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Paper 1C

Mark scheme

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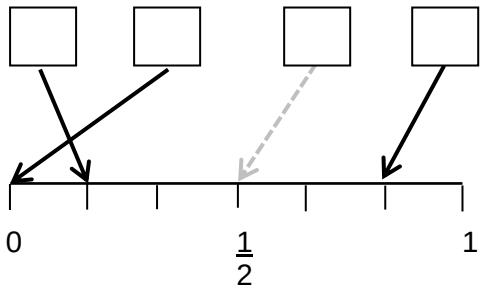
Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this 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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from oxfordaqa.org.uk

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 $a \leqslant$ 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	64	B1	
	Additional Guidance		
2	$x = 36$	B1	
	Additional Guidance		
3	cuboid	B1	
	Additional Guidance		
4	expression	B1	
	Additional Guidance		
5		B3	B1 each correct answer
	Additional Guidance		
	Any indication eg arrow, line		
	Two arrows from the same box is choice		
	Mark intention of arrows which do not go to a marked point		

Q	Answer	Mark	Comments
6	(median =) 26.5	B1	
	(24.1 + 24.6 + 26.5 + 29.5 + 30.3) ÷ 5 or 135 ÷ 5	M1	condone missing brackets
	27	A1	
	26.5 and 27 and mean	A1ft	ft correct decision for their median and their mean if M1 scored
	Additional Guidance		
	Circling 26.5 or crossing out all values except 26.5		B1
7(a)	9627	B1	
	Additional Guidance		
7(b)	2796	B1	
	Additional Guidance		
7(c)	7629 and 7692 and 7926 and 7962 and 9267 and 9276 with none incorrect	B2	B1 3 or 4 correct with none incorrect or 5 or 6 correct with at most 1 incorrect
	Additional Guidance		
	Ignore correct answers repeated		

Q	Answer	Mark	Comments
8(a)	3.25 × 20 + 70 or 65 + 70 or 135	M1	
	2 (hours) 15 (minutes)	A1	
	Additional Guidance		
8(b)	**Alternative method 1**		
	their 2h 15m + 20m or their 135 + 20 or 2h 35m or 155 m	M1	
	4.55 (pm) or 16.55	A1ft	ft their answer to part (a) any acceptable time notation
	Alternative method 2		
	7.30 – their 2h 15m or 5.15	M1	any acceptable time notation eg 17.15
	4.55 (pm) or 16.55	A1ft	ft their answer to part (a) any acceptable time notation
	Additional Guidance		
	1h 35m in (a) 1h 35m + 20m = 1h 55m Answer 5.35 pm		M1A1ft

Q	Answer	Mark	Comments
9	**Alternative method 1**		
	Multiples of 12 (at least 3) 12, 24, 36, …	M1	
	Multiples of 17 (at least 3) 17, 34, 51, …	M1	
	(72 and 51 and) 6 and 3	A1	
	Alternative method 2		
	Multiple of 17 in a trial	M1	eg (7 × 17 =) 119 and (leaves) 4 or (6 × 17 =) 102 and (leaves) 21 or (5 × 17 =) 85 and (leaves) 38 or (4 × 17 =) 68 and (leaves) 55 or (2 × 17 =) 34 and (leaves) 89 or (1 × 17 =) 17 and (leaves) 106
	51 and 72 chosen	M1dep	
	(72 and 51 and) 6 and 3	A1	
	Alternative method 3		
	Multiple of 12 in a trial	M1	eg (10 × 12 =) 120 and (leaves) 3 or (9 × 12 =) 108 and (leaves) 15 or (8 × 12 =) 96 and (leaves) 27 or (7 × 12 =) 84 and (leaves) 39 or (5 × 12 =) 60 and (leaves) 63 or (4 × 12 =) 48 and (leaves) 75 or (3 × 12 =) 36 and (leaves) 87 or (2 × 12 =) 24 and (leaves) 99 or (1 × 12 =) 12 and (leaves) 111
	72 and 51 chosen	M1dep	
	(72 and 51 and) 6 and 3	A1	
	Additional Guidance		
	72 and 51		M2

Q	Answer	Mark	Comments
10	$6b^2$	B1	
	Additional Guidance		
11	is equal to	B1	allow =
	is less than	B1	allow <
	is greater than	B1	allow >
	is greater than	B1	allow >
	Additional Guidance		
12	10π	B1	
	Additional Guidance		

