GCSE MARKING SCHEME

MATHEMATICS - LINEAR

NOVEMBER 2015

INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2015 examination in GCSE MATHEMATICS - LINEAR. 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.

PAPER 1 - FOUNDATION TIER

2015 November Paper 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
1. (a) (i) 2 031 004 (ii) eighty one thousand three hundred and five (b) (i) 24 and 36 (ii) 46 and 18 (iii) 63 (c) (i) 4520 (ii) 5000 (d) 1, 3, 5, 15 (e) (i) 2567 (ii) 7625	B1 B1 B1 B1 B1 B1 B1 B2 B1 B1 11	 Accept embedded answers, e.g. 46 – 18 = 28. B1 for any 3 correct factors and up to 1 incorrect OR B1 for 4 correct factors and 1 extra incorrect given. Accept 1×15, 3×5. Ignore repeats. **Accept 2,5,6,7 B0 for 2.567**
2. (a) (i) 47 (ii) 1 (b) e.g. 54** OR 64** etc (c) 3/25 = (0)·12 13% = (0)·13 (0)·12, (0) ·13, (0)·2 (d) 300 ÷ 5, 305 ÷ 5, 303÷ 5 (Must be ÷5) = 60, 61, 60.6	B1 B1 B2 B1 B1 B1 M1 A1 9	 **OR in words** Any number >5000 with 4 in the hundreds column B1 for any number with hundreds digit of 4. Correct answer OR F.T their decimal values. Accept 3/25 , 13% , (0) ·2 or equivalent. F.T their estimates for simple calculations. SC1 for unsupported 60 only. Penalise extra working (towards actual answer) M0,A0. **B0 for 60 × 5 = 300**
3. (Hours worked =) 8 × 45 (minutes) OR 8 × ¾ **(hours)** = 360 (minutes) OR = 6 (hours) Charge = (£)30 × 6 + (£)65 = (£) 245	M1 A1 M1 A1	Conversion to 'hours' not required at this stage. F.T. 'their time' but there must be an attempt to convert to hours. Special cases SC1 for (£)305 (from 8×30+65) OR SC1 for (£)700 (from 8×£87.50).
Look for (in the most part) Strand 1: For 1 mark Candidates will be expected to • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means Strand 2: For 1 mark Candidates will be expected to • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc	QWC 2 6	 QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar
4. (a) certain — sicr (b) an even chance — siawns deg (c) impossible — amhosibl (d) unlikely — annhebygol	B1 B1 B1 B1 4	

2015 November Paper 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
5. (a) 3x (b) (P =) 11 (c) y = x + 3 (d) (i) (y=) 8 (ii) (x=) 15 (e) even (number)	B1 B2 B2 B1 B1 B1 8	B1 for either 35 OR –24. **Watch out for 4+7=11 gets B0 B1 for 11P.** B0 for 35A and/or –24B OR P = 35A – 24B. B2 for equivalent in words, e.g. 'x is 3 smaller than y'. B1 for +3, add 3, you add 3 etc. Accept embedded answers such as 3×8 = 24. **B0 for y=24** Accept embedded answers such as 15–4=11. **B0 for x=11** Allow 'two times table' or 'multiples of two' or 'double(s)' **or 'double number'.** B0 for 'double digit'.
6. A(2, 1), B (−3, −5) and C(4, −3).	B3 3	B1 for each. Reversed coordinates get B0 every time. Letters A,B,C not needed as long as the point is identified.
7. (a) Total length = 3300 (mm) = 3.3 (metres) (b) **For adding cupboard lengths to get 3700, 3800 or 3900** e.g. 1000, 1000, 1000, 900 1200, 1200, 1200, 300 etc Reason, e.g. 'cannot fill the 30mm', or 'all units are multiples of 100'	 B1 B1 S1 B1 B1 E1 6	Look in the diagram also. If units changed, e.g. to cm, then the units must be stated. F.T. 'their 3300'/1000. **Accept 3m 300mm and 3m 30cm.** For adding cupboard lengths to get 3900 For adding different cupboard lengths to get 3900 630 mm: Some candidates are using part (a) and considering the extra 630mm. Allow all marks as deserved as long as they use the lengths given in part (a).
8. (a) (i) Area = 35 × 41 = 1435 (m^2) (ii) **143 (turkeys)** (from 1435/10 = 143.5) (b) Missing sides = 25 , 34 Perimeter = 64+45+34+25+30+20 OR Perimeter = 2×(64+45) = 218 (m) Enough fencing with 32m left over	M1 A1 B1 S1 M1 A1 B1 7	F.T. 'their 1435' provided rounding **down** is involved, i.e. equivalent level of difficulty. **For either 25 or 34.** **Award M1 for adding the given 64, 45,20, 30 and their two values for the missing sides.** Gets the S1 and M1 C.A.O. **F.T. 250 – 'their 218'**
9. (a) Number of small beads in necklace = 3/5 of 150, or Number of large beads in necklace = 2/5 of 150, or equivalent, e.g. with 30ths Number of small beads = 90 Number of large beads = 60 (b) Bracelet costs 80 + 18×5 + 12×10 (p) = £2.90 (each) OR £290 for 100 Profit = 70/100 × £2.90 **(× 100)** = £2.03 per bracelet **OR** £203 for 100 100 bracelets will cost £493	M1 A1 A1 M2 A1 M1 A1 A1 9	OR Number of small beads in necklace = 18× 5, or Number of large beads in necklace = 12× 5, or equivalent M1 for any 2 of these terms added together C.A.O. F.T. 70% of 'their£2.90' even if it is £80 or 80p **F.T. dependent on at least M1 (out of M2) and M1.**
10. (a) 13·6 (cm) 13·6 × 5 = 68 (km) (b) **Use Overlay** Bearing 136º from A Bearing 219º from B Point (M)	B1 M1 A1 M1 M1 A1 6	Allow 13·4 – 13·8 inclusive (ignore km here) FT 'their 13·6'×5 but M1,A0 for whole number × 5 km not required but A0 for incorrect units. Unsupported answers within 67–69 inclusive get B1,M1,A1. Unsupported answers outside 67–69 inclusive get 0. Allow ±2° Allow ±2° F.T. if at least M1 awarded. Unambiguous dots within the boundaries of the overlay can get the M1s. One unambiguous dot within the 'box' gets all 3 marks. Watch out for line segments. An unambiguous point of intersection does not require M.

