GCSE
MATHEMATICS
8300/1H

Higher Tier Paper 1 Non-Calculator

Mark scheme

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19bg8300/1H/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.

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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.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

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 $a \leq$ 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.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Question	Answer	Mark	Comments
1	250 × 0.85	B1	
2	$x = 0$	B1	
3	(6, 7)	B1	
4	$16x^4$	B1	
5(a)	Says that the wrong line has been given or says that for the given reflection the image would be in the second quadrant (may be implied by sketch) or says that the given line is vertical or gives the coordinates of at least one image point under the given reflection or says that after the given reflection, a rotation 180° (centre (–1, –1)) or an enlargement, scale factor –1 (centre (–1, –1)) is needed	B1	eg the line should be $y = -1$ eg the triangle would move to the other side of the y-axis eg $x = -1$ is vertical eg (1, 1) would move to (–3, 1) (1, 3) would move to (–3, 3) (4, 1) would move to (–6, 1)
	Additional Guidance for this question is on the next page		

	Additional Guidance	
5(a) cont	It is the wrong line/axis (of reflection)	B1
	It's not $x = -1$	B1
	The line should be horizontal	B1
	$y = -1$	B1
	$x = -1$ line drawn with explanation that it is incorrect	B1
	Q should be to the left of P	B1
	Correct line drawn, with indication that it should be that line	B1
	Correct statement with irrelevant statement eg It's the wrong line and Q is in the wrong place	B1
	Correct line drawn, but no explanation or equation given	B0
	$x = -1$ line drawn with no explanation that it is incorrect	B0
	It should be reflected in the y-axis	B0
	It is not a reflection in $x = -1$	B0
	Should be rotation about $y = -1$	B0
	They are not an equal distance from each other	B0
	It should be the point $x = -1$	B0
	Q is in the wrong place	B0
	It is a reflection in the x-axis then a translation by $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$	B0
	Correct statement with incorrect statement eg It's the wrong line, it should be $x = -2$	B0
	If more than one image point is given, they must all be correct	

Question	Answer	Mark	Comments

5(b)	Should say the centre of rotation (is O)	B1	oe statement accept 'axis of rotation' or 'point'
	Additional Guidance		
	Allow origin or (0, 0) for O		
	Should be about O		B1
	There is no centre		B1
	It should be around a point		B1
	It doesn't give the coordinates		B1
	Should/could be 270° clockwise about O		B1
	Should/could be 270° clockwise		B0
	Should be rotation through 90° clockwise about O		B0
	It is a reflection 90° anticlockwise with centre O		B0
	It's not reflected on a point		B0
	Doesn't say which line you're turning around		B0
	Correct statement with incorrect statement eg It should give a centre of rotation at (0, 1)		B0

6(a)	64	B1	accept 4^3
	Additional Guidance		
	4^3 and incorrect value given eg $4^3 = 32$		B0

Question	Answer	Mark	Comments
6(b)	–5 –13	B2	condone –13 –5 B1 –5 as first term or ft their first term – 8
7	60 × 4 or 4(a × 60) or 4a × 60 or $\frac{b}{a}$ = 60 or $\frac{4b}{b/60}$ or 4b = 240a or $\frac{240a}{a}$	M1	accept any multiplication signs
	240	A1	Condone $\frac{240}{1}$
	Additional Guidance		
	Correct answer found by substituting appropriate values for a and b		M1A1
	Incorrect answer found by substituting appropriate values for a and b		M0A0
	Award M1 for 60 × 4 or 240 in working, either as individual expressions or as part of longer expressions eg 4 × 60 = 240, answer 240b eg $\frac{4\times60\times a}{4b}$		M1A0 M1A0
	Do not award M1 for 240 within a list of multiples of 60 that continues beyond 240		

Question	Answer	Mark	Comments
8	(27 =) 3^3	M1	
	$\left(\left(3^2\right)^7 =\right) 3^{2\times7}$ or $\left(\left(3^2\right)^7 =\right) 3^{14}$	M1	
	3^{17}	A1ft	ft 3^a and 3^b then answer 3^{a+b} with M1M0 or M0M1 scored
	Additional Guidance		
	Answer 3^{17} with no incorrect working		M1M1A1
	3^{17} in working with 17 on the answer line or both 3^{17} and 17 on the answer line		M1M1A1
	$3^3 \times 3^9 = 3^{12}$		M1M0A1ft
	Evaluation of powers of 3 as values only		M0M0A0
	Answer 17 with no valid working		M0M0A0

