

**COMPONENT 1: NON-CALCULATOR MATHEMATICS, HIGHER TIER****GENERAL INSTRUCTIONS for MARKING GCSE Mathematics**

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made. When a candidate follows a method that does not correspond to the methods explicitly set out in the mark scheme, marks should be awarded in the spirit of the mark scheme. In such cases, further advice should be sought from the Team Leader or Principal Examiner.

2. Marking Abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

CAO = correct answer only

MR = misread

PA = premature approximation

bod = benefit of doubt

oe = or equivalent

si = seen or implied

ISW = ignore subsequent working

F.T. = follow through ( ✓ indicates correct working following an error and ✗ indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation

A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads

When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.

This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).

5. Marking codes

- 'M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

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Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
1. (a) 9 (b) -6 (c) -3	B1 B1 B1 (3)	1.3a 1.3a 1.3a (3)AO1 (0)AO2 (0)AO3	
2. (a) 68000 (b) $8.53 \times 10^{-5}$ (c) $1.5 \times 10^9$	B1 B1 B2  (4)	1.2 1.2 1.3b  (4)AO1 (0)AO2 (0)AO3	B1 for correct value not in standard form e.g. $15 \times 10^8$ or 1500000000
3. Correctly engaging with ratios to find values that can be used on the graph e.g. Finding the ratio of red : white to be 4 : 5 OR Reducing the ratio of 4 : 9 to enable use on graph e.g. 2 : 4.5 or 1 : 2.25  Using a value for white paint to find a non-zero value of red paint. e.g. 2 litres of white paint gives 1.6 litres of red paint. OR $(4.5 - 2 =)$ 2.5 litres of white paint gives 2 litres of red paint. OR 1.25 litres of white paint gives 1 litre of red paint.  Using the red paint value found to fill in one of the non-zero values required on the red paint axis. e.g. 1.6 found from conversion, then 1.5 indicated on the axis. (The values are 0.5, 1, 1.5, 2, 2.5.)  Correctly filling in all the remaining numbers on the red paint axis: 0, 0.5, 1, 1.5, 2, 2.5	M1   M1  A1  A1 (4)	2.3a   3.1b  3.1b  2.3b (0)AO1 (2)AO2 (2)AO3	Seen or implied.  Ignore incorrect use of 4 : 9 as red : white for this M1  The value must be one that can be read off the graph. This may be implied from markings on the diagram but the value does not need to be indicated on the diagram. Do NOT F.T. from incorrect interpretation of 4 : 9 as red paint : white paint  This mark depends on both previous M marks. Some correct working must be shown. (This could be in the diagram.)  C.A.O.
4.(a) Correctly completing the tree diagram 0.6, 0.3. 0.3, 0.7  (b) $0.4 \times 0.7$ = 0.28  (c) $0.6 \times 0.7$ = 0.42	B2  M1 A1 M1 A1  (6)	2.3b  2.3a 1.3a 2.3a 1.3a  (2)AO1 (4)AO2 (0)AO3	B1 for any one pair of branches correct (total 1)  Or other complete method. F.T. for their $P(\text{walk to college}) \times P(\text{walk home})$ correctly evaluated, or by alternative method

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Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
5. Method to find prime factors 2, 2, 2, 2, 3, 3, 5, 5 $2^4 \times 3^2 \times 5^2$	M1 A1 B1  (3)	1.1 1.3a 1.2  (3)AO1 (0)AO2 (0)AO3	2 correct before 2nd error Ignore 1s for A1, but not for B1 F.T. provided index >1. Accept "."
6. Method to form two correct equations and eliminate one variable First variable found correctly Substitute to find the second variable Tin = £5 and Brush = £2	M1 A1 m1 A1 (4)	3.1d 1.3a 3.1d 3.3 (1)AO1 (0)AO2 (3)AO3	Allow 1 error in one term, not one with equal coefficients Tin = £5 or Brush = £2. F.T. 'their first variable'
7. An arc, centre P, of radius 5 cm Correctly constructing a perpendicular bisector  Correct shading	B1 B2  B1  (4)	2.3a 2.3a  2.3b  (0)AO1 (4)AO2 (0)AO3	Allow $\pm 0.2$ cm B1 for drawing by eye or using a protractor  F.T. for an arc centre P and a line crossing PQ. Shading needs to be on both sides of line PQ
8. 5 parts = (£)30 OR $30 \div 5$ OR $7x - 2x = 30$ OR equivalent (1 part) = (£)6 (Amount shared =) $6 \times 9$ = (£)54	M1 A1 m1 A1  (4)	3.1d 1.3b 3.1d 1.3b  (2)AO1 (0)AO2 (2)AO3	Accept $5/9 = 30$  F.T their 1 part, provided M1 awarded Award M1A1m1A0 for answers of £12 and £42
9. (a) $2x(3x + 4)$  (b) $(x - 10)(x + 10)$	B2  B1  (3)	1.3a  1.3a  (3)AO1 (0)AO2 (0)AO3	B1 for a correct partially factorised expression OR sight of $2x(3x \dots \dots)$ or $2x(\dots \dots + 4)$

