GCSE MARKING SCHEME

MATHEMATICS - UNITISED

NOVEMBER 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2012 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.

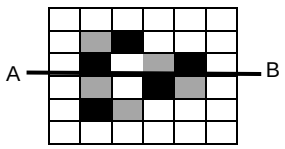
UNIT 1 - FOUNDATION TIER

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
1. (a) Wednesday (b) 6 (hours) (c) (£)0.8(0) + (£)1.45 OR 80(p) + 145(p) = (£)2.25 or 225(p)	B1 B1 M1 A1 4	
2. (a) 24 (m^3) (b) 12 (m^2) (c) 14 m or metres	B1 B1 B1 U1 4	
3. (Cost =) 5 × (£)60 + (£)120 = (£) 420 (Each pays) (£)420 ÷ 4 (£)105	M1 A1 M1 A1 4	For intent to multiply£60 by 5 and then add £120. F.T. 'their total cost' ÷ 4.
4. Correct circle. Straight line 11cm long. Mid-point of line identified. Angle of 60° drawn (as per sketch)	 B2 B1 B1 B1 5	*Allow lengths to be ± 2mm and angle ± 2°.* B1 if a circle drawn but radius ≠ 3cm. 'Free-hand circle' is B0 unless within overlay tolerance. Allow this B1 even if line does not start at centre of circle BUT see below. F.T. their line length. Does not need to be at mid-point for this B1, BUT Penalise −1 once only if one end of the rod is not at centre of circle OR handle is not at mid-point.
5. (Profit week 1 =) (£)1800 (Profit week 2 =) 3 × (£)2500 − 2 × (£)700 = (£)6100 6100 ÷ 1800 OR 1800 × 3 OR 6100 ÷ 3 (3·3(....)) (5400) (2033(.33..)) A statement 'Profit has more than trebled'. Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£', × being appropriate) QWC2: Candidates will be expected to • 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: 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	B1 M1 A1 M1 A1 QWC2 7	 For any correct method that enables a conclusion. F.T. their 'profits'. Statement alone gains M1A1 only if there are stated profits to compare. 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 weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
6. (a) −7 −10 (b) 787 (c) 25	B2 B1 B1 4	B1 for each. F.T. their table. B0 for −25.
7. 24000 × 0·02 = (£)480 Janet should choose the £500 option.	M1 A1 A1 3	For any correct method of finding 2% of 24000. <u>*Alternative method*</u> *500 / 24000 × 100 M1* *= 2·08(....%) A1* A statement must be made. F.T. their '£480'. Ignore any further statements.
8. 3 or 4 angles correct and correctly labelled. 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR <u>If 0 OR 1 for their diagram or no diagram,</u> 360/120 Angles are 54°, 72°, 105° and 129°	 B4 OR (B3) (B3) (B2) (B1) (M1) (A1) 4	Use overlay Allow ±2º Correct labels (Words NOT the frequency OR angle**).** 3 correct labels is enough. If only B1 is scored for the diagram, and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 3° gets the M1. OR SC1 for all correct percentages: 15, 20, 29·2 or 29, 35·8 or 36.
9 . (a) (Time taken =) 7(hours) OR 420(min) Use of 'Distance' ÷ 'Time' = 39 (mph) OR 62·4(kph) OR equivalent. (b) $\frac{273}{40}$ × (£)6.3(0) (£)43	B1 M1 A1 M1 A1 5	 F.T. 'their time'. Any other unit of speed must be stated. *Also allow 280/40 × 6·3 OR 273/40 taken as 7gallons for M1 leading to (£)44 for A1.* (£)42.99(..) is A0. SC1 for evidence of 273/40 (=6·825) taken as 6 ×£6.30 = £38 to nearest '£'
10. (a) (i) 53 (cm) (ii) (3/9/) 2006 and (3/9/) 2007 (iii) 103 (cm) (iv) 16 (b) Comment on misleading visual appearance. e.g. 'looks as if many more boys'. Comment on 'Number' scale not starting at zero. e.g. 'only starts at 80'.	B1 B1 B1 B1 B1 B1 6	 Ignore fractions of a year e.g. 16yrs 4m or 16·3yrs Do not accept 'there are more boys'. Accept the (distinct) comments in either order.

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments	
11. (Area =) 2×35 $= 70(m^2)$	M1 A1		
(Litres required =) $70 \div 6$ $= 11{\cdot}6(.....)$ or 12.	M1 A1	An area must be indicated for a F.T. F.T. 'their area'. A0 for 11 remainder 4 unless 12 used later.	OR <u>if area of wall found</u> Using 5×6 AND 2×6 M1 $= 30(m^2)$ AND $12(m^2)$ A1
(Need to buy) Two '5l tins' and One '2l tin'.	M1	F.T. 'their required litres'. Must be for cheapest combination possible.	F.T. their area.
(Cost =) (£)30	A1 6		
12. (a) 10×30 300 (km)	M1 A1	Accept $(10 \pm 0{\cdot}2) \times 30$. Answers in the range 294 to 306 (km) gain M1A1	
(b) Bearing of 070° from Valencia.	M1	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered.	
Bearing of 200° from Barcelona.	M1		
Position marked OR two lines intersecting.	A1 5	F.T. if at least M1 and two intersecting lines.	
13. (a) Q1. A statement regarding e.g. 'not relevant', 'confidentiality', 'too personal'	B1	For any equivalent statement. Ignore extra comments.	
Q2. 'times not exclusive' 'over what period of time?'	B1	For any **one** of these, or equivalent statement. Ignore extra comments. *SC1 if <u>both</u> correct but in reverse order.*	
(b) A criticism regarding location (biased at library) OR poor distribution method. OR does not target teenagers.	B1 3	For any **one** of these, or equivalent statement. Ignore extra comments.	
14. Showing strategy of two sets of 3 books + 1 book.	S1	Adding five of the prices implies this S1.	
'Best' combination found. (£7.99 and £7.50 free)	B1	Implied by sight of (£)41.48	
$\frac{25}{100} \times$ (£)56.97	M1	Allow 0·25 × 'attempted sum of the **<u>seven</u>** prices'	
= (£)14.24(..)	A1	C.A.O.	
'Buy 3 get cheapest free' a better offer than 25% off.	B1	F.T. their derived amounts (must have considered at least one free book to derive one amount and must have used 25% to derive other amount). *<u>Alternative methods for M1, A1.</u>* *$\frac{(7.99 + 7.50)}{56.97} \times 100$ F.T..their 'saving'. M1* *= 27(·18.)(%) A1* *OR Comparing prices M1* *(£)41.48 (F.T..their 'saving') AND* *(£)42.73 or (£)42 72(....) A1*	
	5		

