GCSE
MATHEMATICS
8300/1H

Higher Tier Paper 1 Non-Calculator

Mark scheme

November 2018

Version: 1.0. Final

18bG8300IH/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 Assessment Writer.

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	5^8	B1	
2	200π	B1	
3	$22a$	B1	
4	$\frac{\sqrt{3}}{2}$	B1	

Question	Answer	Mark	Comments
5	**Alternative method 1**		
	$\frac{17}{2}$ or $\frac{8}{3}$	M1	oe fractions
	their $\frac{17}{2}$ × their $\frac{3}{8}$	M1	conversion of both mixed numbers to improper fractions and multiplication of the conversion of $8\frac{1}{2}$ by the reciprocal of the conversion of $2\frac{2}{3}$
	$\frac{51}{16}$	A1	oe fraction or decimal
	$3\frac{3}{16}$	B1ft	oe mixed number ft correct conversion of their improper fraction to a mixed number
	Alternative method 2		
	$\frac{17}{2}$ or $\frac{8}{3}$	M1	oe fractions
	$\frac{51}{6} \div \frac{16}{6}$	M1	conversion of both mixed numbers to improper fractions, correct conversion to improper fractions with a common denominator and division of the conversion of $8\frac{1}{2}$ by the conversion of $2\frac{2}{3}$
	$\frac{51}{16}$	A1	oe fraction or decimal
	$3\frac{3}{16}$	B1ft	oe mixed number ft correct conversion of their improper fraction to a mixed number

The Additional Guidance for question 5 is on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
5 cont	Working with decimals	0, 3 or 4
	Ignore incorrect attempt to simplify a mixed number eg $3\frac{3}{16} = 3\frac{1}{8}$	M1M1A1B1
	$3\frac{3}{16}$ seen, then $\frac{51}{16}$ on answer line	M1M1A1B0
	$\frac{9}{2}$ and $\frac{8}{3}$, $\frac{27}{6} \div \frac{16}{6}$, $\frac{27}{16}$, $1\frac{11}{16}$	M1M1A0B1ft
	$\frac{9}{2}$ and $\frac{8}{3}$, $\frac{27}{6} \div \frac{16}{6}$, $1\frac{11}{16}$	M1M1A0B1ft
	$\frac{9}{2}$ and $\frac{4}{3}$, $\frac{27}{6} \div \frac{8}{6}$, $\frac{27}{8}$, $3\frac{3}{8}$	M0M1A0B1ft

Question	Answer	Mark	Comments
6	**Alternative method 1**		
	Correct reading of at least one value at 0 hours [46, 50] at 1 hour [63, 67] at 2 hours [80, 84] at 3 hours [96, 100] at 4 hours [114, 118]	M1	may be seen on graph
	$\frac{\text{subtraction of two values}}{\text{correct number of hours}}$	M1	division by 1 may be implied
	17	A1	SC1 29
	Alternative method 2		
	A difference in the range for 1 hour [15, 19] for 2 hours [32, 36] for 3 hours [49, 53] for 4 hours [66, 70]	M1	may be seen on graph
	$\frac{\text{difference}}{\text{correct number of hours}}$	M1	division by 1 may be implied
	17	A1	SC1 29
	Additional Guidance		
	(119 – 42) ÷ 4 = 19.25		M0M1A0
	for 2nd M1 in Alt 1, subtraction must be in the correct order unless recovered		
	17 does not imply three marks, so working must be checked eg (110 – 42) ÷ 4 = 17		M0M1A0

Question	Answer	Mark	Comments
7	**Alternative method 1**		
	(5 – 2) × 180 or 3 × 180 or 540 or 180 – (360 ÷ 5) or (180 – 72) or 108	M1	oe
	Ticks 'No' and 540 or Ticks 'No' and 108	A1	
	Alternative method 2		
	States that a pentagon cannot have five (or all) right angles or states that a pentagon can have five (or all) obtuse angles or states that the maximum number of right angles is three or draws a pentagon with exactly three right angles shown	M1	
	Ticks 'No' and states that a pentagon cannot have five (or all) right angles or states that the maximum number of right angles is three or states that a pentagon can have five (or all) obtuse angles and draws a correct diagram of an attempted pentagon with four right angles shown or draws a pentagon with exactly three right angles shown or draws a pentagon with five obtuse angles	A1	