Question	Answer	Mark	Comments
9	**Alternative method 1: working in terms of π**		
	π (×) 4^2 (×) 10 or 160π or [502, 503]	M1	oe accept 3 or better for π accept 480 or 496
	$\frac{2}{3}$ (×) π (×) 6^3 or 144π or [452, 453]	M1	oe accept 3 or better for π accept 0.66 or 0.67 or better for $\frac{2}{3}$ accept 432 or 446(.4)
	160π and 144π or [502, 503] and [452, 453]	A1	oe values accept 480 and 432 or 496 and 446(.4)
	160π and 144π and cylinder or [502, 503] and [452, 453] and cylinder or cylinder is 16π greater	A1ft	ft correct decision for their 160π and their 144π with M1M1 scored accept 480 and 432 and cylinder or 496 and 446(.4) and cylinder
	Alternative method 2: working without π		
	4^2 (×) 10 or 160	M1	oe
	$\frac{2}{3}$ (×) 6^3 or 144	M1	oe accept 0.66 or 0.67 or better for $\frac{2}{3}$
	160 and 144	A1	oe values
	160 and 144 and cylinder	A1ft	ft correct decision for their 160 and their 144 with M1M1 scored
	Additional Guidance for this question is on the next page		

9	**Additional Guidance**	
	Better than 3 for π could be 3.1, 3.14, 3.142 or $\frac{22}{7}$	
	160π with incorrect method for hemisphere	M1M0A0A0
	144π with incorrect method for cylinder	M0M1A0A0
	160π and 144π with incorrect decision or no decision	M1M1A1A0
	160 and 144 with incorrect or no decision	M1M1A1A0
	Accept values given as fractions for the first A mark, but for the second A mark, they must have a common denominator. eg 160π and $\frac{432\pi}{3}$ and cylinder eg $\frac{480}{3}$ and $\frac{432}{3}$ and cylinder	 M1M1A1A0 M1M1A1A1
	Working with π for one value but not the other can only score M1 eg 160π and 144 (with or without a decision)	 M1 only
	Do not allow M1 for a correct formula as part of an incorrect formula eg $\frac{1}{3} \times \pi \times 4^2 \times 10$	 M0

Question	Answer	Mark	Comments
10	**Alternative method 1: total amount of each colour (judgement accepted that ratio is not 4 : 3)**		
	60 ÷ (2 + 1) or 20 or 40	M1	
	80 + their 20 or 100	M1dep	
	28 + 2 × their 20 or 68	M1dep	dep on first M1 only
	100 and 68 and No	A1	
	Alternative method 2: total of red and how much white should have been added or how much there should have been originally or how much there should be now		
	60 ÷ (2 + 1) or 20 or 40	M1	
	80 + their 20 or 100	M1dep	
	their 100 ÷ 4 × 3 or 75	M1dep	dep on M2
	(75 – 2 × 20 =) 35 and No or 40 and (75 – 28 =) 47 and No or 75 and 68 and No	A1	comparing 35 to 28
	Alternative method 3: total of white and how much red should have been added or how much there should have been originally or how much there should be now		
	60 ÷ (2 + 1) or 20 or 40	M1	
	28 + 2 × their 20 or 68	M1dep	
	their 68 ÷ 3 × 4 or $90\frac{2}{3}$ or $\frac{272}{3}$	M1dep	dep on M2
	($90\frac{2}{3}$ – 20 =) $70\frac{2}{3}$ and No or 20 and ($90\frac{2}{3}$ – 80 =) $10\frac{2}{3}$ and No or $90\frac{2}{3}$ and 100 and No	A1	comparing $70\frac{2}{3}$ to 80
	The scheme for question 10 continues on the next page		

Question	Answer	Mark	Comments
10 cont	**Alternative method 4: total of red and what it should be for total amount of paint**		
	60 ÷ (2 + 1) or 20 or 40	M1	
	80 + their 20 or 100	M1dep	
	(60 + 80 + 28) ÷ (4 + 3) × 4 or 96	M1	
	100 and 96 and No	A1	
	Alternative method 5: total of white and what it should be for total amount of paint		
	60 ÷ (2 + 1) or 20 or 40	M1	
	28 + 2 × their 20 or 68	M1dep	
	(60 + 80 + 28) ÷ (4 + 3) × 3 or 72	M1	
	68 and 72 and No	A1	
	Additional Guidance		
	20 from 80 ÷ 4 is incorrect		
	With no incorrect working, 'He should have added 76 red and 32 white' implies full marks		M1M1M1A1
	'No' can be implied, eg on alt 1 accept 100 and 68 and 'He needs 7 more white'		M1M1M1A1
	Condone dubious notation eg 20 : 40 + 80 : 28 = 100 : 68, so No		M1M1M1A1
	Ignore further work if 100 and 68 and No are seen		M1M1M1A1
	Only works out the amounts of red and white there should be for the total amount of paint, eg, 168 ÷ 7 × 4 = 96 and 168 ÷ 7 × 3 = 72		M0M0M1A0