UNIT 2 - FOUNDATION TIER

UNIT 2 (Non calculator) Foundation Tier	Mark	FINAL MARK SCHEME Comments
1. (a) (i) 34205 (ii) Three million (b) (i) 37, 43 (ii) 45 (iii) 48 (c) (i) 2650 (ii) 3000 (d) (i) 35 (ii) 36 (iii) 31 or 37	B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 10	 Accept 6^2
2. km g m ml OR cm^3 OR cl	B1 B1 B1 B1 4	**Kilo(s) gets B0**
3. (a) 6, 6, 6, 6, 6 (b) 3 or 4 6s with 2 or 1 non 6s (c) Any 5 numbers other than 6 (d) Either two 5s and two 6s and another different number OR one 5 and one 6 and 3 different numbers OR 5 numbers all of which are not 5 or 6.	B1 B1 B1 B1 4	
4. (a) (i) Subtract 7 (from the previous term) (ii) Divide (the previous term) by 4 (b) (0).04 (c) 30/100 × 80 = 24 (d) For the '24' sequence For the '32' sequence 72	B1 B1 B1 M1 A1 B1 B1 B1 8	Accept − 7. Do not accept n – 7 Accept ÷4. Do not accept n ÷ 4 **.04% gets B0** Any correct method for finding 30% **24% gets M1, A0** 24, 48, (72) 32, 52, (72) OR 20, 40, 60
5. (a) Kite (b)  	B1 B2 3	 B1 for at least 3 correct and no more than 2 incorrect.
6. (a) A(3, -2), B(-4, -3) (b) (i) 4 (ii) 2	B1 B1 B1 B1 4	Reverse coordinates get 0.
7. (a) 450 − 150 = 300 300/75 = 4 5 days (b) (£) 90	M1 A1 B1 B1 4	**For subtracting 150 and dividing by 75** **OR for (£)540**
8. (a) 9a + 2b (b) (x =) 100 (c) 1, − 8	B2 B1 B1, B1 5	B1 for either in an expression of the form xa + yb **OR B1 for both 9a and 2b not in an expression** F.T. 'their 1' – 9 if answer negative

UNIT 2 (Non calculator) Foundation Tier	Mark	FINAL MARK SCHEME Comments
9. Cost of apples = £13.80 – 1·80 × 5 = (£) 4.8(0) Cost of 1kg of apples = 4.80/3 = (£) 1.6(0) QWC Look for • Spelling • Clarity of text explanations • The use of notation – watch for '=',kg,'£', 'p' being used appropriately. QWC2: Candidates will be expected to • present work clearly, with words explaining their processes or steps. Use £ and p correctly. AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining their processes or steps. Use £ and p correctly. OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 QWC 2 6	F.T. 'their 4.80' but NOT (£)13.80 Accept rounding, truncating or more than 2 d.p. 160p gets this A1, but 160 gets A0. 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 and grammar.
10.(a) 7/12 (b) Use of all results to inform response, e.g. '60 throws altogether used' 20 sixes or 20/60 (=1/3)(or equivalent) throws sixes Conclusion based on correct working: biased with reason that fair dice would expect fewer sixes recorded or equivalent statement, e.g. 'biased, because should expect 10 sixes and there are 20' **H1**	B2 M1 M1 A1 5	B1 for idea of 12-5 (=7), or for sight of 5/12 Idea of using all data available OR mentions 'results of all children', or 'each person' OR should be 10 sixes for fair dice, or 2 sixes each time Do not award for fact 'fair dice probability is ⅙', unless compared with dice used (P(six) = ⅓) or to give number of 6s expected (2 in 12 throws, or 2/12) OR similar in reverse statement. Must be based on correct working *If all results not referred to then max M0 M1 A1* *If no marks in (b), SC1 in (b) sight of 20/60 in (a)*
11. (a) Enlargement scale factor 3 Correct position (b) Correct rotation (c) Correct reflection **H2**	 B2 B1 B1 B2 6	**If consistent incorrect scale used in (a) then penalise MR-1** B1 for at least 4 vertices correct **(0, 1) , (0, 2), (3, 2), (3, 1)** B1 Reflect in any vertical line or in y=1, OR x=1 seen
12.(a) 27*x* (b) Sight of 54*x* or 54 Attempt 54/4 or similar appropriate strategy 2 size A AND 13 size B Accept an embedded answers **H4**	B2 B1 S1 B2 6	B1 for correct but unsimplified expression, e.g. 3x+6×4x If B2, penalise further working -1 FT for twice the coefficient of *x* or twice the term given in (a) FT their '54*x*'÷4 Similar strategy e.g., a multiple of 4 close to 54 divided by 4 ('52÷4') FT for their '54*x*' B1 for suitable numbers of A and B for their '54x', OR B1 for 13 size B from correct working, OR B1 for a correct method towards maximising the number of size B but 1 error in working Award SC2 (with no other marks) for an answer of 6 size A and 12 size B An answer of 2 size A and 13 size B is awarded all 4 marks.

