



# **GCSE MARKING SCHEME**

**MATHEMATICS - UNITISED**

**JANUARY 2014**

## INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments															
<p>5.(a) (Blue =) <math>6(m^2)</math> (Orange =) <math>1(m^2)</math></p> <p>Look for</p> <ul style="list-style-type: none"> <li>• spelling</li> <li>• clarity of text explanations,</li> <li>• the use of correct units.</li> </ul> <p>For <b>QWC2</b> blue and orange areas must be clearly <b>identified</b> AND the <b>correct units</b> must be given for the areas.</p> <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>• present work clearly, with words explaining process or steps</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer</li> </ul> <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>• present work clearly, with words explaining process or steps</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer</li> </ul> <p>(b) <math>6/3 \times 2.50</math></p> <p>(£)5</p>	<p>B2 B2</p> <p>QWC 2</p> <p>M1</p> <p>A1 8</p>	<p>If no marks gained, allow a B1 for use of Area = length <math>\times</math> width. Allow <math>2 \times 1</math> or <math>2 \times (1+1+1)</math> or <math>(2+2+2) \times 1</math>. OR <math>0.25 \times 1</math> or <math>0.25 \times (1+1+1+1)</math> or <math>(0.25+0.25+0.25+0.25) \times 1</math> to illustrate understanding. Also allow B1 for (Blue =) <math>2 \times 3 \times 3 (=18)</math> or (Orange =) <math>0.25 \times 4 \times 4 (=4)</math>. Clear use of perimeter instead of area is B0.</p> <p>QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</p> <p>QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</p> <p>QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar</p> <p>FT 'their blue area' /3, rounded to the nearest whole number above, and then multiplied by 2.5</p>															
<p>6.(a) 90(litres)</p> <p>(b) A correct method shown</p> <p>80(litres)</p>	<p>B1 M1 A1 3</p>	<p>e.g attempt to read graph at 64 yellow and <math>\times 10</math>. OR attempt to read graph at 80 yellow and <math>\times 8</math>.</p>															
<p>7. C B A D</p>	<p>B1 B1 B1 B1 4</p>																
<p>8. (Aled) <math>12 \times 14 + 8</math> <math>= 176(\text{lbs})</math></p> <p>(Thomas) <math>85 \times 2.2</math> <math>= 187(\text{lbs})</math></p> <p>Thomas by 11lbs</p>	<p>M1 A1 M1 A1 A1</p> <p>5</p>	<p>M1A0 for 176kg.</p> <p>M1A0 for 187kg.</p> <p>F.T. only if <math>160\text{lbs} \leq \text{Aled's weight} \leq 190\text{lbs}</math>. Name and correct units must be given.</p> <p><u>Alternative methods:</u></p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: left;"><math>12 \times 14 + 8</math></td> <td style="text-align: left;"><math>85 \times 2.2</math></td> <td style="text-align: right;"><i>M1</i></td> </tr> <tr> <td style="text-align: left;"><math>= 176(\text{lbs})</math></td> <td style="text-align: left;"><math>= 187(\text{lbs})</math></td> <td style="text-align: right;"><i>A1</i></td> </tr> <tr> <td style="text-align: left;"><math>176 / 2.2</math></td> <td style="text-align: left;"><math>187 / 14</math></td> <td style="text-align: right;"><i>M1</i></td> </tr> <tr> <td style="text-align: left;"><math>= 80(\text{kg})</math></td> <td style="text-align: left;"><math>13.35(7..)(\text{st})</math></td> <td style="text-align: right;"><i>A1</i></td> </tr> <tr> <td style="text-align: left;"><i>Thomas by 5kg</i></td> <td style="text-align: left;"><i>Thomas by 0.78(..)st</i></td> <td style="text-align: right;"><i>A1(FT)</i></td> </tr> </table> <p>(accept 0.8 st) ISW (allow 10.9lb to 11.2lb inc.)</p>	$12 \times 14 + 8$	$85 \times 2.2$	<i>M1</i>	$= 176(\text{lbs})$	$= 187(\text{lbs})$	<i>A1</i>	$176 / 2.2$	$187 / 14$	<i>M1</i>	$= 80(\text{kg})$	$13.35(7..)(\text{st})$	<i>A1</i>	<i>Thomas by 5kg</i>	<i>Thomas by 0.78(..)st</i>	<i>A1(FT)</i>
$12 \times 14 + 8$	$85 \times 2.2$	<i>M1</i>															
$= 176(\text{lbs})$	$= 187(\text{lbs})$	<i>A1</i>															
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<i>Thomas by 5kg</i>	<i>Thomas by 0.78(..)st</i>	<i>A1(FT)</i>															

