GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT). 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)

Applications Unit 1 Foundation June 2012		FINAL
1. (a) 1580 (kg) (b) 6000 (cc) (c) (£) 230000 (d) 3 (seconds)	B1 B1 B1 B1 4	 Accept 3.0
2.(a) (i)650 (ii) 230 (iii) Arrow at 36cm (b) Correct use of scale 2 correct sides of the completed triangle	B1 B1 B1 B1 B2 6	 Must be unambiguous Sight of 45 ÷ 3 (=15), 33 ÷ 3 (=11) or 24 ÷ 3(=8) is evidence of use of scale OR 11 or 8 drawn Award B1 for 1 correct side of triangle OR for 2 correct lengths that do not create a triangle. *Use overlay*
3. (a) Attempt to count area Estimate of area within range 25 – 32 m^2 (b) 84(°) (c) circle of radius 5.7 cm	M1 A1 B1 B1 4	 ± 2° ± 2 mm
4. (a) (£)8.29 + (£)10.79 + (£)1.50 (=12.29) + 2 × (£)9.99 (=19.98) +(£)2.50 =(£)43.06 (b) Need 5 £10 notes	B1 B1 B1 B1 B1 B1 6	*When £2.50 added to each part of the order mark as a misread* *Award B4 for answer of (£)40.56* FT their 2 × 9.99 and/or their 10.79 + 1.50 FT their 43.06. Accept embedded answers.
5. (a)(i) 4.3 × 10 + 62 = 105 (cm) (ii) (191 – 62) ÷ 4.3 = 30 (cm) (b) (Estimate of) 8 Full explanation	M1 A1 M1 A1 B1 E1 6	Attempt to multiply **and** add correctly Attempt to subtract **and** then divide Eg. "Because 1/10 and 8/9 is nearly a whole one and 3 + 4 = 7, so 8 in total." 3 + 5 = 8 gets B1 E1 Only 8 gets B1 E0. An exact answer (7 89/90 or 7.988..) only gets B0 E0, however, if they then round to 8 award B1, E0

Applications Unit 1 Foundation June 2012		FINAL
6. (cost of bricks =)1500 × (£)0.72 = (£)1080 (Charge for laying)(1500 ÷ 500) × (£)200 =(£)600 (Cost of sand=)(1.5 × 42 =) (£) 63 (Cost of cement=) (16 × 4.90 =) (£)78.4(0) (Total cost of the wall=) (£)1821.4(0) <u>Notes:</u> QWC2 can only be awarded if the correct unit is shown in the final answer and the zero is included in the final answer. QWC2 requires words throughout the response not just connected to the final answer. Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£' and '0' appropriately used) 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.	M1 A1 M1 A1 B1 B1 B1 Q W C 2 9	FT their (£)1080, (£)600, (£)63 **AND** (£)78.4(0) 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.
7. (a) Uniform scale used for inches Uniform scale used for cm Plotting all points correctly **Correct** straight line (b) Approximately 22.5. Accept answer in range 22 – 23 (c) Full explanation given Approximately 28 inches	B1 B1 P1 L1 B1 E1 B1 7	*If reversed axes and labelled award marks. But if reversed axes and not labelled penalise -1* L0 for curve or "dog-leg" FT their straight line graph Eg use of graph or arithmetic method FT their graph
8. (a) amount spent on fruit (£)3 (b) Full description given on the trend in the amount spent on chocolate **and** the trend in the amount spent on fruit.	B1 E2 3	Award E1 for partial description OR for description for either fruit **or** chocolate.
9. Mean for Mrs Thomas = 600 ÷ 10 = 60 Mean for Mr Richards (402 ÷ 7 =) 57.(42857143) Mrs Thomas	M1 m1 A1 B1 B1 5	Attempt to add all given values for Mrs Thomas Award B1 if 60 × 7 = 420 used to compare with 402 Only award final B1 if an attempt has been made to calculate **both** means – has been awarded M1 & B1 FT their means

