



# **GCSE MARKING SCHEME**

**MATHEMATICS**

**NOVEMBER 2010**

## **INTRODUCTION**

The marking schemes which follow were those used by WJEC for the November 2010 examination in GCSE MATHEMATICS. 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.


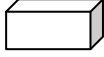
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

## PAPER 1 - FOUNDATION TIER

2010 Autumn Paper 1 (Non calculator) Foundation Tier	Marks	FINAL POST CONFERENCE MARK SCHEME (13/11/10) Comments (Page 1)
1. (a) (i) 4206 (ii) sixteen million  (b) (i) 61 (ii) 24 (iii) 21 (iv) 36  (c) (i) 8620 (ii) 9000  (d) 1, 3, 11, 33  (e) $20/2.99$ OR $20/3$  = 6	B1 B1  B1 B1 B1 B1  B1 B1  B2  M1  A1 12	C.A.O. <u>Ignore extra units such as £.</u>  C.A.O. <u>Accept embedded answers such as 24 + 38 (= 62)</u> Accept $7 \times 3$ OR $3 \times 7$ Accept $6^2$ but not 6  C.A.O. C.A.O.  B1 for any 2 or 3 factors and no incorrect numbers. OR all 4 factors and 1 incorrect number. <u>Ignore repeats.</u>  Award M1, A0 for unsupported $6.6(6\dots)$ OR 6.7 <u>OR for a 'repeated addition' method which clearly shows that the pupil is finding the maximum number of (£)2.99 in (£)20.</u> <u>Look for (£)17.94 OR (£) 20.93. Ignore change</u> C.A.O.
2. (a) $\frac{2}{6}$ $\frac{5}{15}$  (b) $£5 - 34p - £1.27$ <u>OR £5 - £1.61</u> = (£) 3.39	B2  M1 A1  4	B1 for any 1 correct and up to 1 incorrect <u>OR for 2 correct and 1 incorrect.</u>  <u>OR 339 OR 339p</u> <u>SC1 for £339</u>
3. (i) an even chance (ii) certain (iii) likely	B1 B1 B1  3	C.A.O. C.A.O. C.A.O.
4. (a) (i) 31 (ii) 60  (b) $\cdot 3 = 30$ (%) $\frac{1}{4} = 25$ (%) $\frac{1}{4}$ , 28% , $\cdot 3$ OR equivalents	B1 B1  B1  B1  B1  5	C.A.O. C.A.O.  If no answer offered on the dotted lines, allow the first two B1s if 30% and/or 25% seen in subsequent work. F.T. their values. Unsupported correct list gets final B1 only
5. (a) 9 12 6 8 5  (b) 1  (c) 0, 1, 2, 3, M along one axis Uniform scale (No numbers interpreted as 1-12 in ones) Five bars at correct heights  (d) (i) 6 (/40) I.S.W. (ii) No highest number of goals given	B2  B1  B1 B1  B2  B1 E1  9	B1 for any three/four correct frequencies If frequencies score 0, then give B1 for all 5 correct tallies. F.T. their table of frequencies B0 for 12, but B1 for 1 and 12 OR indicated on the bars themselves F.T. their table of frequencies. Use of any other scale must be clearly indicated on graph B1 for at <u>least 3</u> correct bars on F.T. Bars can be of varying width  F.T. 'their 6'. Ignore incorrect reduction Along these lines