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
9.(a)  Mode value given as (£)1. Median value given as (£)2. (Mean =) $15 \times (£)1 + 10 \times (£)2 + 5 \times (£)5 + 2 \times (£)10$ $\div 32$ $= (£)2.5(0)$  (b) $32 \times (£)3 - 32 \times (£)2.5(0)$ or equivalent. $= £16$ AND 'Profit'	B1 B1 M1 m1 A1  M1 A1  7	For each B mark, do not award if an incorrect reason is clearly shown. Must be unambiguously shown as the mode value. Must be unambiguously shown as the median value. M1 for a clear attempt at finding $\Sigma fx$ .  C.A.O.  F.T. 'their mean'.  Also M1 for $32 \times (£)3 - \text{'their } \Sigma fx \text{'}$ OR $15 \times (£)2 + 10 \times (£)1 - 5 \times (£)2 - 2 \times (£)7$ $(= (£)30 + 10 - 10 - 14 = (£)16)$ SC1 for sight of 96 and 80.
10. (a) $720 - \frac{1}{4} \times 720 - \frac{2}{5} \times 720$ Sight of (£)180 Sight of (£)288  (Amount left) (£)252  (b) $252 / 720 \times 100$ $= 35(\%)$	M1 B1 B1  A1  M1 A1  6	<u>Alternative method</u> $1 - \frac{1}{4} - \frac{2}{5}$ or equivalent M1 $= 7/20$ or equivalent A1 $7/20 \times 720$ or equivalent M1 $= (£)252$ A1 For A1, F.T. (£)720 - 'their (£)180' - 'their (£)288' provided at least one B1 gained. Two amounts must be subtracted from (£)720.  F.T. 'their £252'  <u>Alternative method</u> $100(\%) - 25(\%) - 40(\%)$ M1 $= 35(\%)$ A1
11.(a) A valid explanation that shows an understanding that the 35 was not included in the divisor.  (b) 70.3	E1  B2 3	Do not accept 'he pressed the wrong buttons'. Allow e.g. 'He forgot the brackets'. Also allow a correct explanation (an explanation, not just a calculation) of what Asif should have done.  B1 for 70.2(8846...)
12. Least Value Greatest Value  9950 10050  72.5 73.5	B4  4	B1 for each correct entry. Accept 10049.9 recurring but not 10049.9.  Accept 73.49 recurring but not 73.49. Allow 72min. 30(sec). and 73min 30(sec).
13. 8240 <u>247.2(0)</u> 8487.2(0) <u>254.61(6)</u>  8741.81(6) or 8741.82 OR 247.2(0) and 254.61(6)  (£)501.82	B1 M1 A1  A1  4	For the evaluation of a correct 3% OR Sight of 1.03 (494.4 implies $2 \times 247.2$ and gains B1). For attempting to find 2 different 3%. OR $8240 \times 1.03^2$ .  F.T. one error. Must be given correct to the nearest penny. (£)501.81 is BIM1A1A0. Treat depreciation as a mis-read.

## UNIT 1 - HIGHER TIER

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
1. (a) A valid explanation that shows an understanding that the 35 was not included in the divisor.	E1	Do not accept 'he pressed the wrong buttons'. Allow e.g. 'He forgot the brackets'. Also allow a correct explanation (an explanation, not just a calculation) of what Asif should have done.
(b)                    70.3	B2 3	B1 for 70.2(8846...)
2.(a)  Mode value given as (£)1. Median value given as (£)2. (Mean =) $15 \times (£)1 + 10 \times (£)2 + 5 \times (£)5 + 2 \times (£)10$ $\div 32$ $= (£)2.5(0)$	B1 B1 M1 m1 A1	For each B mark, do not award if an incorrect reason is clearly shown. Must be unambiguously shown as the mode value. Must be unambiguously shown as the median value. M1 for a clear attempt at finding $\Sigma fx$ .
(b) $32 \times (£)3 - 32 \times (£)2.5(0)$ or equivalent. $= £16$ AND 'Profit'	M1 A1	F.T. 'their mean'.  Also M1 for $32 \times (£)3 - \text{'their } \Sigma fx \text{'}$ OR $15 \times (£)2 + 10 \times (£)1 - 5 \times (£)2 - 2 \times (£)7$ $(= (£)30 + 10 - 10 - 14 = (£)16)$ SC1 for sight of 96 and 80.
3. (Milk required 1 <sup>st</sup> week) $7 \times \frac{3}{5}$ $= 4\frac{1}{5}$ OR $2\frac{1}{5}$ (Needs to buy) 5 (cartons)	M1 A1 B1	F.T. only if there is a requirement to round up.
(Milk required 2 <sup>nd</sup> week) He has $\frac{4}{5}$ of a litre left over. (Requires an extra) $4\frac{1}{5} - \frac{4}{5} (= 3\frac{2}{5})$ (Needs to buy) 4 (cartons)	B1 M1 A1	Sight of $\frac{4}{5}$ gains B1. F.T. 'their 5 cartons'. F.T. 'their $4\frac{1}{5}$ ' - 'their $\frac{4}{5}$ '
Look for	QWC 2	<u>Alternative method for 2<sup>nd</sup> week</u> <i>Required for 14 days</i> $14 \times \frac{3}{5}$ <span style="float: right;">M1</span> <span style="margin-left: 150px;">9 cartons</span> <span style="float: right;">A1</span> <i>So extra 4 cartons required for 2<sup>nd</sup> week</i> <span style="float: right;">B1</span>
QWC2: Candidates will be expected to		QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
• present work clearly, with words explaining process or steps		
AND		
• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer		QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
QWC1: Candidates will be expected to		
• present work clearly, with words explaining process or steps		
OR		
• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer		QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
	8	

