OXFORD

INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE
MATHEMATICS EXTENSION
9260/2E

Paper 2E

Mark scheme

November 2021

Version: 1.1 Final

21BY9260/2E/MS

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	80	B1	

Q	Answer	Mark	Comments
2	$\frac{31}{15}$	B1	

Q	Answer	Mark	Comments
3	288°	B1	

Q	Answer	Mark	Comments
4	A	B1	

Q	Answer	Mark	Comments
5	Any ratio of the form $4n : 7n$ where n is an integer	B1	eg 4 : 7 or 100 : 175

Q	Answer	Mark	Comments
6(a)	C	B1	accept the question repeated
	Additional Guidance		
	C with other incorrect answers, eg C and D		B0

Q	Answer	Mark	Comments
6(b)	A	B1	accept the question repeated
	Additional Guidance		
	A with other incorrect answers, eg A and B		B0

Q	Answer	Mark	Comments
6(c)	Valid reason	B1	eg mode must be a whole number
	Additional Guidance		
	Where there is ambiguity, take “it” to refer to the mode rather than the data		
	Ignore an irrelevant statement alongside a correct statement eg He must have been working out the mean because you can’t have 0.4 of a person		B1
	2.4 is not an integer		B1
	The data is made up of whole numbers (and the mode is the most common)		B1
	You can’t have 0.4 of a person		B1
	The data is discrete		B0
	He must have been working out the mean		B0

Q	Answer	Mark	Comments
7	**Alternative method 1**		
	2500 – 2350 or 150	M1	
	$\frac{\text{their } 150}{2500}$ (× 100) or 0.06 (× 100)	M1dep	oe
	6	A1	
	Alternative method 2		
	$\frac{2350}{2500}$ (× 100) or 0.94 or 94	M1	
	(1 – their 0.94) (× 100) or 0.06 (× 100) or 100 – their 94	M1dep	oe
	6	A1	
	Additional Guidance		
	2350 – 2500 = –150 leading to –0.06 and answer 6		M1M1A1
	Condone negative values for up to M2 eg 2350 – 2500 = –150 leading to –0.06 and answer –6		M1M1A0
	0.06 or 6 in working but 94 on answer line		M1M1A0
	$\frac{2500 - 2350}{2500}$ (× 100)		M1M1

Q	Answer	Mark	Comments
8	Could be even or odd Must be even Must be odd	B3	B1 each correct row
	Additional Guidance		
	Allow a cross if it's the only answer in that row		
	If a combination of ticks and crosses are used in a row, mark the tick(s)		

Q	Answer	Mark	Comments
9	**Alternative method 1**		
	Two proper fractions for left hand side with a valid common denominator	M1	eg $\frac{16}{24}$ (and $\frac{11}{24}$) or $\frac{32}{48}$ and $\frac{22}{48}$
	$(3)\frac{27}{24}$ with M1 seen or $(2 + 1)\frac{27}{24}$ with M1 seen	M1dep	oe eg $(3)\frac{54}{48}$ with M1 seen
	$4\frac{3}{24} = 4\frac{1}{8}$ with M2 seen or $3\frac{9}{8} = 4\frac{1}{8}$ with M2 seen or $3 + 1\frac{3}{24} = 4\frac{1}{8}$ with M2 seen or $2 + 1 + 1\frac{3}{24} = 4\frac{1}{8}$ with M2 seen	A1	oe eg $4\frac{6}{48} = 4\frac{1}{8}$ with M2 seen or $3 + 1\frac{6}{48} = 4\frac{1}{8}$ with M2 seen
	Alternative method 2		
	Two improper fractions for left hand side with a valid common denominator	M1	eg $\frac{64}{24}$ and $\frac{35}{24}$ or $\frac{128}{48}$ and $\frac{70}{48}$
	$\frac{99}{24}$ with M1 seen	M1dep	oe eg $\frac{198}{48}$ with M1 seen
	$4\frac{3}{24} = 4\frac{1}{8}$ with M2 seen or $\frac{33}{8} = 4\frac{1}{8}$ with M2 seen	A1	oe eg $4\frac{6}{48} = 4\frac{1}{8}$ with M2 seen
	Additional Guidance		
	Condone working with both sides to show they come to a common value eg right side changed to $\frac{33}{8}$ and left side worked out to be $\frac{33}{8}$		M1M1A1