Applications Unit 1 Foundation June 2012		FINAL
10. (a) All sectors correct and labelled	B2	Award B1 for 1 sector correct and labelled OR for all sectors correct but not labelled (±2°) *Use overlay*
(b)(i) 1/6	B1	*Penalise -1 once only for wrong notation used in (b)*
(ii) 1/6 or equivalent	B1	FT their (i) Do not accept 2/12 if shown 1/6 + 1/6 = 2/12
(c) E	B1	Accept 0.19 or 100 spins
Reason given eg More spins leads to a reliable probability	E1	Accept "it's closest value to 1/6"
	6	
11. 5x + 20 or equivalent	B4	Award B3 for 3(x + 5) or 3x + 15 Award B2 for 3 × x + 5 or x + 5 × 3 Award B1 for x + 5
	4	
12.(a) $\pi \times 0.75^2$	M1	
$= 1.7(67145868)$ (m^2)	A1	Allow answers between 1.7 and 1.8 inclusive
(b) $\pi \times 1.5$	M1	
$= 4.7(1238898)$ (m)	A1	
	4	
13.(a) 134° drawn from Start	M1	±2° *Use Overlay*
200° drawn from their first position	M1	±2°
Accurate chart with lengths (±2mm) and angles correct	A1	Within tolerance allowed FT to (b) for any 2-part journey, except for responses related to given information, e.g. leading to responses 200° and 4 nautical miles. Any bearing given in (b) must be 3 figures
(b) Bearing (±2°) from start to **their** 2nd position	B1	Approximately 160°
Distance (±2mm) from start to **their** 2nd position	B1	Approximately 8.5 nautical miles
	5	
14.	B6	Table correct B1 for Q4 **and** Q7 **both** 'Yes' B1 for each correct corrected answer
	6	
15.		*May all be completed by reasonable sketches*
Strategy, e.g. sketching an appropriate rectangle, (e.g. 5 cm by 4 cm)	S1	Intention, accuracy not demanded
Placing both boats at corners	S1	
Indicating one ¼ circle area inside the rectangle	B1	Intention, no need for accuracy Ignore extra ¾ outside the rectangle
Showing or stating boats at diagonally opposite corners, with 2 × ¼ circle areas either included in sketches or stated	B1	Ignore extra ¾ outside the rectangle
Conclusion diagonally opposite corners and based on not wanting overlapping areas	E1	Depends on previous B1. Needs to be stated or annotated on a diagram, e.g. 'look no overlaps' Accept 'covers more area' only if justified by clear diagram**s** (need to show a minimum of least one other situation the best solution)
	5	

Q	Y/N	Correct answer
1	Given	Given
2	No	5y
3	No	29a – 31b
4	Yes	
5	No	5x + 18
6	No	8(3x +1)
7	Yes	
8	No	24

UNIT 1 (HIGHER TIER)

<table>
<tr><th>Applications Unit 1 Summer 2012</th><th></th><th>FINAL</th></tr>
<tr><td>1.(a) a = 62
b = 73
c = 62
d = 136
(b) All three angles given: 134(°), 46(°), 134(°),</td><td>B1
B1
B1
B1
B2
6</td><td>
FT 135 - a
FT a or 135 - b
FT 74 + c
B1 for sight of 134, or for the full process shown but 1 error in the calculation</td></tr>
<tr><td>2.(a) Realises that measurement could have been rounded down to 6 cm (may also give an example), e.g. ‘each box could be at upper bound, so height could be a much as 13 cm’

(b) 4a+4b+4c (cm) or 4(a+b+c) (cm)</td><td>E2

B2

4</td><td>For E2 both of the boxes should be mentioned
E1 for an example without an explanation, or statement such as ‘could be over 6cm’ or similar without mention of rounding down

If B2 penalise further incorrect working -1
B1 for correct expression but not in simplified form, or na + nb + nc where n is a whole number but n≠1 or n≠0
If B2, mark final answer, do not ignore further incorrect work</td></tr>
<tr><td>3 (1,1) (1,2) (1,4) (1,8) (1,16)
(3,1) (3,2) (3,4) (3,8) (3,16)
(9,1) (9,2) (9,4) (9,8) (9,16)</td><td>B3

3</td><td>With no incorrect dots (3,4) was given
B2 for any 8 to 13 correct with no more than 1 or 2 incorrect plots
B1 for any 5 to 7 correct with no more than 3 incorrect
SC1 for all 14 reversed, or sight of all factors of 9 and 16</td></tr>
<tr><td>4.
<table><tr><th>Q</th><th>Y/N</th><th>Correct answer</th></tr><tr><td>1</td><td>Given</td><td>Given</td></tr><tr><td>2</td><td>No</td><td>29a – 31b</td></tr><tr><td>3</td><td>Yes</td><td></td></tr><tr><td>4</td><td>No</td><td>5x + 18</td></tr><tr><td>5</td><td>No</td><td>8(3x +1)</td></tr><tr><td>6</td><td>Yes</td><td></td></tr><tr><td>7</td><td>No</td><td>24</td></tr></table></td><td>B5

5</td><td>Table correct

B1 for Q3 and Q6 both ‘Yes’
B1 for each correct corrected answer</td></tr>
<tr><td>5.(a) 134° drawn from Start
200° drawn from their first position
Accurate chart with lengths (±2mm) and angles correct

(b) Bearing (±2°) from start to their 2nd position
Distance (±2mm) from start to their 2nd position</td><td>M1
M1
A1

B1
B1
5</td><td>±2°
±2°
Within tolerance allowed
FT to (b) for any 2-part journey, except for responses related to given information, e.g. leading to responses 200° and 4 nautical miles.
Any bearing given in (b) must be 3 figures
Approximately 160°
Approximately 8.5 nautical miles</td></tr>
</table>

