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# GCSE MATHEMATICS 8300/3H

Higher Tier

Paper 3 Calculator

Shadow paper based on June 2023 paper

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**Mark scheme**

June 2023

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Version: 1.0

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.

<b>M</b>	Method marks are awarded for a correct method which could lead to a correct answer.
<b>A</b>	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>B</b>	Marks awarded independent of method.
<b>ft</b>	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
<b>SC</b>	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
<b>M dep</b>	A method mark dependent on a previous method mark being awarded.
<b>B dep</b>	A mark that can only be awarded if a previous independent mark has been awarded.
<b>oe</b>	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
<b>[a, b]</b>	Accept values between a and b inclusive.
<b>[a, b)</b>	Accept values $a \leq \text{value} < b$
<b>3.14...</b>	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
<b>Use of brackets</b>	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.

Q	Answer	Mark	Comments
1	-3	B1	

Q	Answer	Mark	Comments
2	$\frac{117}{40}$ or $2\frac{37}{40}$	B1	oe fraction, eg $\frac{2925}{1000}$
	<b>Additional Guidance</b>		
	Ignore attempts to simplify after correct answer seen		
	Do not allow fractions with decimal numerators or denominators eg $\frac{29.25}{100}$		B0

Q	Answer	Mark	Comments
3	$10x - 4x$ or $6x$ or $4x - 10x$ or $-6x$ or $13 + 17$ or $30$ or $-17 - 13$ or $-30$	M1	
	5	A1	
	<b>Additional Guidance</b>		
	Answer 5 with no working or no incorrect working		M1A1
	Embedded answer eg $10 \times 5 - 17 = 4 \times 5 + 13$		M1A0

Q	Answer	Mark	Comments
4	$3.8 \times 6500$ or $24\,700$ or $6500 \div 100$ or $6.5$ or $3.8 \div 100$ or $0.038$	M1	
	247	A1	

Q	Answer	Mark	Comments
5	$1 + 0.02$ or $1.02$ or $0.02 \times 357\ 000$ or $7140$ or $364\ 140$	M1	oe eg $1 + \frac{2}{100}$ 357 860 implies M1
	Full method for exactly 6 compounded percentage calculations with their multiplier	M1	oe eg $357\ 000 \times \text{their } 1.02^6$
	[402 000, 403 000] with M2 awarded	A1	
	<b>Additional Guidance</b>		
	402039.(98...) or 402040 with M2 awarded		M1M1A1
	Answer 399 840 from $7140 \times 6$		M1M0A0
	Answer 399 840 without either 42 840 shown or M2 awarded		M0M0A0
	Intermediate values for separate calculations are 364 140, 371 442.(...), 378 851.(...), 386 428.(...), 394 156.(...)		

Q	Answer	Mark	Comments
	No ticked and correct reason or correct evaluation of the surface areas for any numerical or algebraic values or correct ratio of the surface areas	B2	eg 40 faces hidden B1 No ticked
<b>Additional Guidance</b>			
	Ignore irrelevant reasons or evaluations alongside a correct reason or evaluation, unless contradictory		
<b>6</b>	“No” may be implied by a correct reason		
	Accept reasoning that uses A as a cube		
	No ticked and A has 6, B has 32 (condone sides for faces) A has 3, B has 16 A has 6 sides, on B each cube only has 3 or 2 Ratio is 3 : 16 (accept equivalent ratios) The inside is missing (or covered) When they are put together you lose two faces Some of the faces are covered You cannot see some sides because they are stacked together		B2 B2 B2 B2 B2 B2 B2
	Yes ticked or Cannot tell ticked		B0

Q	Answer	Mark	Comments											
7(a)	12 and -3 in the correct positions	B2	B1 12 or -3 in the correct position											
	<b>Additional Guidance</b>													
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;"><math>x</math></td> <td style="padding: 5px;">-3</td> <td style="padding: 5px;">-2</td> <td style="padding: 5px;">-1</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> </tr> <tr> <td style="padding: 5px;"><math>y</math></td> <td style="padding: 5px;">21</td> <td style="padding: 5px;">12</td> <td style="padding: 5px;">5</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">-3</td> </tr> </table>	$x$	-3	-2	-1	0	1	$y$	21	12	5	0	-3	
$x$	-3	-2	-1	0	1									
$y$	21	12	5	0	-3									