2015 November Paper 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
11. (a) (x=) 180 – 90 – 33 (°) **OR 90 – 33 (°)** = 57 (°) (b) ∠D = 114 y = 180 –114–27 (°) = 39 (°)	 M1 A1 B1 M1 A1 5	Look in the diagram also. **General principle:** 141−180 = 39 gets M1,A1 141 −180 ≠ 39 gets M0,A0
12. 8x – 5x = 21 + 9 3x = 30 x = 10 **H1(a)**	B1 B1 B1 3	FT until 2nd error OR x = 30/3 Must be simplified *Accept an embedded answer of 10* **If no marks, allow 1st B1 only for sight of 3x and 30 (no '=').**
13. ($\frac{1}{5}$ + $\frac{3}{8}$) Sight of, or implied $\frac{8}{40}$ (+) $\frac{15}{40}$ or x/5 +3x/8 + 34 = x (Canada and Japan) $\frac{23}{40}$ OR (Wales) 1 – ($\frac{1}{5}$ + $\frac{3}{8}$) or 8x + 15x + 1360 = 40x or 23x/40 (+34 = x) (Wales) $\frac{17}{40}$ or equivalent or 1360 = 40x - 8x - 15x or 23x + 1360 = 40x or 23x/40 +34 = x 17/40 is equivalent to 34 or 34 × 40÷17 or 17x = 1360 or 17x/40 = 34 or equivalent (Idris has) 80 (relatives) **H3**	B1 B1 B1 M1 A1 5	If an algebraic method is used, FT until 2nd error Or equivalent, e.g. 16/80 (+) 30/80 If an algebraic method is used, only FT from B0 here if at least 3 of the terms are correct and it is then of equivalent difficulty Or equivalents (46/80) FT 'their 8/40 + 15/40' provided at least one of the fractions with common denominator is correct and addition of 'their fractions' is correct Sight of 17/40 or 34/80 implies all previous B marks FT 'their 1- 'their 8/40 + 15/40' provided previous B1 awarded Or alternative suitable strategy or method FT 'their 1- 'their 8/40 + 15/40' is equivalent to 34 provided previous B1 awarded CAO
14. $1 - \frac{1}{6} \times \frac{1}{6}$ or equivalent full method 35/36 **H2**	M1 A1 2	 **Mark final answer**
15. Use of area = ½ base × height, e.g. 12 = ½ ×x×6 (x =) 4 (metres) Area trapezium is ½×x×(6 + 14) 40 (m^2) **H5**	M1 A1 M1 A1 4	Accept written informally but must include relevant values **Must** show substitution for x. FT substitution of 'their derived x', **or unsupported 4 (m)** **Do not FT from a spurious measurement for x, only FT if working is seen to derive x** *Alternative for area of the trapezium, with diagonal splitting into 2 triangles, with the same height, areas of these triangles are $12m^2$ and $12×14/6= 28m^2$*
16. (a) 2, 14, 36 (b)–320 **H9(a)(b)**	B2 B1 3	Ignore any **subsequent** values given B1 for 2 correct terms in the correct position *SC1 for 0, 2, 14 or …, 2, 14, 36*

2015 November Paper 1 (Non calculator) Foundation Tier	Marks	FINAL MARK SCHEME Comments
17.		Ignore incorrect cancelling in final answers throughout. Penalise incorrect notation -1 once throughout this question.
(a) 71/392	B1	
(b) 138/392	B1	
(c) 28/138	B2	B1 for a numerator of 28 or a denominator of 138.
(d) 45/103	B2	B1 for a numerator of 45 or a denominator of 103.
(e) 213/271	B3	B2 for sight or intention or method towards calculating the appropriate probability, i.e. sight of (64+14+28 + 46+34+27) /(138+133) or (138-32 + 133–26)/(138+133) or (106 + 107)/(138+133) OR B1 for correct numerator 213 or correct denominator 271, or sight of 213 with 271, or for 106/138 or for 107/133.
H7	9	

PAPER 1 - HIGHER TIER

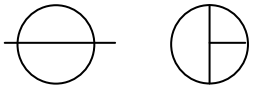
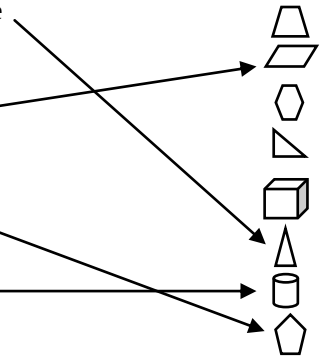
Linear GCSE Mathematics Higher Tier November 2015 Paper 1		**FINAL MARK SCHEME Comments**
1(a) 8x – 5x = 21 + 9 3x = 30 x = 10	B1 B1 B1	FT until 2nd error OR x = 30/3 Must be simplified *Accept an embedded answer of 10* *If no marks, allow 1st B1 only for sight of 3x and 30 (no '=').*
(b) - 4e (+) -5f	B2	Must be an expression. Mark final answer. B1 for either -4e or -5f
(c) (x =) 98	B1 6	Not for 7×14, must be evaluated
2. 1 - ⅙×⅙ or equivalent full method 35/36	M1 A1 2	 Mark final answer
3. Sight of, or implied 8/40 (+) 15/40 or x/5 +3x/8 + 34 = x	 B1	<u>If an algebraic method is used, FT until 2nd error</u> Or equivalent, e.g. 16/80 (+) 30/80 If an algebraic method is used, only FT from B0 here if at least 3 of the terms are correct and it is then of equivalent difficulty
(Canada and Japan) 23/40 or (Wales) 1 – (⅕+ ⅜) or 8x + 15x + 1360 = 40x or 23x/40 (+34 = x)	B1	Or equivalents (46/80) FT 'their 8/40 + 15/40' provided at least one of the fractions with common denominator is correct and addition of 'their fractions' is correct
(Wales) 17/40 or 1360 = 40x - 8x - 15x or 23x + 1360 = 40x or 23x/40 +34 = x or equivalent	B1	Sight of 17/40 or 34/80 implies all previous B marks FT 'their 1- 'their 8/40 + 15/40' provided previous B1 awarded
17/40 is equivalent to 34 or 34 × 40÷17 or 17x = 1360 or 17x/40 = 34 or equivalent	M1	Or alternative suitable strategy or method FT 'their 1- 'their 8/40 + 15/40' is equivalent to 34 provided previous B1 awarded
(Idris has) 80 (relatives)	A1 5	CAO