Q	Answer	Mark	Comments
10	$8 + (8 - 2)$ or $8 + 6$ or 14	M1	
	$\frac{7}{2}$ or $3\frac{1}{2}$ or 3.5	A1	

Q	Answer	Mark	Comments
11	**Alternative method 1 – using triangle *EBG* or triangle *EBC***		
	Angle *EBC* = 117	M1	
	Angle *CBG* = $2x$ or Angle *ECB* = $4x$	M1	
	A correct equation for triangle *EBG* or triangle *EBC*	M1dep	eg $3x + 117 + 2x + 2x = 180$ $3x + 117 + 4x = 180$ or $117 + 2x = 180 - 5x$ $180 - 7x = 117$
	9	A1	
	Alternative method 2 – using angles on straight line *DEF*		
	Angle *CBG* = $2x$ or Angle *ECB* = $4x$	M1	
	Angle *CEF* = $4x$	M1	
	$117 + 3x + 4x = 180$	M1dep	oe
	9	A1	

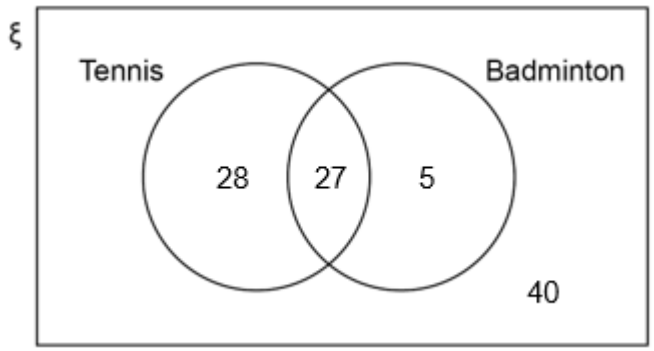
Mark Scheme and Additional Guidance for question 11 continues on the next page

Q	Answer	Mark	Comments
11 cont	**Alternative method 3 – using parallel lines and triangle *BCG***		
	Angle $CBG = 2x$	M1	
	Angle $BCG = 117 + 3x$	M1	corresponding angles
	$117 + 3x + 2x + 2x = 180$	M1dep	oe
	9	A1	
	Alternative method 4 – using exterior angle of triangle *EBC* or alternate angles		
	Angle $ABE = 63$ or Angle $CEF = 63 - 3x$	M1	
	Angle $ECB = 4x$	M1	
	$63 - 3x = 4x$	M1dep	oe eg $4x + 3x = 63$
	9	A1	
	Additional Guidance		
	Mark by the method that gives the best mark		
	Angles may be shown on the diagram		
	For the first two marks allow angle notation eg Angle *CBG* = Angle *CGB*		
	$7x + 117 = 180$		M1M1M1

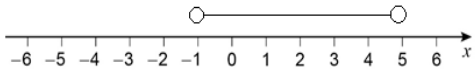
Q	Answer	Mark	Comments
12	12	B1	implied by correct answer
	$\pi \times$ (their 12)$^2 \times 30$	M1	oe
	4320π or [13 564.8, 13 573.44]	A1ft	ft B0M1 accept 13 600 with $\pi \times 12^2 \times 30$ oe seen

Q	Answer	Mark	Comments
13(a)	2	B1	

Q	Answer	Mark	Comments
13(b)	$q > 0$ and $r < 0$	B1	

Q	Answer	Mark	Comments
14	55 – 27 or 28 or 32 – 27 or 5 or 55 + 32 – 27 or 60	M1	may be seen on diagram
	100 – their 28 – their 5 – 27 or 100 – (55 + 32 – 27) or 40	M1dep	may be seen on diagram at least one of their 28 and their 5 must be from a correct method
	$\frac{40}{100}$ or 0.4 or 40%	A1	oe fraction, decimal or percentage
	Additional Guidance		
			M2

Q	Answer	Mark	Comments
15(a)	$3x \geqslant 4 - 10$ or $3x \geqslant -6$ or $-3x \leqslant 10 - 4$ or $-3x \leqslant 6$ or -2	M1	
	$x \geqslant -2$ or $-2 \leqslant x$	A1	
	Additional Guidance		
	$x \leqslant -2$, $x > -2$, $x < -2$ or $x = -2$ imply M1		
	$x \geqslant -2$ in working and -2 on answer line		M1A0

Q	Answer	Mark	Comments
15(b)		B1	
	Additional Guidance		
	Accept the circles shown on the number line		