Q	Answer	Mark	Comments
7(b)	Plots at least three points correctly	M1	correct or ft their table in (a) $\pm \frac{1}{2}$ small square points may be implied by graph passing through them
	Correct graph drawn through the five correct points	A1	$\pm \frac{1}{2}$ small square smooth (quadratic) curve
	<b>Additional Guidance</b>		
	Correct graph drawn without plotting the correct points		M1A1
	Ignore any extra points plotted		
	Ignore any part of graph drawn for $x < -3$ or $x > 1$		
	Ruled straight lines		A0



Q	Answer	Mark	Comments
8	<b>Alternative method 1</b>		
	5625 ÷ (2 + 7) or 5625 ÷ 9 or 625	M1	oe
	their 625 × 7 or 4375 or their 625 × 2 or 1250 or their 625 ÷ 5 or 125	M1dep	oe $5625 \times \frac{7}{9}$ is M2 $5625 \times \frac{7}{9}$ is M2 $5625 \div 45$ is M2
	their 4375 ÷ 5 or (5625 – their 1250) ÷ 5 or their 125 × 7 or 875	M1dep	oe dep on M2
	875 and Yes	A1	accept $875 > 870$
	<b>Alternative method 2</b>		
	870 × 5 or 4350	M1	
	5625 ÷ (2 + 7) or 5625 ÷ 9 or 625	M1	oe
	their 625 × 7 or 4375 or their 625 × 2 or 1250	M1dep	oe dep on 2nd M $5625 \times \frac{7}{9}$ is M2 $5625 \times \frac{2}{9}$ is M2
	4350 and 4375 and Yes	A1	

Additional Guidance is on the next page

<b>Additional Guidance</b>		
<b>8 cont</b>	Up to M3 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts	
	Yes may be implied eg They receive 5 more than 870	M3A1
	Condone £875.00p and Yes	M3A1

<b>Q</b>	<b>Answer</b>	<b>Mark</b>	<b>Comments</b>
<b>9</b>	100 – 60 or 40 or 360 – 60 – 120 – 100 or 80	M1	oe implied by 1 degree = 0.3 people or 10 degrees = 3 people or 12 customers = 40 degrees
	$\frac{12}{40} \times 360$ or 108 or $\frac{12}{40} \times 60$ or 18 or $\frac{12}{40} \times 120$ or 36 or $\frac{12}{40} \times$ their 80 or $\frac{12}{40} \times (60 + 120 + 100)$ or 84	M1dep	
	24	A1	
	<b>Additional Guidance</b>		
	Up to M2 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
10	<b>Alternative method 1 – using sine of an angle</b>		
	sin chosen or used	M1	
	$\sin 35 = \frac{14}{x}$ or $x = \frac{14}{\sin 35}$ or $x \times \sin 35 = 14$	M1dep	oe
	[24.4, 25]	A1	
	<b>Alternative method 2 – using cosine of an angle</b>		
	cos chosen or used	M1	
	$\cos 55 = \frac{14}{x}$ or $x = \frac{14}{\cos 55}$ or $x \times \cos 55 = 14$	M1dep	oe
	[24.4, 25]	A1	
	<b>Alternative method 3 – finding adjacent first</b>		
	$\frac{14}{\tan 35}$ or $14 \times \tan 55$ or 19.9(...) or 20	M1	oe
	$\sqrt{(\text{their } 19.9(\dots))^2 + 14^2}$ or $\sqrt{592.(\dots)}$ or their 19.9(...) $\div$ cos 35 or their 19.9(...) $\div$ sin 55	M1dep	oe
	[24.4, 25]	A1	
	<b>Additional Guidance</b>		
	Do not accept scale drawing		
$\frac{\sin 35}{15} = \frac{\sin 90}{x}$		M1	