Applications Unit 1 Summer 2012		FINAL
6.(a)(i) **Vertical** plots accurate for at least 5 years Horizontal & vertical plots accurate for at least 5 years All points accurately plotted	P1 P1 P1	 Ignore any joining of points
(ii) Appropriate method, e.g. considering an appropriate point on their graph (perhaps approximately ½ way) between 2008 and 2009 plots, or (248 + 300)/2	M1	FT their graph, taking forward the idea of joining points with a straight line or a curve
Answers in the range 254 to 294	A1	
(b) Sight of (640,) 320, 160, (80, …) Realising equal numbers during **2006** Method to establish the quarter, e.g. plotting ordinary light bulb numbers on low energy graph and look for intersection, or comparing 172, 178.5, 185, 191.5, 198 with 320, 280, 240, 200, 160, or arithmetic method, or method based on a curve	M1 A1 m1	FT from their graph drawn in (a) Do not accept a comparison with a 'line of best fit' given in (a)
4th (quarter) 2006	A1	Accept October, November or December 2006 Do not FT from a 'line of best fit' given in (a) *SC3 for unsupported answer 4th quarter of 2006* *SC2 if error in division by 2 of 640, but FT appropriate method and accuracy* *SC1 for conclusion 'January 2007', also possible M1 and if stated 'equal number during 2006' A1, but m0 or final A0. This does <u>not</u> apply to conclusion '1st quarter 2007'*
	9	
7(a) Idea of scale is match of units, 1cm=25 000 cm	S1	Or equivalent initial idea
80 × 25000	M1	Accept sight of 80 × 25000 with a place value error in the 25000
= 2 000 000 (cm)	A1	Maybe embedded with change of units (20 000m) If units are given they must be correct The unit 'cm' also implies previous S1
1km = 100 000cm	B1	Or 1m = 100cm with 1000m = 1km
20 (km)	A1	If units are given they must be correct
(b) 80 cm is 20 km OR 4 cm is 1 km OR equivalent	B1	FT their 20km from (a) leading to 24 × 80/(a)
24 × 4 or equivalent	M1	
96 (cm)	A1	If units are given they must correct *Alternative: 24 (km) ÷25 000* *Unit conversion (× 100 000)* *96 (cm)* *If units are given they must correct*
(c) 24/6 Cycled 20 (km) AND Pushed bike uphill 4 (km)	M1 A1	Answers reversed allow M1
24/12 Cycled 22 (km) AND Pushed bike uphill 2 (km)	M1 A1	Answers reversed allow M1 *If no marks in (c) then SC1 for all answers in correct ratio but not with a total of 24, but not the answers 5 and 1 or 11and 1*
	12	

Applications Unit 1 Summer 2012		FINAL
8.		*May all be completed by reasonable sketches*
Strategy, e.g. sketching an appropriate rectangle, (e.g. 5 cm by 4 cm)	S1	Intention, accuracy not demanded
Placing both boats at corners	S1	
Indicating one ¼ circle area inside the rectangle	B1	Intention, no need for accuracy Ignore extra ¾ outside the rectangle
Showing or stating boats at diagonally opposite corners, with 2 × ¼ circle areas either included in sketches or stated	B1	Ignore extra ¾ outside the rectangle
Conclusion diagonally opposite corners and based on not wanting overlapping areas	E1	Depends on previous B1. Needs to be stated or annotated on a diagram, e.g. 'look no overlaps' Accept 'covers more area' only if justified by clear diagram**s** (need to show a minimum of least one other situation the best solution)
	Q	*Marking misinterpretation:*
Look for	W	*Boats not at the corners: S1 for the rectangle*
• relevance	C	*S0 boats not at the corners*
• spelling	2	*B1 indication of arc of a circle*
• clarity of text explanations		*B0*
• diagrams or sketches		*E1 depends on previous possible S1, B1* *Conclusion 'more area covered'*
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		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: 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		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.
	7	QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
9.(a)(i) Mid points 14.5, 24.5, 34.5 and 44.5	B1	
$14.5\times6 + 24.5\times28 + 34.5\times48 + 44.5\times18$	M1	FT provided their midpoints within the bounds inclusive
/100	m1	
32(.3) (mm)	A1	Unsupported 32.3, award all 4 marks
(ii) Entries 82 and 100	B1	
(iii) Correct cumulative frequency diagram, points plotted and joined with a curve or straight lines	B2	FT from cumulative (ii). B1for points plotted but not joined, or correct diagram with 1 point incorrectly plotted, or correct apart from being a 0.5 horizontal translation
(iv) Median: answers in the range 31 to 34	B1	FT their **cumulative** frequency for portion of the diagram required (median, but possible not IQR)
Interquartile range: (36 to 39) – (25 to 27)	M1	Subtraction intended
Answers in the range 9 to 14	A1	
(b)(i) 2194 2260 2343	B3	B2 for any 2 correct entries, or B1 for a correct method seen, or one correct entry
(ii) Explanation implies that the moving average may be lower **and** states that this is because the summer 2012 value is likely to be less than summer 2011	E2 15	E1 for implies less AND offering a vague explanation, e.g. 'people might wait to buy later', or notices a large increase in Summer 2011

<table>
<tr><th>Applications Unit 1 Summer 2012</th><th></th><th>FINAL</th></tr>
<tr><td>10. 7.2</td><td>B4

4</td><td>B3 for 2 correct trials between 7 and 8 inclusive
B2 for 1 correct trial between 7 and 8 inclusive
B1 for clearly working with a trial & improvement method, but may be an incorrect expression, or for the sight of a correct expression, e.g. $x + x^2 + x^3$

