in this order
	Additional Guidance		
	Same pair used in (a) and (b) (a) B1 (b) B0		
	Condone operations included in this part if already penalised in part (a) eg (a) $x = +2 \quad y = \times 8$ (b) $x = +3 \quad y = \times 7$		(a) B0 (b) B1
14(c)	$m = \text{any multiple of 5 greater than 20}$ $p = \frac{\text{their } m}{5} - 4$	B1	must be in this order m and p must each be evaluated
	Additional Guidance		
	$m = 20 \quad p = 0$		B0
	p given as negative eg $m = 25 \quad p = -1$		B0
	Some examples of correct pairs $m = 25 \quad p = 1$ $m = 30 \quad p = 2$ $m = 35 \quad p = 3$ $m = 40 \quad p = 4$ $m = 45 \quad p = 5$ $m = 50 \quad p = 6$ $m = 100 \quad p = 16$ $m = 500 \quad p = 96$		B1

Q	Answer	Mark	Comments
15	Alternative method 1		
	0.62×13.5 (million) or 8.37 (million) or 8.4 (million) or 0.38×13.5 (million) or $5.1(3)$ (million)	M1	oe eg $\frac{62}{100} \times 13500000$
	0.62×13.5 (million) – 0.38×13.5 (million) or 3.24	M1dep	oe eg $\frac{62}{100} \times 13.5$ (m) – $\frac{38}{100} \times 13.5$ (m)
	3.24 million	A1	oe eg 3240000 or 3.24×10^6 SC2 0.324 million oe or 32.4 million oe SC1 digits 324
	Alternative method 2		
	$62(\%) - 38(\%)$ or $24(\%)$	M1	oe eg $0.62 - 0.38$
	$\frac{\text{their } 24}{100} \times 13.5$ (million) or 3.24	M1dep	oe eg 0.24×13.5 (million)
	3.24 million	A1	oe eg 3240000 or 3.24×10^6 SC2 0.324 million oe or 32.4 million oe SC1 digits 324
	Additional Guidance		
	Ignore incorrect conversion after 3.24 million seen eg 3.24 million = 324000		M1M1A1

Q	Answer	Mark	Comments
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16(a)	<table><tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>-7</td><td>-4</td><td>-1</td><td>2</td><td>5</td></tr></table>	x	-1	0	1	2	3	y	-7	-4	-1	2	5	B2	B1 two correct values	
	x	-1	0	1	2	3										
	y	-7	-4	-1	2	5										
Additional Guidance																

16(b)	At least 3 points plotted correctly	M1	correct or ft their table in (a) $\pm \frac{1}{2}$ small square points can be implied by graph passing through them
	Correct straight line		
		A1	$\pm \frac{1}{2}$ small square
	Additional Guidance		
	Two points for the same x -coordinate is choice		
	Ignore line beyond first and last points		

17	D	B1	
	Additional Guidance		

18(a)	32 mm	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
18(b)	102 104 109 112 112 117 121 123 123 124 131 134 or 134 131 124 123 123 121 117 112 112 109 104 102 or 102 104 109 112 112 117 121 or 134 131 124 123 123 121 117 or $\frac{117 + 121}{2}$ or 117 and 121 chosen	M1	allow one omission, extra or transcription error in a full list
	119	A1	
	Additional Guidance		
	Allow the ordered list to be seen by the given list even if part (b) is blank but not if the mean is calculated in (b)		
	Answer 119 (from any or no list)		M1A1
	Puts list into order then finds the mean		M0A0
	Answer 117.6... or 117.7		M0A0
	Selects 109 and 121		M0A0