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="5">13</td><td>freq (9) = 8</td><td>B1</td><td></td></tr>
<tr><td>freq (6) = 3</td><td>B1ft</td><td>ft 11 – their 8
must be an integer > 0</td></tr>
<tr><td>their frequencies sum to 40</td><td>B1</td><td>must be integers > 0</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2"><table><tr><th>Number on tile</th><th>Frequency</th></tr><tr><td>1</td><td>5</td></tr><tr><td>2</td><td>24</td></tr><tr><td>6</td><td>3</td></tr><tr><td>9</td><td>8</td></tr></table></td><td>B3</td></tr>
<tr><td rowspan="5">14</td><td>Any two of 80, $\sqrt{100}$ and 40
or
any two of 80, 10 and 40</td><td>M1</td><td></td></tr>
<tr><td>20 with correct working</td><td>A1</td><td></td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">Do not allow $\sqrt{108}$ = 10.39 or 10.4 rounded to 10 as one of the approximations</td><td></td></tr>
<tr><td colspan="2">Answer only of 20</td><td>M0A0</td></tr>
<tr><td rowspan="3">15</td><td>1 cm represents 1 m</td><td>B1</td><td></td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2"></td><td></td></tr>
</table>

Q	Answer	Mark	Comments
16	20 14 8 2 –4 –10 or 10 5 0 –5 –10 or 20 14 8 2 and 10 5 0 –5 or $26 - 6n$ or $15 - 5n$ or identifies the rules – 6 and – 5	M1	
	–10	A1	SC1 –40 or $n = 11$
	Additional Guidance		
	Rules could be identified by arrows on the sequences		
	Accept eg subtract 6 or minus 6 for – 6		
	6 and 5 (as rules) with answer –10		M1A1
	6 and 5 (as rules) with incorrect answer		M0
17	$10a + 55b$	B2	B1 one term correct
	Additional Guidance		
	Further work following a B2 answer		B1
	Further work following a B1 answer		B0

Q	Answer	Mark	Comments
18(a)	20 × 55 + (27 – 20) × 80 or 1100 + 560 or 1660	M1	
	12 × 15 or 180	M1	
	1840	A1	
	Additional Guidance		
	Working for M marks may appear in either order		
18(b)	**Alternative method 1**		
	5010 – 20 × 55 – 20 × 15 or 5010 – 1100 – 300 or 5010 – 20 × (55 + 15) or 5010 – 1400 or 3610	M1	oe
	their 3610 ÷ 95 or 38	M1dep	
	58	A1	
	Alternative method 2		
	20 × 55 + 20 × 15 + (n – 20) × 95 = 5010 or 20 × 55 + (n – 20) × 80 + 15n = 5010 or 1400 + (n – 20) × 95 = 5010	M1	oe n is the number of people on the plane and can be any letter
	(n – 20 =) 38 or 95n = 5510	M1dep	
	58	A1	
	Additional Guidance		
	In alt 2 follow through errors in calculations of 20 × 55 and 20 × 15 etc		
	Answer of 38		M1M1A0

Q	Answer	Mark	Comments
19(a)	(2, 0)	B1	
	Additional Guidance		
19(b)	(–5, 2)	B1	
	Additional Guidance		
19(c)	(2, –3)	B1	SC1 (0, 2) in (a), (2, –5) in (b) and (–3, 2) in (c)
	Additional Guidance		
20	$\frac{w+5}{6} - \frac{2w}{6}$ or $\frac{6(w+5)}{6} - \frac{6w}{3} = 2 \times 6$ or $w + 5 - 2w = 2 \times 6$	M1	oe correct use of common denominator eg $\frac{3(w+5)}{18} - \frac{6w}{18}$ or multiplies every term by a multiple of 6 eg $\frac{18(w+5)}{6} - \frac{18w}{3} = 2 \times 18$
	$w + 5 – 2w = 12$ or $5 – w = 12$	A1	oe eg $3w + 15 – 6w = 36$ brackets must be expanded
	–7	A1	
	Additional Guidance		
	Answer –7		M1A1A1

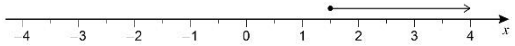
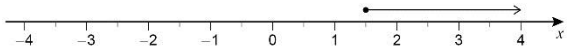
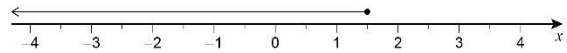
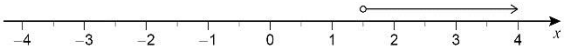
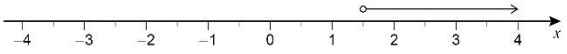
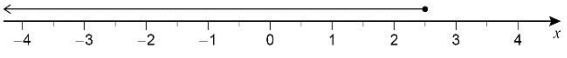
Q	Answer	Mark	Comments
21	6.5(0) ÷ 10 or 0.65 and 2.68 ÷ 4 or 0.67 or adds a multiple of 10 to a multiple of 4 that would have total > 100	M1	oe
	12 (packs of 10) and 2 (packs of 4)	A1	implied by correct answer
	their 12 × 6.5(0) and their 2 × 2.68	M1	any two costs involving both packs and [100, 156] total bottles
	83.36	A1ft	ft any combination using both packs that gives 128 bottles
	Additional Guidance		
	10 (packs of 10) and 7 (packs of 4) and 83.76 or 8 (packs of 10) and 12 (packs of 4) and 84.16 or 6 (packs of 10) and 17 (packs of 4) and 84.56 or 4 (packs of 10) and 22 (packs of 4) and 84.96 or 2 (packs of 10) and 27 (packs of 4) and 85.36		M1A0M1A1ft

