GCSE MARKING SCHEME

MATHEMATICS - UNITISED

JANUARY 2013

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 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) (i) 72034		B1	
1(a)(ii). Five hundred and forty thousand, two hundred and seven.		B1	
1(b). (Ten percent =) 6657 6657 × (£)3 = (£)19971 (To nearest thousand) (£)20000.	✓ ✓ ✓ ✓	B1 M1 A1 A1	 F.T. 'their 6657'. F.T. 'their 19971'.
2(a). 38		B1	
2(b). Indicates '2nd notch to the right of 80'.		B1	Allow unambiguous intent.
3. An attempt to find values that may be directly compared. Finding (25%) 30% and 20% OR 25/100 30/100 and 20/100 or equivalent. OR 0·25 0·3 and (0·2) OR three correct calculations for a common amount. (Best bonus scheme from) Company B		M1 A1 A1	All %, OR all fractions with common denominator, OR all decimals, OR using a common amount for sales made, OR a valid combination. Accept 2·5/10 if comparing 'tenths'. F.T. if only one error made. Accept any unambiguous indication that Company B has been chosen (e.g. '3/10 is best'). SC1 if Company B chosen but with no supporting work.
4. (75 – 99) (100 – 124) **125 – 149** (150 – 174) Using a tally convention. (6) 8 12 4	✓ ✓ ✓ ✓	B1 B1 B2	 Need not be accurate. B2 for all three correct. B1 for 1 or 2 correct.
Ribbon marking for 5(a) and 5(b). 5(a). Cost = 24 × (£)35 + (£)70 = (£)910 5(b). Monthly payment = $\frac{(£)530 - (£)50}{24}$ = (£)20		 M1 A1 M1 A1	 Correctly substituted. M0 if 24 × (£)105 attempted. Correct substitution showing subtraction and division. Allow embedded reference to the correct answer.
6. Position / Name of Dog / Weight 1 / Nell / (10·6kg) 2 / Smot / (9kg 624gm) 3 / Buster / (8·72kg) 4 / Rover / (8·572kg) 5 / Peg / (7964gm)		B3	Mark the order of names only. Disregard any weights that are not given in the question. Allow unambiguous use of friends' names or weights instead of dogs' names. B1 for Nell AND Peg in correct positions B1 if 'Smot > Buster'. B1 if 'Buster > Rover'. *SC1 for complete reversal of names.*
7(a). 6		B1	
Ribbon marking for 7(b), 7(c) and 7(d). 7(b). 4 (min) 8 (sec) 7(c). 3 (min) 47 (sec) 7(d). 21 s(econds)		 B1 B1 B2	 SC1 if both correct answers to (b) and (c) are reversed. (Award this SC1 in part (c).) F.T. the time difference between their (b) and their (c). B1 for 21 OR B1 for -21 s(econds) B0 for -21
8. Showing an understanding of range. (Maximum range for Adam =) 59 (Minimum range for Ben =) 41		S1 B1 B1	Must be for runs scored. OR B2 for finding a possible range for Adam that is greater than a possible range for Ben.

UNIT 1 Foundation Tier		Mark	Final Mark Scheme Comments
9. (Water used in shower =) $\frac{15 \times 60}{10}$	✓	M1	
= 90 (litres)	✓	A1	
			Alternative methods
(40% of 150 litres =) $150 \times 0{\cdot}4$	✓	M1	*OR*
			$\frac{90}{150} \times 100$ *M1* *Using 60% B1*
= 60 (litres)	✓	A1	
So, 60% of the water = 90 (litres)	✓	A1	*= 60(%) (of Liam's amount) A1* *150 × 0·6 M1* *(which is) 40(%) less A1* *= 90(litres) A1*
			OR *60(litres) less B1* $\frac{60}{150} \times 100$ *M1* *= 40(%) A1*
'Yes, Tina's claim was correct.'	✓	A1	F.T. their values.
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', litres, % being appropriate)	✓ ✓	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.
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. 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
10. Repeated attempt to find 1/10 followed by a subtraction of two different amounts. OR Attempt to find 9/10 of two different amounts.		M1	M1 awarded for intent.
(End of 2nd year) 360 (complaints)		B1	
(End of 3rd year) 324 (complaints)		A1	Penalise extra work –1 (e.g. 4th year) , only if M1B1A1 already awarded. Treat 'increase' as a misread.
11. A correct strategy to find area.	✓	S1	Dividing floor area into rectangles.
$6\times13 + 5\times4$ OR $6\times8 + 10\times5$ OR $10\times13 - 8\times4$	✓	M1	
$= 98(m^2)$	✓	A1	
(Weekly rent =) $98 \times$ (£)5	✓	M1	F.T. 'their 98 '.
= (£)490	✓	A1	
12. A		B1	
B		B1	
D		B1	

UNIT 1 Foundation Tier		Mark	Final Mark Scheme Comments
Ribbon marking for 13(a) and 13(b). 13(a). Bearing of 058° from Cherbourg. Bearing of 135° from Portsmouth. Position marked OR two lines intersecting. 13(b). $3{\cdot}9 \times 20$ 78 (km)		 M1 M1 A1 M1 A1	**Use overlay.** ± 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. **Use measuring tool.** F.T. their ship's position. Accept ± 0·2cm. Answers in the range 74 to 82 (km) gain M1A1.
14. Three different valid comments. e.g. 'Not representative.' 'Should only be distributed to car owners', 'Does not ask about the age of the car', 'Does not specify over what period of time', 'How are the questionnaires returned?' 'People might confuse quantity with cost', 'Engine size' 'Type of fuel (diesel/petrol)'	 ✓ ✓ ✓	B3	B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by location). Do not give more than one mark for the same criticism(s).
15. Least Value Greatest Value 265 275 27·5 28·5		 B4	 B1 for each correct entry. Accept 274·9 recurring but not 274·9. Accept 28·49 recurring but not 28·49.
16. 6000 120 6120 122.4(0) 6242.4(0) 124.84(8) 6367.24(8) (£) 6367.25 OR 636725(p)	✓ ✓ ✓ ✓	B1 M1 A1 A1	For the evaluation of a correct 2% OR Sight of 1·02 (360 and 6360 imply use of 3× 120 and gain B1) For attempting to find 3 different 2%. OR $6000 \times 1{\cdot}02^3$. F.T. one error. Accept £6367.25p. Do not accept 6367.25p. Mark final value of investment (i.e. do not penalise if they continue to give £367.25)