Linear GCSE Mathematics Higher Tier November 2015 Paper 1		FINAL MARK SCHEME Comments
4. (Standing charge) 90 × (0.)28	M1	
2520(p) or (£)25.2(0)	A1	If units are given they must be correct. Mark final answer
(Electricity charge) 850 × (0.)14	M1	
11900(p) or (£)119	A1	If units are given they must be correct. Mark final answer
(Total charges) 14420(p) or (£) 144.2(0)	B1	FT provided both M marks awarded. If units are given they must be correct OR FT 'their <u>previous consistent</u> units'
(Total cost including VAT) 144.2 × 1.05 or equivalent	M1	FT 'their 144.2' or 'their 14420' which must follow a sum of at least two amounts, one of which must be either 90 × (0.)28 or 850 × (0.)14 (i.e. at least one of previous M1s) For full method, 144.2(0)×0.05+144.2(0) (=7.21+144.20)
(Total bill) (£)151.41 or 15141(p)	A1	If units are given they must be correct OR units <u>consistent with previously stated</u> units given
QWC2: Candidates will be expected to • present work clearly, maybe with diagrams and 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, maybe with diagrams and 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	QWC 2 9	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
<u>5.</u> **Use of** area = ½ base × height, e.g. 12 = ½ ×x×6	M1	Accept written informally but must include relevant values
(x =) 4 (metres)	A1	
Area trapezium is ½×x×(6 + 14)	M1	**Must** show substitution for x. FT substitution of 'their derived x', or unsupported 4 (m) Do not FT from spurious a measurement for x, only FT if working is seen to derive x
40 (m^2)	A1	*Alternative for area of the trapezium, with diagonal splitting into 2 triangles, with the same height, areas of these triangles are 12m^2 and 12×14/6= 28m^2*
	4	

Linear GCSE Mathematics Higher Tier November 2015 Paper 1		FINAL MARK SCHEME Comments
6.		**Do not accept working with other polygons, no misread** Accept angles written on the diagram
(Exterior angle method) 360÷10 or 360÷6	M1	
36(°) AND 60(°) without contradiction	A2	Award only A1 if these angles are marked as interior angles on the diagram A1 for either angle (irrespective of indication)
Gap 96(°) (which is >90°) without contradiction	A1	Do not award if 264° is indicated as the gap on the diagram, or implied as the gap FT their '360÷10' and their '360÷6'
		Alternative: *Full method, interior angle for 10-sided or hexagon M1* *(10-2)× 180÷10 OR 180 - 360÷10* *(6-2)× 180÷6 OR 180 - 360÷6* *Interior angles 144(°) AND 120(°) A2* *(A1 only if marked as exterior angles on the diagram)* *(Accept sight of 264(°) for M1, A2)* *(A1 for either angle irrespective of indication)* *(360 – 144 – 120) Gap 96(°) (which is >90°) without contradiction A1* *(FT from correct method but with errors in calculations)*
		Further alternative: *Exterior angle of hexagon = 60(°) M1, A1* *If x = 90(°), then the exterior angle of the decagon would be 90(°) – 60(°) = 30(°) **AND*** *the number of sides of the decagon would be 360(°) ÷ 30(°) = 12 A1* *But the decagon has only 10 sides, so x must be greater than 90(°), since regular polygons with fewer sides have greater exterior angles. A1*
	4	Note: Maximum of 2 marks available if angles are marked incorrectly interior when exterior and vice versa, M1, A1, A0, A0
7.		**Ignore incorrect cancelling in final answers throughout** Penalise incorrect notation -1 only throughout this question
(a) 71/392	B1	
(b) 138/392	B1	
(c) 28/138	B2	B1 for a numerator of 28 or a denominator of 138
(d) 45/103	B2	B1 for a numerator of 45 or a denominator of 103
(e) 213/271	B3	B2 for sight or intention or method towards calculating the appropriate probability, i.e. sight of (64+14+28 + 46+34+27) /(138+133) or (138-32 + 133–26)/(138+133) or (106 + 107)/(138+133) OR B1 for correct numerator 213 or correct denominator 271, or sight of 213 with 271, or for 106/138 or for 107/133
	9	
8(a)Any 2 of the lines: x+y=3, y=-2x + 6, y= 2 correct	B2	B1 for any 1 correct line
Correct region shaded	B1	CAO
(b) Yes, Yes, No	B1	CAO (No FT). Independent mark from 8(a)
	4	

Linear GCSE Mathematics Higher Tier November 2015 Paper 1		FINAL MARK SCHEME Comments
9(a) 2, 14, 36	B2	Ignore any subsequent values given B1 for 2 correct terms in the correct position *SC1 for 0, 2, 14 or …, 2, 14, 36*
(b) -320	B1	
(c) $2n^2$ or equivalent (e.g. $n^2 + n^2$ or $n^2 \times 2$)	B2	Mark final answer B1 for (a)$n^2(\pm\ldots)$ with a $\neq 0$, or sight of consistent second difference 4
	5	
10(a) $6x^2 + 21x – 2x - 7$ $= 6x^2 + 19x – 7$	B2 B1	B1 for any 3 terms correct out of 4 FT from B1 provided collection required provided equivalent difficulty, i.e. x^2, x and number terms. Mark final answer *Sight of $6x^2 - 19x – 7$ without sight of the 2 middle terms is awarded B2, B0* *If no marks award SC1 for an answer of $6x^2$ (…) – 7*
(b) $(x + 3)^8$	B1	CAO. Mark final answer
(c) $-36 = k\times 9$ or $-36 = k\times 3^2$ seen or implied $k = -4$ or sight of $y = -4x^2$ or equivalent $y = -4\times 5^2$ $y = -100$	M1 A1 m1 A1 8	Do not treat $36 = k\times 5^2$ as a misread Informal notation is acceptable FT their value for k provided M1 awarded
11(a) 2 and 22 (b) Any 5 correct plots All 7 correct plots joined with a smooth curve	B2 B1 B1	B1 for each correct answer FT from (a) FT from (a)
(c) (-1, 6) and (1, 2)	B2	B1 for each answer, or for sight of -1 and 1 FT from their graph
(d) (x =) -2.2…	B1 7	Must be a unique answer (although FT may lead to more than one solution, in which case all are required) FT intersection(s) with x-axis from their graph Reading tolerance to nearest small square
12. 4r(aspberries) + 5b(lackcurrants) = (£)38 6r(aspberries) + 3b(lackcurrants) = (£)39	S1	For both equations, in symbols or words, however '+' and '=' must be shown as symbols Do not accept 4kg + 5kg = 38 with 6kg + 3kg = 39 *FT provided at least 1 equation correct, but 1 slip in the other equation*
Method to eliminate variable, e.g. equal coefficients First variable Substitute to find second variable	M1 A1 m1	Allow 1 error in one term, not one with equal coefficients **raspberries r = (£)4.5(0) or blackcurrants b = (£)4** FT their first variable FT for m1 not A1 if 'their first variable is negative'
Second variable Jen pays (£)50.5(0)	A1 B1 6	FT provided M1 and m1 awarded, for correct evaluation of 'their 5r + 7b'
13(a) $7h = 11q + 3p – 5p$ or $7h = 11q - 2p$ or equivalent $h = \frac{11q + 3p – 5p}{7}$ or equivalent $h = \frac{11q - 2p}{7}$ or $h = \frac{2p – 11q}{-7}$	B1 B1 B1	Sight of $7h = 11q + 8p$ is 1 error (then FT) FT until 2nd error Implies previous B2. Mark final answer
(b) $ef – kf = t + d$ OR $–d – t = kf - ef$ $f(e – k) = t + d$ OR $–d – t = f(k – e)$ $f = \frac{t + d}{e – k}$ OR $\frac{-d – t}{k - e} = f$	B1 B1 B1 6	FT until 2nd error