Q	Answer	Mark	Comments
11(a)	4 or 5	M1	May be implied by $2^3$ or 8
	4 and 5 and $\frac{2}{40}$ or $\frac{1}{20}$ or 0.05	A1	May be implied by $2^3$ or 8
	<b>Additional Guidance</b>		
	Do not allow exact calculations for M1A1 Eg $9.1039\dots = 9$ and $5.49 = 5$ and $\frac{2}{45}$		M1A0

Q	Answer	Mark	Comments
11(b)	Valid explanation	B1	eg the numbers on the bottom have been rounded down so that means it will make a larger number when it is divided into the top
	<b>Additional Guidance</b>		
	Ignore irrelevant reasons alongside a correct reason, unless contradictory		
	Ignore a calculation using exact values alongside a correct reason eg 0.05 is greater than 0.040 (...) with <b>valid</b> explanation		B1
	0.05 is greater than 0.040 (...)		B0
	The denominator is larger in the unrounded version		B1
	The denominator is smaller in the estimation		B1
	2 is divided by more (with answer less)		B1
	Estimating rounds the numbers down which makes the denominator less		B1
	Estimating rounds the numbers down which makes it less		B0

Q	Answer	Mark	Comments
12(a)	Bill and valid reason	B1	eg spun the most times
	<b>Additional Guidance</b>		
	Do not accept an incorrect reason alongside a correct response		
	Do not accept reasons which refer to the probability increasing		
	Ignore reasons that refer to results being more accurate		

Q	Answer	Mark	Comments
12(b)	Valid reason	B1	eg 3 does not divide into 100 exactly
	<b>Additional Guidance</b>		
	Do not accept an incorrect reason alongside a correct response		
	$\frac{1}{3} \times 100$ is not a whole number		B1
	Number of spins would be a decimal		B1
	Number of spins must be a whole number		B1
	Cannot land on the spinner 33.3... times		B1
	Have to spin 33.3... times		B0
	$\frac{1}{3} \times 100 = 33.3...$		B0
	33.3...		B0
	It is a decimal		B0
	Must be a whole number		B0

Q	Answer	Mark	Comments
12(c)	175 × 0.64 or 112 or 1 – 0.64 or 0.36	M1	oe
	63	A1	

Q	Answer	Mark	Comments
13	$90 \div 50$ or 1.8 or $\frac{9}{5}$ or 1 h 48 mins	M1	oe eg 108 mins  implied by 10 03 am
	$(154 - 90) \div 47$ or $64 \div 47$ or 1.361 ... or $\frac{64}{47}$ or 1 h 21 mins (42. (...) secs)	M1	oe eg 81.702 (...) mins
	their 1.8... + their 1.21 or $\frac{743}{235}$  or [3.01, 3.16]  or 3 h 10 mins  or [11 24 (am), 11.25 (am)]	M1dep	oe eg 189.7 ... mins dep on M2  accept 3 hrs 9 mins 42 secs for 3 h 10 mins implied by adding times eg $8.25 + 1.8 + 1.36 \dots$
	3.25 and [3.01, 3.26] and Yes or 3 h 10 mins and 3 h 15 mins and Yes or 190 mins and 195 mins and Yes or [11 25 (am), 11.26 (am)] and Yes	A1	oe arrival time must be in a comparable time format
	<b>Additional Guidance</b>		
	Up to M3 may be awarded for correct work seen in multiple attempts even if not subsequently used		
	Accept use of 24 hour clock throughout		
Do not accept 11 25 pm as a correct arrival time			