Question	Answer	Mark	Comments
11(a)	10^5 or 25 000	M1	oe correct value not in standard form eg 25×10^3
	2.5×10^4	A1	
	Additional Guidance		
	Condone $2.5 \cdot 10^4$		M1A1
	Condone different spacing or commas eg 2 5000 or 250,00		M1A0
11(b)	$c = 3$ and $d = -2$	B2	B1 $c = 3$ or $d = -2$ or $c = 10^3$ and/or $d = 10^{-2}$
	Additional Guidance		
	One or both of the values may be embedded for B1 only		
12	☐ V is directly proportional to H ✓ V is inversely proportional to H ✓ V is directly proportional to $\frac{1}{H}$ ☐ V is inversely proportional to $\frac{1}{H}$	B1	

Question	Answer	Mark	Comments
13	$\frac{1(1-4)}{\sqrt{1+3}}$ or $\frac{-3}{\sqrt{4}}$ or $\frac{6(6-4)}{\sqrt{6+3}}$ or $\frac{6\times 2}{\sqrt{9}}$ or $\frac{12}{3}$ or $\frac{4}{1}$	M1	oe eg $\frac{1^2-1\times 4}{\sqrt{1+3}}$ eg $\frac{6^2-6\times 4}{\sqrt{6+3}}$
	$\frac{-3}{2}$ or $-1\frac{1}{2}$ or -1.5 or 4	M1dep	
	$2\frac{1}{2}$ or $\frac{5}{2}$ or 2.5	A1	oe mixed number, fraction or decimal
	Additional Guidance		
	$\frac{n^2-4n}{\sqrt{n+3}}$ with no correct substitution		M0M0A0
14	90	B1	
15	All correct	B3	B2 for 3 correct B1 for 1 or 2 correct
	Additional Guidance		

	True	May be true	Not true
The quadrilateral is a rectangle		✓	
The quadrilateral is a parallelogram	✓		
The quadrilateral is a rhombus			✓
The quadrilateral is a kite			✓

Question	Answer	Mark	Comments
16	**Alternative method 1**		
	$45 \times \frac{5}{3}$ or 75	M1	75 seen as total of Small column implied by 120 seen as overall total
	(their 75 + 45) ÷ (1 + 3) or 120 ÷ 4 or 30 (Yellow)	M1dep	30 seen as total of Yellow row
	their 30 – 12 or 18 (Large Yellow)	M1dep	18 in Large Yellow cell
	27	A1	Accept 27 in correct cell if answer blank
	Alternative method 2		
	$45 \times \frac{5}{3}$ or 75	M1	75 seen as total of Small column implied by 120 seen as overall total
	their 75 – 12 or 63 (Small Green)	M1dep	63 in Small Green cell
	(their 75 + 45) ÷ (1 + 3) × 3 or 120 ÷ 4 × 3 or 90 (Green)	M1dep	dep on first M1 90 seen as total of Green row
	27	A1	Accept 27 in correct cell if answer blank
	Alternative method 3		
	$45 \times \frac{5}{3}$ or 75	M1	75 seen as total of Small column implied by 120 seen as overall total
	their 75 – 12 or 63 (Small Green)	M1dep	63 in Small Green cell
	their 63 + x = 3(45 – x + 12)	M1dep	oe 63 + x = 171 – 3x
	27	A1	Accept 27 in correct cell if answer blank
	Additional Guidance		
	In alt 2, 90 only implies M1M0M1 – 63 is also needed for M1M1M1		