UNIT 3 - FOUNDATION

UNIT 3 (Calculator allowed) Foundation Tier	Mark	FINAL MARK SCHEME Comments
1. (a)(i) 21.65 (meat) 5.11 (cheese) 9.84 (drinks) (£) 36.6(0) (ii) 10% = (£) 3.66 5% = (£) 1.83 OR 183 **(p)** Pays (£) 34.77 (b) (i) 256.7 (ii) 257 (iii) 300	B1 B1 B1 B1 M1 A1 B1 B1 B1 B1 10	 F.T. their figures for 1 error Unsupported 36.6(0) gets B4. Any valid method **for finding 5%** F.T. their total Unsupported (£)1.83 gets the M1, A1. F.T. their total and discount
2. (a) (b) Summer	B1 B1 B1 B1 B1 5	 Accept any orientation of the rectangle Accept any orientation of the 3 squares joined together B0 for 550, but B1 for Summer and 550
3. Evidence of square counting 59 – 65 590 – 650	M1 A1 B1 3	 F.T. 10 × 'their area' Unsupported answers in the range 590 – 650 get all 3 marks
Use overlay allow ± 2mm 4. (a) XZ=9.6cm Angle ZXY (63º) Completed triangle (b) Arc through both arms of the angle centre B Arcs to give bisector and line drawn. (c) 2 arcs for 120° Bisecting 60° and 120° arcs Drawing the 90°	 B1 B1 B1 B1 B1 B1 B1 B1 8	 Allow ±2mm Allow ± 2º as on overlay Only if at least one B1 awarded. **Complete reflection of the triangle gets B2**
5. Reading at the end of the period 48576 Reading at the beginning of the period 48262 Number of units used 314 314 × 24 (÷ 100) 75.36 Charge: 35p per day for 90 days 31.5(0) Total cost 106.86	 B1 M1 A1 B1 B1 5	 Must be in £s for the A1. **Pence gets A0.** F.T. their figures.

UNIT 3 (Calculator allowed) Foundation Tier	Mark	FINAL MARK SCHEME Comments
6. (a) 9 × 6 = 54 cm^2 (b) 30 (cm)	M1 A1 U1 B1 4	 Independent of other marks
7. (a) 27 (b) 14	B2 B2 4	B1 for 12 OR 15 B1 for – 3 OR (9 and 8)
8. (a) 1.17 (b) 40.1	B2 B2 4	B1 for 1.174(96423) All places given must be correct rounded or truncated B1 for 40.13(10429) All places given must be correct rounded or truncated
9. (a) Plotting at (20, 1) Horizontal line 10 minutes long Plotting the point 30 minutes along and 10km above the end of their horizontal line OR at (60, 11) (b) 10 km in ½ hour = 20 (km/h) (c) 3.3 to 3.4 (km)	B1 B1 B2 M1 A1 B1 7	 F.T. 'their bus stop' plot The line must be drawn for the B2. B1 for each **<u>OR B1 for a plot at (60,10) and the line drawn.</u>** F.T. their graph. **<u>Difference between distances from 'their school' position and where their line cuts time = 50 secs.</u>**
10. (a) Tablet A runs out after 40/(2+2) = 10 (days) Tablet B runs out after 20 days Tablet C runs out after 30 days Look for • Spelling • Clarity of text explanations • The use of notation – watch for kg,'=','£', 'p' being used appropriately. QWC2: Candidates will be expected to • present work clearly, with words explaining their processes or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining their processes or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 B1 B1 QWC 2	 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 and grammar
(b) Tablets A and B will run out after 20 days	M1 A1	Working with multiples of 10 and 20
(c) All 3 tablets will run out after 60 days	M1 A1 10	Working with multiples of 10, 20 and 30