Q	Answer	Mark	Comments
22	**Alternative method 1**		
	1.5 × 0.8 (× 2) or 1.2 or 2.4 or 1.5 × 0.7 (× 2) or 1.05 or 2.1 or 0.8 × 0.7 (× 2) or 0.56 or 1.12	M1	
	1.5 × 0.8 × 2 + 1.5 × 0.7 × 2 + 0.8 × 0.7 × 2 or (1.2 + 1.05 + 0.56) × 2 or 2.4 + 2.1 + 1.12	M1dep	oe
	5.62	A1	implied by 16.86
	their 5.62 × 3 ÷ 4.5 or 16.86 ÷ 4.5 or 3.7…	M1dep	dep on M2
	4 with working seen	A1ft	ft M2A0M1 with their 5.62 × 3 ÷ 4.5 rounded up to nearest integer

Alternative method and Additional Guidance continued on the next page

Q	Answer	Mark	Comments
22 cont	**Alternative method 2**		
	1.5 × 0.8 (× 2) or 1.2 or 2.4 or 1.5 × 0.7 (× 2) or 1.05 or 2.1 or 0.8 × 0.7 (× 2) or 0.56 or 1.12	M1	
	1.5 × 0.8 × 2 × 3 + 1.5 × 0.7 × 2 × 3 + 0.8 × 0.7 × 2 × 3 or (1.2 + 1.05 + 0.56) × 2 × 3 or (2.4 + 2.1 + 1.12) × 3	M1dep	oe
	16.86	A1	
	their 16.86 ÷ 4.5 or 3.7…	M1dep	dep on M2
	4 with working seen	A1ft	ft M2A0M1 with their 16.86 ÷ 4.5 rounded up to nearest integer
	Additional Guidance		

Q	Answer	Mark	Comments
23(a)	Positive	B1	
	Additional Guidance		
	Ignore non-contradictory words such as ‘strong’, ‘weak’ or ‘scattered’		
23(b)	Correct straight line which passes between (20, 590) and (20, 630) and between (70, 720) and (70, 760)	B1	line must extend from 20 to 70
	Correct monthly rent for their line / curve	M1	their line / curve must be increasing allow any reading from the small vertical square that their point lies within eg if their point is in the first square above 700, allow [700, 710]
	Correct monthly rent for their line / curve × 12 correctly evaluated	A1ft	ft their increasing line / curve allow any reading from the small vertical square that their point lies within eg if their point is in the first square above 700, allow [8400, 8520]
	Additional Guidance		
	No increasing line / curve drawn		B0M0A0
	The line may go through the coordinates of the gates but no further tolerance is allowed for the first mark		
	Ignore any parts of the line outside 20 to 70		

Q	Answer	Mark	Comments
24(a)	$2x \geqslant 4 - 1$ or $2x \geqslant 3$ or $-2x \leqslant 1 - 4$ or $-2x \leqslant -3$ or $-x \leqslant -1\frac{1}{2}$	M1	oe implied by eg $x \leqslant 1\frac{1}{2}$ or $x < 1\frac{1}{2}$ or $x > 1\frac{1}{2}$ or $x = 1\frac{1}{2}$
	$x \geqslant 1\frac{1}{2}$	A1	oe implied by correct solution set on number line
		B1ft	ft their inequality with open or closed circle as appropriate
	Additional Guidance		
	Inequality line may be drawn over existing number line but intention must be clear		
	Condone a missing arrow or use of shading if the line or region extends to within 2 mm of 4 or further right		
	 with no working or with $x \geqslant 1\frac{1}{2}$ or $x = 1\frac{1}{2}$ seen		M1A1B1
	$x \leqslant 1\frac{1}{2}$ and 		M1A0B1ft
	$x \geqslant 1\frac{1}{2}$ and 		M1A1B0
	$x > 1\frac{1}{2}$ and 		M1A0B1ft
	$x \leqslant 2\frac{1}{2}$ and 		M0A0B1ft