Question	Answer	Mark	Comments
17	$\begin{pmatrix} -6 \\ 17 \end{pmatrix}$	B1	
18	**Alternative method 1**		
	$2x + 20$	M1	correct expansion
	$x + 15 = 6x + 60$	M1dep	multiplication by 3
	$15 - 60 = 6x - x$ or $-45 = 5x$ or $60 - 15 = x - 6x$ or $45 = -5x$	M1dep	collects terms
	-9	A1	SC2 -3 from $2x + 10$ or 1 from $6x + 10$
	Alternative method 2		
	$2x + 20$	M1	correct expansion
	$\frac{x}{3} + 5 = 2x + 20$ and $5 - 20 = 2x - \frac{x}{3}$ or $-15 = \frac{5x}{3}$ or $20 - 5 = \frac{x}{3} - 2x$ or $15 = -\frac{5x}{3}$	M1dep	splits the fraction and collects terms
	$15 - 60 = 6x - x$ or $-45 = 5x$ or $60 - 15 = x - 6x$ or $45 = -5x$	M1dep	multiplication by 3
	-9	A1	SC2 -3 from $2x + 10$ or 1 from $6x + 10$
	The scheme for this question continues on the next page		

Question	Answer	Mark	Comments
18 cont	**Alternative method 3**		
	$6(x + 10)$ or $6x + 60$	M1	multiplication of rhs by 3
	$x + 15 = 6x + 60$	M1dep	correct expansion
	$15 - 60 = 6x - x$ or $-45 = 5x$ or $60 - 15 = x - 6x$ or $45 = -5x$	M1dep	collects terms
	–9	A1	SC2 –3 from $2x + 10$ or 1 from $6x + 10$

19(a)	Team A and states that the median is higher or Team A and states that the averages are 9.8 and 9.7	B1	
	Additional Guidance		
	If values are given for the medians they must be correct; Team A 9.8 and Team B 9.7		
	Accept medium or middle or midpoint for median		
	Do not accept answers which also mention other statistical measures		
	Team A and 'The median is further'		B1
	Team A and 'A is 9.8 and B is 9.7'		B1
	Team A and 'A is 9.8'		B0
	Team A and 'The average is higher'		B0

Question	Answer	Mark	Comments
19(b)	States that the interquartile (range) is lower	B1	oe accept 'narrower box'
	Additional Guidance		
	If values are given for the interquartile ranges they must be correct; Team A 0.4 and Team B 0.5		
	Apart from stating that the ranges are equal, do not accept answers which also mention other statistical measures		
	The box is smaller		B1
	The distance between LQ and UQ is smaller		B1
	The box plot is smaller		B0
	0.4 and 0.5 without IQR mentioned		B0
20(a)	$\frac{8}{21}$	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore attempts to convert a correct fraction to a decimal or percentage		B1
20(b)	$\frac{4}{15}$	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore attempts to convert a correct fraction to a decimal or percentage		B1

Question	Answer	Mark	Comments
20(c)	$\frac{28}{36}$ and $\frac{25}{36}$ or 28 and 25	B2	oe fractions with common denominators, decimals or percentages B1 $\frac{28}{36}$ or $\frac{25}{36}$ or 13, 11 and 4 or 28 or 13, 8 and 4 or 25 or Venn diagrams drawn showing both correct regions
	Additional Guidance		
	28 or 25 as a numerator with an incorrect denominator		B1
21	$0.703\dot{8}\dot{4}$	B1	

Question	Answer	Mark	Comments
22	$\frac{10-0}{6-4}$ or $(m=)\ \frac{10}{2}$ or $-3-(6-4)$ or $-3-2$ or $4-(6-(-3))$ or -5 or $(-5, 0)$ and $\frac{10-0}{-3-(-5)}$ or $(m=)\ \frac{10}{2}$ or $0 = 4m + k$ and $10 = 6m + k$ and $10 - 0 = 6m - 4m$ or $2m = 10$ or $(m=)\ 5$	M1	oe method to find the gradient of either line implied by $y = 5x$ … any letters
	10 = their $5 \times (-3) + c$ or $(c=)\ 5 \times (6-(-3)) - 20$ or $(c=)\ 25$ or $y - 10 =$ their $5(x-(-3))$ or $y = 5(x + 9) - 20$ or $5x + 25$	M1dep	oe
	$y = 5x + 25$	A1	
	Additional Guidance		
	Do not allow further incorrect work, eg $y = 5x + 25$ and then $y = x + 5$		M1M1A0

Question	Answer	Mark	Comments
23(a)	$(5x – 4)(x + 2)$	B2	brackets in either order B1 factorisation to $(5x + a)(x + b)$ where $ab = –8$ or $a + 5b = 6$ or $\frac{1}{5}(5x – 4)(5x + 10)$
	Additional Guidance		
	Ignore any attempt to solve $(5x – 4)(x + 2) = 0$		
	Attempt at further factorisation, eg $(5x – 4)(x + 2) = 5(x – 0.8)(x + 2)$		B1
23(b)	$(x + 2)(x + 7)$	M1	brackets in either order
	$(x + 2)(x – 2)$	M1	brackets in either order
	$\frac{x+7}{x-2}$	A1	
	Additional Guidance		
	Further cancelling, eg $\frac{x+7}{x-2} = \frac{7}{2}$		M1M1A0