An answer of 7.24… from $x^2 + x^3$ is awarded B1 and also SC1
Accept values shown truncated or rounded to whole numbers
<table>
<tr><th>x</th><th>$x + x^2 + x^3$</th></tr>
<tr><td>7</td><td>399</td></tr>
<tr><td>7.1</td><td>415.421</td></tr>
<tr><td>7.2</td><td>432.288</td></tr>
<tr><td>7.3</td><td>449.607</td></tr>
<tr><td>7.4</td><td>467.384</td></tr>
<tr><td>7.5</td><td>485.625</td></tr>
<tr><td>7.6</td><td>504.336</td></tr>
<tr><td>7.7</td><td>523.523</td></tr>
<tr><td>7.8</td><td>543.192</td></tr>
<tr><td>7.9</td><td>563.349</td></tr>
<tr><td>8</td><td>584</td></tr>
</table></td></tr>
<tr><td>11.(a) Use of $2 \times \Pi \times r$
Accept answers between 40 050 and 40 100 (km)
4.01×10^4 (km)

(b) $5.112 \times 10^8 - 3.618 \times 10^8$

$1.49(4) \times 10^8$ (km^2) or 1.5×10^8 (km^2)</td><td>M1
A1
B2

M1

A1
6</td><td>Or equivalent

FT their value to give 3 sig.fig. and standard form
B1 for 3 sig.fig. or in standard form
Intention to subtract in this order.
Sight of 1.49(4) implies M1</td></tr>
<tr><td>12.(a) Sight of $0.1h$ or equivalent
$B = R + 0.1h$ or equivalent

(b) $4.60 = 2 + h/10$ or equivalent

26 (words)</td><td>B1
B2

M1

A1
5</td><td>
B1 for $R + 0.1h$
Allow SC1 for $B = R + h$
May be shown in stages
FT their formula if equivalent difficulty, do not FT from $B = R + h$
Penalise -1 once only for use of words instead of symbols</td></tr>
<tr><td>13.(a) $d \propto 1/v^2$ or $d = k/v^2$ or equivalent
$8 = k/4^2$ or equivalent
$d = 128/v^2$ or equivalent

(b) $d = 128/6^2$
Accept 3.55(…) or 3.5 or 3.6 (m)
(c) Use of $d = 0.25$
$d = 128/v^2$
22.6(27… m/s) or 22 (m/s)</td><td>M1
M1
A1

M1
A1
B1
M1
A1
8</td><td>

Accept $k = 128$ if $d = 128/v^2$ or equivalent used in (b) or (c)
FT their formula in terms of v & d in (b) & (c)

FT place value error including use of 25
Positive answer only</td></tr>
<tr><td>14(a) Drawing a reasonable tangent at t = 3
Gradient = difference in volume / difference in time

Reasonable gradient evaluated from their tangent
litres/minute
(b) Rate of change of volume (with time)</td><td>B1
M1

A1
U1
E1

5</td><td>
M0 for 14/3. Tangent not requirement, however evidence of appropriate quotient based on differences is required

Independent mark
Do not accept ‘increase in volume’.
Accept ‘increase of volume in time’, ‘how fast the tank is filling’, ‘amount per minute’, ‘speed of filling the tank’</td></tr>
</table>

Applications Unit 1 Summer 2012		FINAL
15. Strategy, e.g. noticing 0 to 40 is 1.5 times 40 to 50, or first rectangle 3/5 with second 2/5 of a quantity	S1	or £25 with 20 people, or 40 squares for £50 may be seen on the histogram, or 30 written adjacent to 20
$40\times3x + 10\times8x = 40$ or equivalent, or 24 written adjacent to 16,	B1	Award of this B1 implies the award of the S1 also
Uniform scale 0.2, 0.4, 0.6, …, implied or shown (height of first rectangle is 0.6, 2nd height is 1.6, etc.)	B1	or sight of 0.2, or 'each person is 1 square', or sight of any 6 of 24, 16, 18, 22, 24, 18, 2 Award of this B1 implies the award of the S1 and previous B1 also *If M1 or M2 awarded, this implies previous S1, B1 and B1*
20×24+45×16+55×18+65×22+75×24+85×18+95×2 (or with the first term split 12×10+12×30) OR 0.6×20×40 + 1.6×45×10 + 1.8×55×10 + 2.2×65×10 + 2.4×75×10 + 1.8×85×10 + 0.2×95×10	M2	M1 for • any 3 correct products within the overall sum, or • the appropriate sum of products but with bounds used instead of mid points, or • use of mid points 55, 65, 75, 85 and 95 within a product sum
(£)7140	A1 6	CAO

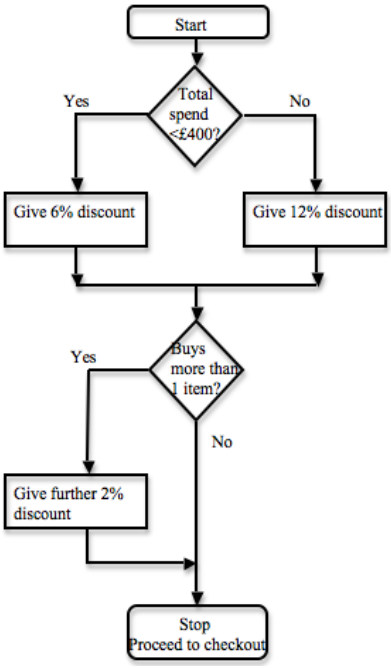
UNIT 2 (FOUNDATION TIER)