Q	Answer	Mark	Comments
16	**Alternative method 1**		
	$5w + 10y = 3w + 4$	M1	
	$10y = 3w + 4 - 5w$ or $10y = 4 - 2w$ or $\frac{4-2w}{10}$ or $\frac{2-w}{5}$	M1dep	oe equation with y term isolated eg $2w - 4 = -10y$
	$y = \frac{4-2w}{10}$ or $y = \frac{2-w}{5}$	A1	oe equation with y as the subject eg $y = \frac{4}{10} - \frac{2w}{10}$ or $y = \frac{w-2}{-5}$
	Alternative method 2		
	$w + 2y = \frac{3w+4}{5}$ or $w + 2y = \frac{3w}{5} + \frac{4}{5}$	M1	
	$2y = \frac{3w+4}{5} - w$ or $2y = \frac{3w}{5} + \frac{4}{5} - w$ or $\frac{4-2w}{10}$ or $\frac{2-w}{5}$	M1dep	oe equation with y term isolated eg $2y = \frac{3w+4-5w}{5}$
	$y = \frac{4-2w}{10}$ or $y = \frac{2-w}{5}$	A1	oe equation with y as the subject eg $y = \frac{4}{10} - \frac{2w}{10}$ or $y = \frac{w-2}{-5}$ or $\frac{4-2w}{10} = y$
	Additional Guidance		
	$y = \frac{4-2w}{10}$ in working with $\frac{4-2w}{10}$ on answer line		M1M1A1
	Allow decimals throughout eg allow 0.4 for $\frac{4}{10}$		
	Do not ignore an incorrect simplification of a correct answer		

Q	Answer	Mark	Comments
17(a)	$2^{10} \times 11^9$ or $11^9 \times 2^{10}$	B1	
	Additional Guidance		
	Accept $2^{10}.11^9$ or $2^{10} \cdot 11^9$ or $2^{10}\,11^9$ or $2^{10},11^9$		B1

Q	Answer	Mark	Comments
17(b)	$2^{20} \times 11^{16}$ or $11^{16} \times 2^{20}$	B1	
	Additional Guidance		
	Accept $2^{20}.11^{16}$ or $2^{20} \cdot 11^{16}$ or $2^{20}\,11^{16}$ or $2^{20},11^{16}$		B1

Q	Answer	Mark	Comments
17(c)	$2^7 \times 11^8$ or $11^8 \times 2^7$	B2	B1 $8 = 2^3$ seen or implied eg $\frac{2^{10} \times 11^8}{2^3}$ or 2^7 or $2^n \times 11^8$ where $n \neq 7$
	Additional Guidance		
	Accept $2^7.11^8$ or $2^7 \cdot 11^8$ or $2^7\,11^8$ or $2^7,11^8$		B2

Q	Answer	Mark	Comments
18	**Alternative method 1**		
	$\frac{1}{4} \times \frac{3}{4}$ or $\frac{3}{16}$ or 0.1875	M1	oe
	2 × their $\frac{3}{16}$	M1dep	oe
	$\frac{3}{8}$ or $\frac{6}{16}$ or 0.375	A1	oe fraction, decimal or percentage
	Alternative method 2		
	$\frac{1}{4} \times \frac{1}{4}$ or $\frac{1}{16}$ or 0.0625 or $\frac{3}{4} \times \frac{3}{4}$ or $\frac{9}{16}$ or 0.5625	M1	oe
	their $\frac{1}{16} \times 6$ or 1 – their $\frac{1}{16}$ – their $\frac{9}{16}$	M1dep	their $\frac{1}{16}$ and their $\frac{9}{16}$ must be from correct methods
	$\frac{3}{8}$ or $\frac{6}{16}$ or 0.375	A1	oe fraction, decimal or percentage
	Alternative method 3		
	Lists the complete sample space of 16 combinations or lists the six combinations with exactly one number 5	M1	may be on a diagram
	Lists the complete sample space of 16 combinations and identifies the six combinations with exactly one number 5	M1dep	may be on a diagram
	$\frac{3}{8}$ or $\frac{6}{16}$ or 0.375	A1	oe fraction, decimal or percentage