2010 Autumn Paper 1 (Non calculator) Foundation Tier	Marks	FINAL POST CONFERENCE MARK SCHEME (13/11/10) Comments (Page 2)	
6. (a) 32 (cm) (b) $11 \times 5$ $= 55$ $\text{cm}^2$	B1 M1 A1 U1 4	C.A.O. C.A.O. Independent of other marks. <b><u>55<sup>2</sup>, 55<sup>2</sup>cm get M1, A1, U0.</u></b>	
7. (a) $\begin{array}{r} 39 \\ \times 56 \\ \hline 234 \\ 1950 \\ \hline 2184 \end{array}$ OR $\begin{array}{r} 56 \\ \times 39 \\ \hline 504 \\ 1680 \\ \hline 2184 \end{array}$ $= (\pounds) 2184$ (b) 12 (c) $1\% = \frac{5}{15}$ and $3\% = \frac{3 \times 5}{15}$ (d) 9	M1 A1 A1 B1 M1 A1 B2 8	Any correct complete method for the multiplication of 39 by 56 For either 234 or 1950 OR A1 for 504 or 1680 C.A.O. Place value errors get M0, A0, A0 C.A.O. Any correct method for finding 3% C.A.O. <u>M1, A0 for 15%</u> <b><u>SC1 for unsupported 485</u></b> B1 for sight of $39+6$ OR 'their 45'/5 OR <b><u>'unsupported 33'/5</u></b>	
8. (a) A at (3, 1) B at (-3, 2) C at (-2, -1) (b) $y = x + 2$	B1 B1 B1 B2 5	C.A.O., Reverse coordinates gets 0. C.A.O., Allow plots within a 2mm square inclusive. C.A.O., Accept the letters A,B, C instead of points B1 for sight of $x+2$ without the $y=$ OR B1 for rule in words, e.g. 'second number is 2 more than the first number'	
9. (a) (i) $k + 5$ <b><u>ISW</u></b> (ii) $k - 4$ <b><u>ISW</u></b> (iii) $3k$ <b><u>ISW</u></b> (iv) $7 + 10k$ <b><u>ISW</u></b> (b) (i) $12x$ (ii) $6a$	B1 B1 B1 B1 B1 B1 6	<b><u>Penalise -1, once only, for changing the k to another letter</u></b> <b><u>Ignore k=, =k, =n, n= etc</u></b> C.A.O. C.A.O. Allow $3 \times k$ OR $k \times 3$ OR $k3$ Allow $7 + 10 \times k$ C.A.O. C.A.O.	
10. (a) $\begin{array}{ccc} 10 & 15 & 20 \\ 8 & 12 & 16 \\ 6 & 9 & 12 \end{array}$ (b) (i) $\frac{3}{20}$ (ii) $\frac{17}{20}$ (c) $\frac{5}{20}$ or equivalent (d) (i) $\frac{5}{20}$ of 800 $= 200$ (ii) Full method of $800 \times 50p - \text{their (d)(i)} \times 1.50$ Profit = 10000 ( <b><u>p</u></b> ) OR ( <b><u>£</u></b> ) 100	B2 B2 B1 B1 M1 A1 M1 A1 10	B1 for any correct row or column. F.T. their table B1 for a numerator of 3 in a fraction less than 1. B1 for a denominator of 20 in a fraction less than 1. F.T. 1 - their (b) (i) F.T. their table. F.T. their (c). 200 out of 800 gets M1, A1 $\frac{200}{800}$ gets M1, A0. Receipts = ( $\pounds$ ) 400 Payouts = ( $\pounds$ ) 300	NOTES: There is no F.T. for the use of any probabilities $\leq 0$ OR $\geq 1$ . Penalise -1 once only for consistent use of a wrong sample space. Penalise -1 once only for consistent use of words such as "3 out of 20", "17 in 20" OR "3:20", "17:20". When fraction and wrong notation seen, DO NOT penalise wrong notation. <b><u>Parts (c) and (d)</u></b> If incorrect reduction of fractions, e.g. $\frac{5}{20} = \frac{1}{5}$ then give the B1, but if they go on to use the incorrect $\frac{1}{5}$ in another part of the question, penalise -1 <b><u>from an A mark at their first use only.</u></b>

2010 Autumn Paper 1 (Non calculator) Foundation Tier	Marks	FINAL POST CONFERENCE MARK SCHEME (13/11/10) Comments (Page 3)
11. (a) $(180 - 48)/2$ $= 66$ (°) (x =) 114 (°)  (b) $360 - 36 - 115 - 44$ <b>OR</b> <b><u>360 - 195</u></b> $= 165$ (y =) 15 (°)	M1 A1 B1  M1 A1 B1 6	<b>Look at the diagram also</b> C.A.O. F.T. 180 – ‘their 66’  C.A.O. F.T. 180 – ‘their 165’
12. (a) Correct cuboid   (b) $3 \times 3 \times 6$ OR $3 \times 3 \times 3 \times 2$ $= 54$ (cm <sup>3</sup> )  <b>Watch for incorrect methods giving answer of 54</b>	B2  M1 A1  4	B1 for a cube  <b>Only sketch asked for so</b> <b>B2 for cuboid like this with correct or no lengths given</b> <b>but only B1 if any incorrect lengths are shown</b>  <b>Condone 54<sup>3</sup>. for M1, A1</b> <b>F.T. from (a) <math>3 \times 3 \times x</math> (x&gt;3) where x is shown on their sketch in (a)</b>
13. (a) Intention of correct location All lines $\times 2$  (b) Reflection In line $x = 1$  (c) Correct rotation $(-2, -1), (-2, -2), (-1, -3)$  <b>H2abc</b>	B1 B2  B1 B1  B2  7	Award B1 for any 2 lines $\times 2$ <b>Any other scale used (<math>\neq 1</math>) is MR-1</b> Do not accept “flip” or “mirror”  B1 for clockwise $90^\circ$ rotation (1, 3), (2, 1), (2, 2) <b>B0 if triangles in all quadrants</b>
14. Entries for 15:    15    32 Entries for 100:  100   202  n (black squares) $2n + 2$ or equivalent  <b>H4</b>	B2  B1 B2  5	<b>For all 4 correct</b> <b>B1 for any 2 OR 3 correct</b>  <b>B1 for <math>2n</math> (OR <math>2 \times n + 1</math> missing brackets)</b> <b>OR <math>\times 2 + 2</math></b>
15 (a) $385 / 11$ (=35) (£) 70 and (£) 315  (b) <u>Reduction of denominator to 0.2 or 0.25 or 0.3</u> <u>Answers in the range 2000 to 3050 from</u> <u>appropriate working</u>  <b>H5bc</b>	M1 A1  M1  A1  4	Suitable for ease of calculation
16. (a) $m^6$  (b) $7x - 28 = 3x - 10$ $4x = 18$ $x = 18/4$ ISW (= $4\frac{1}{2}$ OR $4.5$ )	B1  B1 B1 B1 4	C.A.O. <b>Watch out for <math>m^{20}/m^3 = m^{6.66..} = m^6</math></b>  <b>Clearing brackets correctly = <math>3x - 10</math></b> F.T. until 2 <sup>nd</sup> error F.T. their terms F.T. for $ax = b$ ( $a \neq 1$ )
17. (a) $6^2$ or 36 AND $8^2$ or 64 AND $10^2$ or 100 seen $36 + 64 = 100$ or <b><math>6^2 + 8^2 = 10^2</math></b> or a statement related to square on hypotenuse .....  (b) $\frac{1}{2} \times \pi \times 20^2$ $= 628$ (cm <sup>2</sup> )  <b>H6</b>	E1  E1  M1 A1  4	Accept 6,8,10 is double the triple 3,4,5 for E2  <b>Watch for correct method being used.</b> <i>SCI for an answer of 1256</i>