UNIT 3 (Calculator allowed) Foundation Tier	Mark	FINAL MARK SCHEME Comments
11. (a) Interpretation of the two extra numbers, e.g. 'the total of the 2 numbers is 76', or 'mean of the two extra numbers is 38'	B3	B2 for 7×28=196 and 5×24= 120 with difference 76, or "each number is 38", OR B1 for 5×24= 120 or 7×28=196 or sight of 7×28 - 5×24, or statement such as 'mean of the two numbers is greater than 24' B0 if reference in a statement only to one of the extra numbers
(b) -2, 1, 3, 3 given in any order	B3	B2 for satisfying 3 of the 4 conditions, e.g. greatest number 3 and more than one three with smallest number -2, OR B1 for satisfying 2 of the 4 conditions, e.g. greatest number 3 and more than one three, or for the greatest 3 and smallest -2 *Conditions to check for 'their numbers':* *Mode 3, No number>3, Range 5, Median 2* *B2 for 3 conditions satisfied* *B1 for 2 conditions satisfied*
H3	6	
12.(a) Accurate rhombus drawn within tolerances with all appropriate construction arcs shown (6 cm ± 2mm, 60°±2°, 120°±2°)	B4	B3 for sides all correct lengths (±2mm) and evidence of suitable construction for either a 60°±2° or a 120°±2°with arcs shown, OR B2 for a least 2 sides shown correct (±2mm) and either 60°±2° or 120°±2° constructed correctly with arcs shown, OR B1 for knowing the rhombus has angles 60°, 60°, 120°±2° and 120° ±2°(may be a correct rhombus drawn), or for a construction of 60°±2° or 120°±2° with appropriate arcs, or a construction of a rhombus with sides 6cm showing arcs
(b)Correct region shaded	B3	Mark intention. B1 for line, B1 for arc, B1 for shading (FT arc centre A and a line crossing AB). Shading needs to be on both sides of AB. Remember arc centre B is MR-1 continue to mark *If 2 arcs are drawn, with shading ambiguous then mark the straight line only, B0, B1, B0*
H5	7	
13.(a) Angle 60° (±2°) or sight of ⅙ or equivalent	B1	
60/360 × 1620	M1	Not for 60/360 of 1620, need to see (or imply) "×"
(£)270	A1	FT from their angle , fraction or percentage
b) Complete method, e.g. 2/3 × 270	M1	FT from (a). For bus fares accept 20°(±2°), or 0.05 to 0.06, or 5% to 6%
(£)180	A1	Mark final answer. If no marks SC1 for (£)90 *Errors of premature approximation are penalised -1 in (a) & (b)* *Do not credit 'spurious correct' answers from incorrect working*
(c) Explanation that shows clear understanding that the pie charts are based on different amounts so the angles cannot be directly compared, with a conclusion that Maria is wrong, e.g. 'Maria is wrong as the same angle means that the same proportion of money is spent, not the same amount of money, as Maria has more to spend'	E2	Accept explanations that imply that Maria is wrong. E1 for statement, e.g, 'Maria is wrong, as Mark has less to start with', or 'Mark has a lower first month salary than Maria, so Maria is wrong', OR E1 for understanding shown but no conclusion *Accept errors in calculation if process and idea correct*
H4	7	

UNIT 1 - HIGHER TIER

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments	
1. Bearing of 070° from Valencia. Bearing of 200° from Barcelona. Position marked OR two lines intersecting.	M1 M1 A1 3	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines.	
2. (a)(i) French AND reference to greater spread. (ii)Geography AND reference to 'more high marks'. (b) Comment on misleading visual appearance. e.g. 'looks as if many more boys'. Comment on 'Number' scale not starting at zero. e.g. 'only starts at 80'.	B1 B1 B1 B1 4	Mark allowed for understanding of spread. Ignore extra comments. Do not accept any explanation if based on a calculation. Do not accept e.g. 'Geography because most scored 7 (whilst in French most scored 4)' unless further understanding is shown. Ignore extra comments. Do not accept 'there are more boys'. Accept the (distinct) comments in either order.	
3. (Area =) 2×35 $= 70(m^2)$ (Litres required =) $70 \div 6$ $= 11{\cdot}6(.....)$ or 12. (Need to buy) Two '5l tins' and One '2l tin'. (Cost =) (£)30	M1 A1 M1 A1 M1 A1 6	 An area must be indicated for a F.T. F.T. 'their area'. A0 for 11 remainder 4 unless 12 used later. F.T. 'their required litres'. Must be for cheapest combination possible.	 OR <u>if area of wall found</u> Using 5×6 AND 2×6 M1 $= 30(m^2)$ AND $12(m^2)$ A1 F.T. their area.
4. (a) (i) $2 \times (100)^3$ $= 2000000$ (ii) 2000 (b) ½ x 4.5 x 6 $= 13.5\ (cm^2)$	M1 A1 B1 M1 A1 5	 OR F.T. 'their (i)' / 1000.	

UNIT 1 **Higher Tier**	**Mark**	**FINAL MARK SCHEME** **Comments**
5. Showing strategy of two sets of 3 books + 1 book. 'Best' combination found. (£7.99 and £7.50 free) $\frac{25}{100} \times$ (£)56.97 = (£)14.24(..) 'Buy 3 get cheapest free' a better offer than 25% off.	S1 B1 M1 A1 B1	Adding five of the prices implies this S1. Implied by the sight of (£)41.48. Allow 0·25 × 'attempted sum of the <u>seven</u> prices' C.A.O. F.T. their derived amounts (must have considered at least one free book to derive one amount and must have used 25% to derive other amount). *<u>Alternative methods for M1, A1.</u>* *$\frac{(7.99 + 7.50)}{56.97} \times 100$ F.T..their 'saving'. M1* *= 27(·18.)(%) A1* *OR Comparing prices M1* *(£)41.48 (F.T..their 'saving') AND* *(£)42.73 or (£)42 72(....) A1*
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ and % being appropriate) QWC2: Candidates will be expected to • 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: 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	QWC2 7	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 weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
6. 9000 <u>450</u> 9450 <u>472.5(0)</u> 9922.5(0) <u>496.12(5)</u> 10418.62(5) OR 450, 472.5(0) and 496.12(5) (£) 1418.62(5) OR (£) 1418.63	B1 M1 A1 A1 4	For the evaluation of a correct 5% OR Sight of 1·05 (1350 implies 3× 450 and gains B1). For attempting to find 3 different 5%. OR 9000 × $1{\cdot}05^3$. Accept 496.13 instead of 496.12(5) F.T. one error. SC2 for an answer of (£)922.5(0) Depreciation could gain B1, M1, A0, and A0.

