GCSE MARKING SCHEME

APPLICATIONS OF MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2011 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.

APPLICATIONS OF MATHEMATICS

UNIT 1

FOUNDATION TIER

Applications of Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
1. (a) 24×22 or $24 \times 7 + 24 \times 9 + 24 \times 6$ (=528) $528 - 51$ 477 (b) $64 \times 8 \times 5$ 2560 (c) $182 \div 7$ 26	M1 M1 A1 M1 A1 M1 A1 7	 FT "their 528" CAO
2. (a) 86 (b) Arrow at 92 m.p.h. (c) (i) 8.7 (ii) 124	B1 B1 B1 B1 4	 Arrow >91 and <93 ± 2 mm ± 2º
3. Attempt to count area Estimate in range 54 – 64cm squares 'Their area' × 5 Correct evaluation of their area' × 5	M1 A1 M1 A1 4	 FT 'Their area' 270 – 320 (sq km)
4. Mode 16 Median Put in order 6, 15, 16, 16, 17, 19, 22, 24, 54 = 17 Mean Adding the numbers (189) $\frac{189}{9}$ 21	B1 M1 A1 M1 m1 A1 6	
5. (a) $5 \times 25 + 136$ (£) 261 (b)Use of 24 245×24 (= 5880) 9800 – 5880 = 3920	M1 A1 B1 M1 M1 A1 6	Attempt to multiply and then add FT 'Their 5880' but not 245 FT 'Their 5880' but not 245 *Answer of 9310 gets B0,M0,M1,A1*
6. (a) Newtown (b) 5(°C) (c) Caenarfon & Wrexham (d) – 11(°C)	B1 B1 B1 B1 4	 Accept -5(°C)

Applications of Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
7. (a) Points correctly plotted Straight line through points (b) Approximately 62.5 (c) Suitable method used eg 40/25 Approximately 1.6 km	P1 L1 B1 M1 A1 5	 Accept answers in range 60 – 65 Accept use of their graph
8. (a) All 10 entries correct (b) 60° or 140° drawn Accurate completed shape.	 M1 A1 6	B4 for 10 correct, B3 for 8 correct, B2 for 6 correct, B1 for 4 correct ±2°
9. (a) 36.99 (b) 18000	B2 B1 3	B1 for 36.9(8803615) or B1 for 36.97 or 37
10. Strategy, eg use of a scale drawing 5.2 metres drawn using a suitable scale Angle of 33° drawn in correct position. Horizontal line or line at 90° to their vertical line For measuring their line in cm Answer of 6.2m	S1 B1 B1 B1 B1 B1 6	 ± 2mm if 1cm used for 1m. ±2° ±2° ±0.2cm (marks awarded for use of trig!)
11. (a) Full explanation, e.g. increase in performance but with fluctuations. (b) Award 2 marks for 2 correct statements based on the time series Award 1 mark for 1 correct statement based on the time series.	E2 E2 4	E1 for partial explanation e.g. gets better over the 10 weeks. E.g. Sales are higher in the Spring & Summer of the 3rd year. Sales lower in the autumn & winter of each year compared to spring & summer of each year. Penalise -1 if 2 correct statements with further incorrect statements.

Square			
	Sketch	No	No
Parallelogram		No	Yes
	Sketch	Yes	Yes

Applications of Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
12. (a) Reason, e.g. outside the gym. (b) Two boxes if you are 30. (c) Suitable question with at least 3 boxes, no overlap and all prices from a low value upwards (to maybe £200) considered	E1 E1 E2 QWC 2 6	 Or refers to groups for younger or older people E1 Suitable question with at least 3 boxes, max of 1 overlap or all prices from a low value upwards (to maybe £200) not considered QWC2 Presents relevant material in a coherent & logical manner, using acceptable mathematical form, & with few if any errors in spelling, punctuation & grammar. QWC1 Presents relevant material in a coherent & logical manner but with some errors in use of mathematical form, spelling, punctuation & grammar. OR Evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation & grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation & grammar.
13. (a) (i) 360 – 63 = 297(°) (ii) 360 – 110 or 180 + 70 = 250(°) (b) 60° with construction arcs Bisecting their angle, with arcs shown.	M1 A1 M1 A1 B1 B1 6	 *SC1 for answers of 117 and 070 in (i) and (ii)*
14. 486/18 = 27 (£)54, 81, 351.	M1 A1 A1 3	 CAO