Linear GCSE Mathematics Higher Tier November 2015 Paper 1		FINAL MARK SCHEME Comments
14(a) 108° (b) AĈB = 19(°)	B1 B3 4	 B2 for AÔB = 38(°), OR B1 for HÂO = 90(°) AND also possible B1 for indication (which may be shown as values) that AĈB is ½ AÔB, or AÔB is double AĈB *Accept indication on the diagram or written in working space*
15(a) 1 (b) ¼ (c) $12\sqrt{2}$	B1 B2 B2 5	 B1 for sight of $1/2^2$ or 4^{-1} or $1/_3\sqrt{64}$ or $1/64^{⅓}$ or 2^{-2} or $1/(_3\sqrt{8})^2$ Mark final answer B1 for sight of 288 broken down into factors e.g. 2×144, or 288÷2 = 144, or 12×12×2, or 4×72, or 288 ÷4 = 72, or 2×12^2, or $2^2\times72$, or $2^3\times6^2$
16(a) Translation horizontally to the left Correct translation AND -3 indicated on the x-axis (b) Idea of reflection in x-axis Idea of vertical translation Correct transformation with +2 indicated on the y-axis	B1 B1 B1 B1 B1 5	 *SC1 for translation horizontally to the right AND 3 indicated on the x-axis* May include an incorrect translation, but clearly there has been a reflection Allow 'up' or 'down' *Previous B1 marks are independent of each other, but no FT* CAO for correct transformation
17. Sight of (Ben) 45/2 OR (Sara) 39/3 Select and use correct average speeds: greatest (Ben) 22.5 AND least (Sara) 13 9.5 (km/h)	B2 B1 B1 4	B1 for sight of (greatest distance) 45 or (least distance) 39 CAO
18. $8(3x+1) + (5x+9)((2x-1) = 4(2x-1)(3x+1)$ or $\frac{8(3x+1) + (5x+9)((2x-1)}{(2x-1)(3x+1)} = 4$ $24x + 8 + 10x^2 + 18x – 5x – 9$ or equivalent $4(6x^2 – 3x + 2x -1)$ or $24x^2 – 12x + 8x -4$ or equivalent $14x^2 – 41x – 3 = 0$ or equivalent $(14x + 1)(x – 3)$ (=0) $x = -1/14$ and $x = 3$	M1 M1 M1 A2 A1 A1 7	 For expansion of LHS or numerator brackets, ignore '= …' or denominator. Independent of first M mark Independent of first M mark CAO A1 for any two of $14x^2$, -41x and -3 correct in a similar equation '=0', or terms $-14x^2$, 41x and 3 in an equivalent equation (e.g. $14x^2 = 41x + 3$) A1 for the expression $14x^2 – 41x – 3$, unless '=' reappears later or shows correct solutions, then award A2 FT correct factorisation of quadratic of equivalent level of difficulty provided M3 previously awarded Allow use of quadratic formula, for this A1, need to see their substitution correct with $b^2 – 4ac$ correctly simplified. *No marks for trial and improvement method*

2015 November Paper 2 (Calculator allowed) Foundation Tier	**Marks**	**FINAL MARK SCHEME Comments**
1. (a) (148.20) 30.12 (paste) 49.92 (e paint) 58.16 (g paint)	 B1 B1 B1	
(£) 286.4(0)	B1	F.T. their figures
(b) 10% = 28.64 5% = 14.32 OR (0).05 × 286.4(0) Discount = (£) 14.32 He pays (£)272.08	M1 A1 A1	For any correct method for finding 5% F.T. 'their total'. Ignore extra decimal places. F.T. 'their total – their discount'
Alternative: *0.95× their 286.4(0)* *He pays (£)272.08*	 *M2* *A1*	
(c) Cost = (£)1.56 + (£)2.86 + 98(p) = (£)5.4(0) OR (£)6 – (£)1.56 – (£)2.86 – (£ 0).98 Change = 60(p) OR (£0).6(0)	M1 A1 B1 10	M0, A0 if coffee used instead of tea, but B1 is possible. F.T. 'their £5.40', but B0 if more than £6 **Accept £(0).60p** **B0 for (0).60p. Unsupported (0).60p gets M0,A0,B0**
2. (a) Height: (2 m) 20 m 2 mm 2 cm Weight: 3 g 3 mg 30 kg (3 kg) Volume: 3 litres 30 cm^3 (300 ml) 30 ml Area: (12 m^2) 12 cm^2 12 mm^2 12 cm^3	 B1 B1 B1 B1	
(b) Circle radius 6cm ± 2mm	B1	Continuous line that is drawn with a pair of compasses or good attempt free hand.
Diameter drawn  Too long B0 No labels B0 **If right hand diagram is labelled correctly e.g. diameter and/or radius OR 12cm and /or 6cm then B1**	B1 6	FT their circle (including free hand circles) Mark intention to draw through the centre ± 2mm Unambiguous line
3. Isosceles triangle Parallelogram Pentagon Cylinder 	B1 B1 B1 B1 4	
4. (a) Evidence of square counting 67 – 73 335 – 365	M1 A1 B1	 Inclusive. Inclusive. F.T. 'their 67 – 73' × 5 Unsupported answers in the range 335 – 365 get all 3 marks. Condone square notation, e.g. 70^2, but $70^2 = 4900$ gets A0
(b) Lines Curve	B1 B1 5	For all 3 lines. F.T. their lines, must have opposite curvature, start at the correct place and end at the start of their top line.