Applications Unit 2 Foundation June 2012		FINAL
1. (a) (i) 10.5(0) 19.96 34.75 73.1(0) (ii) $\frac{10}{100}$ × 'their 73.1(0)' (£)7.31 ISW (iii) Actual cost of goods (£)65.79 80 – 'their 65.79' (£)14.21 (b) 20 ÷ 1.39 (14.388..) Buys 14 plants Change = 54(pence) or (£)0.54	B1 B1 B1 B1 M1 A1 B1 M1 A1 M1 A1 A1 12	FT for 1 error. B0 for 73.01 FT their total from(i) (£)65.79 may be seen in (ii). FT their 65.79 Use of 0.388… to calculate change A0 for £54 or 0.54p. Accept £0.54p *For use of 10% discount:* *M1 20 ÷ their cost of a plant* *A1 number of plants bought* *A1 Change given.* *For final A1 a correct 10% value must be used.*
2.(a) (i)Litres Km (ii) Kg or Stones or pounds (b) a = 9 b = 11 c = -3	B1 B1 B1 B1 B1 B1 6	Accept m^3 Accept pounds, lbs or stones and pounds FT their a FT their a and b

Applications Unit 2 Foundation June 2012		FINAL
3.(a) 8 × 6.50 (£)52	M1 A1	
(b) (6.50 × 2 × 5 (£)65	M2 A1	Award M1 for either 6.5(0) × 2 or 6.5(0) × 5 OR Award M1 5 × 2 = 10 hours M1 10 × 6.5(0) A1 (£)65
(c) earnings (32 × 6.50=) (£)208 Tax &NI (1/10 of 208=) (£)20.8(0) Total outgoings (20.8(0) + 50 + 60=) (£)130.8(0) Has left (208 – 130.8(0)=) (£)77.2(0) Number of weeks (439 ÷ 77.2(0)= 5.68...) 6 weeks needed	B1 B1 B1 B1 B1	CAO FT their 208 FT their 20.8(0) FT their 130.8(0) FT their 77.2(0) <u>Alternative method</u> Earnings = 208 **B1** Tax = 20.80 **B1** (208 – 20.80 =)187.20 **B1** Has left 77.20 **B1** FT 187.20 – 50 - 60 Number of weeks = 6 weeks **B1** FT their 77.2(0)
For QWC Look for • spelling • clarity of text explanations • the use of notation (watch for the use of '=', '£' being appropriate) Notes: QWC2 requires words throughout the response not just connected to the final answer. 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	Q W C 2	*If no tax & NI Award* *B1 for 208, B0, B0, B1 for (208 – 110 =) 98, B1 for (439 ÷ 98=) 5 weeks* 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.
	12	
4.Use of height of man 2m or 6 feet Scale factor 8 16m or 48ft	B1 B1 B1	Accept range of 1.5m – 2m or 5ft – 6 ½ft Award B1 if boat subdivided into 8 parts. FT their scale factor if in range 6 – 9 × their height. *For final B1 units of metres or feet must be included.* *Award B3 For unsupported answers in the range 12m – 16m or 40ft – 52ft. Units must be given.*
	3	

Applications Unit 2 Foundation June 2012		FINAL
5.(a) Labels on both axes Uniform scale on vertical axis All bars correct	B1 M1 A1	 Bars must have correct heights and equal widths
(b) 1 | 5 8 8 2 | 3 4 8 8 3 | 1 7 9 4 | 2 9 5 | 2 6 6 | 8	B2	-1 for each error Award SC1 for a correct stem and leaf diagram but not ordered
Key eg. 5/6 represents 56	B1	
(c) 3 or 4 angles correct and correctly labelled. OR 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR <u>If 0 OR 1 for their diagram or no diagram.</u> 360/120 Angles are 84, 93, 111, 72.	B4 OR (B3) (B3) (B2) (B1) (M1) (A1) 10	Use the correct overlay and allow ±2°. Correct labels (Words NOT the frequency OR angle) 3 correct labels are enough. If only B1 is scored for the diagram and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 3° gets the M1 OR SC1 for all the correct percentages 23.3%, 25.8%, 30.8%, 20%
6. $6 \times 45 = 270$ (mins) 4 hours = $4 \times 60 = 240$ (mins) or 270 (mins) = 4 ½ (hours) No because she needs 30 mins more	B1 B1 E1 3	*Alternative method* *2 programmes = 1 ½ hours* *4 programmes = 3 hours* *6 programmes = 4 ½ hours* Accept "no because there isn't enough time" or "can watch 5 episodes (and 15 mins of 6th)" *Penalise -1 for incorrect use of hours and minutes for final E1*
7. (a) $^4/_{10}$ (ISW) or $^2/_5$ (b) knowing that 3 parts represent 24 mins $24 \div 3 = 8$ 10×8 = 80 (mins) or equivalent	B2 B1 M1 M1 A1 6	B1 for denominator of 10 (5) or B1 for numerator of 4 (2) in a fraction less than 1.