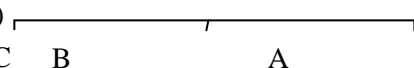


UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments																								
8. $36 \times \frac{70}{42}$ $\times \frac{10}{15}$ $= 40 \text{ (workers)}$	M1 M1 A1  3	Or equivalent. Or equivalent (the 36 must have been used). M1 for correctly using two of the operators ‘ $\times 70$ ’, ‘ $\div 42$ ’, ‘ $\times 10$ ’ and ‘ $\div 15$ ’ with the 36. C.A.O. Do not penalise pre-approximations as long as 40 given as the final answer. <i>Alternative presentation.</i> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>Area</u></td> <td style="text-align: center;"><u>Time</u></td> <td style="text-align: center;"><u>Workers</u></td> <td></td> </tr> <tr> <td style="text-align: center;">42</td> <td style="text-align: center;">10</td> <td style="text-align: center;">36</td> <td></td> </tr> <tr> <td style="text-align: center;">.....</td> <td></td> <td></td> <td style="text-align: right;">Award M1 for correct step(s) to reach 70.</td> </tr> <tr> <td style="text-align: center;">.....</td> <td></td> <td></td> <td style="text-align: right;">Award M1 for correct step(s) to reach 15.</td> </tr> <tr> <td style="text-align: center;">.....</td> <td style="text-align: center;">.....</td> <td style="text-align: center;">.....</td> <td></td> </tr> <tr> <td style="text-align: center;">70</td> <td style="text-align: center;">15</td> <td style="text-align: center;"><b>40</b></td> <td style="text-align: right;">A1 C.A.O.</td> </tr> </table>	<u>Area</u>	<u>Time</u>	<u>Workers</u>		42	10	36		.....			Award M1 for correct step(s) to reach 70.	.....			Award M1 for correct step(s) to reach 15.	.....	.....	.....		70	15	<b>40</b>	A1 C.A.O.
<u>Area</u>	<u>Time</u>	<u>Workers</u>																								
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.....	.....	.....																								
70	15	<b>40</b>	A1 C.A.O.																							
9. Correct substitution into formula. Using 16553(p) $U = \frac{16553}{1.05} - 90 \times 31.48$ or equivalent $11.546$ (Units used = ) 1120	M1 m1 m1  A1 4	Do not penalise using (£)165.53 at this stage. The two ‘m’ marks may be awarded in either order. C.A.O. Accept answers of $1120 \pm 1$																								
10. Sight of 7005 (metres) Sight of 1523 (seconds) Sight of 1522.5 (seconds) or 25min 22.5sec Use of ‘Distance’ / ‘Time’ (Greatest av. Speed) $\frac{7005}{1522.5}$ $= 4.6(009. \text{ms}^{-1})$	B1 B1 B1 M1 M1  A1  6	FT their conversion to seconds. 1522.5 implies 2 <sup>nd</sup> B1. F.T. ‘their greatest distance’ / ‘their least time’ only if ‘greatest distance’ >7000 AND ‘least time’ < their 1523. Do not accept an answer unless the correct method has been shown. An answer of 4.6 found using values which are not their greatest distance and least time is MOA0.																								
11(a) (Angle subtended in the shaded sector =) $70^\circ$ Use of $\frac{70}{360} \times \pi \times 8^2 \times 3$ $= 117.28(6..)(\text{cm}^2) \text{ or } 112\pi/3$  (b) Use of $\frac{70}{360} \times 2 \times \pi \times 8$ OR sight of 9.77(....) $\times 3$ $+ 48$ $= 77.3(\dots \text{cm})$	B1 M2  A1    M1  m1 m1 A1  8	May be implied by sight of $210^\circ$ F.T. ‘their $70^\circ$ ’. M1 for $\frac{70}{360} \times \pi \times 8^2$ A1 for 39(.09...)) Allow answers between 117.2 to 117.4 inclusive. Do not penalise final answer of 117( $\text{cm}^2$ ) if previous permissible answer seen. <i>Note: Using <math>50^\circ</math> instead of <math>70^\circ</math> giving a final answer of 83.7(7..) is B0, M2(on follow through), A1.</i> <i>BUT if candidates then use <math>\pi \times 8^2 - 83.7(7..) = 117.3</math>, then all marks awarded.</i> F.T. ‘their $70^\circ$ ’.( <i>Note: Use of <math>50^\circ</math> gives 6.98</i> ) Allow 77 (cm) .( <i>Note: Use of <math>50^\circ</math> gives 68.9..</i> ) Mark their final answer.																								



UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
<p><i>Mark parts (a) and (b) together.</i></p> <p>12(a) Sight of <math>\frac{1}{3} \times \pi \times r^2 \times h_1</math> AND <math>\frac{1}{3} \times (\text{area of base}) \times h_2</math></p> <p>A clear intention to use <math>h_1 = 2h_2</math> in the above.</p> $\frac{1}{3} \times \pi \times 4^2 \times 2h = \frac{1}{3} \times (\text{length})^2 \times h$ $(\text{length})^2 = 32\pi$ <p>(side length <math>\Rightarrow</math>) 10(.0.. cm)</p> <p>(b) <math>\frac{1}{3} \times \pi \times 4^2 \times (\text{cone height}) = 335.1 \div 2</math> OR  <math>\frac{1}{3} \times 32\pi \times (\text{pyramid height}) = 335.1 \div 2</math> OR  <math>\frac{1}{3} \times \pi \times 4^2 \times 2l/3 + \frac{1}{3} \times 32\pi \times l/3 = 335.1</math></p> <p>(cone height <math>\Rightarrow</math>) <math>\frac{3 \times 167.55}{16\pi}</math> or equivalent  OR (pyramid height <math>\Rightarrow</math>) <math>\frac{3 \times 167.55}{32\pi}</math> or equivalent  OR <math>l = \frac{3 \times 3 \times 335.1}{32\pi + 32\pi}</math> or equivalent</p> <p>(cone height <math>\Rightarrow</math>) 10(cm) OR (pyramid height <math>\Rightarrow</math>) 5(cm)</p> <p>Overall length = 15(cm)</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>M1</p> <p>m1</p> <p>A1</p> <p>A1</p> <p>9</p>	<p><i>Take care that the length of the base of the pyramid (10cm) is not confused with the height of the cone (also 10cm).</i></p> <p><i>If the height of the cone is found in part (a) then award the appropriate marks for this work in part (b).</i></p> <p>For B1 allow unconventional use of notation and symbols as long as accurate intent is clear (e.g. <math>h_1</math> and <math>h_2</math> may both be given as 'h' or 'height').</p> <p>Accept 100.45 to 100.6 inclusive.  SC1 for an answer of 7(.08..cm) (using <math>h_1 = h_2</math>).  [Note 10(cm) = height of cone for part (a) is MOAOAO (unless then used to find the length of the base of the pyramid) but will gain the M1m1A1 in part (b) and possibly go on to gain the final A1 in part (b)].</p> <p>F.T. using ('their side length')<sup>2</sup> for <math>32\pi</math>.  Or equivalent e.g. using '2h' and 'h' (where h = pyramid height).</p> <p>Do not penalise approximating <math>32\pi</math> as 100. (Pyramid height given as 5.026).</p> <p>OR <math>l = 15</math> is A2</p>