Applications of Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
15. One correct evaluation $3 \leq x \leq 4$ 2 correct evaluations $3 \leq x \leq 3.1$ one either side of 0 *(Some candidates may evaluate 3.1 and use knowledge of 3)* Correct evaluation for 3.05 Correct conclusion 3.1	B1 B1 M1 A1 4	3 -2 3.1 0.491 3.2 3.168 3.3 6.037 3.4 9.104 3.5 12.375 **3.05 -0.777** 3.6 13.856 3.7 19.553 3.8 23.472 3.9 27.619 4 32 *Evaluation rounded or truncated to 1 sig. fig.* *If values are not shown DO NOT accept the use of statements, e.g. "greater than 0". Unsupported 3.1 gets B0 B0 M0 A0*
16. (a) 6 miles (b) (0)8 : 48 (c) Sight of 14 (:) 24 or 2 (:) 24 Attempt to find the time difference 08 : 48 to 14 : 24 5 hours 36 minutes. (d) Explanation, e.g. graph steeper going to school 6	B1 B1 B1 M1 A1 E1 6	Miles must be given, B0 for an answer of 6 Any suitable notation Maybe implied in working FT their departure & arrive times at school CAO. Do not accept 05 : 36 for A mark, award B1, M1, A0. *Alternative: 5 hours B1,* *6 ×6 (small squares) M1,* 5 hrs 36 minutes A1 *An answer of 5.6 hours is awarded B1 M1 A0* Accept less time for the same distance

APPLICATIONS OF MATHEMATICS

UNIT 1

HIGHER TIER

<table>
<tr><th>Applications of Mathematics
January 2011 Unit 1
Higher Tier</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1.(a) Reason, e.g. outside the gym
(b) Two boxes if you are 30
(c) Suitable question with at least 3 boxes, no overlap and all prices from a low value upwards (to maybe £200) considered</td><td>E1
E1
E2

QWC
2

6</td><td>Or refers to groups for younger or older people
E1 Suitable question with at least 3 boxes, max of 1 overlap or all prices from a low value upwards (to maybe £200) not considered

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.</td></tr>
<tr><td>2. All 17 entries correct
<table><tr><td>Square</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>Sketch</td><td>No</td><td>Yes</td><td>No</td></tr><tr><td>Kite</td><td></td><td>No</td><td>No</td><td>Yes</td></tr><tr><td></td><td>Sketch</td><td>Yes</td><td>Yes</td><td>No</td></tr><tr><td>Trapezium</td><td></td><td>No</td><td>No</td><td>No</td></tr></table></td><td>B7

7</td><td>B6 for 15 correct,
B5 for 13 correct,
B4 for 11 correct,
B3 for 9 correct,
B2 for 7 correct,
B1 for 5 correct</td></tr>
<tr><td>3.(a) (i) 360 – 63
= 297(°)
(ii) 360 – 110 or 180 + 70
= 250(°)
(b) 60° with construction arcs
Bisecting their angle, with arcs shown</td><td>M1
A1
M1
A1
B1
B1
6</td><td>

SC1 for answers of 117 and 070 in (i) and (ii)</td></tr>
<tr><td>4.(a) 486/18
= 27
(£)54, 81, 351
(b)(i) 45 700 000
(ii) 0.07
(c)(i) Identifying a common factor of both numbers
30
(ii) Reasonable idea, e.g. fixed amount, a percentage</td><td>M1
A1
A1
B1
B1
M1
A1
E1
8</td><td>

CAO</td></tr>
<tr><td>5.(a) (i) (£) 1000
(ii) (7000-1000) / 12 or equivalent
(£) 500
(b) Draw a line through (0, 2000)
Line with correct gradient
(c) Refers to the same choice:
Possible advantage
Possible disadvantage</td><td>B1
M1
A1
B1
B1

E1
E1
7</td><td>

FT for their graph. E.g. Hayward because cheaper overall but more deposit to pay, or Sure Way because less deposit to start only bit more expensive</td></tr>
</table>