Q	Answer	Mark	Comments
18(c)	Suitable key	B1	
	Fully correct, ordered and aligned	B2	B1 two rows correct or complete but unordered
	Additional Guidance		
	Alignment should be considered for the B2 for the leaves – relative row length should be correct for each row		
	Key: 10 2 represents 102 mm (may use a different value)		B3
	10	2 4 9	
11	2 2 7		
12	1 3 3 4		
	13	1 4	
19	Alternative method 1		
	$x + 12 = 2 \times (x - 3)$ or $2x - 6$ seen	M1	
	$x + 12 = 2x - 6$	M1dep	oe
	18	A1	SC1 -27
	Alternative method 2		
	$\frac{x+12}{2} = x - 3$ or $\frac{x}{2} + 6$ seen	M1	
	$\frac{x}{2} + 6 = x - 3$	M1dep	oe
	18	A1	SC1 -27
	Additional Guidance		
	18 from trial and improvement method		M1M1A1

Q	Answer	Mark	Comments
20(a)	Valid description	B1	eg the higher the speed, the lower the fuel consumption allow negative correlation
	Additional Guidance		
	At low speeds the car has high fuel consumption		B1
	Fast speeds mean low fuel consumption		B1
	The higher the speed, the less distance per litre of fuel		B1
	As the car goes faster, more litres of fuel used (per km)		B1
	Fuel consumption decreases as / when speed increases		B1
	While the fuel consumption decreases the speed increases		B1
	Do not allow implication that speed is dependent on fuel consumption eg Lower fuel consumption makes the car faster eg Less consumption, more speed		B0 B0
	Decreasing		B0
20(b)	Straight line passing through (40, 28 – 35) and (110, 16 – 21)	B1	accept clear intention to draw a straight line ignore anything outside of the gates
	Additional Guidance		
20(c)	Correct reading $\pm \frac{1}{2}$ square for their straight line of best fit	B1ft	ft straight line with negative gradient accept if clear intention to draw a straight line ignore any working lines on the graph
	Additional Guidance		
	No line of best fit		B0ft
	Line of best fit not straight		B0ft

Q	Answer	Mark	Comments
21	$3150 \div (1 + 4)$ or $3150 \div 5$ or 630	M1	may be seen in the ratio 630 : 2520
	$(3150 + 250) \div (1 + 3)$ or $3400 \div 4$ or 850	M1	oe eg $3150 \div 4 + 250 \div 4$ may be seen in the ratio 850 : 2550
	220	A1	
	Additional Guidance		
	630 or 850		M1
	630 and 850		M1M1
22(a)	$\frac{b}{a}$	B1	
	Additional Guidance		
22(b)	$\cos 37 = \frac{y}{12}$ or $12 \times \cos 37$ or $\sin (90 - 37) = \frac{y}{12}$ or $12 \times \sin (90 - 37)$	M1	oe eg $\sqrt{12^2 - (12 \sin 37)^2}$
	[9.58, 9.584] or 9.6	A1	
	Additional Guidance		
	If trigonometry and Pythagoras are used it must be a fully correct method that would lead to the correct value of y		
	Accept $\cos 37 \times 12$		M1
	Accept adj or a for y eg $\cos 37 = \frac{\text{adj}}{12}$		M1
	$\cos = \frac{y}{12}$ or $\cos \theta = \frac{y}{12}$ (unless recovered)		M0
	Answer coming from scale drawing		M0A0
	Answer in range seen followed by 9 or 9.5 or 10		M1A1

Q	Answer	Mark	Comments
23	similar	B1	
	Additional Guidance		
24	Alternative method 1		
	$194 - 160$ or 34	M1	
	$\frac{\text{their } 34}{160} (\times 100)$ or 0.2125	M1dep	oe
	$\frac{85}{4}$ or $21\frac{1}{4}$ or 21.25 or 21.3	A1	
	Alternative method 2		
	$\frac{194}{160} (\times 100)$ or 1.2125 or 121.25	M1	oe
	(their 1.2125 – 1) ($\times 100$) or 0.2125 or their 121.25 – 100	M1dep	oe
	$\frac{85}{4}$ or $21\frac{1}{4}$ or 21.25 or 21.3	A1	
	Additional Guidance		
	Answer only 21		M0M0A0