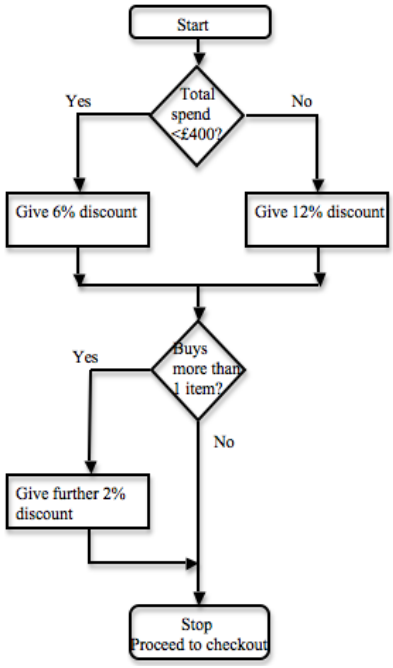
Applications Unit 2 Foundation June 2012		FINAL
8. Area of whole = 38.5^2 = 1482.25 One Dimension of green = 35.5 Area of green = (35.5^2) 1260.25 Area of path 1482.25 – 1260.25 = 222 square metres <u>Alternative method 1</u> M1 38.5 × 1.5 M1 35.5 × 1.5 A1 for either 57.75 or 53.25 B1 for both 115.5 and 106.5. M1 115.5 + 106.5 A1 222 square metres <u>Alternative method 2</u> M1 38.5 × 1.5 (= 57.75) A1 (57.75 × 4 =) 231 M1 1.5 × 1.5 (= 2.25) A1 (2.25 × 4 =) 9 M1 231 – 9 A1 222 square metres	M1 A1 B1 B1 M1 A1 6	 FT their 1482.25 – their 1260.25 FT their 2 × 57.75 and 2 × 53.25 FT provided M1, A1 and B1 awarded FT provided both M marks awarded and one A mark
9.(a) All 7 points plotted correctly, not joined (b) Reasonable straight line of best fit by eye, some points above and below (c) Positive (d) Indicates Sunday (12, 100) (e) No with a reason based on risk, not really a secure relationship between what people give and how many	B2 B1 B1 B1 E2 7	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined Accept appropriate descriptions E1 for No with statement such as ‘people only gave £1 each’

Applications Unit 2 Foundation June 2012		FINAL
10.(a) Correct flowchart with appropriate symbols Accept equivalent ways of describing the discounts (or equivalent using $\geq$ **400** with reverse initial decisions) For example,  	B6	Ignore if start/stop rounded rectangle and input parallelogram missing. Accept shapes not drawn using a ruler. Mark as follows: B1 Shape of boxes –All decision boxes shown as rhombus, all non-decision boxes as (intention) rectangle B1 for correct use of **<400** or in words "less than 400" within a flowchart, or equivalent *Accept if ≤ or < written or implied as appropriate* B1 Yes/No with actions for initial discounts correct B1 Bringing back together ready for next consideration as single flow *FT if now two separate flows* B1 Question(s) relating to more than 1 item AND Yes/No with action for discount B1 Finish indicated, e.g. "proceed to checkout", accept as two separate flows
(b)(i) Selects 6% discount only & no further discounts 350 - 0.06 × 350 or 0.94 × 350 or equivalent (£)329	S1 M1 A1	Indication of 6% may be with incorrect notation
(ii) 4 × 160 + 450 (£)1090 1090 × 0.88 or equivalent (£)959.2(0) 959.2(0) × 0.98 (£)940(.016)	M1 A1 M1 A1 M1 A1	FT their 1090 FT their 959.2(0) May be embedded answers leading towards a final response Accept 940, 940.01, 940.02, 940.016 *If 1 chair and a table then:* *(M0 160 + 450)* *(A0 = (£)610)* *M1 610 × 0.88 (FT their 610)* *A1 = (£)536.8(0)* *M1 536.8(0) × 0.98 (FT their 536.8(0)* *A1 = (£)526(.064)* *Treat starting with 4 chairs or 1 table as above with FT, however if only 1 table no 2% discount should be awarded marks, hence maximum, M0, A0, M1, A1, M0, A0* *No marks for working with 1 chair only* *Candidates working with discount of 14%, possible M1, A1 for (£)1090, then SC1 for (£)937.4(0), allow FT from their (£)1090*
	15	

UNIT 2 (HIGHER TIER)

Applications Unit 2 Summer 2012 Higher Tier		FINAL
1.(a) $122 \div 14$	M1	Or for repeated addition or subtraction of 14, at least 6 correct calculations
8 (stone) 10 (pounds)	A2	A1 for 8.7(142…) with an attempt to work with the decimal, or sight of 112. M1, A0 for 8.7(142…) or 8 stone 7lb
(b) $10 \times 14 + 4$	M1	The "+4" may be embedded in further calculation
144 (pounds)	A1	May be implied in later calculation
$144 \div 2.2$	m1	FT provided M1 awarded
65 (kg) or 65.5 (kg)	A1	Accept 65.4(545…) *Conversion of 4lb to a decimal (0.2857…)leads to a difference in final answer, penalise PR-1* *SC1 for an answer of 66.18.. or 66.2 or 66 (from 10.4×14÷2.2), OR for an answer of 63.6(33…) (from 10×14÷2.2)*
	7	
2.(a) All 7 points plotted correctly, not joined	B2	B1 for at least 3 correct plots not joined, or all points plotted correctly but joined
(b) Reasonable straight line of best fit by eye, some points above and below	B1	
(c) Positive	B1	Accept appropriate descriptions
(d) Indicates Sunday (12, 100)	B1	
(e) No with a reason based on risk, not really a secure relationship between what people give and how many visitors	E2	E1 for No with statement such as 'people only gave £1 each'
	7	