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
7. (a) $1050 = \frac{1{\cdot}8 \times 900 - F}{1{\cdot}2}$	B1	For correct substitution.
$(F =)\ 1{\cdot}8 \times 900 - 1050 \times 1{\cdot}2$	M1	Accept $1050 \times 1{\cdot}2 - 1{\cdot}8 \times 900\ (= -F)$
$(F =)$ 360 (euros)	A1	A0 for –360
(b) Indicates that point A is linked to the fixed cost or that no plates were sold.	B1	Accept any unambiguous equivalent statements. B0 for e.g. 'making a loss' unless there is some reference to the fixed cost or that no plates were sold.
Indicates that point B shows number of plates that must be sold in order to break even.	B1 5	Accept e.g. 'minimum sold in order to start making a profit'.
8. (a) Least capacity = 595 Greatest capacity = 605	B1 B1	Accept 604·999...recurring.
(b) Greatest volume = 120 × 605	M1	F.T. 'their greatest capacity' only if > 600. Ignore other multiplications seen
= 72600(ml) OR 72·6(litres)	A1	
Indicates that 'smallest tank' holds 72500(ml) OR 72·5(litres)	B1	
A statement that there is a possibility of overflowing.	E1 6	F.T. logical statement. Numerical errors are allowed but must remain consistent with the possibility of overflowing. *Note also the correct division arguments* *'72·5 /0·605 = 119·3(...) which is less than 120' OR* *'72·5 /120 = 0·604(1..) which is less than 0·605'.*
9. *Area* *Time* *Machines* *600* *5* *3*		
....	M1	For correctly arriving at a row with (area)1120 OR (time) 4.
....	M1	F.T. above row to 'correctly' arrive at a row with (area)1120 AND (time) 4.
1120 *4* **7** (Watch out for compensating errors)	A1 3	C.A.O. with the answer evaluated. If no marks gained allow SC1 for sight of '40m^2 per machine per hour' or equivalent OR sight of 7/3 or equivalent. *Alternative method* $3 \times \frac{1120}{600}$ *M1* $\times \frac{5}{4}$ *M1* *= 7 (machines) A1*
10. 65% ≡ 1144 (Original number) $\frac{1144}{65} \times 100$ = 1760	B1 M1 A1 3	Accept any indication. C.A.O.

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
11. (a) $\frac{310}{360} \times 2 \times \pi \times 3$	M1	
$= 16{\cdot}2(...)$	A1	
(Perimeter =) $22{\cdot}2(..)$(m)	A1	F.T. 'their $16{\cdot}2$' + 6. SC1 for $2{\cdot}6(....)$ (*using 50° instead of 310°.)* SC2 for $8{\cdot}6(....)$ *In part (b) treat finding the volume of the 'metal left' as a misread and mark accordingly.*
(b) (Area of cross section) $\frac{50}{360} \times \pi \times 2^2$	M1	
$= 1{\cdot}74(5....)(cm^2)$ or $5\pi/9$ or equivalent	A1	
(Volume) $1{\cdot}74(5..) \times 6$	M1	F.T. their derived <u>area.</u>
$= 10{\cdot}4(7...)(cm^3)$ or $10{\cdot}5(cm^3)$ or $10\pi/3$ or equivalent.	A1	*<u>Alternative method</u>* (Volume of cylinder) $\pi \times 2^2 \times 6$ M1 $= 75{\cdot}4...(cm^3)$ or 24π A1 F.T their derived <u>volume</u>. (Volume removed) $\frac{50}{360} \times 75{\cdot}4$ M1 $= 10{\cdot}4(7...)(cm^3)$ or $10{\cdot}5(cm^3)$ A1 or $10\pi/3$ or equivalent.
	7	
12. Use of 'Distance' / 'Speed' <u>First car</u> (120 / 50) = 2·4 (hrs) or 2(hrs) 24(min) or equivalent.	M1 A1	Ignore units used
<u>Second car</u> $\frac{60}{40} + \frac{60}{60}$	m1	Must show intent to add.
= 2·5 (hrs) or 2(hrs) 30(min) or equivalent.	A1	
Time difference = 6 (min)	A1 5	F.T. 'their two times'.
13. (a) Sight of $\frac{1}{3} \times \pi \times 10^2 \times 9$ OR $\frac{1}{3} \times \pi \times 4^2 \times 3{\cdot}6$	M1	For correct substitution(either cone)
300π or $942{\cdot}(47..)(cm^3)$	A1	Accept 942 to 943 inclusive.
$19{\cdot}2\pi$ or $60{\cdot}3(1..)(cm^3)$	A1	Accept 60·2 to 60·4 inclusive.
(Volume of frustum =) $280{\cdot}2\pi$ or $882{\cdot}1(...)(cm^3)$	A1	F.T. 'their two derived volumes'.
(b) $\frac{4}{3} \times \pi \times (\text{radius})^3 = 882{\cdot}1$	M1	F.T. 'their frustum volume'
$(\text{radius})^3 = \frac{882{\cdot}1 \times 3}{4 \times \pi}$ (210·6)	A1	
Radius = $5{\cdot}9(5..)$(cm)	A1 7	F.T. 'their $(\text{radius})^3$'. Accept an answer of 6 if previous M1, A1 awarded.