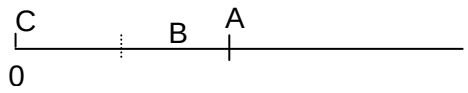
UNIT 1 - HIGHER TIER

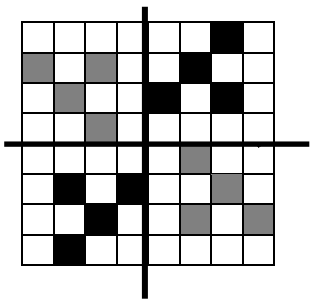
UNIT 1 Higher Tier	✓	Mark	Final Mark Scheme Comments
1. (F =) $100 \times 100 - 100^2$ $= 0$		M1 A1	
2(a). Attempt at $\sum f \times x$ (162) Division by $\sum f$ (20) (Mean =) 8·1 (goals)		M1 m1 A1	 C.A.O. Accept 8 (goals) only if 162/20 seen.
Ribbon marking for 2(b)(i) and 2(b)(ii). 2(b)(i). 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 3 | 10 | 6 | 0 | 1 | 0 1-10 | 11-20 | 21-30 13 | 6 | 1 2(b)(ii) E.g. '*Kick* because it is more detailed'. '*Penalty!* because its less cluttered'.		 B2 E1	 'Blank spaces' to be taken as 0. For all 9 correct entries. B1 for 7 or 8 correct entries. Allow F.T. from '*Kick'* table to *'Penalty!'* table. Reason must be valid for their choice.
3. Three different valid comments. e.g. 'Not representative.' 'Should only be distributed to car owners', 'Does not ask about the age of the car', 'Does not specify over what period of time', 'How are the questionnaires returned?' 'People might confuse quantity with cost', 'Engine size' 'Type of fuel (diesel/petrol)'	 ✓ ✓ ✓	B3	B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by location). Do not give more than one mark for the same criticism(s).
Ribbon marking for 4(a) and 4(b). 4(a). Bearing of 058° from Cherbourg. Bearing of 135° from Portsmouth. Position marked OR two lines intersecting. 4(b). (Distance =) 3·9 × 20 (= 78) (Speed =) $\frac{3{\cdot}9 \times 20}{4}$ = 19·5 (km/h)		 M1 M1 A1 M1 M1 A1	**Use overlay.** ± 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. **Use measuring tool.** F.T. their ship's position. Accept ± 0·2cm. Dependent on both M marks.
5. (Jack receives) 450 ÷ 1·2 = (£)375 (Gillian receives) 400 × 1·08 = 432(euros) A clearly stated explanation that <u>each</u> would have received more of their required currency by swapping.	✓ ✓ ✓ ✓ ✓	M1 A1 M1 A1 E1	*<u>Alternative method</u> 450 ÷ 400 M1* *= 1·125 A1* *1·08 < 1·125 < 1·2 E1* *1·125 < 1·2better for Jack E1* *1·125 > 1·08better for Gillian E1* Explanation should refer to amounts. Allow one arithmetical slip when awarding E mark.

UNIT 1 Higher Tier	✓	Mark	Final Mark Scheme Comments
6. (Total income =) (£)44600	✓	B1	
(Taxable income =) (£)37125	✓	B1	F.T. 'their total income' – 7475.
A correct method of finding 20% or 40% of a relevant value.	✓	M1	
(Tax due =) (£) 850	✓	A1	F.T. 40% of ['their 37125' – 35000].
(+ 7000) = (£)7850.	✓	A1	F.T. 'their 850' + 'their 7000'.
(Tax paid =) (£)8920	✓	A2	F.T. 20% of 'their 44600'.
AND a correct statement for their amount	✓		OR showing £7850 to be 17·6% of £44600. A1 if no statement or an incorrect statement.
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ , % being appropriate)	✓ ✓	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.
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. 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.
7. *(The following are for using the two times linked to Carol as a starting point).*			
Looking at time differences.	✓	M1	Award M1 if any one of the following is being considered, Sat/Thurs OR 5pm/10am OR 40/30.
(Differences) 2days, 7hours, 10min	✓	A2	A1 for one correct difference. Units not required as long as each value is unambiguously identifiable.
(Bryn phoned on 'Wed 6.24am + 2days 7hrs 10min')	✓		
Friday at 1 : 34 p.m.	✓	A2	F.T. their differences. A1 for one correct. Must have p.m. (or a.m. on a FT) or correct 24-hour time for the A2.
OR		OR	OR
(The following are for using the two times linked to the answering machine as a starting point).			
Looking at time differences.	✓	M1	Award M1 if any one of the following is being considered, Wed/Thurs OR 6am/10am OR 24/30.
(Differences) 1days, 4hours, 6min	✓	A2	A1 for one correct difference. Units not required as long as each value is unambiguously identifiable.
(Bryn phoned on 'Sat 5.40pm – 1day 4hrs 6min')	✓		
Friday at 1 : 34 p.m.	✓	A2	F.T. their differences. A1 for one correct. Must have p.m. (or a.m. on a FT) or correct 24-hour time for the A2.
8. 87% ≡ (£)4760000	✓	B1	Accept any indication.
(Last year's profit) $\frac{4760000}{87} \times 100$	✓	M1	
= (£)5471264(.368)	✓	A1	
= (£)5470000	✓	B1	F.T. from above if of equivalent difficulty.