## UNIT 2 - FOUNDATION TIER

UNIT 2 (non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
1. (a) 12 756 (km) (b) (i) 4670 (ii) 5000 (c) 1067 (d) 1,5,7,35  (e) 5 hundred OR 500	B1 B1 B1 B1 B2  B1 7	B1 for 3 or 4 correct factors and no more than 1 wrong factor Accept hundred(s)
2. cm       centimetres km       kilometres g         grams m <sup>3</sup> or l   cubic metres or litres	B1 B1 B1 B1 4	Accept kl
3. (a) 5(p) (b) 	B1  B1 B1 B1 4	Allow 7/10 and 2/10 to represent A and B respectively. Use overlay. A should be between 0.6 and 0.8 inclusive. B should be between 0.1 and 0.3 inclusive. C should be at 0.
4. (a) 2g (b) 11  (c) (i) (x = ) 4 (ii) (x = ) 36	B1 B2  B1 B1 5	B1 for $7 \times 5 - 4 \times 6$ OR $35 - 24$ OR $35 - \dots$ OR $\dots - 24$ OR sight of both 35 and (-)24 Accept embedded answers Accept embedded answers

UNIT 2 (non calculator) Foundation Tier		FINAL MARK SCHEME Comments
<p>5. (a) (<math>5 \times 1</math> pint costs <math>5 \times \pounds 0.50 = \pounds 2.50</math>) or 250(p)  <math>(3 \times 1 + 1 \times 2</math> pints cost <math>\pounds 1.50 + \pounds 0.85 = \pounds 2.35</math>) or 235(p)  <math>(1 \times 1 + 2 \times 2</math> pints cost <math>\pounds 0.50 + 1.70 = \pounds 2.20</math>) or 220(p)  <math>(1 \times 1 + 1 \times 4</math> pints cost <math>\pounds 0.50 + 1.75 = \pounds 2.25</math>) or 225(p)</p> <p>QWC: Look for</p> <ul style="list-style-type: none"> <li>relevance of work shown</li> <li>generally correct spelling</li> <li>clarity of text explanation</li> <li>use of notation (appropriate use of '=', £, p, pints)</li> </ul> <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>present work clearly, with words explaining process or steps (equivalent statements to those in brackets in (a) are needed)</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their working (correct use of = and £)</li> </ul> <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>present work clearly, with words explaining process or steps</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar, and include units in their working</li> </ul>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>QWC 2</p>	<p>Only award these SC marks if combinations have not already been credited with a B1: SC2 for all 4 correct combinations SC1 for 2 or 3 correct combinations. Example: '2 monies correct and 2 monies incorrect but with correct combinations of milk' gets B1 B1 B0 B0 SC1 MR -1 if consistent use of wrong milk throughout (a)</p> <p>QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</p> <p>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.</p> <p>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. A final unsupported statement only gets QWC0</p>
<p>(b) Identifying cheapest option:  <math>(2 \times 2 + 1 = \pounds 2.20)</math> or 220(p)  (Skimmed milk <math>2 + 1</math> pints = £ 1.55 or 155(p)</p> <p>(Total = (£) <math>2.20 + \pounds 1.55 =</math> ) (£) 3.75 or 375(p)</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>9</p>	<p>FT their answers to (a) provided more than one answer</p> <p>FT if semi-skimmed milk used (i.e. 'their cheapest option' + £1.25)</p>



UNIT 2 (non calculator) Foundation Tier		FINAL MARK SCHEME Comments
<p>9. (a) 32 34 36 38 52 54 56 58</p> <p>(b) (i) 5/12</p> <p>(b) (ii) 1 or 100%</p> <p>(c) Yes <b>and</b> statement saying all numbers on the second (square) spinner are even</p>	<p>B2</p> <p>B2</p> <p>B1</p> <p>E1</p> <p>6</p>	<p>B2 for 8 correct entries and no extra B1 for 8 correct entries and extra wrong values B1 for between 4 and 7 correct entries</p> <p>FT their list provided at least one number greater than 37 B1 for a numerator of 5 in a fraction less than 1. B1 for a denominator of 12 in a fraction less than 1. Do not penalise incorrect reduction of fractions from a FT. <b>NB</b> Penalise –1 for use of words such as ‘5 out of 12’, ‘5 in 12’. or ‘5:12’. When both fraction and wrong notation seen, DO NOT penalise wrong notation.</p> <p>Accept 12/12 o.e.</p> <p>Accept ‘all the numbers in (a) are even’ There must be reference to (a) OR the 2<sup>nd</sup> spinner OR the units digits in their answers to (a)</p>
<p>10. <math>\hat{A}CD = 90^\circ</math></p> <p><math>\hat{A}CB = 140^\circ - 90^\circ = 50^\circ</math></p> <p><math>\hat{C}AB = (180^\circ - 70^\circ - 50^\circ) = 60^\circ</math> OR converse explanation that, for the triangle <math>ABC</math> to be isosceles, its ‘base angles’ need to be <math>55^\circ</math></p> <p>Statement ‘Since <math>\hat{A}CB \neq \hat{C}AB</math> (or <math>\hat{D}CB \neq \hat{E}AB</math>) then <math>AB \neq BC</math>’ or equivalent</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>E1</p> <p>4</p>	<p>Angles marked in correct places on diagram are awarded appropriate marks. Accept method using sum of angles of a polygon.</p> <p>If <math>90^\circ</math> was not seen, awarding the second B1 mark implies the first B1.</p> <p>FT from ‘their <math>\hat{A}CB</math>’</p> <p>Be aware of alternative arguments e.g. showing that an isosceles triangle <math>ABC</math> contradicts the condition that <math>ACDE</math> is a rectangle.</p> <p>E1 is dependent on at least 2 B1 marks being awarded Accept ‘triangle <math>ABC</math> is not isosceles’ or ‘diagram is not symmetrical’ if B3</p>