UNIT 2 - HIGHER

UNIT 2 Higher Tier	Mark	FINAL MARK SCHEME Comments
1.(a) 7/12	B2	B1 for idea of 12-5 (=7), or for sight of 5/12
(b) Use of all results to inform response, e.g. '60 throws altogether used'	M1	Idea of using all data available OR mentions 'results of all children', or 'each person'
20 sixes or 20/60 (=1/3)(or equivalent) throws sixes	M1	OR should be 10 sixes for fair dice, or 2 sixes each time Do not award for fact 'fair dice probability is ⅙', unless compared with dice used (P(six) = ⅓) or to give number of 6s expected (2 in 12 throws, or 2/12)
Conclusion based on correct working: biased with reason that fair dice would expect fewer sixes recorded or equivalent statement, e.g. 'biased, because should expect 10 sixes and there are 20'	A1 5	OR similar in reverse statement. Must be based on correct working *If all results not referred to then max M0 M1 A1* *If no marks in (b), SC1 in (b) sight of 20/60 in (a)*
2.(a) Enlargement scale factor 3 Correct position (b) Correct rotation (c) Correct reflection	 B2 B1 B1 B2 6	*If consistent incorrect scale used in (a) then penalise MR-1* B1 for at least 4 vertices correct. B1 Reflection in any vertical line or in y=1, OR x=1 seen
3.(a) $40^{(0)}$ (b) $17^{(0)}$ (c) 180 – 40 or equivalent calculation $140^{(0)}$	B1 B1 M1 A1 4	 e.g. (360 – 80)/2
4.(a) $27x$ (b) Sight of $54x$ or 54 Attempt 54/4 or similar appropriate <u>strategy towards</u> use of <u>as many size B as possible</u> 2 size A AND 13 size B Accept embedded answers For QWC2 the process steps leading to any answer need to be clear Allow QWC if working with a value, rather than an expression in (b) QWC2: Candidates will be expected to • 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: 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	B2 B1 S1 B2 Q W C 2 8	B1 for correct but unsimplified expression, e.g. 3x+6×4x If B2, penalise further working -1 FT for twice the coefficient of x or twice the term given in (a) FT their '$54x$'÷4 Similar strategy e.g., a multiple of 4 close to 54 divided by 4 ('52÷4') FT for their '$54x$' B1 for suitable numbers of A and B for their '54x', OR B1 for 13 size B from correct working, OR B1 for a correct method towards maximising the number of size B but 1 error in working <u>Award SC2 (with no other marks) for an answer of 6 size A and 12 size B</u> <u>An answer of 2 size A and 13 size B is awarded all 4 marks.</u> 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 and grammar.
5.(a) $y^5 - 2y^2$ (b) $8(x^3 + 2)$ (c) $5x < 30$ or $x < 30/5$ $x < 6$ (d) $4n + 5$	B2 B2 B1 B1 B2 8	B1 for each term. If B2, penalise further incorrect working -1 B1 for correct partially factorised expression, OR B1 for 8(.. + 2) OR $8(x^3 + ..)$ SC1 for $x < 3⅓$ or $x < 3.3(33…)$ or $x<3^3/_9$ (Not for $x<30/9$ nor $x<10/3$) B1 for $4n$. (B0 for n+4)
6.(a) 8.3×10^{-4} (b) 4.6×10^5	B1 B1 2	Penalise incorrect notation -1 only

UNIT 2 Higher Tier	Mark	FINAL MARK SCHEME Comments
7. $bc - bd = e$ $b(c - d) = e$ $b = e/(c - d)$	B1 B1 B1 3	Collect like terms FT until 2nd error Factorise Isolate
8. Any two statements equivalent to the equations: $17x + 4y = 180$, $7x+17x+3y = 180$, $7x+3y=4y$ Method to equate 1 coefficient (accept 1 slip) First variable correct Method to find second variable Second variable correct	S2 M1 A1 m1 A1 6	Accept informal notation (e.g. when trial & improvement used). S1 for any one statement **FT** provided 1 equation correct and same level of difficulty Or alternative method leading to evaluation of variable Depends on first M1 being awarded FT provided M1 and m1 awarded **x = 4 and y = 28** *If correct answers are seen, award all 6 marks*
9. Gradient = (-)8/2 = - 4 $y = -4x + 5$	M1 A1 A1 3	Or equivalent Award M1 A0 for gradient of 4 FT gradient of 4 provided M1 awarded *If no other marks then SC1 for $y = ...x + 5$ or $y=5x - 4$*
10.(a) 90(°) AND reason (b) TR or RT AND reason (c) 360 – 90 – 90 – 42 or equivalent /2 69(°)	B1 B1 M1 m1 A1 5	e.g. 'radius meets tangent', allow a description but must include reference to either the 'radius' or the 'tangent' e.g. 'meeting of tangents to circle', 'tangents from same point (to the circle)', allow a description Method to find angle in quadrilateral (138°)
11.(a)x =0.4747… & 100x= 47.47…with attempt to subtract 47/99 (b) $1/20^2$ or 20^{-2} 1/400 ISW	M1 A1 M1 A1 4	 $1/64000000^{1/3}$ or equivalent *If no marks allow SC1 for sight of 400*
12.(a) Strategy: Idea 1 – P(RR) – P(BB) – P(YY), OR equivalent P(RR) = 5/10 × 4/9 or P(BB) = 4/10 × 3/9 or P(YY) = 1/10 × 0/9 or other non replacement product 1 – {5/10 × 4/9 + 4/10 × 3/9 + (1/10 × 0/9)} 29/45 (= 58/90) (b) 35/100 × 35/100 1225/10000 or 0.1225 or 49/400 12(.25%)	S1 M1 A1 A1 M1 A1 A1 7	For the idea, not notation. Accept missing brackets *YY may be omitted as P(YY)=0* Or alternative full calculation shown Allow missing brackets if intention clear ISW. Ignore incorrect cancelling *An answer of 32/90 or 29/90 gets the M1 as implied, no other marks* OR for intention (100-65)/100 × (100-65)/100 Allow 35%×35%, do not allow 35×35 Do not FT from error in miscalculation of '100-65' FT provided M1 awarded If no marks SC1 for an answer of 6.25(%) or 20.25(%)
13.(a) Sketch (shift down) **Correct** sketch with (0, -13) indicated (b) Intention to show reflection in *x*-axis passing through (2,0) Correct reflection and (0, 8) indicated	B1 B1 B1 B1 4	Allow passing through (-3,0) and/or (3,0) Accept -13 on the y-axis. Do not allow if passing through (-3,0) and/or (3,0) *SC1 for a correct translation up with -3 indicated* Intention means that reflection of the curve is correct in at least 2 of the 3 quadrants Accept 8 on the y-axis *Reflection in y=-8 or x = 0 is awarded B0, B0*