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Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
10. Setting up one of two models (needing 3 strips along 8m or 5 strips along 13m)	S1	3.1d	For the strategy and finding the need for 3 or 5 strips of carpet as appropriate
(Cost along 8m side =) $13 \times 3 \times (\pounds) 25$	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(Cost along 13m side =) $8 \times 5 \times (\pounds) 25$	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(\pounds) 975 AND (\pounds) 1000	A1	1.3a	
8m method is cheaper by (\pounds) 25	A1	3.4b	F.T. for their costs provided at least S1 awarded. Must state which method is cheaper for their costs
	(5)	(1)AO1 (0)AO2 (4)AO3	
11. Attempt to find vector <b>EF</b> e.g. <b>ED + DF</b> or <b>-DE + DF</b>	M1	3.1b	Accept intention, i.e. missing brackets e.g. $-3\mathbf{a} - 2\mathbf{b}$ instead of $-3\mathbf{a} + 2\mathbf{b}$
$= -\mathbf{a} + 7\mathbf{b}$	A1	1.3a	C.A.O.
<b>EF</b> $\times -3$	M1	2.3a	F.T. 'their $-\mathbf{a} + 7\mathbf{b}$ ' $\times -3$ M1 for sight of $-3\mathbf{a} + 21\mathbf{b}$ or $\mathbf{a} - 7\mathbf{b}$ or $-3(-\mathbf{a} + 7\mathbf{b})$
$3\mathbf{a} - 21\mathbf{b}$	A1	1.3a	
	(4)	(2)AO1 (1)AO2 (1)AO3	

Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
<p>12. (a) <math>24 \times \frac{45}{30}</math> <math>\times \frac{10}{15}</math>  <math>= 24</math> (workers)</p> <p>(b) Stating one assumption made e.g. 'similar work will be carried out on the other site' or 'all workers will work at the same rate' or similar. Stating an impact e.g. 'if the work is harder or the workers are slower, then more workers will be needed.'</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>E1</p> <p>E1</p> <p>(5)</p>	<p>3.1c</p> <p>3.1c</p> <p>1.3a</p> <p>3.4a</p> <p>3.5</p> <p>(1)AO1 (0)AO2 (4)AO3</p>	<p>Or equivalent.</p> <p>Or equivalent (the 24 must have been used). M1 for correctly using two of the operators '×45', '÷30', '×10' and '÷15' with the 24.</p> <p>C.A.O. Do not penalise pre-approximations as long as 24 is given as the final answer. <i>Alternative presentation:</i> <u>Area</u>   <u>Time</u>   <u>Workers</u> 30   10   24 ....Award M1 for correct step(s) to 45 ....Award M1 for correct step(s) to 15 .... 45   15   <u>24</u>   A1 C.A.O.</p>
<p>13.(a)(i) <math>m_1 = -3</math></p> <p>(ii) <math>m_2 = \frac{1}{3}</math></p> <p>(b) Method to find the intercept of line <math>L_2</math> e.g. substituting <math>m_2</math>, 1, 6 into <math>y = mx + c</math> <math>c = \frac{17}{3}</math> or equivalent Finding the equation of <math>L_2</math> e.g. substituting <math>m_2</math> and <math>c</math> into <math>y = mx + c</math> to give <math>y = \frac{1}{3}x + \frac{17}{3}</math> or equivalent <math>x - 3y + 17 = 0</math></p>	<p>B2</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1 (7)</p>	<p>2.3a</p> <p>1.1</p> <p>3.1b</p> <p>1.3a</p> <p>3.1b</p> <p>1.3a (3)AO1 (2)AO2 (2)AO3</p>	<p>B1 for evidence of interpreting the graph to find the gradient e.g. <math>(9 - 0)/(0 - 3)</math> or equivalent or stating <math>m_1 = 3</math></p> <p>F.T. as long as <math>m_1 \times m_2 = -1</math></p>