Q	Answer	Mark	Comments
19	a^2	B1	

Q	Answer	Mark	Comments
20	**Alternative method 1**		
	$\frac{9-4}{k-3}$ or $\frac{4-9}{3-k}$	M1	oe
	$5 = 2(k-3)$ or $5 = 2k-6$ or $2k = 11$ or $11 = 2k$ or $3 + \frac{5}{2}$	M1dep	oe eg $-5 = 2(3-k)$ or $-5 = 6-2k$ or $-2k = -11$ or $k - 3 = 2.5$
	5.5	A1	oe
	Alternative method 2		
	$4 = 2(3) + c$ or $c = -2$	M1	oe
	$9 = 2k$ + their -2 or $11 = 2k$	M1dep	oe
	5.5	A1	oe

Q	Answer	Mark	Comments
21	6 : 7	B2	B1 $\sqrt{36}$ and $\sqrt{49}$ or 6 and 7 or a ratio equivalent to 6 : 7
	Additional Guidance		
	For equivalent ratios allow numbers rounded or truncated to 2 dp or better eg 1 : 1.17 0.86 : 1		B1 B1

Q	Answer	Mark	Comments
22	$12x^3 - 10x^2$	M1	oe may be implied by $(2x^2(6x - 5) + 7x^2 =)\ 12x^3 - 3x^2$
	$3x^2 - 12x^3 + 2 - 8x$	M1	oe
	$2 - 8x$ or $-8x + 2$ or $2(1 - 4x)$ or $-2(4x - 1)$	A1ft	ft M1M0 or M0M1 with a total of one error only
	Additional Guidance		
	Condone an attempt to solve $2 - 8x = 0$		M1M1A1
	Do not ignore further incorrect algebraic simplification eg 1 $2 - 8x = -6x$ eg 2 $2 - 8x = 1 - 4x$ eg 3 $2 - 8x = 8x - 2$		M1M1A0
	$12x^3 - 10x^2$ $3x^2 - 12x^3 + 2 - 6x\ (+7x^2)$ $2 - 6x$		M1 M0 A1ft
	$12x^3 - 10x$ $3x^2 - 12x^3 + 2 - 8x\ (+7x^2)$ $10x^2 - 18x + 2$		M0 M1 A1ft
	$12x^3 - 10x^2$ $3x^2 - 8x$ (2 errors) $12x^3 - 8x$		M1 M0 A0ft
	$12x^3 - 10x$ (1 error) $3x^2 - 12x^3 + 2 - 6x$ (1 error) $10x^2 - 16x + 2$		M0 M0 A0ft
	Condone an incorrect simplification of $12x^3 - 10x^2$ for the first M1 but this counts as one error eg $12x^3 - 10x^2 = 2x$		M1

Q	Answer	Mark	Comments
23	21	B1	

Q	Answer	Mark	Comments
24	$2 \times \pi \times 26 \times \frac{35}{360}$	M1	oe
	[15.87, 15.9] or $\frac{91}{18}\pi$	A1	oe implied by correct answer
	[67.87, 67.9]	A1ft	ft their [15.87, 15.9] + 52

Q	Answer	Mark	Comments
25	$1 + p + q = 8$ or $4 + 2p + q = 14$	M1	oe
	$-p = -3$ or $4 + 2(8 - q - 1) + q = 14$	M1	oe eliminates one variable ft their equations
	$p = 3$ and $q = 4$	A1	implied by correct answer
	58	A1ft	ft their p and their q with M1 awarded

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="11">26(a)</td><td>$(2x - 1)(x - 4)$
or
$(1 - 2x)(4 - x)$</td><td>B2</td><td>B1 $(2x + a)(x + b)$
where $ab = 4$ or $a + 2b = -9$
or
$(c - 2x)(d - x)$
where $cd = 4$ or $c + 2d = 9$
SC1 $2(x - 4)(x - \frac{1}{2})$</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">Ignore any attempt to solve $(2x - 1)(x - 4) = 0$ after factorising
eg $(2x - 1)(x - 4)$ in working with 0.5 and 4 on answer line</td><td>B2</td></tr>
<tr><td colspan="2">Correct answer in working contradicted by further working</td><td>B1</td></tr>
<tr><td colspan="2">$(2x + 1)(x + 4)$</td><td>B1</td></tr>
<tr><td colspan="2">$(2x + 1)(x - 4)$</td><td>B0</td></tr>
<tr><td colspan="2">Condone multiplication signs for B2
eg $(2x - 1) \times (x - 4)$</td><td>B2</td></tr>
<tr><td colspan="2">Condone multiplication signs for B1
eg1 $(2x + 1) \times (x + 4)$
eg2 $(2 \times x + 1) \times (x + 4)$</td><td>B1
B1</td></tr>
<tr><td colspan="2">Condone missing final bracket
eg1 $(2x - 1)(x - 4$
eg2 $(2x + 1)(x + 4$</td><td>B2
B1</td></tr>
</table>