UNIT 1 Higher Tier	✓	Mark	Final Mark Scheme Comments
9. Sight of (diameter =) 49·5 (cm) Sight of (length =) 45·5 (cm) AND (width =) 32·5(cm) (Circumference =) $\pi \times 49{\cdot}5$ OR (Perimeter =) $2 \times (45{\cdot}5 + 32{\cdot}5)$ (Crcmf. =) 155·5(cm) AND (Perim. =) 156(cm) A clear statement that the length of tape around the rectangular base can be longer than the length around the circular base.	✓ ✓ ✓ ✓ ✓	B1 B1 M1 A1 A1	Or (radius =) 24·75 (cm) *Ignore other values.* F.T. their values as long as 'diameter ' < 50, 'length' > 45 and 'width' > 32. Accept 155·4 to 155·6 for circumference. Accept equivalent wording as long as it is consistent with 'Perimeter' > 'Circumference'.
10. $12 \times \frac{72000}{54000}$ $\times \frac{1}{2}$ = 8 (hrs)		M1 M1 A1	Or equivalent work. Or equivalent work. C.A.O.
Ribbon marking for 11(a) and 11(b). 11(a) . $\frac{80}{360} \times 2 \times \pi \times 15$ = 20·9(4....) (cm) OR $20\pi/3$ 11(b). $\frac{360 - 80}{360} \times \pi \times 15^2$ = 549(·77...) (cm^2) OR 175π		M1 A1 M2 A1 5	 Accept 20·9 to 21 inclusive. M1 for $\frac{80}{360} \times \pi \times 15^2$ and A1 for 157(·07..) Accept 549 to 550 inclusive.
12 Use made of 'Distance / Time'. Use made of '1000 metres in 1 km'. Use made of '1 mile ≈ 1·6km'. Use made of '3600 seconds in 1 hour'. $\left[\frac{60 \times 3600}{1000 \times 1{\cdot}6 \times 3}\right]$ = 45 (mph)	 ✓ ✓ ✓ ✓ ✓	 M1 M1 M1 M1 A1	Candidates may earn these M marks (or some of them) in the order that they undertake each step. *(Watch out for embedded 'multiple method' steps.)* *(Ignore units at this stage.)* E.g. (i) $60/3 = 20(ms^{-1})$ $20 \times 3600 = 72000(mh^{-1})$ $72000/1000 = 72(kmh^{-1})$ 72/1·6 E.g. (ii) 1mile = 1600m (2^{nd} M1 and 3^{rd} M1) 1600/20 = 80 (1^{st} M1 implied by 20) 3600/80 (4^{th} M1) (To gain <u>all four</u> M marks then candidates must make <u>correct use</u> of each one.) *Note when part methods are earned* *E.g. 20/1600 (= 0.0125)* *M1, M1, M1, M0* A0 if any pre-approximations used.
13. (Volume of cone =) $\frac{1}{3} \times \pi \times 12^2 \times h$ (Volume of cylinder =) $\pi \times 12^2 \times 5h$ 20 litres = 20000 (cm^3) $20000 = \frac{1}{3} \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h$ $h = \frac{3 \times 20000}{144 \times \pi \times 16}$ or equivalent = 8·28(93..) (Total height =) 49·7(.....) (cm)	✓ ✓ ✓ ✓ ✓ ✓	B1 B1 B1 M1 A1 A1 A1	Accept any notation or word(s) for 'height'. B1 given only when its height is noted as 5× height of cone. F.T their '20000'. F.T. their two volumes only if of equivalent form (i.e. contains 'π' AND the <u>height of the cylinder expressed as a multiple of the height of the cone</u>.) Accept correct to 1dp. F.T. 6 × 'their 8·28(93..)'.

UNIT 2 - FOUNDATION TIER

UNIT 2 (Non calculator) Foundation Tier	Marks	Final Mark Scheme Comments
1. (a) (i) 19526	B1	
1. (a) (ii) Thirty thousand and fifty four	B1	Ignore extra words such as 'pounds. Ignore slight misspellings.
1. (b) (i) 32, 38	B1	
1. (b) (ii) 57	B1	
1. (b) (iii) 35	B1	
1. (c) (i) 36800	B1	
1. (c) (ii) 36830	B1	
1. (d) (i) 42, 48	B1, B1	–1 for each extra incorrect number.
1. (d) (ii) 49	B1	B1 for 7×7 OR 7^2, but B0 for 7×7=wrong number. B0 for 7.
2. mm OR cm OR m g km l(itres)	B1 B1 B1 B1	
3. (a) 9	B1	
3. (b) 	B1 B1 B1	A should be at the half way mark. B should be between 1/4 and 1/2 exclusive (Between the c and h of 'Rachel') C should be at 0.
4. (a) (i) Subtract 9 from the previous term (ii) Multiply the previous term by 4	B1 B1	Accept − 9 Accept × 4
4. (b) (0).15	B1	
4. (c) 40/100 × 70 = 28	M1 A1	Any correct method for finding 40% M1, A0 for incorrect units, e.g. 28% or £28
4. (d) For the '8' sequence (+ 3) For the '12' sequence (+ 3) 27	B1 B1 B1	8, 16, 24, (32), ... OR 11, 19, 27, (35), ... 12, 24, ... OR 15, 27, ... Award B3 for an answer of 27. SC1 for 24.

UNIT 2 (Non calculator) Foundation Tier	Marks	Final Mark Scheme Comments
Indirect marking - Tick marked 5. Cost of entrance fee for children = (£)8×5×9 OR 8×45 = (£) 360 Total cost of adult tickets = (£) 523 – 360 – 115 = (£)48 Number of adults = 48/12 = 4 Look for • spelling • clarity of text explanations, • the use of notation (watch for the units (£, p) 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 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 in their final answer.	✓ M1 A1 M1 A1 M1 A1 QWC 2	F.T. 'their 360' F.T. 'their 48' 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.
Indirect marking - Tick marked 6. Either ¼ of £600 = (£)150 1/5 of £600 = (£)120 Remainder = (£) 330 Fraction = 330/600 = 11/20. If 'their 330/600 cannot be reduced then A0 OR ¼ + 1/5 = 9/20 Remainder = 1 – 9/20 =11/20	✓ B1 B1 M1 A1	Any incorrect method for adding fractions, e.g. 2/9 gets M0 C.A.O. F.T. their first part. .55 OR 55% get M1, A0
7. 	B2	B1 for each quadrant
8. (a) 4x – 2y	B2	B1 for either in an expression of the form af(x) ± bg(y) Allow B1 for 4–2y OR 4x–2 etc 4x and –2y separated gets B1 4x+–2y gets B1
8. (b) (i) (y=) 72	B1	Accept embedded answers such as 72/6 = 12
8. (b) (ii) 7x = 28 x = 4	B1 B1	Isolate the x term F.T. ax = b (a≠1) B0 for 28/7 Accept embedded answers such as 7×4 – 8 = 20
8. (c) 5(n + 4) OR (n + 4)5 OR 5n + 20	B2	B1 for 5 × n+4 OR n+4 × 5. B0 for 5n + 4