The Additional Guidance for question 7 is on the next page

Question	Answer	Mark	Comments

7 cont	**Additional Guidance**	
	If comparing 72° to 90°, they must state that they are referring to the exterior angles	
	If 'Yes' is ticked, M1 can still be scored	
	If neither box is ticked, 'No' must be implied by the explanation for M1A1	

8(a)	8 and lowest (value) or 8 and outlier	B1	oe Accept 102 for day 8
	Additional Guidance		
	8 and '(Only 102 landed whereas) All the other days were over 140'		B1
	8 and 'Fewer (less) planes landed (than the other days)'		B1
	8 and 'It's an anomaly'		B1
	8 and 'There was a (big) drop / reduction / decrease in the number of planes'		B1
	8 and 'There were only 102 planes'		B1
	8 and 'It's low' or 8 and 'It's lower' or 8 and 'It's too low'		B1
	8 and 'It doesn't follow the trend (or pattern)'		B1
	8 and 'It reduces a lot that day'		B1
	Ignore a non-contradictory statement with a correct statement eg 8 and It's the lowest, it dropped by 53'		B1
	Do not award B1 with a numerical error in the statement eg 8 and 'It's the lowest by 40'		B0
	8 and 'There were 102 planes'		B0
	8 and 'There's a drop of 53 (implies a point to point comparison)'		B0
	8 and 'It's below average'		B0
	8 and 'It's the odd one out'		B0

Question	Answer	Mark	Comments
8(b)	**Alternative method 1**		
	150 × 24 ÷ 4 or 150 × 6 or 900	M1	oe
	their 900 × 365 or their 900 × 7 × 4 × 12 or their 900 × 7 × 52 or 302 400 or 360 000	M1dep	for 365, allow 336, 360, 364, 366, 370 and 400
	324 000 or 327 600 or 328 500 or 329 400 or 333 000	A1	
	Alternative method 2		
	365 × 150 or 54 750 or 365 × any multiple of 150	M1	for 365, allow 336, 360, 364, 366, 370 and 400 for 54 750 allow 50 400, 54 000, 54 600, 54 900, 55 500 and 60 000
	their 54 750 × 24 ÷ 4 or 302 400 or 360 000	M1dep	
	324 000 or 327 600 or 328 500 or 329 400 or 333 000	A1	
	Alternative method 3		
	365 × (24 ÷ 4) or 365 × 6 or 2190	M1	for 365, allow 336, 360, 364, 366, 370 and 400 for 2190, allow 2016, 2160, 2184, 2196, 2220 and 2400
	their 2190 × 150 or 302 400 or 360 000	M1dep	
	324 000 or 327 600 or 328 500 or 329 400 or 333 000	A1	

Question	Answer	Mark	Comments
8(c)	Ticks 'Her prediction could be too low or too high' and explains that fewer landings in winter would make it too low, but fewer landings at night would make it too high or states that the actual numbers are not given	B2	oe reason B1 ticks 'Her prediction could be too low or too high'
	Additional Guidance		
	Ticks 'Her prediction could be too low or too high' and states that there is not enough data		B1 only

Question	Answer	Mark	Comments
9	**Alternative method 1**		
	$(6^2 =)$ 36 or $(8^2 =)$ 64 or 100 or $\sqrt{100}$	M1	
	10	A1	
	their 10 = $5a$ or (their 10)^3 = $125a^3$ or 1000 = $125a^3$ or 8 = a^3	M1	
	2	A1ft	ft their 10 with both method marks scored
	Alternative method 2		
	5 or a	M1	
	$5a$	A1	
	their $5a$ = $\sqrt{100}$ or their $5a$ = 10	M1	$(a =)\frac{\sqrt{100}}{5}$ or $(a =)\frac{10}{5}$ implies M1A1M1
	2	A1ft	ft their $5a$ with both method marks scored
	Additional Guidance		
	Use the scheme that gives the better mark eg1 $\sqrt{14^2}$ = $5a$, 14 = $5a$, a = 2.8 scores M0A0M1A0 on alt 1 and M1A1M0A0 on alt 2 eg2 $\sqrt{100}$ = $5a^3$, 10 = $5a^3$, a = $\sqrt[3]{2}$ scores M1A1M0A0 on alt 1 and M1A0M1A1ft on alt 2		Award M1A1M0A0 Award M1A0M1A1ft