Applications Unit 2 Summer 2012 Higher Tier		FINAL
3.(a) 300 × 154.18 46254 (krona) Need to buy 46240 (krona) 46240 ÷ 154.18 299.91 (euros) Look for • spelling • clarity of text explanations, • the use of notation and units (watch for the use of '=', euro, krona being appropriate) QWC2 can only be awarded if 'krona' is stated appropriately in working, and 'euro' in a final answer 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	M1 A1 A1 M1 A1 QWC 2	FT 'their 46240' but not 300 or 46254 An answer of 299.9(0) is M1, A1, A1, M1, A0 QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
(b) 0.082 Canadian Dollars = 0.058 euros, linked with either appropriate calculation required 0.7073… euros, rounded or truncated 1.41379… Canadian Dollars, rounded or truncated	M1 A1 A1 10	May be implied by 1 correct answer *Do not award M1 if answers are reversed* 1÷0.082 (= 12.195122…) × 0.058 = 0.707… 1÷0.058 (=17.241379…) × 0.082 = 1.41379… *Penalise premature truncation or rounding errors -1 only, and only if their answer would be different to 0.70, 0.71 and 1.41 if truncated or rounded* *If a place value error is repeated in (b), due to use of, for example 0.58 or 0.82, then penalise once only* *M1 may be implied by answer from premature approximation*

Applications Unit 2 Summer 2012 Higher Tier		FINAL
4.(a) Correct flowchart with appropriate symbols Accept equivalent ways of describing the discounts (or equivalent using $\geq$ **400** with reverse initial decisions) For example,  	B6	Ignore if start/stop 'rounded rectangle' and/or input/output parallelogram missing. Accept shapes not drawn using a ruler. Mark as follows: B1 Shape of boxes –All decision boxes shown as rhombus, all non-decision boxes as (intention) rectangle B1 for correct use of **<400** or in words "less than 400" within a flowchart, or equivalent *Accept if ≤ or < written or implied as appropriate* B1 Yes/No with actions for initial discounts correct B1 Bringing back together ready for next consideration as single flow *FT if now two separate flows* B1 Question(s) relating to more than 1 item AND Yes/No with action for discount B1 Finish indicated, e.g. "proceed to checkout", accept as two separate flows
(b)(i) Selects 6% discount only & no further discounts 350 - 0.06 × 350 or 0.94 × 350 or equivalent (£)329	S1 M1 A1	Indication of 6% may be with incorrect notation
(ii) 4 × 160 + 450 (£)1090 1090 × 0.88 or equivalent (£)959.2(0) 959.2(0) × 0.98 (£)940(.016)	M1 A1 M1 A1 M1 A1	FT their 1090 FT their 959.2(0) May be embedded answers leading towards a final response Accept 940, 940.01, 940.02, 940.016 *If 1 chair and a table then:* *(M0 160 + 450)* *(A0 = (£)610)* *M1 610 × 0.88 (FT their 610)* *A1 = (£)536.8(0)* *M1 536.8(0) × 0.98 (FT their 536.8(0)* *A1 = (£)526(.064)* *Treat starting with 4 chairs or 1 table as above with FT, however if only 1 table no 2% discount should be awarded marks, hence maximum, M0, A0, M1, A1, M0, A0* *No marks for working with 1 chair only* *Candidates working with discount of 14%, possible M1, A1 for (£)1090, then SC1 for (£)937.4(0), allow FT from their (£)1090*
	15	