UNIT 2 (Non calculator) Foundation Tier	Marks	Final Mark Scheme Comments
Indirect marking - Tick marked	✓	
9.(Monthly saving =) 0.15×1260	M1	An answer of 18.9(0) implies M0
(£)189	A1	
(Needs to save £1340 - £584 = £)756 (more)	B1	
(Number of months =) 756/189 or equivalent	m1	FT 'their 189' provided M1 awarded or if place value error in digits 1890 And FT 'their 756' Or repeat addition, with 189, 378, 567 shown , or any 3 correct terms in an appropriate summation series with no more than 1 incorrect, or 2×378 seen
4 (months)	A1	As a final answer. If units are given they must be correct Depends on M1 and m1 and must FT for their values including rounding up if necessary Alternative: Memo 0.15×1260 M1 584 = (£)189 A1 773 584 + 189 + 189 m1 (no extra) 962 + 189 + 189 = 1340 A1 1151 OR reverse calculation working back from 1340 1340 4 (months) A1 Unsupported 4 gets 0
10. (a) Realising only 1 way to score 14, i.e. 8+6 OR '8 and 6'	B1	Do not accept ⅙ + ⅛ as evidence Accept sight of 6 + 8 = 14
Number of possible outcomes 6×8 (=48)	B1	Accept sight of ../48 or ../8 × ../6 Sight of ⅛×⅙ is awarded B1, B1 with no other ways
1/48	B1	CAO *An answer of 1:48 gets B2*
(b) 1	B1	Accept fractions equivalent to 1 and 100% B0 for 'certain' B0 for incorrect notation such as 14 out of 14, 14:14 etc
Indirect marking - Tick marked	✓	Watch out for work on the DIAGRAM, but work given on the dotted lines takes precedence in any conflict.
11. $A\hat{D}C$ = 90(º)	B1	Any angle in the square
$F\hat{D}E$ = 60(º)	B1	Any angle in the equilateral triangle
$F\hat{D}A$ = 30(º)	B1	C.A.O.
$A\hat{F}D$ = 30(º)	B1	F.T. their $F\hat{D}A$
$D\hat{F}E$ = 60(º)		
Therefore $A\hat{F}E$ = 90(º) OR 270(º)	B1	F.T. 60 + their $D\hat{F}A$ Unsupported answer of 90º gets 0.
All parts (a) – (c) marked at the same time		
12. (a) 11	B1	
Use overlay		
12. (b) Plots	P1	Allow one error. FT 'their (a)' or 11
All correct plots joined with a curve	C1	FT 'their (a)' or 11. If (a) blank then FT points given, otherwise must included plot at x=-3
12. (c) From their graph (approximately -2.2 and 1.6)	B1	FT their graph. x-values, coordinates are not required

UNIT 2 - HIGHER TIER

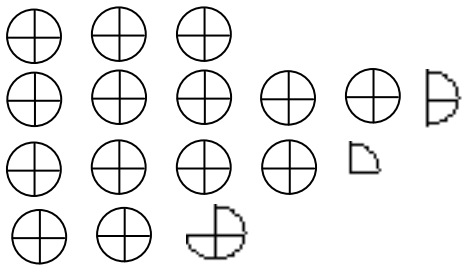
UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
1.(Monthly saving =) 0.15×1260 (£)189 (Needs to save £1340 - £584 = £)756 (more) (Number of months =) 756/189 or equivalent	M1 A1 B1 m1	An unsupported answer of 18.9(0) implies M0 FT 'their 189' provided M1 awarded OR if place value error in digits 1890 and FT 'their 756' Or repeat addition, with 189, 378, 567 shown , or any 3 correct terms in an appropriate summation series with no more than 1 incorrect, or 2×378 seen
4 (months)	A1	As a final answer. If units are given they must be correct Depends on M1 and m1 and must FT for their values including rounding up if necessary Award no marks for an unsupported answer of 4(months) Alternative: 0.15×1260 M1 = (£)189 A1 584 + 189 + 189 m1 (no extra) + 189 + 189 = 1340 A1 *OR reverse calculation working back from 1340* 4 (months) A1
Look for • spelling • clarity of text explanations, • the use of notation (watch for the units 'months' and £) Needs to have sufficient stages of working processed for QWC2 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 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 in their final answer	QWC 2	(For information: 584, 773, 962,1151,1340 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.
2. Realising only 1 way to score 14, i.e. '8+6' OR '8 and 6' Number of possible outcomes 6×8 (=48) 1/48	B1 B1 B1	Do not accept ⅙ + ⅛ or 1/14 Accept sight of 6 + 8 = 14 Accept sight of ../48 or ../8 × ../6 Sight of ⅛×⅙ is awarded B1, B1 with no other ways CAO *An answer of 1:48 gets B2*
3(a) $3q = m - h^2$ $q = (m - h^2)/3$ or equivalent	B1 B1	 FT from $3q = m + h^2$ or $3q = h^2 - m$ *Allow SC1 provided no other marks awarded for missing brackets:* *$q = m - h^2 \div 3$ OR $q = m - h^2/3$ provided no previous incorrect working*
3(b) 3x = 15× 2 or x/2 = 15/3 x = 10	M1 A1	 x = 30/3 gets M1 A0