2015 November Paper 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
5. Condone notation such as .02p for 2p, .20p for 20p etc		OR
Must give 6 coins and get one back in change	S1	Attempt at trialling to pay total coins >£1.78 & state change
Total of coins = £2.94 OR 294p (Spent = £ 1.78 OR 178p)	B1	2nd trial total coins >£1.78 & state correct change
Coins = £1, 50p, 20p, 5p, 2p, 2p (Change of 1p)	B1	Coins = £1, 50p, 20p, 5p, 2p, 2p (Change of 1p)
OR B1 for Amount left = £1.16 **OR £1.14 + 2p change**		
Coins = £1, 10p, 5p, 1p	B1	Coins = £1, 10p, 5p, 1p
Allow the use of a coin to pay that is then given back in change: e.g. 7 coins £1, 50p, 20p, 5p, 5p, 2p and 2p which amounts to £1.84 and then gives the change as 1p and 5p.		A correct solution is awarded B4
Look for (in the most part)	QWC 2	
Strand 1: For 1 mark Candidates will be expected to • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means		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.
Strand 2: For 1 mark Candidates will be expected to • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling.
	6	
6. (a) 36 45 56 61 74 77 87 110	M1	For identifying the correct TWO middle numbers OR for arranging the 8 numbers in ascending or descending order.
Median = (135/2) = 67.5 (cm)	A1	C.A.O. Unsupported 67.5 gets M1, A1.
(b) Sum of the numbers (546)	M1	For attempt to add all the numbers
Sum/8	M1	For dividing a number in the range 436 to 656 by 8.
Mean = 68.25 (cm) **I.S.W.**	A1	C.A.O.
(c) (Range =) 74 (cm)	B1	
	6	
7.		**In part (a) if acceptable answer seen award the mark and ignore other answers.**
(a) (i) Subtract 12 from the previous term	B1	Accept subtract 12, –12, 'goes down in 12s', etc B0 for n–12, OR –12n + 110
(ii) Multiply previous term by 5	B1	Accept ×5 etc B0 for n×5 or 5n
(b) (i) **1.2(0)**	B1	
(ii) 140.6**(08) I.S.W.**	B1	
(c) (0) .09	B1	
(d) 1000/68 **OR 10/0.68 OR** 14.(705...)	M1	OR 14 notebooks cost (£)9.52, 15 cost (£)10.20 (therefore)
He can buy 14 notebooks .	A1	14 **OR use of 70p×14 gets M1,A1.**
Change =1000 – 14×68 = 48p OR (£0).48	**B1**	**F.T. 1000 – 'their 14'×68.** B0 for .48p.
(e) $\frac{4}{9} \times 63$	M1	**Changing 4/9 to decimals or percentages will lead to approximations and not to 28. This gets M1,A0**
= 28	A1	
	10	

2015 November Paper 2 (Calculator allowed) Foundation Tier		Marks	FINAL MARK SCHEME Comments
8. (a) 2a – b		B2	Mark final answer. Must be an expression. B1 for either term, 2a or -b OR 2a + (–b)
(b) 12		**B2**	**Final answer must be 12 for the B2.** **B1 for 'Add 7 to get 48' followed by** **B1 for 'Divide by 4 to get 12'** **Accept embedded answers.**
(c) Sight of 380 or 260	Sight of (1 ap + 1 pr weighs) 260 (g) OR Sight of (2 ap + 1 pr weighs) 380 (g)	B1	For either reading from the scales
1 apple weighs **380** – 260 **(= 120(g))**	2 ap+ 2 pr weigh 520 (g)	M1	F.T. their reading provided 'their 260' is between 200 and 300 exclusive, **AND** 'their 380' is between 300 and 400 exclusive
1 pear weighs 260 – 120 = 140 (g)	1 pear weighs 520 – 380 = 140 (g)	m1 A1 8	**Follow through 'their values for 380, 260 and 520'** C.A.O. A correct solution is awarded all 4 marks
9. (a) **a** 1278 **b** 236.43 **c** 11.82(15) **d** 248.25(15) (12.46) **e** 260.71(15)		B1 B1 B1 B1 B1	C.A.O. F.T. 'their a' × 0.185 F.T. 'their b' × 0.05 F.T. 'their b' + 'their c' F.T. 'their d' + 12.46
(b) 260.71(15) / 3 = (£)86.90		M1 A1 7	F.T. 'their e'/3
10.(a) (£)660		B1	
(b) (£)120		B1	
(c) Reasonable straight line of best fit		B1	Some points above and some points below. Do not accept if clearly joining (4, 120) and (0, 660) or corner to corner of the graph paper
(d) Negative (correlation)		B1	
(e) FT from a 'line of best fit' (reading accurate to small square) (curved line or straight line, not dot-to-dot)		B1	**OR** B1 for an answer between (£)260 and (£)320 inclusive only if no line of best fit or if B0 awarded in part (c) Reading accurate to gridline if within a small square, if shown to be on a gridline reading should be accurate
H1		5	

2015 November Paper 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
11. (a) OR Stephen is more likely to win because EVEN wins 10 times, ODD wins 6 times (out of 16) **OR Probabilities : EVEN 10/16 or 5/8 ODD 6/16 or 3/8**	S1 B2 E1	For any strategy that attempts to derive the sample space. Accuracy of entries. B1 **for any 6 correct entries** **Candidates can get all 4 marks for an explanation that clearly shows that there are more sample entries that are even than odd. (as in the example given in the conference)** Correct deduction. F.T. only if at least 13 entries (not all **necessarily** correct)
11. (b) EVEN wins 10 times, ODD wins 6 times (out of 16) so game is not fair (c) **(Drawing this table is not required, but can be either of the two types shown in part (a).)** (i) Choice of any two even with any two odd numbers (ii) Rule stated, e.g. '2 even and 2 odd (numbers)'	B1 E1 B1 E1 8	B1 **for any 6 correct entries** **Candidates can get both marks for an explanation that clearly shows that there are more sample entries that are even than odd. (as in the example given in the conference)** Correct deduction. F.T. only if at least 13 entries (not all **necessarily** correct) F.T. from (i)
12. **Use overlay** (a) Scale factor 2 enlargement (Intention of the) Correct position (b) Correct rotation about (1, 2) **H3**	 B1 B1 B2 4	 In the correct orientation (Watch for the position of the bottom left vertex **of a rectangle**) B1 for rotation of 180° about (2, 1)
13.(a) 350 × 192.45 67357.5(0) (Icelandic krona) (b) 2608.32 ÷ 100.32 (£) 26 (c) **Use of** 53.67 rubles = 192.45 krona, e.g. sight of 192.45÷53.67 (=3.585…) or 53.67÷192.45 (= 0.278…) **OR** 100 rubles = (£) 100÷53.67 (=£ 1.86(32)) **OR** 1 ruble = (£) 1/53.67 (=£0.0186…) 1 ruble = 192.45÷53.67 (=3.585…) krona, or work with proportion or ratio as a stage towards unitary equivalence OR 192.45 × (£)1.86(32) or 192.45 × 100÷53.67 (100 rubles) Answers in the range 357.6 to **360** (krona) **H5**	M1 A1 M1 A1 B1 M1 A1 7	 **Incorrect units get A0** Candidates need to show an attempt at a calculation using 53.67 and 192.45. Do not accept if rupees are also inappropriately included. Accept sight of unsupported 3.58… , 3.6, 0.27… or 0.28, OR (£)1.86(32) Must be a method that could lead to a correct response if all calculations were to be correctly evaluated FT 'their incorrectly evaluated 100÷53.67' **Unsupported answers in the range 357.6 to 360 (krona) get B1M1A1**