UNIT 2 (non calculator) Foundation Tier		FINAL MARK SCHEME Comments
<p>11. <u>Method 1 (total profit = total selling price – total cost price)</u>  (Money taken for full-price fruit cakes =) <math>\frac{3}{4} \times 20 \times (\pounds)6</math> (= (£)90)  (Money taken for reduced-price fruit cakes =) <math>5 \times 0.7 \times (\pounds)6</math>  (= (£)21)  (Total money taken for chocolate cakes =) <math>13 \times (\pounds)2 + 2 \times (\pounds)1</math>  (= (£)28)</p> <p>(Total cost =) <math>20 \times (\pounds)3 + 15 \times (\pounds)1</math> (= (£)75)  (Profit =) (£) [90 + 21 + 28] – (£)75  = (£) 64</p> <p>OR</p> <p><u>Method 2 (total profit = fruit cake profit + chocolate cake profit)</u>  (Full-price fruit cake profit =) <math>\frac{3}{4} \times 20 \times (\pounds)6 - \frac{3}{4} \times 20 \times (\pounds)3</math>  OR <math>\frac{3}{4} \times 20 \times (\pounds)(6 - 3)</math> (= (£)45)  (Reduced-price fruit cake profit =) <math>5 \times 0.7 \times (\pounds)6 - 5 \times (\pounds)3</math>  OR <math>5 \times (0.7 \times (\pounds)6 - (\pounds)3)</math> (= (£)6)</p> <p>(Full-price chocolate cake profit =) <math>13 \times (\pounds)2 - 13 \times (\pounds)1</math>  OR <math>13 \times (\pounds)(2 - 1)</math> (= (£)13)  (Reduced-price chocolate cake profit = 0)</p> <p>(Total profit =) (£) [45 + 6 + 13 (+0)]  = (£) 64</p>	<p>B1 B1 B1  B1 M1 A1  OR  B1 B2  B1  M1 A1  6</p>	<p>Or equivalent e.g. (£) 0.60 × 5 × 7. FT from ‘their <math>\frac{3}{4} \times 20</math>’  Consideration of ‘+ 2 × (£)1’ can be implicit  FT provided at least B2 awarded CAO  B1 for sight of <math>5 \times 0.7 \times (\pounds)6</math> or (£)1.20 FT from ‘their <math>\frac{3}{4} \times 20</math>’  FT provided at least B2 CAO</p>
<p>12. <math>6x + 10 + 145 - 2x + 4x - 15 + 3x</math>  <math>= 360</math> (°)</p> <p><math>11x = 220</math> (°)  (<math>x =</math>) 20 (°)</p>	<p>B1 M1 A1 A1  4</p>	<p>Or equivalent statement for the sum of the 4 angles Allow provided the sum of at least 3 of the given angles is equated to 360° FT FT <math>ax = b</math> if <math>a \neq 1</math> If M0, then allow SC1 and possible B1 for 40/11 or 400/11 (for 180° or 540°) 4 marks for correct answer of 20° with no working or from trial and improvement method</p>
<p>13. (a) 0</p> <p>(b) At least 5 correct plots</p> <p>All 7 points correctly plotted and joined with curve</p> <p>(c) Line drawn correctly  <math>x</math>-coordinate</p>	<p>B1  P1 C1  P1 B1  5</p>	<p>Plots should be accurate to within one small square FT ‘their table’. C0 for a polygon  FT ‘their curve’ for point of intersection B1 does NOT imply P1</p>