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
4(a) 11	B1	
4(b) Plots All correct plots joined with a curve	P1 C1	Allow one error. FT 'their (a)' or 11 FT 'their (a)' if reasonable or 11. If (a) blank then FT points given, otherwise must include plot at x=-3
4(c) From their graph (approximately -2.2 and 1.6)	B1	FT their graph. x-values, coordinates are not required
5(a) -3n + 15 or equivalent	B2	B1 for sight of '-3n'
5(b) 2n + 1 or equivalent	B2	B1 for '2n + …', OR for sight of 3, 5, 7 showing difference of 2, NOT for 'n+2'
6(a) Any 2 lines drawn correctly Correct region identified	B2 B1	B1 for any 1 line drawn correctly Allow where ambiguous x or y as 1 or -2 unless incorrect line uniquely selected. Allow any line as correct if selected as a side of the region CAO
6(b) $5x < 40$ or $x < 40/5$ $x < 8$	M1 A1	No marks for use of =, unless replaced to give $x<8$, then allow both marks SC1 for $x<40/11$
7 (a) $4c + 5p = 38.8$ and $2c + 7p = 35.6$ or equivalent Equating one variable One correct solution Method to find the other variable, e.g. substitution Other correct variable	B1 M1 A1 m1 A1	<u>FT from 1 slip in setting up equations</u> Allow 1 slip but not in the equated variable *Any change of unit must be consistent* FT their solution provided M1 awarded Solutions p= 3.6 (cm) and c = 5.2 (cm) *No marks for trial and improvement, apart from maybe the first B1.* *Answer only gets no marks*
7 (b) (80 – 38.8)/c (= 41.2/ 'their c') OR attempt 'c × value = 80 – 38.8' OR alternative full method working with 80, 38.8 and c 7 (beads)	 M1 A1	<u>Must strictly FT from c=5.2 or 'their c'</u> FT number of (whole) (80-38.8)/ 'their c' Do not accept use of 'p' (as problem to solve requires thinking to use 'c') FT response must be rounded down to nearest whole Answer must be from correct working (if seen), e.g 7×5.2=36.4 compared with 41.2, or attempt 41.2/c Do not accept an answer of 8, however do accept answers (whole numbers) <7 if working is shown and a reason given based on fitting on the necklace
8(a) 2.4×10^{-3} 10^3 2100 2.4×10^3 or equivalent	B2	Mark answer space, unless blank B1 for a run of 3 in the correct order ignoring the incorrect one (i.e. blank out 1 value to find 3 in the appropriate order ignoring the gap made by the incorrect value, placing on the answer spaces thus incorrect) For incorrect value written in answer space for 2400, 1000 or 0.0024 in the answer space penalise -1 only
8(b) 1.5×10^{14}	B2	B1 for 15×10^{13}

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
9. (3+-3)/2 or (20 +16)/2	M1	Or suitable sketch with indication of points and idea to locate mid-way (e.g. showing step triangles), or look at number pattern
First point found to be (0,18)	A1	Notation not required, e.g. accept without brackets
Reflection to give (1,10)	B1	Notation not required, e.g. accept without brackets FT provided at least one of (0, 18), (1, 10) correct
Method to find gradient, e.g. sketch with points plotted with horizontal and vertical lines drawn to give an appropriate triangle	M1	Or (18 – 10)/(0 – 1)
Gradient = -8	A1	Gradient given as '8' gets M1 A0
Conclusion y = -8x + 18	A1	If first M1, A1 award but final M0, A0, A0 then award SC1 for their answer with y=mx **+ 18**, m≠0 If no marks, then SC2 for their answer with y=mx **+ 18**, m≠0
10(a) Correct rotation	B2	B1 for anticlockwise rotation about (2,1), OR For clockwise rotation about (1,2)
10(b) Enlarge scale factor (±)1/2	B1	Any placement
Correct position	B1	For their 'enlargement', i.e working with '-' and using (0,0) as the centre
11. (BÂC =) 75(°)	B2	B1 for sight of BÔC = 150(°) E marks **depend on appropriate B mark awarded** and **must be stated** (90° indicated on diagram is insufficient)
Reason: Tangent meet radius 90°	E1	
Reason: Angle at the centre is twice angle at circumference	E1	Angle sum of quadrilateral is **insufficient** *Alternative:* *Equal tangents (leading to isosceles triangle),* *CBT= BĈT = 75° followed by* *alternate segment theorem and* *BÂC = 75°* *respectively E1, B1, E1 and B1 with E marks depending on B marks.*
12(a) 1	B1	
12(b) $\sqrt{80} = \sqrt{(16 \times 5)}$ or $\sqrt{(4\times4\times5)}$ or $4\sqrt{5}$	M1	
$\{ (\sqrt{80} - \sqrt{5})^2 \} = (4\sqrt{5} - \sqrt{5})^2$ $(= (3\sqrt{5})^2)$	M1	
$= 45$	A1	CAO *Alternative method:* *M2 for 80 - 2√80√5 + 5 (=80 - √80√5 - √80√5 + 5)* *or M1 for 80 …. + 5 or 80 - √80√5 - √80√5 …* *or … - √80√5 - √80√5 + 5* *A1 45 CAO* *Method may be shown in stages* *-√80√5 may be written -√400 or -20*
12(c) x = 0.42828… **and** 100x = 42.828… with an attempt to subtract	M1	Or 10x **and** 1000x, or equivalent. Or alternative method
424/990 (=212/495)	A1	An answer of 42.4/99 gains M1 only. Mark final answer, do not ignore incorrect cancelling
12(d) $3\pi + \pi^2 - 9 - 3\pi$	M1	Must have 3 of the 4 terms correct
$= \pi^2 - 9$	A1	CAO. Mark final answer
13(a) 10/25 × 9/24	M1	
90/600 (= 9/60 = 0.15) ISW	A1	*ISW means ignore incorrect final cancelling throughout*

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
13(b) 1 – P(no pinto beans)	M1	Or other **full** method showing intended operations In terms of beans, so may be replacement
1 - 16/25 × 15/24	M1	Overall **full** method showing intention of operations with correct values substituted
= 360/600 (=36/60 = 0.6) ISW	A1	*ISW means ignore incorrect final cancelling throughout* *Alternatives:* *2×P(pk) = 2×9/25 ×6/24,* *2×P(pb) = 2×9/25 ×10/24,* *P(pp) = 9/25 × 8/24* *OR P(pinto, not pinto) = 2× 9/25 ×16/24, with* *P(pp) = 9/25 × 8/24*