2015 November Paper 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
14.(a)		*If an error is made with 1 – 0.24 or equivalent, i.e. working with e.g. uniquely 0.66 or 0.86, penalise -1 once only*
(Rowena's car depreciated value) (£)3500×0.76^3	M2	M1 for 3500×0.76 or $3500 - 3500 \times 0.24$ or 2660, or allow M1 for $3500 - 3500 \times 0.24^3$, or M1 for simple **depreciation** 3500 - 3×840 (= £980) **M1 for appreciation 3500×1.24**
(£)1536(.416)	A1	CAO, but accept 1540 from correct working or a value rounding to (£)1536
(Dafydd needs to save a total of £1536(.416) - £100) (£)1436(.416)	B1	FT 'their 1536' – 100 evaluated correctly provided at least M1 awarded *If no marks so far due to working with £3400, then award SC3 for (£)1492.51(84) or (£)1492.52 , or* *SC2 for 3400×0.76^3, or* *SC1 for sight of 3400×0.76 or $3400 - 3400 \times 0.24$ or allow for sight of $3400 - 3400 \times 0.24^3$* ***or 3400 - 3×816 (=952****)*
(Dafydd needs to save, per month £) 1436(.416) ÷ 36	M1	FT 'their 1436(.416)' ÷ 36, i.e. what they think the car is now worth, but **do not** FT for 3500÷ 36 or 3400÷ 36 Note: £1536(.416) ÷ 36 – (£)100 ÷ 36 is equivalent to B1, M1
(£) 40	A2	A1 for (£)39.88… to (£)39.90(00...) FT for A2 provided rounding is necessary, otherwise maximum of FT A1 only. When rounding is necessary, accept rounding up or down to the nearest pound if number of pence is <50 *An answer of (£)43 is from (£)1536(.416) ÷ 36 evaluated correctly with answer to the nearest £, this is awarded M2, A1, B0, then FT M1 and A2 (or A1 for (£)42.6(….)* ***or (£)42.70*** ***'Trial and improvement' method leading to (£)40 gets full marks***
(b) Conclusion stated or implied with a suitable reason, e.g. 'yes, because he might get interest on his money so have more than he needs', or 'no, because Rowena only estimated the value (and the car could be worth more)'**, 'don't know because Rowena may decide to sell it for more or less than its value after depreciation'**	E1	Do not accept contradictions given in the response, **unless the candidate is clearly discussing uncertainty.** **Accept 'don't know' or 'unsure' within a reasoned answer.** **Candidates need to express uncertainty of depreciation or relate to a rounding of their answer for Dafydd's saving plan** **Accept 'yes, as Rowena's car could depreciate more than 24% (a year)'** **Accept 'no' or 'yes' as appropriate with 'Dafydd's saving is rounded to the nearest pound' (yes if rounding was up in (a), no if rounding was down in (a)) or with calculations to show there is less/more in his account than what he thinks he needs, or reverse working to show amount saved × 36 < or > depreciated value.** **Do not accept the statement 'I think the amount Dafydd is saving each month will be enough to buy the car' without a valid reason or calculation(s)**
H8	8	

2015 November Paper 2 (Calculator allowed) Foundation Tier	Marks	FINAL MARK SCHEME Comments
15. (a) $10y^3 - 15y$	B2	**Must be as an expression. Mark final answer.** **B1 for either term correct OR $10y^3$ +(–15y)**
(b) $20h^5$	B1	
(c) $3 < n < 6½$ OR $3 < n < 13/2$ OR $n > 3$ with $n < 6½$	M1	
$n = 4,5,6$	A2	A1 for all 3 with at most 1 error OR any 2 correct and no errors **If no marks, award** SC2 for sight of any 2 correct answers with no incorrect answer **If no marks, award** SC1 for sight of any 1 correct answer with no incorrect answer **Accept embedded answers**
H7bc	6	

PAPER 2 - HIGHER TIER

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		**FINAL MARK SCHEME Comments**
1.(a) (£)660	B1	
(b) (£)120	B1	
(c) Reasonable straight line of best fit	B1	Some points above and some points below. Do not accept if clearly joining (4, 120) and (0, 660) or corner to corner of the graph paper
(d) Negative (correlation)	B1	
(e) FT from a 'line of best fit' (curved line or straight line, not dot-to-dot)	B1	**OR** B1 for an answer between (£)260 and (£)320 inclusive only if no line of best fit or if B0 awarded in part (c) Reading accurate to gridline if within a small square, if shown to be on a gridline reading should be accurate
	5	
2. a = 93(°)	B1	
b = 87(°)	B1	FT 180 – their a
c = 78(°)	B1	
d = 102(°)	B1	FT 180 – their c
	4	
3.(a) Scale factor 2 enlargement	B1	In the correct orientation
(Intention of the) Correct position	B1	(Watch for the position of the bottom left vertex)
(b) Correct rotation about (1, 2)	B2	B1 for rotation of 180° about (2, 1)
	4	
4.(a) Yes, with working, e.g. 2×4 - 3× - 2 or 8 - - 6 (= 8 + 6 = 14)	B1	
(b) No, with working, e.g. 2×4 (≠) 4^2 or 8 (≠) 16	B1	Allow incorrect use of '=' provided intention is clear and No selected as their response Ignore a slip, not a misinterpretation, in calculating 2×4 if 4^2 is correctly evaluated as 16. But obviously do not accept 2×4 evaluated as 2^4 (=16) as a slip.
(c) Coordinates of any two points that lie on x + y = -4	B2	B1 for coordinates of any one correct point.
	4	
5.(a) 350 × 192.45	M1	
67357.5(0) (Icelandic krona)	A1	
(b) 2608.32 ÷ 100.32	M1	
(£) 26	A1	
(c) **Use of** 53.67 rubles = 192.45 krona, e.g. sight of 192.45÷53.67 (=3.585…) or 53.67÷192.45 (= 0.278…) **OR** 100 rubles = (£) 100÷53.67 (=£ 1.86(32)) **OR** 1 ruble = (£) 1/53.67 (=£0.0186…)	B1	Candidates need to show an attempt at a calculation using 53.67 and 192.45. Do not accept if rupees as also inappropriately included. Accept sight of unsupported 3.58… , 3.6, 0.27… or 0.28, OR (£)1.86(32)
1 ruble = 192.45÷53.67 (=3.585…) krona, or work with proportion or ratio as a stage towards unitary equivalence **OR** 192.45 × (£)1.86(32) or 192.45 × 100÷53.67	M1	Must be a method that could lead to a correct response if all calculations were to be correctly evaluated FT 'their incorrectly evaluated 100÷53.67'
(100 rubles) Answers in the range 357.6 to 360 (krona)	A1	
	7	