**PAPER 2 - FOUNDATION TIER**

2010 Autumn Paper 2 (Calculator allowed) Foundation Tier	Marks	FINAL CONFERENCE MARK SCHEME (20/11/10) Comments (Page 1)
<p>1. (a) (i) (4.05) 5.24 4.86 1.25 15.4(0)</p> <p>(ii) 10% = 1.54 5% = (£) 0.77 OR 77p</p> <p>(b) <math>35 \times 5 \times 4</math> <b>(£)7</b> OR 700(p)</p>	<p>B1 B1 B1 B1</p> <p>M1 A1</p> <p>M1 A1</p> <p>8</p>	<p>C.A.O. C.A.O. C.A.O. F.T. their figures for 1 error Unsupported 15.4(0) gets B4.</p> <p>F.T. their total Any correct method for 5% (£)14.63 gets the M1, A1. <b>Unsupported .77p gets M1, A0</b></p> <p>C.A.O. <b>SC1 for (£)9.8(0), OR 980(p)</b></p>
<p>2. (a) Attempt to count squares 54 – 62 inclusive</p> <p>(b) (i) Perpendicular through A</p> <p>(ii) Trapezium</p>	<p>M1 A1</p> <p>B1</p> <p>B1 4</p>	<p>Intent rather than accuracy</p> <p>C.A.O.</p>
<p>3. (a) (£) 12.65</p> <p>(b) (£) 14.75 OR (£) 6.70 <math>14.75 - 6.70</math> = (£) 8.05</p> <p>(c) No 9 a.m. available (on Saturday) OR delivery by 1:00pm (£) 23.85</p>	<p>B1</p> <p>B1 M1 A1</p> <p>E1 E1 6</p>	<p>C.A.O.</p> <p>For either cost For subtracting the 2 costs C.A.O. <b>Consistent readings from the 500g row, that is, <math>12.65 - 5.40 = 7.25</math> gets B1, M1, A1, MR-1 OR Consistent readings from the 1kg row, for SATURDAY, <math>16.95 - 8.90 = 8.05</math> gets B1, M1, A1, MR-1</b></p> <p>Along these lines, the (only) delivery is for 1 p.m.</p>
<p>4. A = 40 B = 110 C = 0 D = -50</p>	<p>B1 B1 B1 B1 4</p>	<p>C.A.O. C.A.O. C.A.O. C.A.O.</p>
<p>5. (a) Cost = <math>40 \times 36 + 30</math> = (£) 1470</p> <p>(b) Deposit = <math>1330 - 36 \times 35</math> = (£) 70</p>	<p>M1 A1</p> <p>M1 A1</p> <p>4</p>	<p>C.A.O.</p> <p>Correctly substitution in this form C.A.O. Accept embedded answers</p>
<p>6. (a) Both lines of symmetry</p> <p>(b) kite identified kite</p> <p>(c) <math>180 - 90 - 26</math> OR <math>90 - 26</math> = 64</p>	<p>B2</p> <p>B1 B1</p> <p>M1 A1 6</p>	<p>B1 for either line and no other OR B1 for both correct lines and one incorrect line.</p> <p>F.T. their chosen shape</p> <p>C.A.O.</p>