Q	Answer	Mark	Comments	
14	$600 \div 0.2$ or $600 \times 5$ or 3000	M1	oe	
	17 700	A1		
	$(\text{their } 17700 - 6500) \times 0.1575$ or $11200 \times 0.1575$	M1	their 17 700 must be $> 6500$ full method to calculate National Insurance	
	1764	A1ft	ft their 17 700, which must be $> 6500$	
	<b>Additional Guidance</b>			
	Accept final answer rounded or truncated to the nearest pound if a more accurate value is seen in working			
	Do not accept '15.75% of 11 200' or $15.75\% \times 11200$ for M mark unless accompanied by a correct method or value			
	$3000 \times 0.1575$ or 472.5(0)			M1A0M0A0ft

Q	Answer	Mark	Comments
15(a)	$48 \div (320 - 260)$ or $48 \div 60$ or 0.8	M1	may be on diagram
	$40 \times 2.4 (= 96)$ $20 \times 3.6 (= 72)$ $20 \times 1.6 (= 32)$	M1dep	allow 1 error or 1 omission or 1 misread of a frequency density value  may be on diagram.
	200	A1	

Q	Answer	Mark	Comments
15(b)	Rectangular box plot with whiskers to 150 and 200	B1	
	Lower quartile drawn at 163 and median drawn at 172	B1	
	Upper quartile drawn at 187	B1ft	correct or ft their lower quartile + 24 must be the vertical line at right side of their box
	<b>Additional Guidance</b>		
	Mark intention eg any height and allow horizontal line through centre of box		
	Allow ends of whiskers to be vertical lines of any length, dots, crosses or stops		
	$\pm \frac{1}{2}$ small square tolerance		
	Median must be the second vertical line of a box with three vertical lines		
Only vertical lines or points plotted	B0		



Q	Answer	Mark	Comments
16	<b>Alternative method 1 – using Pythagoras' theorem or 5, 12, 13 triangle</b>		
	39 ÷ 13 × 5 or 15(cm) or identifies triangle as 5, 12, 13	M1	oe length of $a$ may be on diagram
	$\sqrt{39^2 - (\text{their } 15)^2}$ or $\sqrt{1521 - 225}$ or $\sqrt{1296}$ or $3 \times 12$	M1dep	
	36 (cm)	A1	length of $b$ may be on diagram
	270	A1ft	ft $\frac{1}{2} \times \text{their } 36 \times \text{their } 15$ with M2 awarded
	<b>Alternative method 2 – using trigonometry and <math>\frac{1}{2}ab \sin C</math> formula</b>		
	39 ÷ 13 × 5 or 15 (cm)	M1	oe length of $a$ may be on diagram
	$\cos^{-1}\left(\frac{15}{39}\right)$ or 67.3(...) or 67.4	M1dep	angle between sides $a$ and $c$
	$\frac{1}{2} \times 39 \times 15 \times \sin(\text{their } 67.3(\dots))$	M1dep	dep on M2
	270	A1	
	<b>Additional Guidance</b>		
	$\frac{1}{2} \times 39 \times 15 \times \sin 90$		M1M1M1

Q	Answer	Mark	Comments
17	<b>Alternative method 1 – multiplies through by 10 or common denominator of 10</b>		
	$4(x - 4) + 3(10 - x)$ or $4x - 16 + 30 - 3x$	M1	oe numerator on the left-hand side if written as a fraction allow one error or omission in the expansion if brackets not seen eg $4x + 30 - 3x$
	$x + 14$	A1	
	their $(x + 14) = 1 \times (\text{their } 12)$ or their $(x + 14) = 12$ or $x + 2 = 0$	M1	oe allow an unsimplified expression for their $(x + 14)$ equation may be implied by answer
	-2	A1ft	ft M1A0M1
	<b>Alternative method 2 – collects terms with fractions</b>		
	$\frac{x}{3} - \frac{4}{3} + \frac{10}{4} - \frac{x}{4}$	M1	oe eg $\frac{1}{3}x - \frac{4}{3} + 2.5 - 0.25x$ allow one error
	$\frac{1}{12}x + \frac{7}{6}$	A1	oe
	$\frac{1}{12}x = 1 - \frac{7}{6}$ or $\frac{1}{12}x = -\frac{1}{6}$	M1	oe terms must be collected
	-2	A1ft	ft M1A0M1