Question	Answer	Mark	Comments
10	**Alternative method 1**		
	280 – 80 or 200	M1	
	their 200 ÷ 80 (× 100) or 2.5 (× 100)	M1dep	oe
	250	A1	
	Alternative method 2		
	280 ÷ 80 or 3.5	M1	oe
	280 ÷ 80 × 100 (– 100) or their 3.5 × 100 (– 100) or 350 (– 100) or (their 3.5 – 1) (× 100) or 2.5 (× 100)	M1dep	oe
	250	A1	
11	A and D	B1	

Question	Answer	Mark	Comments
12	**Alternative method 1**		
	$(x + a)(x + b)$	M1	where $ab = \pm 12$ or $a + b = -1$
	$(x - 4)(x + 3)$	A1	
	4 and –3	A1	SC1 4 or –3 with no or one incorrect answer
	Alternative method 2		
	$\frac{(- -)1 \pm\sqrt{((-)1)^2 - 4(1)(-12)}}{2(1)}$ or $\frac{1 \pm\sqrt{1 + 48}}{2}$ or $\frac{1 \pm\sqrt{49}}{2}$	M1	oe allow one sign error
	$\frac{(- -)1 \pm\sqrt{((-)1)^2 - 4(1)(-12)}}{2(1)}$ or $\frac{1 \pm\sqrt{1 + 48}}{2}$ or $\frac{1 \pm\sqrt{49}}{2}$	A1	oe fully correct
	4 and –3	A1	SC1 4 or –3 with no or one incorrect answer
	Alternative method 3		
	$\left(x - \frac{1}{2}\right)^2 \ldots$	M1	
	$\left(x - \frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 - 12 \ (= 0)$	A1	oe equation
	4 and –3	A1	SC1 4 or –3 with no or one incorrect answer
	Additional Guidance		
	4 and –3 with no working		M1A1A1
	M1 can be scored amongst incorrect attempts to factorise		
	Condone trailing bracket missing eg $(x - 4)(x + 3$		M1A1

Question	Answer	Mark	Comments
13	**Alternative method 1**		
	$2 \times 5 : 3 \times 5$ or $10 : 15$ and $5 \times 3 : 4 \times 3$ or $15 : 12$	M1	oe common value for f eg $10 : 15 : 12$ or $\frac{2}{3} : 1 : \frac{4}{5}$
	$10 : 12$	M1dep	oe unsimplified ratio condone fractions or decimals
	$5 : 6$	A1	
	Alternative method 2		
	$3e = 2f$ and $4f = 5g$	M1	oe equations
	$6e = 5g$	M1dep	oe equation
	$5 : 6$	A1	
	Additional Guidance		
	Variables in an otherwise correct answer: the same variable scores 2 marks, eg $5f : 6f$ different variables do not score, unless earlier marks can be awarded, eg $5e : 6g$ with no working worth M1 or M1M1		M1M1A0 M0M0A0
14	$1 - 0.3 - 0.15 - 0.35$ or $1 - 0.8$ or 0.2 or $0.15 + 0.35$ (+ 0.2) or 0.5 (+ 0.2) or $1 - 0.3$ or A' U B clearly shaded on diagram	M1	oe
	0.7	A1	oe fraction, decimal or percentage
	Additional Guidance		
	Do not award M1 for 0.15 + 0.35 or 0.5 if it is then used in an incorrect calculation eg 0.15 + 0.35 = 0.5, 0.5 + 0.3 = 0.8 (no further working)		M0

Question	Answer	Mark	Comments
15(a)	C and 'lowest median'	B2	oe B1 C
	Additional Guidance		
	If the value of the median is given it must be 4 for B2		
	Accept midpoint oe for median		
	Do not accept mean for median		
	Only accept average for median if the value of 4 is also given		
	Accept mention of the lowest lower quartile with correct mention of the median for B2, but do not accept mention of any extra statistical measure as part of their justification		
15(b)	B and 'lowest interquartile range' or B and 'lowest range'	B2	oe B1 B
	Additional Guidance		
	If the value of the interquartile range is given it must be 2 for B2 If the value of the range is given it must be 5 for B2		
	For B2, do not accept non-statistical reasons, eg 'the narrowest box'		
	For B2, do not accept mention of any extra statistical measure as part of their justification		