UNIT 3 - FOUNDATION TIER

UNIT 3 (Calculator allowed) Foundation Tier	Marks	Final Mark Scheme Comments
All parts (a) – (c) marked at the same time		
1. (a) (i) 19.70 (meat) 12.56 (bread) 11.62 (milk) 4.92 (cereal) 48.8(0)	B1 B1 B1 B1	F.T. their figures for 1 error
1. (a) (ii) (£) 60 – (£)48.8(0) =(£)11.2(0)	M1 A1	F.T. their '48.80'
1. (a) (iii) Points = 4×5 = 20	M1 A1	
1. (b) (i) 5.32	B1	
1. (b) (ii) 75	B1	B0 for any decimal places e.g. 75.0 and 75.00 etc get B0
1. (b) (iii) 66000	B1	
All parts (a) – (b) marked at the same time **Indirect marking - Tick marked**	✓	
2. (a) 	B1 B1 B1 B1	
(b) Weeks 1,2,3, 4 along one axis	B1	Anywhere within the base (inc.) of the corresponding bar.
Uniform scale for the frequency axis starting at 0 and labelled	B1	If no scale then B0, but allow one square to represent 20. If frequency scale starts with 20 at the top of the first square the starting at 0 will be implied for B1. Condone frequency numbers alongside square instead of at the top of the squares.
Four bars at correct heights (bars must be of equal width). Can be in any order.	B2	B1 for any 2 or 3 correct bars on F.T.
3. Evidence of square counting 42 – 48 inclusive area = 420 – 480 (m^2)	M1 A1 B1 3	F.T. 10 times their 'square count'
All parts (a) – (b) marked at the same time		
4. (a) 26 m	B1 U1	Independent of other marks
(b) 8 × 5 = 40	M1 A1 4	

UNIT 3 (Calculator allowed) Foundation Tier	Marks	Final Mark Scheme Comments
5.(a) 38 – 16 = 22	M1 A1	
5. (b) 26	B1	
5. (c) Total = 138 /5 27.6	M1 m1 A1	Allow up to 2 errors in their readings for the M1 C.A.O.
Use Overlay 6. (a) $A\hat{B}C = 73°$ $A\hat{C}B = 55°$ Completed triangle	 B1 B1 B1	 Allow ± 2º Allow ± 2º Only if at least one B1 awarded. Complete reflection of the triangle gets B2
Use Overlay 6. (b) Arcs for first step Line drawn	 B1 B1	
Use Overlay 6. (c) Arcs for 60° Bisecting 60° arcs step 1 Bisecting 60° arcs step 2 and line drawn.	 B1 B1 B1	
7. (a) 5/8 – 2/8 = 3/8	M1 A1	Accept decimals, e.g. (0).625 – (0).25 = (0).375
(b) 3x = 15 x = 5	B1 B1	 F.T. ax = b, a≠1
(c) 32 = 3×6 + 2W 2W = 14 W = 7	B1 B1 B1	Correct substitution Isolating the W F.T. if ax = b (a≠1)
8. (a) 1.829	B2	B1 for 1.82(8836..) OR 1.83 All places given must be correct rounded or truncated.
8. (b) 30.74	B2	B1 for 30.74(1781...) All places given must be correct rounded or truncated
9. Adults (£) 668 + 668 (1336) Cost per child = 668/2 + 150 Children 484 × 3 (1452) Sea view 10 × 5 × 14 (700) Balcony 6 × 5 × 14 (420) Total (£)3908 Look for • spelling • clarity of text explanations, • the use of notation (watch for the units £) 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 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 in their final answer	B1 B1 B1 B1 B1 B1 QWC 2	Using the adult and child prices consistently from another row of the table gets MR–1. OR B1 for 50 AND 30 OR B1 for 140 AND 84 F.T. for one error (i.e. if B4 awarded from first five B1s). 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.

UNIT 3 (Calculator allowed) Foundation Tier	Marks	Final Mark Scheme Comments
10. (a) (Between) 14(:)00 and 14(:)30 or equivalent	B1	If am/pm used it must be correct, i.e. pm. Do not accept ½ hour or 30 minutes
10. (b) 20 (km)	B1	Ignore sight of incorrect units
10. (c) 2 ½ (km) / 30(minutes) OR 2 ½ / 0.5 OR equivalent 5 km/h	M1 A1 U1	Accept statement '2 ½ (km) in half hour' or similar (OR 5000) Independent of other marks (OR ……. m/h) Accept k(m)ph
Indirect marking - Tick marked 11. 1 hat made in 2/3 hour or 40 minutes Pay per hat (2/3 of £12.60) (£)8.4(0) (Cost of fabric) 0.45 × 3.4(0) (= £)1.53 (Total costs excluding ribbon £) 8.4(0)+ 1.53 (=£9.93) (Ribbon cost per hat) (£)10.25 – (£)9.93 (= £0.32 or 32p) (Ribbon costs) 64(p) (per metre)	 B1 B1 M1 A1 m1 m1 A1	*If units are given they must be correct, penalise once only* FT 'their 1.53' provided M1 awarded and 'their £8.40' provided ≠£12.60 FT 10.25 – 'their 9.93', provided it includes pay and fabric costs CAO *Alternative:* *(Cost of fabric for 3 hats) 3×0.45×3.4(0) M1* *= (£)4.59 A1* *(or M1, A1 for cost of fabric for 1 hat £1.53)* *(Pay for 3 hats in 2 hours 2×£12.60 = £)25.2(0) B1* *(Sales of 3 hats 3 ×10.25 = £)30.75 B1* *(Cost of ribbon for 3 hats)* *(£)30.75 – (£)4.59 –(£)25.2(0) (=96p) m1* *FT provided first M1 and includes pay and sales* *(Cost ribbon per hat or per metre) ÷3 (×2) m1* *FT provided first M1 and includes pay and sales* *(Cost of ribbon per metre)* *64(p) or (£)0.64 A1 CAO*
12. (a) $6x + 7 = 4x + 24$ $2x = 17$ $x = 8.5$ OR $8\frac{1}{2}$ (b) $\frac{x}{5} = 9$ OR $x + 20 = 65$ $x = 45$	B1 B1 B1 B1 B1	Correctly clearing brackets F.T. until second error Collecting terms F.T. $ax = b$ with $a \neq 1$ Accept embedded answers such as 45/5 = 9 for B2, but if they go on to write x=13 for example then B1 only.
13. One correct evaluation, $2 \leq x \leq 3$ 2 correct evaluations, 2.55 ≤x ≤2.75, one either side of 0 2 correct evaluations, 2.65 ≤ x ≤2.75, one either side of 0 2.7 *No calculations shown: accept "too high",">", etc.*	B1 B1 M1 A1	x $x^3 + 2x - 25$ 2 -13 2.1 -11.5.. 2.2 -9.95.. 2.3 -8.2.. 2.4 -6.37.. 2.5 -4.37.. 2.55 -3.318.. 2.6 -2.2.. **2.65 -1.09..** **2.7 0.083** 2.75 1.29.. 2.8 2.55.. 2.9 5.18.. 3 8