2010 Autumn Paper 2 (Calculator allowed) Foundation Tier		Marks	FINAL CONFERENCE MARK SCHEME (20/11/10) Comments (Page 3)	
15. (a) $10 \cdot 5 - 10 \cdot 9$ $\times 6$ $= 63 \cdot 0 - 65 \cdot 4$ (km)		B1 M1 A1	FT 'their $10 \cdot 5 - 10 \cdot 9$ ' $\times 6$ Unsupported answers in this range get the 3 marks Overlay	
(b) Bearing <b>(Mark this first)</b> Distance <b>(Must be in the sea)</b>		B1 B1	Allow $\pm 2^\circ$ Allow $\pm 2$ mm <b>If B1 for bearing is awarded then this B1 is awarded for any point on the bearing that is <math>8\text{cm} \pm 2\text{mm}</math> from Q. Use your overlay to measure this. If the first B1 has not been awarded, then this B1 is for any point that is <math>8\text{cm} \pm 2\text{mm}</math> from Q.</b>	
5		5		
16. 1604	a	B1	C.A.O.	Accept truncated or rounded answers
200.5(0)	b	B1	F.T. (B0 unless in £s)	$a \times 0 \cdot 125$
230.76	c	B1	F.T.	$b + 30 \cdot 26$
11.53(8)	d	B1	F.T.	$c \times 0 \cdot 05$
260.11(8)	e	B1	F.T.	$c + d + 17 \cdot 82$ <b>OR <math>1 \cdot 05c + 17 \cdot 82</math></b>
6.13(2) CR		B1	F.T.	$e - 266 \cdot 25$ Allow $\pm 2p$ MUST USE CR OR - if appropriate.
6		6		
17. $44 \times 1 \cdot 15$ $= 50 \cdot 6(0$ euros)		M1 A1	<b>UNITS are ignored throughout this question</b>	
$40 \times 0 \cdot 98$ $= 39 \cdot 2(0$ euros)		M1 A1		
11.4(0 euros)		A1	FT provided that both M marks are awarded	
<b>H3</b>		5	<b>Final answer must be numerically correct for euros</b>	
18. (a) $c = 10$ $a = 7$ $b = 5$ $c + b = 15$		B1 B1 B1 B1	<b>STRICT FT</b> their $c - 3$ <b>STRICT FT</b> their $12 - a$ <b>STRICT FT</b> their $c + b$	
(b) 4, 7, 12		B2	$B1$ $1^2+3, 2^2+3, 3^2+3$ OR any 2 terms correct <b>in correct position</b> <b>B1 for 3, 4, 7</b>	
(c) $7n + 1$		B2	B1 for $7n$	
<b>H4</b>		8		
19. $P(HH) = \frac{1}{4}$ OR $P(TT) = \frac{1}{4}$ OR HH TT HT TH $P(HH) = \frac{1}{4}$ AND $P(TT) = \frac{1}{4}$		M1 A1	Showing either one of the probabilities is $\frac{1}{4}$ or the sample space. Accept at the stage $P(HH) = \frac{1}{2} \times \frac{1}{2}$ OR $P(TT) = \frac{1}{2} \times \frac{1}{2}$	
Conclusion that the statement is not true		A1 3	For showing both events to have a probability of $\frac{1}{4}$	
20. Mid points 4, 11, 18 $4 \times 15 + 11 \times 33 + 18 \times 12$ OR 639 $(\sum fx / 60) = 639/60$		B1 B1 M1	FT for their mid points from within group FT "their correctly evaluated $\sum fx / 60$ .	
10.65... (days) rounded or truncated		A1	Do not allow unsupported 11, but unsupported 10.6 or 10.7 awarded all 4 marks.	
<b>H8</b>		4	FT answer of (lower)7.65. or (upper) 13.65	
21. One correct evaluation $0 \leq x \leq 1$		B1	$x$ $x^3 + x - 1$ 0      -1 1      1	$x$ $x^3 + x - 1$ 0.1      -0.899 0.2      -0.792 0.3      -0.673 0.4      -0.536 0.5      -0.375 0.6      -0.184 0.7      0.043 0.8      0.312 0.9      0.629
2 correct evaluations, $0.6 \leq x \leq 0.75$ , one either side of 0		B1	0.61 -0.163019 0.62 -0.141672	
2 correct evaluations, $0.65 \leq x \leq 0.75$ , one either side of 0		M1	0.63 -0.119953 0.64 -0.097856 0.65 -0.075375 0.66 -0.052504	
0.7		A1	0.67 -0.029237 0.68 -0.005568	
No calculations shown: accept "too high", ">", etc.		4	0.69 0.018509	<b>0.75</b> <b>0.172</b>
<b>H9</b>		4		