Additional Guidance is on the next page

<b>Additional Guidance</b>		
<b>17 cont</b>	Accept decimal answers for follow through correct to 1 dp or better	
	Apply the principles of alt 1 for any use of other common denominators eg common denominator of 24 (or multiplication through by 24) $8(x - 4) + 6(10 - x) = 2x + 28$ $2x + 28 = 24 \quad x = -2$	M1A1 M1A1
	An incorrect simplification of $4x - 16 + 30 - 3x$ may still gain the third and fourth marks eg $4x - 16 + 30 - 3x = x + 46$ followed by $x + 46 = 12$ and $x = -34$	M1A0M1 A1ft M1A0M1 A1ft
	An incorrect denominator may still gain the third and fourth marks $\frac{4x - 16 + 30 - 3x}{7}$ followed by $4x - 16 + 30 - 3x = 7$ and $x = -7$	M1A0M1 A1ft
	Denominator not processed $x + 14 = 1$ followed by $x = -13$	M1A1M0A0
	$(x - 4) + (10 - x) = 12$	M0A0M1A0

Q	Answer	Mark	Comments
18(a)	$3(x+3)^2 - (x+3)$	M1	may be seen in a grid
	$3(x^2 + 6x + 9) - x - 3$ or $3x^2 + 18x + 27 - x - 3$	M1dep	fully expanded expression with terms summed allow one omission or one arithmetic error
	$3x^2 + 18x - x + 27 - 3$ and $3x^2 + 17x + 24$	A1	
	<b>Additional Guidance</b>		
	$3x^2 + 27 - x + 3$ is two errors		

Q	Answer	Mark	Comments	
18(b)	$3x^2 + 17x + 19 (= 0)$	M1	must be correct	
	$x = \frac{-17 \pm \sqrt{17^2 - 4(3)(19)}}{2 \times 3}$ or $x = \frac{-17 \pm \sqrt{61}}{6}$	M1dep	oe implies first M1	
	$(x =) -4.14$ and $(x =) -1.53$	A1	cao	
	<b>Additional Guidance</b>			
	SC2 from using $3x^2 + 17x + 29 (= 0)$			
	Trial and improvement with both answers correct and chosen from any list			M1M1A1
Trial and improvement with one answer correct			M0M0A0	

Q	Answer	Mark	Comments
19	Creates an algebraic product in the form $(x + a)(x + b)$ where there is a difference of 2 between $a$ and $b$	M1	accept any letter for $x$ eg $x(x + 2)$ or $x^2 + 2x$ or $x(x - 2)$ or $x^2 - 2x$
	Correctly expands their product, adds 1 and simplifies to a quadratic expression	M1dep	eg $x^2 + 2x + 1$ or $x^2 - 2x + 1$
	Correctly factorises their quadratic expression to the form $(x + c)^2$ with M2 awarded	A1	eg $(x + 1)^2$ or $(x - 1)^2$
	<b>Additional Guidance</b>		
	Trialling integers scores no marks, but ignore any testing of values alongside correct algebra		
	Ignore any further work or attempts to solve after correct answer seen		
	Missing brackets may be recovered, eg $x \times x + 2$ followed by $x^2 + 2x + 1$		M1M1
$(x + 1)(x + 1)$ without $(x + 1)^2$ seen does not score the A mark			

Q	Answer	Mark	Comments
20(a)	Substitutes a correct pair of coordinates and states that the equation is incorrect	B1	eg $E = \frac{14}{2} = 7$ and the graph is [7.4 ,7.5] so he is wrong.
	<b>Additional Guidance</b>		
	Accept 'No' or a cross or any clear indication that he is incorrect		
	Do not accept pairs of values not on the graph		
	Do not accept a correct answer alongside an incorrect response unless clearly chosen		
Do not accept a coordinate with no substitution seen			