Question	Answer	Mark	Comments
24	**Alternative method 1**		
	($\sqrt{18}$ =) $\sqrt{9}$ $\sqrt{2}$ or $3\sqrt{2}$ or ($\sqrt{50}$ =) $\sqrt{25}$ $\sqrt{2}$ or $5\sqrt{2}$	M1	oe simplifies one surd implied by $\frac{28}{5\sqrt{2}}$
	$\frac{28}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}}$ or $\frac{28\sqrt{50}}{50}$	M1	oe rationalises second term $\frac{28}{5\sqrt{2}} \times \frac{5\sqrt{2}}{5\sqrt{2}}$ or $\frac{140\sqrt{2}}{50}$ or $\frac{14\sqrt{2}}{5}$ implies M1M1
	$3\sqrt{2} - \frac{140\sqrt{2}}{50}$ or $\frac{150\sqrt{2} - 140\sqrt{2}}{50}$ or $\frac{10\sqrt{2}}{50}$	M1dep	dep on M2 oe both terms rational with a common surd
	$\frac{\sqrt{2}}{5}$ or $a = 2$, $b = 5$	A1	oe in the form $\frac{\sqrt{a}}{b}$ eg $\frac{\sqrt{50}}{25}$ or $\frac{\sqrt{200}}{50}$
	The scheme for this question continues on the next page		

Question	Answer	Mark	Comments
24 cont	**Alternative method 2**		
	($\sqrt{18}$ =) $\sqrt{9}\sqrt{2}$ or $3\sqrt{2}$ or ($\sqrt{50}$ =) $\sqrt{25}$ $\sqrt{2}$ or $5\sqrt{2}$ or $\frac{\sqrt{18}\sqrt{50}}{\sqrt{50}}$ or $\frac{\sqrt{900}}{\sqrt{50}}$	M1	oe simplifies one surd implied by $\frac{28}{5\sqrt{2}}$ or changes first term to match second
	$\frac{\sqrt{900}}{\sqrt{50}} - \frac{28}{\sqrt{50}}$ or $\frac{3\sqrt{2}\times 5\sqrt{2}}{\sqrt{50}} - \frac{28}{\sqrt{50}}$ or $\frac{30-28}{\sqrt{50}}$ or $\frac{2}{\sqrt{50}}$	M1dep	oe common denominator
	$\frac{30-28}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}}$ or $\frac{2\sqrt{50}}{50}$	M1dep	oe rationalisation of a single term
	$\frac{\sqrt{2}}{5}$ or a = 2, b = 5	A1	oe in the form $\frac{\sqrt{a}}{b}$ eg $\frac{\sqrt{50}}{25}$ or $\frac{\sqrt{200}}{50}$
	Additional Guidance		
	Ignore further work after a correct value, eg $\frac{\sqrt{50}}{25}$ = $\sqrt{2}$		M1M1M1A1
25(a)	1 or 100%	B1	oe fraction, decimal or percentage eg $\frac{56}{56}$
	Additional Guidance		
	Do not accept answers in words only, eg ‘Certain’		B0

Question	Answer	Mark	Comments
25(b)	**Alternative method 1**		
	$\frac{3}{8}$ and $\frac{2}{7}$ or $\frac{6}{56}$	M1	may be seen on a tree diagram oe fraction, decimal or percentage eg $\frac{3}{28}$
	$1-(\frac{3}{8}\times\frac{2}{7})$ or $1-\frac{6}{56}$	M1dep	
	$\frac{50}{56}$	A1	oe fraction, decimal or percentage eg $\frac{25}{28}$
	Alternative method 2		
	$\frac{5}{8}$ and $\frac{4}{7}$ or $\frac{20}{56}$ or $\frac{5}{8}$ and $\frac{3}{7}$ or $\frac{3}{8}$ and $\frac{5}{7}$ or $\frac{15}{56}$ or $\frac{30}{56}$	M1	may be seen on a tree diagram oe fraction, decimal or percentage
	$\frac{5}{8}\times\frac{4}{7}+2(\frac{5}{8}\times\frac{3}{7})$ or $\frac{20}{56}+2(\frac{15}{56})$ or $\frac{20}{56}+\frac{30}{56}$	M1dep	oe eg $\frac{5}{8}\times\frac{4}{7}+\frac{5}{8}\times\frac{3}{7}+\frac{3}{8}\times\frac{5}{7}$
	$\frac{50}{56}$	A1	oe fraction, decimal or percentage eg $\frac{25}{28}$
	Additional Guidance		
	Condone a correct pair of fractions seen in a multiplication chain for M1 eg $\frac{3}{8}\times\frac{2}{7}\times\frac{1}{6}$ or $\frac{5}{8}\times\frac{2}{7}\times\frac{3}{8}\times\frac{4}{7}$ (includes $\frac{5}{8}\times\frac{4}{7}$)	M1	