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Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
14. (Distance =) $3 \times 40$ = 120 (miles) (Time =) $120 \div 30$ = 4 (hrs)  (average speed =) $\frac{120 + 120}{3 + 4}$  = 34(.2...mph) 'So not correct'.	M1 A1 M1 A1  M1  A1  (6)	2.2 1.3a 2.2 1.3a  2.2  2.5a  (2)AO1 (4)AO2 (0)AO3	F.T. 'their calculated values'. OR $7 \times 35$ M1 OR $240 / 35$ M1  = 245 (miles) A1 =6(.8..)(hrs) A1 Calculation AND statement required.
15. (For triangles $B\hat{C}P$ and $B\hat{C}Q$ ) $\hat{P}CB = \hat{Q}CB$ (or equivalent) Base angles of an isosceles triangle.  (So) $\hat{P}BC = \hat{Q}CB$ Angles were bisected.  Side $BC$ is common ( $BC = BC$ )  Reasons given  (So triangles $B\hat{C}P$ and $B\hat{C}Q$ are congruent) <p style="text-align: right;">ASA</p>	B1  B1  B1  E1  B1  (5)	2.4b  2.4b  2.4b  2.4b  2.1a  (0)AO1 (5)AO2 (0)AO3	The first two reasons noted above must be given for E1 to be awarded.  For correctly giving the condition for congruence.

Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
16.(a) Entries 30, 30, 40, 35, 5	B2	2.3a	B1 for any 3 correct entries F.T. for their entries for M marks only in (b)
(b) (Number of cars exceeding limit = $40/100 \times 140 =$ ) 56 cars	B1	3.1d	Accept $60/100 \times 140 = 84$ .
$56 - 35 - 5 = 16$ cars in 30-40 group. (OR $84 - 30 - 30 = 24$ )	M1	3.2	For attempting to identify the number of 'cars fined' (or not fined) in the correct single group.
$16/40 \times 10 = 4$ mph (OR $24/40 \times 10 = 6$ mph)	M1	3.1d	F.T. 'their 56' or 'their 84'. For translating this number into a speed. F.T. their number of cars
Estimate of speed = $40 - 4 = 36$ mph (OR $30 + 6 = 36$ mph)	A1	1.3a	
(c) 3, 4, 2, 1.5, 0.5	B1	1.3a	
Axes correct and labelled, no gaps between bars	M1	2.3b	Histogram needs to be attempted.
Correct histogram	A1	2.3b	F.T. candidate's frequency density if table completed incorrectly but the idea of frequency density is used. SC1 if correct but not labelled.
(d) Yes, with reason e.g. 'there were more slower speeds recorded'.	B1	2.1b	F.T from their histogram in (c) if necessary. Other reasons could include: '40 cars exceeded 40mph before but only 20 afterwards.' '80 cars exceeded 30mph before but only 40 afterwards.' 'Only 28% exceeded 36mph instead of 40%.'
	(10)	(2)AO1 (5)AO2 (3)AO3	
17. Sight of $y \propto \frac{1}{x}$ or $y = \frac{k}{x}$	B1	1.1	May be implied in further work
$16 = \frac{k}{1/2}$	M1	1.3b	
$k = 8$	A1	1.3b	
$y = \frac{8}{x}$	A1	1.3b	F.T, 'their 8'
	(4)	(4)AO1 (0)AO2 (0)AO3	