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
6.(a)(i) Mid-points 10, 20, 30, 40 $10\times5 + 20\times10 + 30\times12 + 40\times1$ Intention their $\sum fx / 28$ 23(.214…cm)	B1 M1 m1 A1	 FT their mid points, including bounds, provided they fall within the classes. 50 + 200 + 360 + 40 (= 650) (650/28) Following correct working, however accept unsupported 23(.2..cm) for all 4 marks.
(ii) Modal class $25 \leq s < 35$ (iii) Median $15 \leq s < 25$	B1 B1	Accept '25 to 35' or any other unambiguous indication Accept '15 to 25' or any other unambiguous indication *If neither B1 awarded in (ii) or (iii), then award SC1 for answers of 30 and 20 respectively.*
(b) Explanation with understanding that heavy snowfall on (some of) the other days would raise the mean (but that the arranged data mid value could still be lower), e.g. 'the median is 9 cm, so all the snowfall greater than this can increase the mean', 'just one day with heavy snowfall can raise the mean', 'the mean is an average so on the other days snowfall was much higher'	E1 7	Needs to demonstrate understanding that heavy snowfall during the other half of the 28 days. Allow 'there may be other places **in Terragal** that have more snowfall than where Ralph was on holiday' (must refer to 'places in Terragal' Do not accept 'other areas of Terragal may be different', or 'the mean is the addition of all the snowfall' without further comment regarding 'the others days' or 'other areas of Terragal' with heavy snowfall
7.(a) $8x(x - 2)$ (b) $10y^3 - 15y$ (c) $20h^5$ (d) $2f^5$	B2 B2 B1 B1 6	B1 for correctly partially factorised, or for $8x(x \ldots.)$ or $8x(... -2)$ Must be as an expression. Mark final answer. B1 for either term correct

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
8.(a)		*If an error is made with 1 – 0.24 or equivalent, i.e. working with e.g. uniquely 0.66 or 0.86, penalise -1 once only*
(Rowena's car depreciated value) (£)3500×0.76^3 or equivalent	M2	M1 for 3500×0.76 or $3500 - 3500 \times 0.24$ or 2660, or allow M1 for $3500 - 3500 \times 0.24^3$, or M1 for simple depreciation $3500 - 3 \times 840$ (= £980) M1 for appreciation 3500×1.24
(£)1536(.416)	A1	CAO, but accept 1540 from correct working or a value rounding to (£)1536
(Dafydd needs to save a total of £1536(.416) - £100) (£)1436(.416)	B1	FT 'their 1536' – 100 evaluated correctly provided at least M1 awarded *If no marks so far due to working with £3400, then award SC3 for (£)1492.51(84) or (£)1492.52 , or* *SC2 for* 3400×0.76^3*, or* *SC1 for sight of* 3400×0.76 *or* $3400 - 3400 \times 0.24$ *or allow for sight of* $3400 - 3400 \times 0.24^3$ *or* $3400 - 3 \times 816$ *(=952)*
(Dafydd needs to save, per month £) 1436(.416) ÷ 36	M1	FT 'their 1436(.416)' ÷ 36, i.e. what they think the car is now worth, but **do not** FT for 3500÷ 36 or 3400÷ 36 Note: £1536(.416) ÷ 36 – (£)100 ÷ 36 is equivalent to B1, M1
(£) 40	A2	A1 for (£)39.88… to (£)39.90(00...) FT for A2 provided rounding is necessary, otherwise maximum of FT A1 only. When rounding is necessary, accept rounding up or down to the nearest pound if number of pence is <50 *An answer of (£)43 is from (£)1536(.416) ÷ 36 evaluated correctly with answer to the nearest £, this is awarded M2, A1, B0, then FT M1 and A2 (or A1 for (£)42.6(….) or (£)42.70*
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	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 or grammar.

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
(b) Conclusion stated or implied with a suitable reason, e.g. 'yes, because he might get interest on his money so have more than he needs', or 'no, because Rowena only estimated the value (and the car could be worth more)', 'don't know because Rowena may decide to sell it for more or less than its value after depreciation'	E1 10	Do not accept contradictions given in the response, unless the candidate is clearly discussing uncertainty. Accept 'don't know' or 'unsure' within a reasoned answer. Candidates need to express uncertainty of depreciation or relate to a rounding of their answer for Dafydd's saving plan Accept 'yes, as Rowena's car could depreciate more than 24% (a year)' Accept 'no' or 'yes' as appropriate with 'Dafydd's saving is rounded to the nearest pound' (yes if rounding was up in (a), no if rounding was down in (a)) or with calculations to show there is less/more in his account than what he thinks he needs, or reverse working to show amount saved × 36 < or > depreciated value. Do not accept the statement 'I think the amount Dafydd is saving each month will be enough to buy the car' without a valid reason or calculation(s)
9.(a) $14.8^2 = 7.9^2 + x^2$ or $(x^2 =) 14.8^2 - 7.9^2$ $x^2 = 156.63$ or $(x =) \sqrt{156.63}$ $(x =)$ 12.5(15…cm) (b) $y = 12.3 \times \sin 45.9°$ $(y =)$ 8.8(3295..cm)	M1 A1 A1 M2 A1 6	 ISW. Allow 13(cm) following correct working M1 for $\sin 45.9° = y/12.3$
10.(a) Intention to subtract cumulative frequency readings at 35 and 20 seconds, sight of 90 – 30 60 (passengers) (b) Intention to subtract cumulative frequency reading at 40 from 100 (100 – 94 to 96) Answer 4, 5 or 6 (passengers) (c) Intention to find the difference between 30 seconds and the time when the cumulative frequency is 85(%) (32 to 33 - 30) Answer between 2 to 3 (seconds) inclusive	M1 A1 M1 A1 M1 A1 6	 An answer between 4 and 6 which is not a whole number implies M1 Accept an answer that states the range 'between 0 and 10 (passengers) Accept an answer that states the range 'between 0 and 5 (seconds)