Q	Answer	Mark	Comments
26(b)	$3(2y + 5)(2y – 5)$	B2	B1 $(6y + 15)(2y – 5)$ or $(2y + 5)(6y – 15)$ or $3(4y^2 – 25)$ or $(2y + 5)(2y – 5)$ or $(\sqrt{12}\,y + \sqrt{75})\,(\sqrt{12}\,y – \sqrt{75})$ oe factorisation using surds
	Additional Guidance		
	Ignore any attempt to solve $3(2y + 5)(2y – 5) = 0$ after factorising eg $3(2y + 5)(2y – 5)$ in working with $–2.5$ and 2.5 on answer line		B2
	$3(2y – 5)(2y + 5)$		B2
	$(6y – 15)(2y + 5)$		B1
	Condone multiplication signs for B2 eg $3 \times (2y + 5) \times (2y – 5)$		B2
	Condone multiplication signs for B1 eg1 $(6y + 15) \times (2y – 5)$ eg2 $(2 \times y + 5) \times (y \times 6 – 15)$		B1 B1
	Condone missing final bracket eg1 $3(2y + 5)(2y – 5$ eg2 $(6y + 15)(2y – 5$		B2 B1

Q	Answer	Mark	Comments
27(a)	$6\sqrt{3}$ or $5\sqrt{3}$	M1	
	$6\sqrt{3}$ and $5\sqrt{3}$ and $11\sqrt{3}$	A1	

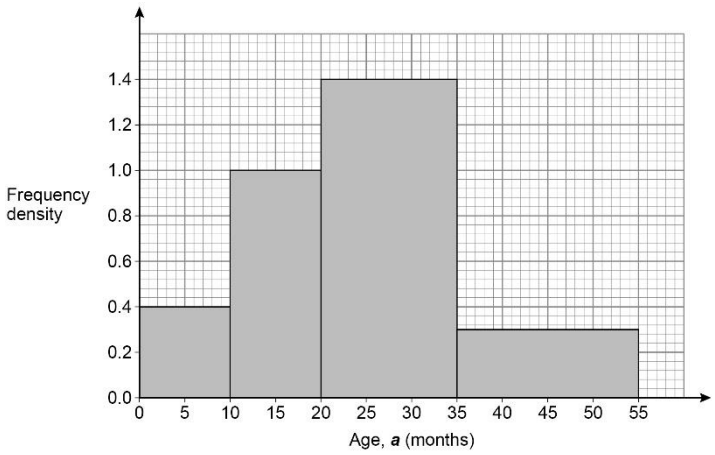
Q	Answer	Mark	Comments
27(b)	$\frac{(3+\sqrt{2})\times(2+\sqrt{2})}{(2-\sqrt{2})\times(2+\sqrt{2})}$	M1	may be implied by the second mark
	$6 + 3\sqrt{2} + 3\sqrt{2} + 2$ or $6 + 5\sqrt{2} + 2$ or $8 + 3\sqrt{2} + 3\sqrt{2}$ and $4 + 2\sqrt{2} - 2\sqrt{2} - 2$ or $2^2 - 2$ or $4 - 2$ or 2	M1dep	
	$\frac{6+3\sqrt{2}+2\sqrt{2}+2}{4-2}$ and $\frac{8+5\sqrt{2}}{2}$ or $\frac{6+5\sqrt{2}+2}{4-2}$ and $\frac{8+5\sqrt{2}}{2}$	A1	allow $a = 8$ and $b = 5$ for $\frac{8+5\sqrt{2}}{2}$ allow $4 + 2\sqrt{2} - 2\sqrt{2} - 2$ or $2^2 - 2$ or 2 for $4 - 2$
	Additional Guidance		
	Do not ignore further working eg $8 + 5\sqrt{2} = 13\sqrt{2}$		M1M1A0
	Equating and multiplying across to reach $\frac{8+5\sqrt{2}}{2}$ or $a = 8$ and $b = 5$		M0M0A0