Question	Answer	Mark	Comments
26	**Alternative method 1: using the radius**		
	$2\pi r$	M1	
	$2\pi r \times \frac{x}{360}$	M1dep	oe length of arc
	$2\pi r = 2\pi r \times \frac{x}{360} + 2r$ or $\pi = \frac{\pi x}{360} + 1$ or $2\pi = \frac{2\pi x}{360} + 2$	M1dep	oe equation
	$\frac{360(\pi - 1)}{\pi}$ or $\frac{360\pi - 360}{\pi}$ or $360 - \frac{360}{\pi}$	A1	oe expression in π with r cancelled throughout
	Alternative method 2: using the diameter		
	πd	M1	oe
	$\pi d \times \frac{x}{360}$	M1dep	oe length of arc
	$\pi d = \pi d \times \frac{x}{360} + d$ or $\pi = \frac{\pi x}{360} + 1$	M1dep	oe equation
	$\frac{360(\pi - 1)}{\pi}$ or $\frac{360\pi - 360}{\pi}$ or $360 - \frac{360}{\pi}$	A1	oe expression in π with d cancelled throughout
	Additional Guidance		
	Ignore attempts to simplify, cancel or expand a correct expression		M1M1M1A1

Question	Answer	Mark	Comments
27(a)	**Alternative method 1**		
	$(x - 3)^2$	M1	may be preceded by y =
	3	A1	
	Alternative method 2		
	$(8 = x^2 - 6x + 17$ and) $x^2 - 6x + 9$ (= 0)	M1	
	3	A1	
27(b)	$(x + 2)^2 - 4 + b$ or $-4 + b = 8$	M1	
	12	A1	SC1 12 from $(x - 2)^2 - 4 + b$
28	$\frac{1}{10}$ or 0.1	B2	B1 $\sqrt{100}^{-1}$ or 10^{-1} or $\left(\frac{1}{100}\right)^{\frac{1}{2}}$ or $\frac{1}{100^{\frac{1}{2}}}$ or $\frac{1}{\sqrt{100}}$ or $\sqrt{\frac{1}{100}}$
	Additional Guidance		
	Accept ± or – for B1 only, eg $\pm 10^{-1}$ or $-\frac{1}{10}$		B1

Question	Answer	Mark	Comments
29	**Alternative method 1**		
	(sin 30° =) $\frac{1}{2}$ or (cos 30° =) $\frac{\sqrt{3}}{2}$ or (tan 30° =) $\frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$ or $\left(\frac{1/2}{\sqrt{3}/2}\right)$	M1	may be seen beside question
	$5\left(\frac{1}{2}\right) \times \frac{\sqrt{3}}{2} \times 8\left(\frac{1}{\sqrt{3}}\right)$ or $5\left(\frac{1}{2}\right) \times \frac{\sqrt{3}}{2} \times 8\left(\frac{1/2}{\sqrt{3}/2}\right)$ or $\frac{5}{2} \times \frac{\sqrt{3}}{2} \times \frac{8\sqrt{3}}{3}$	M1dep	oe multiplication string with all correct values
	$\frac{40\sqrt{3}}{4\sqrt{3}}$ or $\frac{40\sqrt{3}\sqrt{3}}{12}$	M1dep	oe single fraction with roots rationalised or able to be cancelled
	10 from correct working	A1	
	Alternative method 2: substituting $\frac{\sin}{\cos}$ for tan and cancelling		
	$5\sin 30° \times \cos 30° \times 8\frac{\sin 30°}{\cos 30°}$	M1	
	$40\sin^2 30°$	M1dep	oe cancels cos 30°
	$40\left(\frac{1}{2}\right)^2$	M1dep	oe
	10 from correct working	A1	