## PAPER 1 - HIGHER TIER

Paper 1 November 2010 Higher Tier		Comments - (Page 1)
1.(a) All points plotted correctly  (b) Positive (c) Line of best fit with points above and below (d) Number of visitors from their line of best fit	B2  B1 B1 B1 5	B1 for at least 3 correct plots. Ignore line of best fit at this stage. If B2 penalise joined point to point -1 Do not accept descriptions. No line of best fit then B0
2.(a) Intention of correct location All lines x2  (b) Reflection In line $x = 1$ (c) Correct rotation (-2,-1), (-2,-2), (-1,-3)  (d) Enlargement 1/2 Correct position	B1 B2  B1 B1 B2  B1 B1 9	Award B1 for any 2 lines x2.  Do not accept "flip" or "mirror" B1 for clockwise $90^\circ$ rotation (1,3), (2,1), (2,2) B0 if triangles in all quadrants
3.(a) $a = 55^\circ$ , $b = 55^\circ$ , $c = 142^\circ$ , $d = 38^\circ$ (b)(i) Bearing $258^\circ \pm 2^\circ$ (ii) $100^\circ \pm 2^\circ$ from X $225^\circ \pm 2^\circ$ from Y $Z$ indicated or implied by point (iii) $20 \times$ their XZ correctly evaluated	B4 B1 M1 M1 A1 B1 9	B1 for each, FT (b) = (a) and (d) = $180 - (c)$  Depends on at least 1 M mark Allow $\pm 2$ mm tolerance for their measurement If units are given they must be correct
4. Entries for 15: 15 32 Entries for 100: 100 202 $n$ (black squares) $2n + 2$ or equivalent	B2  B1 B2 5	B1 for any 2 correct entries  B1 for $2n$ OR $2 \times n + 1$ missing brackets OR for $\times 2 + 2$
5.(a) (i) 184.626 (ii) 7890 (iii) 92313 (b) $385/11 (=35)$ (£) 70 and (£) 315 (c) Reduction of denominator 0.2 or 0.25 or 0.3 Answers in the range 2000 to 3050 from appropriate working	B1 B1 B1 M1 A1 M1 A1 7	Suitable for ease of calculation
6.(a) $6^2$ or 36 AND $8^2$ or 64 AND $10^2$ or 100 seen $36 + 64 = 100$ or $6^2 + 8^2 = 10^2$ or a statement related to square on hypotenuse ..... (b) $\frac{1}{2} \times \pi \times 20^2$ $= 628 \text{ (cm}^2\text{)}$	E1 E1  M1 A1 4	Accept 6,8,10 is double the triple 3,4,5 for E2  <i>SCI for an answer of 1256</i>
7. (a) 6 bananas+ $2 \text{ apples} = 130$ $1 \text{ banana} = 149 - 130$ $= 19 \text{ (pence)}$ $1 \text{ apple} = 8 \text{ (pence)}$ (b) $2(2x+3) + 4(x-1) = 7$ or equivalent  $8x + 2 = 7$ $x = 5/8$ ISW	$3b + 1a = 65$ $7b + 2a = 149 \text{ (1.49)}$ Equal coefficients $b = 19 \text{ (pence)}$ $a = 8 \text{ (pence)}$  M1 M1 A1 A1 M2  A1 A1 8	Accept mixed units of money for M marks, e.g. 1.3 or 130, 149 or 1.49  This maybe implied by the price of the apple <i>Award B4 for answer only</i> Correctly clearing all 3 fractions, OR M1 for clearing 2 fractions FT from M1