UNIT 3 - HIGHER TIER

Unit 3 Higher Tier	Mark	Final Mark Scheme Comments
1(a) (Between) 14(:)00 and 14(:)30 or equivalent	B1	If am/pm used it must be correct, i.e. pm. Do not accept ½ hour or 30 minutes
1(b) 20 (km)	B1	Ignore sight of incorrect units
1(c) 2 ½ (km) / 30(minutes) OR 2 ½ / 0.5 OR equivalent 5 km/h	M1 A1 U1	Accept statement '2 ½ (km) in half hour' or similar (OR 5000) Independent of other marks (OR ……. m/h) Accept k(m)ph
2. 360/6 OR 4 × 180/6 OR 720/6 60(° exterior) OR 120(° interior) **4** (of the 5) sides to be drawn forming a polygon drawn all of length 4cm (±2mm) **4** (of the 6) angles drawn correctly (within 2° tolerance) A correct hexagon, within tolerances allowed	M1 A1 B1 B1 B1	Need not be associated with interior or exterior angle Accept in working, or 120(°) **implied** in the drawing, Do not accept if incorrectly labelled on a drawing, e.g 120° drawn but incorrectly labelled 60°, allow M1, A0. Allow unless contradicted Irrespective of angles See overlay *Penalise drawing polygons with number of sides 5, 7, 8, … as -1 then FT,*
3. Strategy: measure angles 120°, 240° in both pie charts, or appropriate 1:2 ratio, or sight of appropriate ⅓ to ⅔, or appropriate use of ratio for 1 pie chart 50 boys **and** 100 girls in year 7 90 boys in Year 8 90/2 or 45 girls in Year 8 (Total number of girls) 145	S1 B1 B1 B1 B1	Accept sight of '120 and 240', or '120(°/360°) is ⅓' or '240(°/360°) is ⅔' May be in different sections of working and implies S1 FT 'their 50' + 40 provided S1 awarded and 'their 50'≠120 FT 'their 90'/2 provided S1 awarded CAO *If incorrect angles used, they must total 360°, then mark as follows:* *S0, FT to possible B1, B1, then B0, B0*
4. (£) 42.21/7 (£)6.03 and (£)36.18	M1 A1	
5. One correct evaluation, $2 \le x \le 3$ 2 correct evaluations, $2.55 \le x \le 2.75$, one either side of 0 2 correct evaluations, $2.65 \le x \le 2.75$, one either side of 0 2.7 *No calculations shown: accept "too high", ">", etc.*	B1 B1 M1 A1	x $x^3 + 2x - 25$ 2 -13 2.1 -11.5.. 2.2 -9.95.. 2.3 -8.2.. 2.4 -6.37.. 2.5 -4.37.. 2.55 -3.318.. 2.6 -2.2.. **2.65** **-1.09..** **2.7** **0.083** 2.75 1.29.. 2.8 2.55.. 2.9 5.18.. 3 8

Unit 3 Higher Tier	Mark	Final Mark Scheme Comments
6. 1 hat made in 2/3 hour or 40 minutes Pay per hat (2/3 of £12.60) (£)8.4(0) (Cost of fabric) 0.45 × 3.4(0) (= £)1.53 (Total costs excluding ribbon £) 8.4(0)+ 1.53 (=£9.93) (Ribbon cost per hat) (£)10.25 – (£)9.93 (= £0.32 or 32p) (Ribbon costs) 64(p) (per metre) QWC2 requires sight of the majority of the process steps shown, labelled, with units and money expressed correctly, with a clear final answer QWC1 requires at least 2 of the process steps, which are labelled and units correct in a labelled final answer OR QWC1 majority of process steps shown with units correct in a labelled final answer Look for • spelling • clarity of text explanations, • the use of notation (watch for the units and '0' for unit pence when using £) 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 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 in their final answer	 B1 B1 M1 A1 m1 m1 A1 QWC 2	*If units are given they must be correct, penalise once only* FT 'their 1.53' provided M1 awarded and 'their £8.40' provided ≠£12.60 FT 10.25 – 'their 9.93', provided it includes pay and fabric costs CAO *Alternative:* *(Cost of fabric for 3 hats) 3×0.45×3.4(0)* *M1* *= (£)4.59 A1* *(or M1, A1 for cost of fabric for 1 hat £1.53)* *(Pay for 3 hats in 2 hours 2×£12.60 = £)25.2(0) B1* *(Sales of 3 hats 3 ×10.25 = £)30.75 B1* *(Cost of ribbon for 3 hats)* *(£)30.75 – (£)4.59 –(£)25.2(0) (=96p) m1* *FT provided first M1 and includes pay and sales* *(Cost ribbon per hat or per metre) ÷3 (×2) m1* *FT provided first M1 and includes pay and sales* *(Cost of ribbon per metre)* *64(p) or (£)0.64 A1 CAO* 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.
7(a) $6x^2(x - 2)$	B2	B1 for correct partial factorisation, OR B1 for correct highest common factor and 1 term in brackets correct
7(b) $(x – 7)(x + 6)$	B2	Mark final answer. B1 for (x … 7)(x … 6)
7(c) $(3x + 2)(5x + 7)$	B2	Mark final answer. B1 for (3x + 7)(5x + 2) or (3x … 2)(5x … 7) or 5x(3x +2) + 7(3x + 2) or equivalent
8(a) $2x + 5 = 5x + 5$ $x = 0$	M1 A1	Or $3x = 0$ Accept 0 = x. Do not accept x = 0 from incorrect working, if M0 seen, then A0
8(b) $2x + 3 + 3\times4x = 8\times3$ or $2x/3 + 1 + 4x = 8$ $14x = 21$ or $14x/3 = 7$ $x = 3/2$ or 1.5 or equivalent	B1 B1 B1	Sight of ⅔ written as 0.6 is an error. FT until 2nd error Mark final answer
9(a) $w^2 + 12.7^2 = 56.2^2$ or $(w^2 =) 56.2^2 - 12.7^2$ $w^2 = 2997.15$ or $(w =) \sqrt{2997.15}$ 54.7(46… cm) or 55 (cm)	M1 A1 A1	