Q	Answer	Mark	Comments
25(a)	Straight line from (10.00, 0) through (10.30, 2.5) or (11.00, 5) or 48 (minutes) seen or 10.48	M1	mark intention for straight line may be implied by a line that stops at 10.48 $\pm \frac{1}{2}$ square tolerance
	Correct line stopping at 10.48	A1	mark intention for straight line $\pm \frac{1}{2}$ square tolerance
	Horizontal line from their (10.48, 4) intersecting Sabine's line	B1ft	$\pm \frac{1}{2}$ square tolerance
	Additional Guidance		
25(b)	Correct value for the time between the end of their line and Sabine's line	B1ft	must fit the horizontal time difference
	Additional Guidance		
	22 from no line or from a line that would give a different answer		B0

Q	Answer	Mark	Comments
26	$(18 \times 25) + (20 \times 35) + (33 \times 45) + (9 \times 55)$ or $450 + 700 + 1485 + 495$ or 3130	M1	may be seen in table allow one error
	(their 450 + their 700 + their 1485 + their 495) $\div$ 80 or their 3130 $\div$ 80	M1dep	condone bracket error if working seen eg $450 + 700 + 1485 + 495 \div 80$
	39.1(25) or 39.13 or $\frac{313}{8}$ or $39\frac{1}{8}$	A1	
	Additional Guidance		
	One error may be a consistent error in the midpoints eg using 24.5, 34.5, 44.5 and 54.5		
	Correct value seen but answer given as one of the classes		M2A0
	Correct products seen in the table but a different method not using their products is choice eg 3130 in table but mean calculated as $80 \div 4 = 20$		M0M0A0

Q	Answer	Mark	Comments
27	$(x^6 \times x^8 =) x^{6+8}$ or x^{14} or $(x^6 \times x^8 \times x^4 =) x^{6+8+4}$ or x^{18} or $c - 4 = 6 + 8$ or $6 + 8 + 4$	M1	
	18	A1	
	Additional Guidance		
	Allow using a value for x leading to answer 18		M1A1
28	$\frac{2(5x-6)}{2 \times 3}$ or $\frac{3(7x+4)}{3 \times 2}$ or $\frac{10x-12}{6}$ or $\frac{21x+12}{6}$ or $\frac{5x}{3} + \frac{7x}{2}$	M1	oe any multiple of 6 for denominator
	$\frac{10x-12}{6} + \frac{21x+12}{6}$ or $\frac{10x}{6} + \frac{21x}{6}$	M1dep	oe eg $\frac{62x}{12}$ or $\frac{15.5x}{3}$
	$\frac{31x}{6}$ or $5\frac{1}{6}x$	A1	oe
	Additional Guidance		
	Numerator only		M0M0A0
	Further incorrect simplification after the correct answer is A0 eg $\frac{31x}{6} = 5\frac{x}{6}$ or $\frac{31x}{6} = \frac{15.5x}{3}$ or $\frac{31x}{6} = 5\frac{1}{6}$ or $\frac{31x}{6} = 25x$		M1M1A0

Q	Answer	Mark	Comments
29	180×3 or 540 or (exterior angle =) $360 \div 5$ or 72	M1	oe may be implied by interior angle
	$180 \times 3 \div 5$ or $540 \div 5$ or $180 - 360 \div 5$ or $180 - 72$ or 108	M1dep	oe method for interior angle of pentagon may be seen on diagram
	(BCP =) their $108 - 60$ or 48	M1dep	may be seen on diagram
	$(180 - \text{their } 48) \div 2$ or $132 \div 2$	M1dep	their 48 must not be 60
	66	A1	
	Additional Guidance		
	Interior angle 108 seen even if not subsequently used		M1M1
	Angle BCP seen as 48 even if not subsequently used		M1M1M1
	$360 \div 5 = 72$ $180 - 72 = 108$ $108 - 60 = 48$ $180 - 48 - 72$ Ans = 60		M1M1M1M0
	$360 \div 5 = 72$ $72 - 60 = 12$ (72 is being used as the interior angle of the pentagon)		M0
	Angle BPC = $360 \div 5$ with no other valid work		M0