Paper 1 November 2010 Higher Tier		Comments - (Page 2)								
8.(a) $a^7$ (b) $x^2+2x$ (c) $6w + 6y = 10y - 7$ $6w = 10y - 6y - 7$ $w = (4y - 7) / 6$ or equivalent (d) $(x - 3)(x + 4) (=0)$ $x = 3$ and $x = -4$ (e) $3n - n > 9 - 5$ $n > 4/2$ ISW	B1 B1 B1 B1 B1 B1 B1 B1 B1 10	CAO FT until 2 <sup>nd</sup> error in (c) OR $w+y=(10y-7)/6$ B2 $w=(10y-7)/6 - y$ B1 Mark final answer B1 for $(x \dots 3)(x \dots 4)$ FT their pair of brackets FT until 2 <sup>nd</sup> error. Use of “=” gets 0 marks, unless replaced to give correct answer, then B2								
9.(a) Method with at least 2 correct prime factors Sight of correct factors (2, 2, 3, 3, 3, 7) $2^2 \times 3^3 \times 7$ or $2^2 \cdot 3^3 \cdot 7$ (b) $2^6 \times 5^2$ OR $64 \times 25$ OR $256 \times 25 / 4$ $1600$ $1.6 \times 10^3$	M1 A1 B1 B1 B1 B1 6	Ignore 1s seen FT their factors (with at least on index >1 used). Do not ignore 1s. Or alternative first stage of working CAO FT for their answer expressed in standard form								
10.(a) Last reading (0.7 or 100) Reason “More throws gives better estimate” (b)(i) $0.6 \times 60$ $= 36$ (ii) $100 - 70$ $= 30$	B1 E1 M1 A1 M1 A1 A1 6	SC1 for sight of 0.3 or 1 - 0.7								
11. Sight of $90^{(0)}$ $62^{(0)}$	M1 A1 2									
12. (a) $y \propto 1/x^2$ OR $y = k/x^2$ $4 = k/5^2$ $y = 100/x^2$ (b)	B1 M1 A1 B2 5	FT non linear only Maybe implied in part (b) B1 for each value. FT their non linear expression for SC1 only, both correct answers								
<table border="1"> <tbody> <tr> <td>x</td> <td>-1</td> <td>5</td> <td>10</td> </tr> <tr> <td>y</td> <td>100</td> <td>4</td> <td>1</td> </tr> </tbody> </table>	x	-1	5	10	y	100	4	1		
x	-1	5	10							
y	100	4	1							
13.(a)(i) Entries 16, 16 and 20 (ii) Attempt to find $\frac{1}{4}$ or $\frac{3}{4}$ of 16 Either $60 - \frac{3}{4} \times 16$ OR $\frac{1}{4} \times 16 + 20 + 16 + 8$ 48 (logs) (b) Entries 40, 150, 40, 30 Correct histogram (c) Explanation Yes, stated or implied	B1 M1 M1 A1 M2 A1 M1 A1 9	Or $\frac{1}{4}$ or $\frac{3}{4}$ of their first entry in (i) M1 for any 2 correct entries FT their frequency densities provided at least M1 awarded								
14. (a) $(x =) -1, 2, 5$ (b) Tangent drawn at $x=4.5$ Grad = change y / change x (9.75 or) FT for their reasonable tangent (c) Line $y = x$ stated or shown 3 x value solutions (d) Using trapezium rule or summation of areas Use of y values 0, 10, 8, 0 Correct expression for total area $18$ (unit <sup>2</sup> )	B1 B1 M1 A1 B1 B2 B1 B1 M1 A1 11	Has to be “change in” values Maybe implied B1 for 2 solutions. FT from incorrect line Allow 1 error in y value CAO <i>Working includes below x-axis B marks only</i>								
15.(a) Suitable sketch (b) $60^{(0)}$ $- 60^{(0)}$	B2 B1 B1 4	B1 either steeper or intention to reflect in x-axis Allow $\pm 2^0$ FT -(first answer). Penalise further values -1								

**PAPER 2 - HIGHER TIER**

<b>Paper 2 November 2010 Higher Tier</b>		<b>Comments - (Page 1)</b>
1.(a) $84.96 + 354$ OR $1.24 \times 354$ $= (\pounds) 438.96$ (b) $146.32 / 236 (\times 100)$ $62(\%)$ (c) e.g. $0.66(6..)$ or $0.7$ or $0.67$ $0.6$ $0.45$ $9/20$ OR $0.45$	M2 A1 M1 A1 B1 B1 7	M1 for $24/100 \times 354 + 354$ ISW Answer of 0.62 is M1 Or equivalent as percentage, or common denominator fractions Independent of working. OR FT from one incorrect or missing conversion. Answer only B0 B1
2.(a) $(x =) 80$ (b) $7(2y + 5)$ (c) $12x + 28 = 64$ OR $3x + 7 = 64/4$ $12x = 36$ $3x = 9$ $x = 36/12 (=3)$ $x = 9/3 (=3)$ (d) 12	B1 B1 B1 B1 B1 B1 6	Maybe embedded In (c) FT until 2 <sup>nd</sup> error ISW
3. $44 \times 1.15$ $= 50.6(0 \text{ euros})$ $40 \times 0.98$ $= 39.2(0 \text{ euros})$ $11.4(0 \text{ euros})$	M1 A1 M1 A1 A1 5	FT provided that both M marks are awarded
4.(a) $c = 10$ $a = 7$ $b = 5$ $c + b = 15$ (b) 4, 7, 12 (c) $7n + 1$	B1 B1 B1 B1 B2 B2 8	If c incorrect then strictly a FT FT their $c - 3$ FT their $12 - a$ FT their $c + b$ B1 $1^2+3, 2^2+3, 3^2+3$ OR any two terms correct OR 3, 4, 7 B1 for $7n$
5. HH TT HT TH or $P(HH) = 1/4$ or $P(HT)+P(TH) = 2/4$ $P(HH) = 1/4$ AND $P(HT)+P(TH) = 2/4$ Conclusion that the statement is not true	M1 A1 A1 3	Accept $P(HH) = 1/2 \times 1/2$ or $P(HT)+P(TH) = 1/4 + 1/4$
6.(a) Suitable axes, with uniform scales Polygon with at least 3 vertices correctly plotted (vertical & horizontal) All 5 vertices of the polygon correct (b) Entries 23, 50, 82, 98, 100 (c) 20 (minutes)	B1 M1 A1 B1 B1 5	Must be values only not ranges. No polygon M0. Ignore bars. Mid points - allow intention SCI for a correct polygon translated horizontally or all correct plots with no polygon (or curved polygon!) Do not accept an interval
7.(a) $10x + 25 - 6x + 8$ $4x + 33$ (b) $2y^3 + 6y$ (c) $n^2$ (d) $(x =) 8$	B1 B1 B2 B1 B1 6	FT until 2 <sup>nd</sup> error ISW B1 for each term. If B2 penalise further incorrect working -1 Or equivalent Accept embedded answer
8. Mid points 4, 11, 18 $4 \times 15 + 11 \times 33 + 18 \times 12 (=639)$ $(\sum fx / 60 =) 639 / 60$ $10.65$ (days) rounded or truncated	B1 B1 M1 A1 4	FT for their mid points from within group FT "their correctly evaluated $\sum fx$ " / 60 correctly evaluated. Do not allow unsupported 11, but unsupported 10.6 or 10.7 awarded all 4 marks. FT answer of (lower)7.65. or (upper) 13.65