Question	Answer	Mark	Comments
16	27 000	B1	
17	$\left(\frac{4}{3}\right)^3$ or $\frac{4^3}{3^3}$ or $\left(\frac{27}{64}\right)^{-1}$ or $\frac{1}{\frac{27}{64}}$ or $\frac{1}{\left(\frac{3}{4}\right)^3}$ or $\frac{1}{0.75^3}$ or $\left(\frac{1}{0.75}\right)^3$	M1	
	$\frac{64}{27}$ or $2\frac{10}{27}$	A1	oe fraction, mixed number or decimal
	Additional Guidance		
	$\frac{64}{27}$ followed by an incorrect attempt to convert to a mixed number		M1A1
	$\frac{27}{64}$		M0A0

Question	Answer	Mark	Comments
18	**Alternative method 1**		
	$\frac{1}{4}$ (completed) or $\frac{3}{4}$ (left)	M1	oe eg 25% (completed) or 75% (left)
	$\frac{1}{8} + \frac{1}{10}$ or $\frac{9}{40}$	M1	oe eg 12.5% + 10% or 22.5%
	$\frac{3}{4} \div$ their $\frac{9}{40}$	M1dep	oe eg 75% ÷ their 22.5% dep on M1M1
	$3\frac{1}{3}$ or 4 days with correct working seen	A1	oe
	Alternative method 2 – assumes a number of pages (eg 80)		
	$\frac{3}{4}$ × their 80 or 60	M1	oe
	$\frac{1}{8}$ × their 80 or 10 and $\frac{1}{10}$ × their 80 or 8	M1	oe
	their 60 ÷ (their 10 + their 8)	M1dep	oe dep on M1M1
	$3\frac{1}{3}$ or 4 days with correct working seen	A1	oe
	Additional Guidance		
	8 – 2 = 6, 10 – 6 = 4, answer 4		M0M0M0A0
	In alt 1, for the third mark allow a build-up method in percentages, fractions or decimals showing that 3 days is not enough (and 4 is enough) eg 47.5%, 70%, 92.5%, (115%), answer 4		M1M1M1A1

Question	Answer	Mark	Comments
19(a)	$2(x + 5) = y + 8$ or $2x + 10 = y + 8$	M1	oe eg $\frac{x+5}{y+8} = \frac{1}{2}$ or $\frac{y+8}{x+5} = 2$
	$2x + 10 = y + 8$ and $y = 2x + 2$	A1	
19(b)	$x + 10 = y + 1$	M1	oe
	Eliminates x or y from their $(x + 10) = y + 1$ and $y = 2x + 2$	M1	their $(x + 10) = y + 1$ must be an equation in x and y eg $x + 10 = y – 1$ (and $y = 2x + 2$) followed by $x + 11 = 2x + 2$
	$x = 7$ and $y = 16$	A1	
	Additional Guidance		
	$x = 7$ or $y = 16$ with no value or an incorrect value for the other unknown and no working worth M marks		M0M0A0

Question	Answer	Mark	Comments
20	**Alternative method 1**		
	angle *QPR* = 27	M1	may be seen on diagram
	angle *XPS* = $\frac{180-50}{2}$ or 65	M1	may be seen on diagram
	angle *QPR* = 27 and angle *XPS* = 65 and angle *QPS* = 92 and angle in a semicircle is a right angle	A1	 oe accept 92 ≠ 90
	all reasons for angle facts: angles in same segment (are equal) and angle sum of triangle (is 180) and base angles of isosceles triangle (are equal)	A1	 oe oe oe

Question	Answer	Mark	Comments
20 cont	**Alternative method 2**		
	angle *SXR* = 180 – 50 or 130 and angle *XRS* = 180 – their 130 – 27 and angle *PQS* = their 23	M1	may be seen on diagram angle *XRS* = 23
	angle *XSP* = $\frac{180-50}{2}$ or 65	M1	may be seen on diagram
	angle *SXR* = 130 and angle *XRS* = 23 and angle *PQS* = 23 and *XSP* = 65 and angle *QPS* = 92 and angle in a semicircle is a right angle	A1	 oe accept 92 ≠ 90
	all reasons for angle facts: angles on a straight line (add up to 180) and angle sum of triangle (is 180) and angles in same segment (are equal) and base angles of isosceles triangle (are equal)	A1	 oe oe oe oe