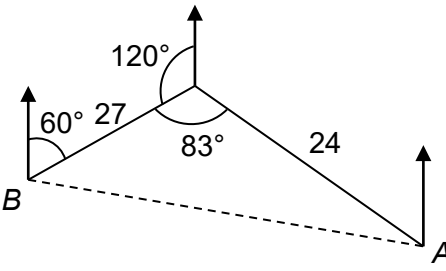
Q	Answer	Mark	Comments
20(b)	<b>Alternative method 1</b>		
	$G \propto H^2$ or $G = kH^2$ or $10 \div 1 \times 5 = k(100)$ or $50 = k(100)$	M1	oe equation  $k$ may be any letter
	$k = \frac{50}{100}$ or $k = 0.5$ or $G = \text{their } 0.5H^2$	M1dep	their 50 must be the result of $10 \div 1 \times 5$
	their $0.5 \times \text{their } 20^2$ or 200	M1dep	dep on M2
	200 : 20 or 10 : 1	A1	oe ratio
	<b>Alternative method 2</b>		
	20 $\div$ 10 or 2	M1	
	2 <sup>2</sup> or 4	M1dep	
	5 $\times$ their 4 or 20 or 50 $\times$ their 4 or 200	M1dep	dep on M2
	200 : 20 or 10 : 1	A1	oe ratio
	<b>Additional Guidance</b>		
	Ignore an incorrect attempt to simplify a correct ratio eg 200 : 20 followed by 20 : 10		M1M1M1A1
	$k = 0.5$ implies M2 unless from incorrect working		
	$G \propto kH^2$ is M0 unless recovered		

Q	Answer	Mark	Comments
21	$7 \times 5 \times 6$ or $7 \times 5 + 7 \times 5$	M1	
	210 or 70	A1	
	Maximum 210 and Minimum 70	A1	

Q	Answer	Mark	Comments
22	Reflection	B1	
	Straight line drawn on diagram passing through the points (0, 7) and (7, 0)	B1	soi getting a correct answer of $x + y = 7$ oe implies this mark.
	In the line $x + y = 7$	B1	oe eg $y = 7 - x$
	<b>Additional Guidance</b>		
	Do not accept rotation as the first B1 Do not accept "mirror" or "flip" for first B1		



Q	Answer	Mark	Comments
23(a)	Angle $YXZ = 38$ and Angle $YZX = 64$ and sine rule indicated	M1	May be seen on diagram.  If sine and cosine rule are quoted then it must be clear that the sine rule has been selected as the one to use.
	$\frac{206 \times \sin 38}{\sin 64} = 141.10\dots$	A1	$YZ = 141.1071473\dots$
	<b>Additional Guidance</b>		
	Using sine rule with $\sin 38$ and $\sin 64$ transposed	M1A0	

Q	Answer	Mark	Comments
23(b)	<b>Alternative method 1</b>		
	$16 \times 1.5 (= 24)$ or $18 \times 1.5 (= 27)$ or $240(^{\circ}) - 157(^{\circ}) = 83(^{\circ})$ or $360(^{\circ}) - 240(^{\circ}) = 120(^{\circ})$ or $180(^{\circ}) - 120(^{\circ}) = 60(^{\circ})$	M1	 <p>Values may be seen on a diagram as above.</p>
	$AB = \sqrt{24^2 + 27^2 - (2 \times 24 \times 27 \times \cos 83)}$ (= 33.8682...)	M1ft	If a diagram is seen for M1 then ft their 27, 24 and 83 if it has been clearly substituting into the cosine formula
	$\sin^{-1}\left(\frac{24 \sin 83}{\text{their } 33.8682\dots}\right)$ (= 44.69651534...)	M1ft	Use of sine rule to calculate angle <i>OBA</i> . Again if a diagram is seen then ft their values if they are clearly substituted into the sine rule formula
	105°	A1	or better 104.69651534
	<b>Additional Guidance</b>		
There is no follow through from part (a)			
Accept any notation for the angle, eg $\sin x$ or $\sin C$ for angle <i>OBA</i>			