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<p>9. One correct evaluation  <math>0 \leq x \leq 1</math></p> <p>2 correct evaluations,  <math>0.6 \leq x \leq 0.75</math>, one either side of 0</p> <p>2 correct evaluations,  <math>0.65 \leq x \leq 0.75</math>, one either side of 0</p> <p style="text-align: center;">0.7</p> <p><i>No calculations shown: accept "too high", "&gt;", etc.</i></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">x</td> <td style="width: 50%; text-align: center;"><math>x^3 + x - 1</math></td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">-1</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">0.61</td> <td style="text-align: center;">-0.163019</td> </tr> <tr> <td style="text-align: center;">0.62</td> <td style="text-align: center;">-0.141672</td> </tr> <tr> <td style="text-align: center;">0.63</td> <td style="text-align: center;">-0.119953</td> </tr> <tr> <td style="text-align: center;">0.64</td> <td style="text-align: center;">-0.097856</td> </tr> <tr> <td style="text-align: center;">0.65</td> <td style="text-align: center;">-0.075375</td> </tr> <tr> <td style="text-align: center;">0.66</td> <td style="text-align: center;">-0.052504</td> </tr> <tr> <td style="text-align: center;">0.67</td> <td style="text-align: center;">-0.029237</td> </tr> <tr> <td style="text-align: center;">0.68</td> <td style="text-align: center;">-0.005568</td> </tr> <tr> <td style="text-align: center;">0.69</td> <td style="text-align: center;">0.018509</td> </tr> </table>	x	$x^3 + x - 1$	0	-1	1	1	0.61	-0.163019	0.62	-0.141672	0.63	-0.119953	0.64	-0.097856	0.65	-0.075375	0.66	-0.052504	0.67	-0.029237	0.68	-0.005568	0.69	0.018509	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">x</td> <td style="width: 50%; text-align: center;"><math>x^3 + x - 1</math></td> </tr> <tr> <td style="text-align: center;">0.1</td> <td style="text-align: center;">-0.899</td> </tr> <tr> <td style="text-align: center;">0.2</td> <td style="text-align: center;">-0.792</td> </tr> <tr> <td style="text-align: center;">0.3</td> <td style="text-align: center;">-0.673</td> </tr> <tr> <td style="text-align: center;">0.4</td> <td style="text-align: center;">-0.536</td> </tr> <tr> <td style="text-align: center;">0.5</td> <td style="text-align: center;">-0.375</td> </tr> <tr> <td style="text-align: center;">0.6</td> <td style="text-align: center;">-0.184</td> </tr> <tr> <td style="text-align: center;">0.7</td> <td style="text-align: center;">0.043</td> </tr> <tr> <td style="text-align: center;">0.8</td> <td style="text-align: center;">0.312</td> </tr> <tr> <td style="text-align: center;">0.9</td> <td style="text-align: center;">0.629</td> </tr> <tr> <td style="text-align: center;">0.75</td> <td style="text-align: center;">0.171875</td> </tr> </table>	x	$x^3 + x - 1$	0.1	-0.899	0.2	-0.792	0.3	-0.673	0.4	-0.536	0.5	-0.375	0.6	-0.184	0.7	0.043	0.8	0.312	0.9	0.629	0.75	0.171875
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<p>10.(a) -4  (b) Plots  Curve  (c) -1 and 3.5</p>	<p>B1  P1  C1  B1  4</p>	<p>Allow one error. (FT their (a))  Must be a curve joining through at least 6 points  FT their graph. x-values, coordinates are not required</p>																																														
<p>11. (a) <math>3/5</math>, <math>2/5</math> and <math>7/10</math>, <math>3/10</math>, <math>7/10</math>, <math>3/10</math> correctly placed  OR decimal equivalents  (b) <math>2/5 \times 3/10</math>  = <math>6/50</math>  (c) Considering RW and WR as possibilities</p> $3/5 \times 3/10 + 2/5 \times 7/10 = 23/50$	<p>B3  M1  A1  B1  M1  A1  8</p>	<p>B2 carton correct with one box pair correct OR B1 for any pair (total 1) correct</p> <p>FT their white probabilities, <math>&gt;0</math> &amp; <math>&lt;1</math>  Ignore incorrect cancelling of final answer  Or values for RW or WR. FT their tree if probabilities are between 0 and 1, but not <math>1/2</math></p> <p>Ignore incorrect cancelling of final answer</p>																																														
<p>12. Overall strategy  <math>1/2(3.2 + 8) \times BC = 30.8</math>  <math>BC = 5.5</math>  <math>(8 - 3.2) = 4.8</math>  <math>AD^2 = 4.8^2 + 5.5^2</math>  <math>AD^2 = 53.29</math>  <math>AD = 7.3</math> (cm)</p>	<p>S1  M1  A1  B1  M1  A1  A1  7</p>	<p>Sight of 4.8  FT their BC with their 4.8 correctly substituted  FT  CAO</p>																																														
<p>13.(a) Suitable correct diagram, drawn or implied</p>  <p><math>\tan \dots = 7.7/4.1</math>  OR selecting correct angle North from harbour  <math>\tan \dots = 1.8780487\dots</math> accept rounded or truncated  61.966...<sup>(o)</sup> accept rounded or truncated  062<sup>(o)</sup> from calculation</p> <p>(b) <math>AC^2 = 4.6^2 + 8.7^2 - 2 \times 4.6 \times 8.7 \times \cos 37</math>  <math>AC^2 = 32.927\dots</math> rounded or truncated  <math>AC = 5.7(38\dots \text{cm})</math></p>	<p>B1  M1  M1  A1  B1  M1  A1  A1  8</p>	<p>If implied, understanding of directions must be clear, rt. angled triangle with 7.7 &amp; 4.1 is insufficient, however .....</p> <p>FT their diagram for finding an angle measured from the North  OR <math>\tan^{-1}(7.7/4.1)</math></p> <p>Must be three figure bearing. FT provided M1 awarded and possible to understand their diagram, e.g for <math>298^{(o)}</math> from calculation</p> <p>Do not accept unsupported 6(cm), accept supported 6(cm)</p>																																														
<p>14.(a) <math>AB = -8x + 5y + 2y</math>  = <math>-3x + 2y</math>  (b) <math>OC = 5x + 2y + -(2x + y)</math>  = <math>3x + y</math></p>	<p>M1  A1  M1  A1  4</p>																																															