## UNIT 2 - HIGHER TIER

UNIT 2 Higher Tier	Mark	FINAL MARK SCHEME Comments
1. $3x + 34(^{\circ}) = 124(^{\circ})$ $3x = 90(^{\circ})$ $x = 30(^{\circ})$	M1 A1 A1 3	Using alternate angles. Correct method to solve equation. FT for $3x = k$ , provided M1 awarded
2. (a) Correct reflection  (b) Correct rotation	B2  B2  4	B1 for a reflection in any vertical line or in $y = -2$ or sight of the line $x = -2$ B1 for anticlockwise rotation through $90^{\circ}$ OR clockwise rotation through $90^{\circ}$ about (2, 0)
3. <u>Method 1 (total profit = total selling price – total cost price)</u> (Money taken for full-price fruit cakes =) $\frac{3}{4} \times 20 \times (\pounds)6$ (= (£)90) (Money taken for reduced-price fruit cakes =) $5 \times 0.7 \times (\pounds)6$ (= (£)21) (Total money taken for chocolate cakes =) $13 \times (\pounds)2 + 2 \times (\pounds)1$ (= (£)28)  (Total cost =) $20 \times (\pounds)3 + 15 \times (\pounds)1$ (= (£)75) (Profit =) $(\pounds) [90 + 21 + 28] - (\pounds)75$ $= (\pounds) 64$  <b>OR</b> <u>Method 2 (total profit = fruit cake profit + chocolate cake profit)</u> (Full-price fruit cake profit =) $\frac{3}{4} \times 20 \times (\pounds)6 - \frac{3}{4} \times 20 \times (\pounds)3$ $\text{OR } \frac{3}{4} \times 20 \times (\pounds)(6 - 3)$ (= (£)45) (Reduced-price fruit cake profit =) $5 \times 0.7 \times (\pounds)6 - 5 \times (\pounds)3$ $\text{OR } 5 \times (0.7 \times (\pounds)6 - (\pounds)3)$ (= (£)6)  (Full-price chocolate cake profit =) $13 \times (\pounds)2 - 13 \times (\pounds)1$ $\text{OR } 13 \times (\pounds)(2 - 1)$ (= (£)13) (Reduced-price chocolate cake profit = 0)  (Total profit =) $(\pounds) [45 + 6 + 13 (+0)]$ $= (\pounds) 64$  Look for <ul style="list-style-type: none"> <li>• relevance</li> <li>• spelling in at least 1 statement/sentence</li> <li>• clarity of text explanations</li> <li>• the use of notation (watch for the use of ‘=’, £, % being appropriate).</li> </ul> <p>QWC: Candidates would be expected to</p> <ul style="list-style-type: none"> <li>• clearly show how they arrived at their solution</li> <li>• have few errors in mathematical form, spelling, punctuation and grammar</li> </ul> <p>Count incorrect use of ‘=’ in situations such as ‘<math>0.7 \times (\pounds)6 = (\pounds)4.20 \times 5</math>’ within the ‘few errors in mathematical form’</p> <p>QWC2: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>• present work clearly, with words explaining process or steps</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units (£) in their final answer</li> </ul> <p>QWC1: Candidates will be expected to</p> <ul style="list-style-type: none"> <li>• present work clearly, with words explaining process or steps</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units (£) in their final answer</li> </ul>	B1 B1 B1  B1 M1 A1  <b>OR</b>  B1  B2  B1  M1 A1  Q W C 2	Or equivalent e.g. $(\pounds) 0.60 \times 5 \times 7$ FT from ‘their $\frac{3}{4} \times 20$ ’ Consideration of ‘ $+ 2 \times (\pounds)1$ ’ can be implicit  FT provided at least B2 awarded C.A.O.  B1 for sight of $5 \times 0.7 \times (\pounds)6$ or $(\pounds)1.20$ FT from ‘their $\frac{3}{4} \times 20$ ’  FT provided at least B2 awarded C.A.O.  QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.  QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.  QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.  A final unsupported statement only gets QWC0
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UNIT 2 Higher Tier	Mark	FINAL MARK SCHEME Comments
4. $\hat{ACD} = 90^\circ$ $\hat{ACB} = 140^\circ - 90^\circ = 50^\circ$  $\hat{CAB} = (180^\circ) - 70^\circ - 50^\circ = 60^\circ$ OR converse explanation that, for the triangle $ABC$ to be isosceles, its 'base angles' need to be $55^\circ$  Statement 'Since $\hat{ACB} \neq \hat{CAB}$ (or $\hat{DCB} \neq \hat{EAB}$ ) then $AB \neq BC$ ' or equivalent	B1  B1  B1   E1   4	Angles marked in correct places on diagram are awarded appropriate marks. Accept method using sum of angles of a polygon. If $90^\circ$ was not seen, awarding the second B1 mark implies the first B1.  FT from 'their $\hat{ACB}$ '  Be aware of alternative arguments e.g. showing that an isosceles triangle $ABC$ contradicts the condition that $ACDE$ is a rectangle.  E1 is dependent on at least 2 B1 marks being awarded Accept 'triangle $ABC$ is not isosceles' or 'diagram is not symmetrical' if B3
5. $2a + 0.4 + 3a = 1$ OR $(5a =) 0.6$ $(a =) 0.6/5$ or $0.12$ (Required probability =) $0.36$	M1 A1 A1  3	Use of 'total probability = 1'  If first 2 marks were M1A0, then FT $3 \times$ 'their $a$ ', provided $3a < 1$ .
6. (a) 0 and 9 (b) At least 5 correct plots All 7 points correctly plotted and joined with curve (c) Line drawn correctly x-coordinate	B2 P1 C1 P1 B1  6	B1 for either correct Plots should be accurate to within one small square FT 'their table'. C0 for a polygon  FT 'their curve' for point of intersection B1 does NOT imply P1
7. $y \geq -1$ or equivalent $y \leq 2x$	B1 B2  3	Accept '>' Accept '<'. B1 for $y = 2x, y > 2x, y \geq 2x$ B1 for $y \leq kx (+ 0)$ , with $k > 0$
8. (a) Attempting to sum both totals, with at least one correct $128/200 (= 64/100)$ or equivalent 0.64 (b) Increase number of throws / Repeat process	M1 m1 A1 E1 4	128, 200 FT from their totals provided one was correct C.A.O. Any convincing suggestion
9. $5x - 1 - 2x = 1$ $3x = 2$ $x = 2/3$ or equivalent	B1 B1 B1 3	Clearing fractions. FT until 2 <sup>nd</sup> error. Collecting terms. FT $ax = b$ , with $a \neq 1$
10. $(2 \times 10^{27}) - (5 \times 10^{24})$ $(2 \times 10^{27}) \div (5 \times 10^{24})$ 400 or $4 \times 10^2$	B1 M1 A1  3	Suitable rounding of both numbers Correct division attempted. FT their rounded numbers. Allow $0.4 \times 10^3$ . ISW An answer of $2.5 \times 10^{-3}$ implies the B1 only.
11. $2k + 3p = 2.05$ and $3k + 5p = 3.20$ (or $2k + 3p = 205$ and $3k + 5p = 320$ ) Method to find the first variable  Correct first variable Method to find the second variable Correct second variable	S1  M1  A1 m1 A1  5	Strategy of forming a pair of equations. (Do not penalise for not defining variables.) Allow one slip. Do NOT accept a trial and improvement method.  FT their first variable. $k = (\pounds) 0.65$ or $65(p)$ , $p = (\pounds) 0.25$ or $25(p)$ If incorrect units are given, penalise $-1$ once only.
12. Angle BOD = $156^\circ$  Angle at the centre is twice the angle at the circumference Angle BCD = $24^\circ$ Tangent and radius are perpendicular (and angle sum of quadrilateral is $360^\circ$ )	B1   E1 B1 E1 4	Accept correct alternative methods. Check for answers on diagram.   Angle sum of quadrilateral alone is insufficient