Unit 3 Higher Tier	Mark	Final Mark Scheme Comments
9(b) sin m = 14.2/34.6 m = 24(.23…°)	M1 A2	A1 for m = $\sin^{-1}0.4(104…)$
10. (x =) (46.2/8.4) × 10 (OR 5.5 × 10) (=) 55(cm) (y =) 18.7 ÷ (46.2/8.4) (OR 18.7/5.5) (=) 3.4(cm)	M1 A1 M1 A1	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 5.5 throughout
11. In either order: D with F, in any order Reason: 3 sides or SSS C with E, in any order Reason: 2 sides and <u>included</u> angle or SAS	 B1 E1 B1 E1	E marks depend on B marks
12(a) Intention to subtract horizontal values on x-axis for vertical axis reading across at 45 and 15 (= 30 – 13 to 14) IQR answers in the range 16 to 17 12(b) Indicates the first task due to smaller IQR	M1 A1 E1	 FT for 'their IQR' comparison with conclusion
13(a)(i) -2.5 **and** 5	B1	
13(a)(ii) Sight of y=5, in working or on graph -2.2 to -2.1AND 4.6 to 4.7	M1 A1	
13(b) Strategy, set up a table or list to calculate values for $y=x^2-2x-3$ with at least 1 point correct, or equate $-2x^2+5x+25=x^2-2x-3$ At least 3 values in their table or list correct **and** plotted, OR $3x^2-7x-28=0$ with substitution into quadratic formula (allow 1 slip) All necessary correct points plotted joined with **correct curve drawn** to intersections, OR x ={7±√385}/6 Intersection approximately at x = 4.4 and x = -2.1 x = 4.4, y = 7.8 and x = -2.1, y = 5.6	S1 M1 A1 A1 A1	 x: -3, -2, -1, 0, 1, 2, 3, 4, 5, 6 y: 12, 5, 0, -3, -4, -3, 0, 5, 12, 21 CAO. Not a FT from incorrect points, then FT for possible A marks FT from points plotted but not joined FT provided M1 FT their graph, or their x calculation to evaluate y correctly
14(a) Mid points 14.5, 24.5, 34.5, 44.5 2×14.5 + 18×24.5 + 29×34.5 + 1×44.5 (=1515) $\sum fx$ / 50 (£) 30.3(0)	B1 M1 m1 A1	 FT for their mid points from within group FT for correct sum of their *fx* terms /50 FT their $\sum fx$ / 50 correctly evaluated Accept (£)30 provided correct working seen
14(b) Strategy, e.g. noticing 0 to 20 same area as 20 to 30, or noticing first 2 rectangles are of equal area 20× frequency density = 8, or equivalent, or 16 people split 8 people and 8 people for first 2 rectangles Uniform scale, implied or shown (height of first rectangle is 0.4, 2nd height is 0.8, etc.) 8×10+8×25+11×32.5(0)+12×37.5(0)+9×42.5(0)+1×47.5(0) OR 20×0.4×10 + 10×0.8×25 + 5×2.2×32.50 + 5×2.4×37.50 + 5×1.8×42.50 + 5×0.2×47.50 (£)1517.5(0)	S1 B1 B1 M2 A1	Or £20 with 8 people, or 32 squares for £30, or 32 squares for 16 people, or 16 squares for 8 people Or sight of 0.4 Award of this B1 implies S1 also Or sight of 0.4 and 0.8 appropriately, or 'each person 2 squares', or sight of 8, 8,11,12, 9,1or sight of any 4 of 10, 25, 32.5(0), 37.5(0), 42.5(0), 47.5(0) Award of this B1 implies S1 and previous B1 also *If M1 or M2 are awarded,* *this implies previous S1, B1 and B1* <u>Do not FT from incorrect frequency density scale</u> M1 for • any 3 correct products within the overall sum • the appropriate sum of products but with bounds used instead of mid points, or • use of mid points 10, 25, 32.5(0), 37.5(0), 42.5(0) and 47.5(0) within a product sum CAO. Mark final answer

<table>
<tr><th>Unit 3
Higher Tier</th><th>Mark</th><th>Final Mark Scheme
Comments</th></tr>
<tr><td>15(a) $g \propto t^2$ or $g = kt^2$
$450 = k \times 7.5^2$
$g = 8t^2$
15(b)
<table><tr><td>g</td><td>50</td><td>450</td><td>800</td></tr><tr><td>t</td><td>2.5</td><td>7.5</td><td>(±) 10</td></tr></table></td><td>B1
M1
A1

B2</td><td>Ignore incorrect use of ‘=’ or ‘$\propto$’ throughout
FT from non linear only
May be implied in (b)

B1 for each value.
FT non linear expressions for SC1 only if both FT answers accurately evaluated</td></tr>
<tr><td>16. Use of sine rule followed by cosine rule
AC/sin49 = 142/sin62
AC = sin49 × 142/sin62
AC = 121 or 121.3(76…) or 121.4 (metres)
$AD^2 = AC^2 + 224^2 - 2 \times AC \times 224 \times \cos 74$
$AD^2 = 49875.25$ to 49922.816..
AD = 223(.3…. metres)</td><td>S1
M1
A1
A1
M1
A1
A1</td><td>

FT their AC provided ≠142 or ≠224 or spurious

Depends on previous M1 and A1</td></tr>
<tr><td>17. 70(°) and 290(°) with no other values</td><td>B2</td><td>B1 for either value</td></tr>
</table>

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