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Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
18. $\frac{3\sqrt{7}}{4+\sqrt{7}} = \frac{3\sqrt{7}(4-\sqrt{7})}{(4+\sqrt{7})(4-\sqrt{7})}$ Numerator $12\sqrt{7} - 21$ Denominator $9$ $\frac{4\sqrt{7}-7}{3}$	M1  A1 A1  A1  (4)	1.3b  1.3b 1.3b  1.3b  (4)AO1 (0)AO2 (0)AO3	C.A.O.
19. $a = 6$ $b = -22$	B1 B1  (2)	1.3a 1.3a  (2)AO1 (0)AO2 (0)AO3	.
20.(a) $x = 0.7878\dots$ and $100x = 78.78\dots$ with an attempt to subtract. $\begin{array}{r} 78 \\ 99 \end{array} \quad \begin{array}{l} (= 26) \\ ( 33) \end{array}$ (b) $1/9 \times 3 = 0.333\dots$	M1  A1  B2 B1  (5)	1.3a 1.3a  1.3a 1.1  (5)AO1 (0)AO2 (0)AO3	Or equivalent method.  B1 for each. Must be convincing as a recurring decimal.
21. Interpreting diagram to get formula for area of either rectangle e.g. $x(x+2) = y$ or equivalent OR $12(4+x) = 4y$ or equivalent  Equating formulae e.g. $x(x+2) = 12+3x$ OR $12(4+x) = 4x(x+2)$ OR equivalent  Deriving a quadratic equation e.g. $x^2 - x - 12 = 0$ OR $4x^2 - 4x - 48 = 0$  Factorising and solving their quadratic equation e.g. $(x+3)(x-4) = 0$  $x = -3$ or $x = 4$ Statement about ignoring $x = -3$ as it leads to negative lengths Dimensions 4 (cm) and 6 (cm)	B1  M1  A1  M1  A1 E1 A1  (7)	2.3a  3.1b 1.3b  3.1b  1.3b 3.4b 3.3  (2)AO1 (1)AO2 (4)AO3	This B1 mark maybe implied by the correct quadratic, hence if M1 awarded also award this B1 mark. ISW  Allow 1 error, e.g. missing brackets, or from incorrect expansion. FT provided equivalent level of difficulty  Must equate to zero  FT provided equivalent level of difficulty  Must have both solutions F.T provided on +ve and one -ve solution

Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
<p>22.(a) Concave down curve translated left Point <math>(-7,0)</math> shown. Point <math>(1, 0)</math> shown.</p> <p>(b) Concave down curve symmetrical about the <math>y</math>-axis. Stationary points at <math>(0, 3)</math>.</p> <p>(c) A comment regarding no scale or coordinates shown.</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>(6)</p>	<p>2.3a</p> <p>2.3b</p> <p>2.3b</p> <p>2.3a</p> <p>2.3b</p> <p>2.5b</p> <p>(0)AO1 (6)AO2 (0)AO3</p>	<p><i>Allow appropriate marking of axes if coordinates not given.</i></p>
<p>23.(a) (i) <math>0.7 \times 0.7 \times 0.3</math> <math>= 0.147</math></p> <p>(ii) Indicates three possible situations e.g.HMM or MHM or MMH <math>0.441</math> Less than a 50% chance.</p> <p>(b) (i) Evaluating the method used e.g. Indicates that the first ball selected is returned to the box before the second ball is selected or 2 attempts are independent.</p> <p>(ii) Stating how the results would be different e.g. if the first ball was not returned then the probability of winning would be less than <math>1/16</math>.</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>E1</p> <p>E1</p> <p>(7)</p>	<p>3.1c</p> <p>1.3a</p> <p>3.1c</p> <p>1.3a</p> <p>2.1a</p> <p>3.4a</p> <p>3.5</p> <p>(2)AO1 (1)AO2 (4)AO3</p>	<p>May be indicated by <math>0.3 \times 0.7 \times 0.7 \times 3</math> or equivalent. F.T. 'their <math>0.147 \times 3</math> F.T. 'their <math>0.441</math>'.</p>
<p>24. <math>\frac{1}{2}x(x+3)\sin 60^\circ = \sqrt{300}</math> <math>\frac{1}{2}x(x+3)\frac{\sqrt{3}}{2} = \sqrt{300}</math> <math>x^2 + 3x - 40 = 0</math> <math>(x+8)(x-5) = 0</math> <math>x = 5</math></p> <p><math>BA^2 = 8^2 + 5^2 - 2 \times 8 \times 5 \cos 60^\circ</math></p> <p>Sight of <math>\cos 60^\circ = \frac{1}{2}</math> <math>BA = 7</math> (cm)</p>	<p>M1</p> <p>m1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>B1</p> <p>A1</p> <p>(8)</p>	<p>3.1d</p> <p>3.2</p> <p>3.2</p> <p>1.3a</p> <p>3.3</p> <p>3.2</p> <p>1.1</p> <p>1.3a</p> <p>(3)AO1 (0)AO2 (5)AO3</p>	<p>Allow missing brackets Or similar progress</p> <p>F.T. 'their <math>\sin 60^\circ</math>'</p> <p>Accept <math>BA^2 = (x+3)^2 + x^2 - 2 \times x \times (x+3)\cos 60^\circ</math>.</p>