Q	Answer	Mark	Comments
28	**Alternative method 1**		
	$\frac{725}{10000}$ or $\frac{29}{400}$ or $\frac{87}{1200}$	M1	
	87	A1	
	Alternative method 2		
	$\frac{7.25}{100}+\frac{72.5}{1000}+\frac{72.5}{1000}$	M1	oe eg 72.5 + 7.25 + 7.25
	87	A1	

Q	Answer	Mark	Comments
29	$3x^2$ or $10x$	M1	oe eg $3 \times x^{3-1}$ or $5 \times 2 \times x^{2-1}$
	$3x^2 - 10x$	A1	
	-8	A1ft	ft their $\frac{dy}{dx}$ with one term correct
	Additional Guidance		
	Do not ignore further working eg -8 followed by equation of tangent -8 followed by coordinates eg $(-8, -12)$ or $(2, -12)$		M1A1A0
	$\frac{dy}{dx} = 3x^2 - 10$ followed by answer of 2		M1A0A1ft

Q	Answer	Mark	Comments
30(a)	Never true Always true Always true	B3	B1 each correct row
	Additional Guidance		
	Allow a cross if it is the only answer in that row		
	If a combination of ticks and crosses are used in a row then mark the tick(s)		

Q	Answer	Mark	Comments
30(b)	**Alternative method 1**		
	Angle $QST = m$ or angle $QTS = m + 15$	M1	
	Angle $SQT = m + 15$	M1dep	
	$m + 2(m + 15) = 180$	M1dep	oe eg $180 - m - (m + 15) = m + 15$
	50	A1	
	Alternative method 2		
	Angle $QST = m$	M1	
	Angle $SQT = \frac{180 - m}{2}$	M1dep	oe
	$\frac{180 - m}{2} + m + m + 15 = 180$ or $\frac{180 - m}{2} = m + 15$	M1dep	oe
	50	A1	
	Alternative method 3		
	Angle $SQT = 180 - (m + m + 15)$ or $165 - 2m$	M1	oe
	Angle $QST = m$ or $180 - (165 - 2m) - (165 - 2m)$ or $4m - 150$	M1	oe
	$m + 165 - 2m + 165 - 2m = 180$ or $4m - 150 = m$	M1dep	oe eg $4m - 150 = m$
	50	A1	
	Additional Guidance		
	For the first two marks, the angles may be shown on the diagram		
	The third method mark is for any correct equation using triangle QST or the straight line or from equating an angle obtained in two different ways		
	$\frac{180 - m}{2} = 180 - (m + m + 15)$ (alt 2)		M1M1M1

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="6">31(a)</td><td>4 ÷ 10 or 0.4
or
10 ÷ 10 or 1
or
21 ÷ 15 or 1.4
or
6 ÷ 20 or 0.3</td><td>M1</td><td>implied by bar of correct height
$\pm\frac{1}{2}$ small square</td></tr>
<tr><td>Three or four correct frequency densities</td><td>M1dep</td><td>at least three from
0.4, 1, 1.4, 0.3
implied by bar of correct height
$\pm\frac{1}{2}$ small square</td></tr>
<tr><td>Fully correct histogram</td><td>A1</td><td></td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2"> 
</td><td>M1M1A1</td></tr>
<tr><td colspan="2">Condone frequency polygon superimposed over the histogram</td><td></td></tr>
</table>

Q	Answer	Mark	Comments
31(b)	**Alternative method 1 – Using the table**		
	$\frac{35-30}{35-20} \times 21$ or $\frac{1}{3} \times 21$ or 1.4×5 or $21 - 14$ or 7	M1	oe
	13	A1	SC1 28
	Alternative method 2 – Using their histogram		
	$\frac{1}{3} \times (35 - 20) \times$ their 1.4 or 7	M1	ft from part (a) if their histogram has 4 bars of correct width and all heights less than or equal to 1.6 oe eg $\frac{5}{15} \times (35 - 20) \times$ their 1.4
	13	A1ft	ft from part (a) if their histogram has 4 bars of correct width and all heights less than or equal to 1.6 and answer rounded or truncated to an integer $\frac{1}{3} \times (35 - 20) \times$ their 1.4 + (55 – 35) × their 0.3 SC1 28
	Additional Guidance		
	Their 1.4 must be the frequency density from their histogram in part (a) for the interval $20 \leqslant a < 35$ and their 0.3 must be their frequency density from their histogram for the interval $35 \leqslant a < 55$		