<b>UNIT 2 Higher Tier</b>	Mark	<b>FINAL MARK SCHEME Comments</b>
13. $6p + pq = 5 - t$  $p(6 + q) = 5 - t$ $p = \frac{5-t}{6+q}$ or equivalent	B1  B1 B1  3	Collecting terms. FT until 2 <sup>nd</sup> error (for equivalent difficulty). Factorising Quotient Mark final answer.
14. (a) $\frac{1}{4}$ or 0.25  (b) $x = 0.004444\dots$ $10x = 0.04444\dots$ with an attempt to subtract $\frac{4}{900}$ or $\frac{2}{450}$ or $\frac{1}{225}$ or equivalent  (c) $16 + 4\sqrt{3} + 4\sqrt{3} + 3$ $19 + 8\sqrt{3}$	B2  M1 A1  M1 A1 6	B1 for $4^{-1}$ or $1/2^2$ or $1/3\sqrt{64}$ or $1/64^{1/3}$ or $(1/64)^{1/3}$  Or $10x$ and $100x$ , or equivalent. Or an alternative method. An answer of $0.04/9$ gains M1 only. Mark final answer. Do not ignore incorrect cancelling. 3 of the 4 terms correct Do not ignore subsequent working
15. $4/8 \times 3/7 \times 2/6$  $4/8 \times 3/7 \times 2/6 \times 2$ or $4/8 \times 3/7 \times 2/6 + 4/8 \times 3/7 \times 2/6$ $48/336 (=1/7)$	B1  M1 A1  3	Do not ignore incorrect cancelling  If no other marks awarded, SC1 for method 'with replacement' $4/8 \times 4/8 \times 4/8 \times 2$ or $4/8 \times 4/8 \times 4/8 + 4/8 \times 4/8 \times 4/8$ (=1/4)
16. Inverted curve (no vertical or horizontal stretch) with vertex at the origin Vertical translation down Point (0, -3) indicated in relation to 2 <sup>nd</sup> curve.	B1 B1 B1 3	Clear intention FT their curve Accept -3 indicated on y-axis



UNIT 3 (calculator allowed) Foundation Tier	Mark	FINAL MARK SCHEME Comments
7. S and Q	B2 2	B1 for at least one correct answer and no more than one incorrect answer.
8. (a) 13 (b) 7	B1 B1 2	Accept embedded answers
9. (a) April (b) 11 (°C) (c) 100 (mm)  (d) Spring, Summer, Autumn, Winter indicated along one axis AND vertical axis correctly labelled  Uniform scale for frequency axis starting at 0 Four bars at correct heights	B1 B1 B1  B1  B2  6	Or indicated on the bars themselves.  B1 for at least 2 correct bars, consistent with their scale. Bars must be of equal width.
10. (a) $12 \times 5 - 5 \times 3 - 3 \times 2 (= 60 - 15 - 6)$  39  (b) Strategy to explore possible combinations.  $18 \times 5 = 90$ $90 - 3 = 87$ so 18 correct answers (with one incorrect answer). The mark drops to 85 from 87 so the 20th question scores -2, (so the last question was not answered).	M1 A1  S1 B1 B1  5	Sight of two of 60, -15, -6 and an attempt to combine marks gets M1 39 alone get 2 marks.  Evidence of trial and improvement or correct answer gets S1. Sc2 for correct answer with no working Correct calculations infer correct answer
11. First arc(s) crossing the given line. Final arc and line with angle of $60^\circ$ at the point X	B1 B1    2	Arc must be big enough for the second arc to cut it. B2 for correct construction at X Allow $\pm 2^\circ$ . If no arc(s) B0 B0. Arc must be big enough for the second arc to cut it. B1 maximum for a correct construction elsewhere on the line.
12. (a) 5 (miles) (b) 30 (mins) (c) Reference to decrease in steepness, gradient or equivalent after horizontal section.  (d) A horizontal line stopping at the point (14:00, 7)  Point at (16:12, 12) Points joined with straight lines.	B1 B1 E1  B1  B1 B1  6	Accept half an hour Ignore calculations. Explanation should refer to gradient, slope or steepness or any other evidence <b>from the graph</b> . B1 for a horizontal line that continues past (14:00, 7) so long as no other line is drawn.  FT their points, provided one point correct and walk finishes at 12 miles.
13. (a) Method of finding the number of whole blocks that fit in length, width and height. $9 \times 5 \times 4$ 180 (blocks)  (b) $1600 - 400$ $\div 60$ 20 (blocks)	M1  m1 A1  M1 m1 A1 6	May be implied by sight of two of 9, 5 or 4  Multiplication of three values, at least two correct C.A.O. SC1 for $26910 \div 125$ or 215.28 or 215  C.A.O