Q	Answer	Mark	Comments
24(b)	$-8 < 2y \leqslant 4$	B1	
	Additional Guidance		

25(a)	**Alternative method 1**		
	12^2 and 10^2 seen or 144 and 100 seen or 44	M1	
	$\sqrt{12^2 - 10^2}$ or $\sqrt{144 - 100}$	M1dep	
	$\sqrt{44}$ or $2\sqrt{11}$ or 6.6…	A1	accept 7 with working
	Alternative method 2		
	$\sin^{-1}\frac{10}{12}$ or 56.4... or $\cos^{-1}\frac{10}{12}$ or 33.5...or 33.6	M1	oe
	$\tan\left(\sin^{-1}\frac{10}{12}\right) = \frac{10}{x}$ or $\cos\left(\sin^{-1}\frac{10}{12}\right) = \frac{x}{12}$ or $\tan\left(\cos^{-1}\frac{10}{12}\right) = \frac{x}{10}$ or $\sin\left(\cos^{-1}\frac{10}{12}\right) = \frac{x}{12}$	M1dep	oe
	$\sqrt{44}$ or $2\sqrt{11}$ or 6.6…	A1	accept 7 with working
	Additional Guidance		
	$\sqrt{44}$ or $2\sqrt{11}$ with incorrect simplification or conversion to decimal		M1M1depA1

Q	Answer	Mark	Comments
25(b)	**Alternative method 1**		
	$\sin 52 = \frac{10}{y}$ or $\cos 38 = \frac{10}{y}$	M1	
	$\frac{10}{\sin 52}$ or $\frac{10}{\cos 38}$	M1dep	
	[12.69, 12.7]	A1	accept 13 with working
	Alternative method 2		
	$\frac{y}{\sin 90} = \frac{10}{\sin 52}$	M1	
	$\frac{10}{\sin 52} \times \sin 90$	M1dep	
	[12.69, 12.7]	A1	accept 13 with working
	Alternative method 3		
	$\left(\frac{10}{\tan 52}\right)^2 + 10^2$ or $(10 \times \tan 38)^2 + 10^2$	M1	oe eg $\left(\frac{10 \times \sin 38}{\sin 52}\right)^2 + 10^2$
	$\sqrt{\left(\frac{10}{\tan 52}\right)^2 + 10^2}$ $\sqrt{(10 \times \tan 38)^2 + 10^2}$	M1dep	oe eg $\sqrt{\left(\frac{10 \times \sin 38}{\sin 52}\right)^2 + 10^2}$
	[12.69, 12.7]	A1	accept 13 with working
	Additional Guidance		

Q	Answer	Mark	Comments
26	**Alternative method 1**		
	360 – 248 or 112	M1	
	180 – 43 or 137	M1	
	their 112 + their 137 + 49 + 49 + x = 360 or 360 – their 112 – their 137 – 49 or 62	M1dep	oe dep on M2
	13	A1	
	Alternative method 2		
	180 – 2(49 + x) or 82 – 2x	M1	oe correct expression for angle C
	43 + 248 + x + 180 – 2(49 + x) = 360	M1dep	oe correct equation
	x – 2x = 360 – 43 – 248 – 180 + 2 × 49	M1dep	oe collecting terms
	13	A1	
	Alternative method 3		
	360 – 43 – 248 – x or 69 – x	M1	oe correct expression for angle C
	69 – x + 2(49 + x) = 180	M1dep	oe correct equation eg $\frac{180-(69-x)}{2} - x = 49$
	–x + 2x = 180 – 69 – 2 × 49	M1dep	oe collecting terms eg $\frac{x}{2} - x = 49 - \frac{111}{2}$ or $\frac{x}{2} = 6.5$
	13	A1	
	Additional Guidance		
	Award marks for angles on the diagram even if not used in working		
	Beware the assumption that angle at centre is twice angle at C 360 – 248 = 112, angle C = 112 ÷ 2 = 56 x = (180 – 56) ÷ 2 – 49 = 13		M1M0 M0A0

Q	Answer	Mark	Comments
27(a)	(x =) 3 (x =) 7	B1	both answers required
	Additional Guidance		
	(3, 0) and (7, 0)		B0
	(x – 3)(x – 7)		B0
	(x – 3) and (x – 7)		B0
	3, 7 and 21		B0
27(b)	**Alternative method 1**		
	(their 3 + their 7) ÷ 2 or (x =) 5 or $5^2 - 10 \times 5 + 21$ or (y =) –4	M1	
	(5, –4)	A1ft	ft their two roots from (a)
	Alternative method 2		
	$(x - 5)^2 - 25 + 21$ or $2x - 10 = 0$ or (x =) 5	M1	
	(5, –4)	A1	
	Additional Guidance		
	If exactly two roots are given in (a), allow correct or ft answer in (b) eg (a) –3 and –7 (b) (–5, 96)		M1A1ft