Applications Unit 2 Summer 2012 Higher Tier		FINAL
5.(a)(i) (ii) Statement, e.g. 'greater spread for the men (than the women)', or 'very similar' (b) Reason that includes reference to the fact that cannot tell how much time was spent	B3 E1 E1 5	B2 for 4 or 5 correct entries B1 for 2 or 3 correct entries Accept 'more higher weights for men', 'the difference in the range is (only) one' Do not accept 'there are more men than women', without further clarification related to not knowing the time spent
6.(a) 3.5×10^{10} 8.2×10^{-4} 4.1×10^{-14} (b) Evidence of 9.5, 10.5, 7.5, 8.5 Lower **34** (cm) Upper **38** (cm) Lower **71.25** (cm^2) Upper **89.25** (cm^2)	B2 B2 B1 B1 B4 10	B1 for $3.4(78) \times 10^{10}$ B1 for $8.24(9) \times 10^{-4}$ CAO *Penalise once, on the first occasion, only for consistent incorrect notation* May be implied by 3 correct answers in the table In upper bounds accept $0.49^{\cdot}$ or 0.49 recurring B1 for each correct entry Accept 71.3 and 89.3, for 71.25 and 89.25 respectively from evidence of correct bounds *Also possible SC1for appropriate use of values in the range 10.4 to 10.49.. **and** 8.4 to 8.49.., e.g. for sight of 37.6 for upper perimeter and 87.36 or 87.4 for upper area from use of 10.4 and 8.4*
7.(a) Speed = $\frac{1.2}{9/60}$ or equivalent 8 (mph) (b) $h = \sin 11.2(°) \times 2.6$ $= 0.5(05\ldots)$	M1 A1 M2 A1 5	or 1.2/0.15 CAO M1 for $\sin 11.2(°) = h/2.6$ Mark final answer
8. Strategy: attempt to set up simultaneous equations with clear indication of the variables, e.g. on diagrams 2x+2y=10 with 6x+4y=27, or equivalent Equating coefficient (1 slip allowed), One of the variables found Method to find the second variable, using their first variable Second variable	S1 M1 M1 A1 M1 A1 6	May be informal, shown by diagrams. Variables used may be implied later Could be semi-perimeter with correct interpretation later <u>N.B. Any FT from here is for M marks only, accuracy marks for correct answers only</u> FT for x+y=10 with 3x+2y=27, or one of these 2 equations with an appropriate one of 2x+2y=10 or 6x+4y=27. FT for one correct equation with another in a similar form. Do not award M1 for a trial & improvement method Do not award M1 for a trial & improvement method Answer of 7 and 3 as a final answer is A0 ***(Length cost) x=(£)3.5(0) and (Width cost) y=(£)1.5(0)*** *Award SC2 for unsupported correct answers, or for correct answers from correct visual interpretation* *x + y =10 and 2x +3y = 27 leading to answer of 7 and 3 from a correct method is awarded 3 marks: S1, M0, M1, A0, M1, A0*
9.Strategy: Pythagoras' Theorem and $\Pi r^2 h/3$ $8.4^2 - 5.2^2 = h^2$ h = 6.596969… or appropriately rounded $\frac{\Pi \times 5.2^2 \times h}{3}$ Accept answers 186 (cm^3) to 187(cm^3) inclusive	S1 M2 A1 m1 A1 6	 M1 for $8.4^2 = 5.2^2 + h^2$ Depends on previous M1 or M2. FT 'their height' not 8.4, however if inappropriately truncated then FT for M1 only Must be from correct working, or unsupported

Applications Unit 2 Summer 2012 Higher Tier		FINAL
10. Overall idea, working in the quadrant shown to find a region and technique for solution of the problem	S1	
Any 2 of the lines 5y=7x-14, x+2y=14 and 3x+2y=18 drawn correctly	B2	B1 for 1 line
Correct region identified from all correct lines	B1	CAO. May be implied by further work in maximising
Use of x+y= … OR solution of x+2y = 14 & 3x+2y = 18	M1	FT for their identified region
Maximised when $x = 2$ and $y = 6$	A1 6	FT for their identified region
11.(a)(i) All 9 plots accurate (taking into account accuracy difficulty of plotting after 6.25) AND joined with a curve	B3	B2 for plots generally accurate from 100 to 6.25 with an attempt at the others, but not joined by a curve, OR B1 for points 100 to 12.5 accurately plotted For information: *100, 50, 25, 12.5, 6.25, 3.125, 1.5625, 0.78125, 0.390625*
(ii) From their graph, provided their answer is between 4 and 5 (seconds) **exclusive**	B1	
(b) $f = m/2^t$ or $f = m \times 0.5^t$	B3	B2 for expression $m/2^t$, or $m \times 0.5^t$, OR B1 for evidence of m **repeatedly** being divided by 2 or multiplied by 0.5, i.e. more than once, or sight of 2^t or 0.5^t
	7	
12.(a)(i) Use of $i = 0.086$	B1	
Use of $n = 4$	B1	
$(1 + 0.086/4)^4 - 1$	M1	Correct substitution in the formula given
AER 8.88(%)	A2	A1 for 0.088(813467……) or incorrect rounding or truncation of the AER percentage
(ii) Explanation, based on need for fair comparison of interest rates	E1	Accept 'percentage of interest paid annually', must mention 'year' or 'annual'
(b) $5.54/100 \times 350$ or 0.0554×350	B1	
$(1 + 0.0554)^3 \times 350$	M1	May be embedded in further calculation Method of adding on different amounts , 3 year period, following attempts to calculate 5.54% (350+19.39=369.39 369.39+20.46(42..)=389.85(42..) 389.85+21.597.. =)
(£) 411.45(21…)	A1	Accept 411.44(7..)) *B1 and SC1 for depreciation 294.99, but no FT*
Conclusion, e.g. Yes as more than £410	E1	*Accept 5.4% monthly used instead to give an answer of 411.40(15..)*
	10	FT from their compounded amount provided M1, and FT from simple interest for an answer of 408.17 (408.12 from monthly) being < than 410
13.(a) $31.3 = (80/360) \times \Pi \times r^2$	M1	
$r^2 = 31.3/\{(80/360) \times \Pi\}$	m1	
Answers between 6.69 and 6.70 (m)	A1	
(b) $(280/360) \times 2 \times \Pi \times r$	M1	FT 'their r'
Answers between 32.6 and 32.75(m)	A1	
Adding on 13.4 correctly (between 46.0 and 46.15 (m))	A1	FT +13.4 provided M1 awarded
	6	

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