Question	Answer	Mark	Comments
21	**Alternative method 1**		
	(second differences =) 4 or $2n^2$ or $a = 2$	M1	second difference seen at least once and not contradicted
	$11 - 2 \times 1^2$ and $26 - 2 \times 2^2$ and $45 - 2 \times 3^2$ (and $68 - 2 \times 4^2$) or 9 and 18 and 27 (and 36) or $9n$	M1dep	
	$2n^2 + 9n$	A1	oe
	Alternative method 2		
	any two of $a + b + c = 11$ $4a + 2b + c = 26$ $9a + 3b + c = 45$ $16a + 4b + c = 68$	M1	
	$3a + b = 26 - 11$ and $5a + b = 45 - 26$ or $a = 2$ and $b = 9$ (and $c = 0$)	M1dep	oe obtains two correct equations in same two variables from their equations
	$2n^2 + 9n$	A1	oe
	Alternative method 3		
	(second differences =) 4 or $2n^2$ or $a = 2$	M1	second difference seen at least once and not contradicted
	$3a + b = 26 - 11$ and substitutes $a = 2$ or $b = 9$ or $9n$	M1dep	
	$2n^2 + 9n$	A1	oe

Question	Answer	Mark	Comments
22	Any two of $x(x-2)$ and $7(x+4)$ and $(x-2)(x+4)$	M1	oe $x(x-2)$ and $7(x+4)$ cannot be denominators
	correct equation including $x(x-2)$ and $7(x+4)$ and $(x-2)(x+4)$	M1dep	
	$x^2 - 2x + 7x + 28 = x^2 + 4x - 2x - 8$	M1dep	oe all brackets must be expanded
	–12	A1	
	Alternative method 2		
	$\frac{x(x-2)}{x+4} + 7 = x - 2$	M1	
	$\frac{x(x-2)}{x+4} = x - 9$ or $x(x-2) = (x-9)(x+4)$	M1dep	
	$x^2 - 2x = x^2 - 9x + 4x - 36$	M1dep	oe all brackets must be expanded
	–12	A1	
	Alternative method 3		
	$x + \frac{7(x+4)}{x-2} = x + 4$	M1	
	$\frac{7(x+4)}{x-2} = 4$ or $7(x+4) = 4(x-2)$	M1dep	
	$7x + 28 = 4x - 8$	M1dep	oe all brackets must be expanded
	–12	A1	
	Additional Guidance		
	In Alt 1, do not allow $x \times x - 2$ or $7 \times x + 4$ unless recovered		

Question	Answer	Mark	Comments
23	**Alternative method 1**		
	$\sqrt{4}$: $\sqrt{9}$ or 2 : 3	M1	length A : length B
	30 ÷ their 3 × their 2 or 20	M1dep	length A
	480 ÷ their 20 or 24	M1dep	area cross section A
	their 24 ÷ 4 × 9	M1dep	
	54	A1	
	Alternative method 2		
	$\sqrt{4}$: $\sqrt{9}$ or 2 : 3	M1	length A : length B
	$(\sqrt{4})^3$: $(\sqrt{9})^3$ or 8 : 27	M1dep	volume A : volume B
	480 ÷ their 8 × their 27 or 1620	M1dep	volume B
	their 1620 ÷ 30	M1dep	
	54	A1	

Question	Answer	Mark	Comments
24	**Alternative method 1**		
	$\frac{2\sqrt{6}}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ or $\frac{\sqrt{3}}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}}$	M1	
	$\frac{2\sqrt{30}}{5}$ or $\frac{4\sqrt{30}}{10}$ or $\frac{\sqrt{30}}{10}$	M1dep	
	$\frac{3\sqrt{30}}{10}$	A1	
	Alternative method 2		
	$\frac{2\sqrt{6}\sqrt{2}}{\sqrt{10}} - \frac{\sqrt{3}}{\sqrt{10}}$ or $\frac{2\sqrt{12}}{\sqrt{10}} - \frac{\sqrt{3}}{\sqrt{10}}$	M1	oe common denominator eg $\frac{2\sqrt{60}}{\sqrt{50}} - \frac{\sqrt{15}}{\sqrt{50}}$
	$\frac{4\sqrt{3}}{\sqrt{10}} - \frac{\sqrt{3}}{\sqrt{10}}$ or $\frac{3\sqrt{3}}{\sqrt{10}}$	M1dep	oe common denominator and common surd in numerator $\frac{4\sqrt{15}}{\sqrt{50}} - \frac{\sqrt{15}}{\sqrt{50}}$ or $\frac{3\sqrt{15}}{\sqrt{50}}$
	$\frac{3\sqrt{30}}{10}$	A1	
	Additional Guidance		
	Ignore an attempt at further simplification after $\frac{3\sqrt{30}}{10}$		M1M1A1