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
11.(a) $\pi \times r^2 = 35$	M1	
$r = \sqrt{(35/\pi)}$ $(=\sqrt{11.13\ldots})$	A1	
$r = 3.3(37\ldots m)$	A1	Allow A1 for r = 3 (m) only if 3.3(37…) or $\sqrt{11.13\ldots}$ is seen in previous working
Diameter in the range 6.67…(m) to 6.68(m)	A1	FT from 3 m gives a diameter of 6(m) which is A0, as premature approximate *Allow trial & improvement:* • *showing substitution for r between 3.2(cm) and 3.4(cm) M1* • *calculation for r between 3.2(cm) and 3.4(cm) A1* • *r = 3.3(… cm) A1* • *diameter in the range 6.67…(m) to 6.68(m) A1*
(b) 1000 litre = $1m^3$, or 1 litre = 0.001 m^3, or 1000 litre = 1 000 000cm^3 AND 1 000 000cm^3 = $1m^3$, or 1 litre = 1000cm^3 AND $1m^3$ = 1 000 000cm^3	B1	OR equivalent for 50 litre comparisons, e.g. 50 litres = 0.05 m^3
0.05 (m^3) in 60 (seconds) or 0.05÷60 (m^3/s) or 0.05/60	M1	FT 'their 0.05'÷60 provided 'their 0.05' ≠ 50, i.e. not 0.83(3..). Other sightings of digits 83(3…) implies M1
8.33×10^{-4} (m^3/s to 3s.f.)	A2	A1 for 0.000833 or 8.3×10^{-4} or $8.333(3..)\times10^{-4}$ or 0.833×10^{-3} or sight of digits 833 (*e.g. FT from 50000 gives 50000÷60 = 8.33 ×10²*) *If no marks as B0, M0 with sight of 0.83(3…), then allow SC1 for an answer of 8.33 × 10⁻¹*
	8	
12.(a) Strategy, finding area	M1	Any single area is sufficient
$0.25\times20 + 1\times10 + 1.8\times5 + 2\times5 + 0.5\times10$	M1	Allow 1 error in 1 of the products (Note for markers: 5+10+9+10+5)
39 (people)	A1	CAO
(b) $2\times3 + 0.5\times10$	M1	
11 (people)	A1	
(c) Explanation of the first bar now being only between 10 and 20 with double the height or with height 0.5.	E1	FT if possible from (a) Do not accept mention only that there is now no bar between 0 and 10. However, accept mention only of just double height bar **between** 10 and 20 Do not accept 'the frequency density is increased' without saying to what or how.
	6	

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
13.(a) $(x + 3)(x - 8)$ $x = -3$ with $x = 8$	B2 B1	B1 for $(x -3)(x +8)$ or $x(x-8)+3(x-8)$ or equivalent Strict FT from their pair of brackets FT from their pair of brackets, or from previous B1 Do not accept answer only, must FT from factorising
(b) $x = \frac{-2 \pm \sqrt{(2^2 - 4\times5\times-9)}}{2 \times 5}$ $= \frac{-2 \pm \sqrt{184}}{10}$ $x = 1.16$ with $x = -1.56$ (Answer to 2dp)	M1 A1 A1 6	Allow one error in sign or substitution, not in the formula CAO CAO *For a trial & improvement method:* *Trial of a value between 1 and 2* *AND a value between -1 and -2* *M1* *Correct evaluations for values either side of* *1.16 AND -1.56* *A1* *$x = 1.16$ with $x = -1.56$ (Answer to 2dp)* *A1*
14.(a) P(plain, plain) with sight of $5/20 \times 4/19$ or $5/20 \times 4/20$ $(5/20 \times 4/19 =) 20/380$	S1 B1	Including replacement ISW $(2/38 = 1/19)$
(b) 1 - P(red, red) or P(red, not red) + P(not red, red) + P(not red, not red) $1 - 2/20 \times 1/19$ or $2/20\times18/19 + 18/20 \times 2/19 + 18/20\times17/19$ $378/380$	S1 M1 A1 5	OR equivalent. Including replacement OR equivalent full method that could lead to a correct answer (ISW) *If no marks, SC1 for 1-P(not red, not red) leading to an answer of 74/380, or* *SC1 for P(red, not red) + P (not red, not red) or* *P(not red, red) + P (not red, not red) leading to an answer of 342/380*
15. Seen or implied: linear scale factor $32/26$ (=1.23…) or $26/32$ (= 0.8125) OR volume scale factor $(32/26)^3$ (=1.8643…) or $(26/32)^3$ (=0.5363…) Smaller volume $(26/32)^3 \times 500$ OR $500 \div (32/26)^3$ 268(.188.. cm^3)	S1 M1 A1 3	Accept sight of $(500\times 32/26 =) 615(.38…)$ or $(500\times 26/32 =)$ 406(.25) as evidence of linear scale factor Accept rounded or truncated *Penalise premature approximation of the scale factor, e.g. linear $(32/26 =) 1.2$, leading to $(1.2)^3$ becoming 1.7(…), by awarding A0, but allowing S1 and possible M1*
16.(a) Correct **curved** graph through (0°, 1), (90°, 0), (180°, -1), (270°, 0) & (360°, 1)	B1	Do not allow straight line towards 0°, 180° or 360°
(b) 128(°) with 232(°)	B2 3	B1 for sight of 128(.0246..°) or 231.9(753..°) or 232(°)

Linear GCSE Mathematics Higher Tier November 2015 Paper 2		FINAL MARK SCHEME Comments
17. ½ ×6.7×8.4×sinA = 22.8 Â = 54(.1188…°)	M1 A1	Or for Â = $\sin^{-1}$0.81(023…)
$DB^2 = 6.7^2+8.4^2 - 2\times6.7\times8.4\times\cos54(.1188…°)$ DB = 7(.03..cm)	M1 A2	FT their Â provided it is ≠32°, ≠46°, ≠102°, ≠90° or 22.8 Accept rounded or unrounded answers 7, 7.02 or 7.03(4) A1 for DB^2 = 49 to 49.4779.. or 49.5 OR appropriate for their FT angle *(Use of 78° leads to DB^2 = 92.04… and DB = 9.6 cm)*
Use of Ĉ=102° or 180°-46°-32° with DB in appropriate sine rule statement, $\frac{7(.034…)}{\sin102°} = \frac{BC}{\sin46°}$ OR $\frac{7(.034…)}{\sin102°} = \frac{DC}{\sin32°}$	M1	FT their DB provided ≠6.7 or ≠8.4
$BC = \frac{\sin46°\times7(.034..)}{\sin102°}$ OR $DC = \frac{\sin32°\times7(.034..)}{\sin102°}$	M1	Rearranged form also implies previous M1
BC = 5.1 to 5.2(cm) AND DC = 3.79 to 3.8(1..cm)	A2	Rounded or unrounded from correct working Do not accept DC=3.7(cm) A1 for either BC or DC correct *(Use of 78° initially leads to BC = 7(.06… cm) and DC = 5.2 (cm) or 5.19(…cm), but as M0 initially this will be B0)*
Perimeter (6.7+8.4+BC+DC =) 24 (cm) or 24.1(cm) or 24.08(3…cm)	B1 10	FT 15.1+their BC + their DC correctly evaluated provided all M marks awarded

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