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<p>15. (a) Sight any 1 of: 29.5, 30.5, 14.5, 15.5            (value 29.5 to 29.99) <math>\times</math> (value 14.5 to 14.99) <math>\times</math> 20            Using min values to give an answer 8555(cm<sup>2</sup>)            Statement that it is always possible, based on working</p> <p>(b) <math>30.5 \times 15.5 \times 20</math> (or <math>0.305 \times 0.155 \times 20</math>)            9455(cm<sup>2</sup>) (0.9455 (m<sup>2</sup>))</p>	B1 M1 A1 E1  M1 A1 6	Or alternative using division CAO. With correct conclusion Depends on A1. Maybe implied with use of inequalities
<p>16.(a) Sight of <math>3x</math> OR <math>7x(3x+2)</math>  <math>3x + 7x(3x+2) = 250</math>  <math>21x^2 + 17x - 250 = 0</math></p> <p>(b) <math>\{ -17 \pm \sqrt{17^2 - 4 \times 21x - 250} \} / 42</math>  <math>\{ -17 \pm \sqrt{21289} \} / 42</math>            3.07 (and <math>-3.88</math>)</p> <p>(c) Substitution of (b) into <math>x + 3x + 2</math>            14.28 or 14.3 (seconds)</p>	M1 A1 A1 M1 A1 A1 M1 A1 8	CAO. Convincing Allow one error in substitution  CAO, must be to 2dp  FT only if M1 awarded in (b) or for 3.07 used. Must be positive only
<p>17. Overall strategy, trig. with subtraction of areas  <math>126/360 \times \pi \times 4.2^2</math>  <math>= 19.3(9\dots)</math></p> <p>Use of Area triangle = <math>\frac{1}{2} ab \sin C</math>  <math>= \frac{1}{2} 4.2^2 \sin 126</math>  <math>= 7.1(\dots \text{ cm}^2)</math></p> <p>Shaded area = <math>12.(26\dots \text{ cm}^2)</math></p>	S1 M1 A1 M1 A1 A1 B1 7	Or $0.35 \times \pi \times 4.2^2$ Maybe embedded in later working Or $\cos 63 = h/4.2$ Or $\sin 27 = h/4.2$ ( $h = 1.9\dots$ ) Full method to find base, Pythagoras or trig. (3.74... or 7.48...) Area triangle = $7.1(\dots \text{ cm}^2)$ , maybe embedded in overall calculation FT their areas provided at least M1 awarded of each separate area



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