Question	Answer	Mark	Comments
25	**Alternative method 1**		
	$a(-3)^2 + b(-3) + c = 0$ or $a(3)^2 + b(3) + c = 0$	M1	oe
	any two of $(-)6b = 0$, $c = 18$ and $9a + 18 = 0$	M1dep	oe
	$y = 18 - 2x^2$	A1	oe equation
	Alternative method 2		
	$y = 18 - 2x^2$	B3	oe equation B2 correct equation missing $y =$ eg $18 - 2x^2$ B1 equation of a quadratic curve that passes through (–3, 0) or (3, 0) or (0, 18) condone missing $y =$ eg $(y =) 18 - x^2$ or $(y =) (3 + x)(3 - x)$ or $(y =) x^2 - 2x - 3$ or $(y =) (x + 3)(x - 3)$
	Additional Guidance		
	Correct equations include $y = 2(3 + x)(3 - x)$ $y = -2(x + 3)(x - 3)$ $y = (6 + 2x)(3 - x)$ $y = (3 + x)(6 - 2x)$		
	For B3, B2 or B1 ignore incorrect expansion after correct equation or expression seen		

Question	Answer	Mark	Comments
26	**Alternative method 1**		
	0.5 × 20 × x × sin 60 or 10x sin 60 or $5\sqrt{3}\,x$	M1	oe
	0.5 × 20 × x × sin 60 = $25\sqrt{3}$ or x = 5	M1dep	oe equation
	(their 5)^2 + 20^2 – 2 × their 5 × 20 × cos 60 or 25 + 400 – 200 cos 60 or 325	M1	oe their 5 must be their value of x
	$\sqrt{\text{their 325}}$	M1dep	dep on 3rd M1 their 325 can be unsimplified
	$5\sqrt{13}$	A1	
	Alternative method 2		
	0.5 × 20 × h = $25\sqrt{3}$ or $h = \frac{5\sqrt{3}}{2}$	M1	oe any letter h is perpendicular height for 20 cm base
	sin 60 = $\frac{\text{their } \frac{5\sqrt{3}}{2}}{x}$ or x = 5	M1dep	oe
	(their 5)^2 + 20^2 – 2 × their 5 × 20 × cos 60 or 25 + 400 – 200 cos 60 or 325	M1	oe their 5 must be their value of x
	$\sqrt{\text{their 325}}$	M1dep	dep on 3rd M1 their 325 can be unsimplified
	$5\sqrt{13}$	A1	

Question	Answer	Mark	Comments
26 cont	**Alternative method 3**		
	$0.5 \times 20 \times h = 25\sqrt{3}$ or $h = \frac{5\sqrt{3}}{2}$	M1	oe any letter h is perpendicular height for 20 cm base
	$\tan 60 = \frac{\text{their } h}{c}$ or $c = \frac{5}{2}$	M1dep	oe any letter c is part of 20 cm base
	$\left(\text{their } \frac{5\sqrt{3}}{2}\right)^2 + \left(20 - \text{their } \frac{5}{2}\right)^2$ or $\left(\text{their } \frac{5\sqrt{3}}{2}\right)^2 + \left(\frac{35}{2}\right)^2$ or 325	M1dep	
	$\sqrt{(\text{their } \frac{5\sqrt{3}}{2})^2 + (20 - \text{their } \frac{5}{2})^2}$ or $\sqrt{\text{their } 325}$	M1dep	
	$5\sqrt{13}$	A1	
	Additional Guidance		
	Omitting 0.5 in area formula can score a maximum of M0M0M1M1A0		
	$\sqrt{(\text{their } 5)^2 + 20^2 - 2 \times \text{their } 5 \times 20 \times \cos 60}$		M0M0M1M1A0
27(a)	$-k$	B1	
27(b)	k	B1	