UNIT 3 - HIGHER

UNIT 3 Higher Tier	Mark	FINAL MARK SCHEME Comments
1.(a) All points plotted correctly	B2	B1 for 5 correct, or reverse correct for 7 or 8 points
(b)(i) (26+38+56+64+46+36+62+48+14+20)/10	M1	410/10. Allow 1 slip in y-values used
41	A1	For intention to add y-values and divide by 10
(ii) Line of best fit through means	B2	CAO Tolerance within half square, excluding 40 and 42. B1 for a straight line of best fit, with points above and below, OR for straight line of best fit through the means but skewed
(c) Positive	B1	
(d) From their line of best fit (reading to 1 small square)	B1 8	FT from straight lines or curves. If no line, B0
2.(a) 5×6.2 - 2×-3.1	M1	31 + 6.2
37.2	A1	If no mark SC1 for 24.8
(b) 1/4 + 7×3/4	M1	½ needs to be squared within a correct substitution with an attempt to add
22/4 or equivalent (5.5)	A1 4	Mark final answer, if 22/4 incorrectly simplified A0
3.(a) Interpretation of the two extra numbers, e.g. 'the total of the 2 numbers is 76', or 'mean of the two extra numbers is 38'	B3	B2 for 7×28=196 and 5×24= 120 with difference 76, or 'each number is 38', or they state two numbers with a sum of 76, OR B1 for 5×24= 120 or 7×28=196 or sight of 7×28 - 5×24, or statement such as 'mean of the two numbers is greater than 24' B0 if reference in a statement only to one of the extra numbers
(b) -2, 1, 3, 3 given in any order	B3	B2 for satisfying 3 of the 4 conditions, e.g. greatest number 3 and more than one three with smallest number -2, OR B1 for satisfying 2 of the 4 conditions, e.g. greatest number 3 and more than one three, or for the greatest 3 and smallest -2 *Conditions to check for 'their numbers':* *Mode 3, No number>3, Range 5, Median 2* *B2 for 3 conditions satisfied* *B1 for 2 conditions satisfied*
	6	
4.(a) Angle 60° (±2°) or sight of ⅙ or equivalent	B1	
60/360 × 1620	M1	Not for 60/360 of 1620, need to see (or imply) "×"
(£)270	A1	FT from their angle , fraction or percentage
(b) Complete method, e.g. 2/3 × 270	M1	FT from (a). For bus fares accept 20°(±2°), or 0.05 to 0.06, or 5% to 6%
(£)180	A1	Mark final answer. If no marks SC1 for (£)90 *Errors of premature approximation are penalised -1 in (a) & (b)* *Do not credit 'spurious correct' answers from incorrect working*
(c) Explanation that shows clear understanding that the pie charts are based on different amounts so the angles cannot be directly compared, with a conclusion that Maria is wrong, e.g. 'Maria is wrong as the same angle means that the same proportion of money is spent, not the same amount of money, as Maria has more to spend'	E2 7	Accept explanations that imply that Maria is wrong. E1 for statement, e.g, 'Maria is wrong, as Mark has less to start with', or 'Mark has a lower first month salary than Maria, so Maria is wrong', OR E1 for understanding shown but no conclusion *Accept errors in calculation if process and idea correct*

UNIT 3 Higher Tier	Mark	FINAL MARK SCHEME Comments
5.(a) Accurate rhombus drawn within tolerances with all appropriate construction arcs shown (6 cm $\pm$ 2mm, 60°$\pm$2°, 120°$\pm$2°)	B4	B3 for sides all correct lengths ($\pm$2mm) and evidence of suitable construction for either a 60°$\pm$2° or a 120°$\pm$2°with arcs shown, OR B2 for a least 2 sides shown correct ($\pm$2mm) and either 60°$\pm$2° or 120°$\pm$2° constructed correctly with arcs shown, OR B1 for knowing the rhombus has angles 60°, 60°, 120°±2° and 120° ±2°(may be a correct rhombus drawn), or for a construction of 60°±2° or 120°±2° with appropriate arcs, or a construction of a rhombus with sides 6cm showing arcs
(b)Correct region shaded	B3 7	Mark intention. B1 for line, B1 for arc, B1 for shading (FT arc centre A and a line crossing AB). Shading needs to be on both sides of AB. Remember arc centre B is MR-1 continue to mark *If 2 arcs are drawn, with shading ambiguous then mark the straight line only, B0, B1, B0*
6.(a) Mid points 124, 133, 142, 151 $\frac{124\times8 + 133\times26 + 142\times48 + 151\times18}{100}$ (OR13984) = 139.8(4) or 140 (b) 138 to 146 (c) Suitable uniform scales with axes labelled Correct frequency polygon	B1 M1 m1 A1 B1 B1 B2 8	Two shown is sufficient if no error Attempt ∑fx for their mid-points, FT provided their mid points are within interval including bounds Attempt their∑ fx divided by 100. Depends on M1 Allow 139 and accept 140 from correct working Do not accept 142 alone Number of boxes vertical, Raisins horizontal Mid-points uniformly spaced, irrespective of (0,0) *FT their scales if possible* *FT reversed axes for appropriate plots* B1 for frequency polygon with one error in plotting, or for a translated polygon, or correct points plotted (but not joined with straight lines (curves or not joined)) *Ignore frequency diagram if polygon seen.*
7. Correct statement of Pythagoras' Theorem with values given, e.g. $34.7^2 - 26.1^2$ $x^2 = 522.88$ or $x = \sqrt{522.88}$ $x = 22.866569\ldots$ or 22.9 or 22.87 (cm)	M1 A1 A1 3	1204.09 – 681.21 Accept 22.8, 22.86 (cm) *Alternative:* *Full method using trigonometry and/or Pythagoras' Theorem* *M1* *Accurate intermediate answer* *A1* *Correct response* *A1*
8.(a) 5x(x - 2) (b) x(x – 6) (=0) x = 0 AND x =6	B2 M1 A1 4	B1 for 5x(x …) or 5x(… -2) or correct partially factorised
9.(a) 5×10^5 (b) 3.1×10^{-5}	B2 B2 4	B1 for 500 000 B1 for 3.08×10^{-5} or 0.0000308 or 0.000031 *Penalise incorrect notation only once, -1*