Q	Answer	Mark	Comments
32	**Alternative method 1**		
	Second difference is 4 or $2a = 4$ or $a = 2$ or $2n^2$	M1	second difference seen at least once and not contradicted
	Subtracts $2n^2$ values from at least two consecutive terms in the original sequence	M1dep	eg $5 - 2 \times 1^2$ and $10 - 2 \times 2^2$ or 3 and 2 or $19 - 2 \times 3^2$ and $32 - 2 \times 4^2$ or 1 and 0
	$2n^2 - n + 4$	A1	allow $a = 2$, $b = -1$ $c = 4$
	Alternative method 2		
	Any 3 of $a + b + c = 5$ $4a + 2b + c = 10$ $9a + 3b + c = 19$ $16a + 4b + c = 32$	M1	
	Any 2 equations in 2 unknowns eg $3a + b = 5$ $5a + b = 9$ $7a + b = 13$	M1dep	obtains two correct equations in same two variables from their equations
	$2n^2 - n + 4$	A1	allow $a = 2$, $b = -1$ $c = 4$
	Alternative method 3		
	Second difference is 4 or $2a = 4$ or $a = 2$ or $2n^2$	M1	second difference seen at least once and not contradicted
	$3a + b = 5$ and substitutes their a or $b = -1$ or $-n$	M1dep	
	$2n^2 - n + 4$	A1	allow $a = 2$, $b = -1$ $c = 4$

Mark scheme and Additional Guidance for question 32 continues on the next page

Q	Answer	Mark	Comments
32 cont	**Alternative method 4**		
	Second difference is 4 or $2a = 4$ or $a = 2$ or $2n^2$	M1	second difference seen at least once and not contradicted
	$0n^2 + 0n + c = 4$ or $c = 4$	M1	continues sequence backwards to the 0th term to find the value of c
	$2n^2 - n + 4$	A1	allow $a = 2$, $b = -1$ $c = 4$

Q	Answer	Mark	Comments
33	**Alternative method 1**		
	360 ÷ 5 or 72 or 36 or 108 or 54	M1	may be seen on diagram
	$2 \div \sin\left(\frac{\text{their } 72}{2}\right)$ or 2 ÷ sin (their 36) or $2 \div \cos\left(\frac{\text{their } 108}{2}\right)$ or 2 ÷ cos (their 54) or $4 \times \frac{\sin\left(\frac{\text{their } 108}{2}\right)}{\sin(\text{their } 72)}$ or $\sqrt{4^2 \div (2 - 2\cos 72)}$	M1dep	
	3.4…	A1	implied by correct answer
	$\sqrt{10^2 + (\text{their } 3.4)^2}$	M1dep	dep on M2
	10.56… or 10.6	A1	

Mark scheme and Additional Guidance for question 33 continues on the next page

Q	Answer	Mark	Comments	
33 cont	**Alternative method 2**			
	360 ÷ 5 or 72 or 36 or 108 or 54	M1	may be seen on diagram	
	2 ÷ tan (their 36) or 2 × tan (their 54) or 2.75… and $\sqrt{2^2 + (\text{their } 2.75)^2}$	M1dep		
	3.4…	A1	implied by correct answer	
	$\sqrt{10^2 + (\text{their } 3.4)^2}$	M1dep	dep on M2	
	10.56… or 10.6	A1		
	Additional Guidance			
	Allow 11 following $\sqrt{10^2 + (\text{their } 3.4)^2}$ or 10.56… or 10.6			M1M1A1M1A1

Q	Answer	Mark	Comments
34	$\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ or $9\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ or $\begin{pmatrix}9 & 0\\0 & 9\end{pmatrix}$	B1	may be implied by two correctly equated elements in subsequent working
	$\begin{pmatrix}a^2+5b & 5a+10\\ab+2b & 5b+4\end{pmatrix}$	B2	oe B1 2 or 3 correct elements must be a 2 × 2 matrix may be implied by correct equation(s)
	$5a + 10 = 0$ or $a = -2$ or $ab + 2b = 0$ or $a^2 + 5b = 9$ or $5b + 4 = 9$ or $b = 1$	M1dep	oe any of their elements correctly equated ft from their 2 × 2 matrix for $\mathbf{M}^2$ and their identity matrix
	$a = -2$ and $b = 1$	A1	
	Additional Guidance		
	The first B mark may be seen at any stage of the working		
	Use of an incorrect identity matrix will score a maximum of B2M1		