Unit 3 Higher Tier		FINAL MARK SCHEME Comments																																																												
6. Sketch of circle of correct radius drawn.	B2          2	Allow freehand sketch. Use overlay. ( $\pm 5\text{mm}$ ) B1 for intention of sketching the correct circle using points, or arcs, OR B1 for intention of correct circle but outside the tolerance. Ignore other lines on the diagram drawn to find the centre of the circle. Penalise -1 for other loci drawn that are not intended to find the centre of the circle.																																																												
7. $\frac{1}{2} \times 5 \times 8 \times 14$  280  cm <sup>3</sup>	M1 A1 U1 3	Independent of other marks.																																																												
8. (a) $((6 - 2) \times 180) \div 6$ 120(°) (b) (Angle at bottom of triangle = $120 - 90 = 30^\circ$ ) $(180 - 30) / 2$ 75(°)	M1 A1 B1 M1 A1 5	OR $180 - (360 \div 6)$ OR $360 \div 3$ OR $60 \times 2$  May be indicated on the diagram. FT 'their 120' - 90. FT 'their 120' - 90.																																																												
9. Strategy of multiplying $h$ by $(h+2)$ either numerically or algebraically towards an answer of 70 or equivalent.  One correct evaluation $7 \leq h \leq 8$  2 correct evaluations $7.35 \leq h \leq 7.55$ one either side of 70  2 correct evaluations $7.35 \leq h \leq 7.45$ one either side of 70  <i>If evaluations not seen, accept 'too high' or 'too low'.</i>  $h = 7.4$	S1  B1 B1 M1  A1  5	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 15%; text-align: center;"><math>\frac{h}{7}</math></th> <th style="width: 15%; text-align: center;"><math>\frac{h \times (h+2)}{63}</math></th> <th style="width: 15%; text-align: center;"><math>\frac{h}{7.35}</math></th> <th style="width: 15%; text-align: center;"><math>\frac{h \times (h+2)}{68.7225}</math></th> </tr> </thead> <tbody> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.6</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.7</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.8</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7.9</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		$\frac{h}{7}$	$\frac{h \times (h+2)}{63}$	$\frac{h}{7.35}$	$\frac{h \times (h+2)}{68.7225}$	7					8					7.1					7.2					7.3					7.4					7.5					7.6					7.7					7.8					7.9				
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10. (a) $(8 \div 5) \times 7$ or $7 \div (5 \div 8)$ 11.2 (cm)  (b) $20 \div (8 \div 5)$ or $20 \times (5 \div 8)$ 12.5 (cm)	M1 A1  M1 A1 4	Accept 11 from correct working.  Accept 13 from correct working.																																																												
11. a) $0.02 + 0.3$ or $0.32$ or equivalent $3.2 \times 10^{-1}$ b) Correct conversion to common units. $20,000 \div 1.25$ or $2,000,000 \div 125$ (= 16000 or equivalent) $1.6 \times 10^4$	M1 A1 B1 M1 A1 5	FT with incorrect place value provided conversion attempted.																																																												
12. $\tan(\text{RPQ}) = 45/80$ OR $\tan(\text{PRQ}) = 80/45$ $29(.35\dots^\circ)$ OR $60.6(42\dots^\circ)$ or 61. (Bearing =) $029(.35\dots^\circ)$	M1 A2 B1 4	A1 for $\tan^{-1}(45/80(= 0.5625))$ or $\tan^{-1}(80/45(= 1.77\dots))$ FT from incorrect trigonometry AND FT 'their angles' obtained from premature rounding.																																																												
13. a) Interquartile range: Readings from cf's of 15 and 45 $(50 \text{ to } 52) - (24 \text{ to } 25)$ $= 25 \text{ to } 28 \text{ inclusive}$ b) Valid reason e.g. 'Kevin's median is higher than Sunil's', 'Kevin's graph is to the right of Sunil's' Kevin	M1 A1 E1  B1 4	SC1 for Kevin's IQR of 24 to 26 inclusive. Accept sight of medians for both cricketers (36 and 60).  Provided E1 awarded. Penalise -1 if incorrect medians are quoted.																																																												
14. a) $d \propto t^2$ or $d = kt^2$ $4.9 = k \times 1^2$ $d = 4.9t^2$ b) $d = 19.6$ (when $t = 2$ ) $t^2 = 28.2/4.9 (= 5.755\dots)$ or $(t =) \sqrt{(28.2/4.9)}$ $t = 2.39(89\dots)$ or 2.4(0)	B1 M1 A1 B1 M1 A1 6	FT for non-linear only. Maybe implied by responses to (b). FT from their non-linear (a). .																																																												

Unit 3 Higher Tier		FINAL MARK SCHEME Comments
15. a) i) Correct expansion of both brackets $x^2 + 4x + 4 + 3x + 3 - 11$ $(=) x^2 + 7x - 4$  ii) $(x =) \frac{-7 \pm \sqrt{(7^2 - 4 \times 1 \times (-4))}}{2 \times 1}$  $(x =) \frac{-7 \pm \sqrt{65}}{2}$  $(x =) 0.53$ and $-7.53$  b) $(5x - 3)(x + 5)$ $x = 3/5$ or $x = -5$	M1 A1 M1 A1 A1 B2 B1 8	Use of formula, allow one slip in substitution.  CAO.  CAO. Must be correct to 2 decimal places.  B1 for $(5x \dots 3)(x \dots 5)$ . FT for their pair of brackets provided at least one bracket is of form $(ax \dots)$ . Must come from factorising.
16. a) Cosine curve starting at 1 on the y axis Maximum and minimum points at (0,1), (180, -1) and (360,1)  b) 113.578...( $^\circ$ ) 246.42...( $^\circ$ ) with no other angles given.	M1 A1 B1 B1 4	Accept rounded or truncated answers for both B1's. FT 360 – their first angle.
17. a) Frequencies: 14, 15, 21, 29, 46  b) $14 + 0.4 \times 15$ or equivalent 20	B2 M1 A1 4	B1 for 2, 3 or 4 correct frequencies.  FT 'their 14' and 'their 15' provided not 0.7 and 1.5.
18. Overall strategy e.g. cosine rule & $\frac{1}{2}ab\sin C$ $AC^2 = 9.9^2 + 7.2^2 - 2 \times 9.9 \times 7.2 \times \cos 75$ $AC^2 = 112.95 \dots$ $AC = 10.6(279 \dots)$ $\text{Area ABC} = \frac{1}{2} \times 9.9 \times 7.2 \times \sin 75 (= 34.425 \dots)$ $\text{Area ADC} = \frac{1}{2} \times AC \times 4.9 \times \sin 24 (= 10.590 \dots)$ $\text{Area quadrilateral} = 23.8(348 \dots \text{cm}^2)$	S1 M1 A1 A1 M1 M1 A1 7	FT provided M1 awarded.  FT their AC but not for 9.9, 7.2 or 4.9. Accept answers in the range 23.8 to 23.9. FT if one of the last M1 marks awarded, and their calculations are accurate to 1 d.p.



WJEC  
245 Western Avenue  
Cardiff CF5 2YX  
Tel No 029 2026 5000  
Fax 029 2057 5994  
E-mail: [exams@wjec.co.uk](mailto:exams@wjec.co.uk)  
website: [www.wjec.co.uk](http://www.wjec.co.uk)