UNIT 3 Higher Tier	Mark	FINAL MARK SCHEME Comments
10. (x =) (24.5/7) × 9 (OR 3.5 × 9) (=) 31.5(cm) (y =) 15.4 ÷ (24.5/7) (OR 15.4/3.5) (=) 4.4(cm) Look for: QWC1: Calculations shown in full QWC2: Labelled calculations shown in full with units and labelled (x and y) in final answers with correct use of '=' QWC2: Candidates will be expected to • present work clearly, use of '=' and cm AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, use of '=' and cm OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 QWC 2 6	Or alternative full method to find x, x not implicit Or alternative full method to find y, y not implicit Alternatively candidates may refer to scale factor 3.5 throughout *If no marks SC1 for sight of scale factor 3.5 or equivalent* 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 and grammar.
11.(a) (x – 7)(x + 2) (b) 2(x+2) + 3(x-2) = 3×2×3 OR equivalent 2x + 4 + 3x – 6 = 18 OR 5x = 20 OR equivalent x = 4 (c) x = { -3 $\pm\sqrt{}$(3^2 – 4 . 2 . -3)} / 2×2 = [-3 $\pm\sqrt{}$33] /4 0.69 and -2.19	B2 M2 A1 A1 M1 A1 A1 9	B1 for (x … 7)(x … 2) Penalise any further incorrect work -1 (e.g. 'solve') M1 for 2 of the 3 terms correct FT from M1 for both A marks equivalent difficulty Depends on previous A1 and must be simplified form Allow one slip CAO. Must be correct to 2 decimal places
12.Attempt Volume = 4/3 π 3.4^3 (OR 4/3 π 0.034^3) 164(.636.. cm^3) (OR 0.000164(…m^3)) Answers in range 164(.55 to 164.70…) or 165 (cm^3) Use of conversion 1m^3 = 1 000 000cm^3 3509.6g converted to 3.5096(kg), or implied Use of mass / their volume Answers when rounded to 3sig.figs give 21300 (kg/ m^3)	M1 A1 B1 B1 M1 A1 6	Accept incorrect place value for digits 3 4 for M1 FT incorrect place value 3 4, correct evaluation OR for sight of 0.034^3, not for 3.4 cm = 0.034m 'Their volume', i.e. must have attempted use of formula dimensionally correct Do not award A1 for correct response from compensating errors in place value
13.Realising the aim is to find angle in triangle at P sin P = (36 × sin 48)/42 (=0.636981….) Angle at P = 39.567…(°) 062.5(67°) to 063°	S1 M2 A1 B1 5	M1 for sin P/ 36 = (sin 48)/42 or equivalent Answers from 39.5 to 39.6 or 40. Do not accept 39 FT "23 + their P" provided leading zero given for the bearing and that at least M1 awarded

UNIT 3 Higher Tier	Mark	FINAL MARK SCHEME Comments
14.(a) Reasonable tangent drawn	S1	
Gradient = difference v / difference t	M1	With or without tangent
Calculated gradient for **their tangent**	A1	(Answers may be in the range 25 to 37)
Units given m/s^2 or ms^{-2}	U1	Independent of other marks
(b)(i) Attempt to find area by splitting up or trapezium rule	S1	
Suitable area sections with at least 2 correct areas OR using trapezium rule correct substitution for the majority of areas	M2	M1 Suitable area sections with at least 1 correct area OR an attempt to use the trapezium rule (correct rule, but with a slip). *Allow tolerance in reading the velocity, as estimation required.*
Answers in the range 134 to 158 from correct working	A1	Units not required
(ii) FT from their answer in (b)	B1	FT irrespective of their answer not being within the range required in (a) If an incorrect unit is given, then B0 *e.g. 5 areas of width 1 seconds, heights are 26, 46 to 47, 46 to 48, 32 to 33, min area 150, max area 154* *2 areas split at 2.5 seconds gives 97.5*
	9	
15.(a) Sin curve, through the origin	M1	
± 1 shown, and $\pm 180^0$ shown or implied	A1	
(b) -27^0 and -153^0 with no other angles	B2	B1 for a correct angle. Accept unrounded values and embedded answers
	4	

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