Applications of Mathematics January 2011 Unit 1 Higher Tier	Mark	Comments
6. One correct evaluation $3 \leq x \leq 4$ 2 correct evaluations $3 \leq x \leq 3.1$ one either side of 0 *(Some candidates may evaluate 3.1 and use knowledge of 3)* Correct evaluation for 3.05 Correct conclusion 3.1	B1 B1 M1 A1 4	3 -2 3.1 0.491 3.2 3.168 3.3 6.037 3.4 9.104 3.5 12.375 **3.05 -0.777** 3.6 15.856 3.7 19.553 3.8 23.472 *Evaluation rounded or truncated to 1 sig. fig.* 3.9 27.619 4 32 *If values are not shown DO NOT accept the use of statements, e.g. "greater than 0". Unsupported 3.1 gets B0 B0 M0 A0*
7.(a)(i) Quadrant at any corner indicated, radius 3 cm (ii) $\frac{1}{4} \times \pi \times 15^2$ 177 (m^2) (b) Bisector of XY Arc centred at X radius 6 cm Correct region identified, both sides of XY	B2 M1 A2 B1 B1 B1 8	B1 for a quadrant at any corner FT for their radius for M1 only, e.g. $\frac{1}{4} \times \pi \times 3^2$ A1 for not rounded, 176.7145…m^2, or A1 an answer of 7 from working with a radius of 3. *SC1 for answer of 707 (i.e. no ¼)* $\pm$2mm FT from a straight line and an arc, i.e. similar region
8.(a) 6 miles (b) (0)8 : 48 (c) Sight of 14 (:) 24 or 2 (:) 24 Attempt to find the time difference 08 : 48 to 14 : 24 5 hours 36 minutes (d) Explanation, e.g. graph steeper going to school	B1 B1 B1 M1 A1 E1 6	Miles must be given, B0 for an answer of 6 Any suitable notation Maybe implied in working FT their departure and arrive times at school CAO. Do not accept 05 : 36 for A mark, award B1 M1 A0 *Alternative: 5 hours B1, 6 ×6 (small squares) M1,* *5 hrs 36 minutes A1* *An answer of 5.6 hours is awarded B1 M1 A0* Accept less time for the same distance
9.(a) 8×10^{27} (b) 5.4×10^7	B2 B1 3	B1 for 0.8×10^{28}
10.(a)(i) Mid points 4.5, 7, 9.5 and 12 $(4.5 \times 8 + 7 \times 34 + 9.5 \times 10 + 12 \times 2)/ 54$ (=393/54) 7.27777… rounded or truncated (ii) Use of 5.5 or 11 An answer of 5.5 (b) (i) 34, 37.2, 41.2, 38 (ii) Explanation, e.g. it includes irrelevant data	B1 M1 A1 B1 B1 B3 E1 9	FT their midpoints 5.5 seen with no working, award B1 B1 OR B2 for any 2 correct entries, OR B1 for a correct method seen, or one correct entry Accept responses that state the sales before August were all high, or that it is related to smoothing out data
11.(a) Entries 22, 62, 112, 120 (b) Explanation, e.g "measured to the nearest cm", or "those less than half way go in the group below" (c) Correct cumulative frequency diagram, points plotted and joined with a curve or straight lines (d) Median …….. Intention to subtract horiz. readings for vert. 90 & 30 Interquartile range ……. (e) Horizontal scale correctly indicated Range correct as whiskers LQ, median, UQ to form a box	B1 E1 B2 B1 M1 A1 B1 B1 B2 11	FT from cumulative (a). B1points plotted but not joined, correct diagram with 1 point incorrectly plotted, or correct apart from being a 0.5 horizontal translation. FT their cumulative frequency diagram Do not penalise break in scale not indicated FT their answers. B1 if one error
12. Strategy, equivalent to $x(x + 7) = 504$ (accept trial) 2 reasonable trials, one resulting in an answer >504, one <504 Confirmation that the answer is between 19.2 and 19.3 Confirmation (e.g. consideration of 19.25) to 1 dp Width 19.2 (cm) CAO Length 26.2 (cm) CAO	 S1 B1 B1 M1 A1 A1 6	*Alternative:* *Equating $x(x + 7) = 504$ or $x^2 + 7x - 504 = 0$ or equivalent* *Method to solve: quadratic formula or complete square* *Correct stage of working* *Evaluation* *Width 19.2 (cm) (correct to 1d.p.)* *Length 26.2 (cm)*

Applications of Mathematics January 2011 Unit 1 Higher Tier	Mark	Comments
13.(a) "No, data is destroyed" OR "Yes, not many very short or very long leaves"	E1	Needs to give a decision with logic/reasoning explained
(b) Frequency density, 3 correct	M1	
0.6, 1.6, 2.8, 7.2, 6.4, 4(.0), 0.4	A1	
Axes correct and labelled, no gaps between bars	M1	Histogram needs to be attempted
Correct histogram	A1	FT candidates frequency density if table completed incorrectly but the idea of frequency density is used
	5	
14.(a) Correct evaluation of at least 3 coordinates	B1	
Suitable axes with appropriate scale and labels	B1	
Plotting at least 6 correct points	M2	FT for their axes if reasonable. M1 for plotting between 3 and 5 correct points
Joining all 7 points with a curve	A1	
(b)(i) (At t =) 3	B1	
(ii) Strategy, e.g. to draw a tangent at t = 1.2	S1	Accept appropriate other methods, e.g. close calculations to 1.2
Use of difference v / difference t	M1	Must be differences, not readings from axes
Their difference v / difference t	A1	
= …… (m/s^2)	A1	Reasonable from their graph
(c) Identifying the required area	S1	Maybe shown on their graph
Splitting area into areas that can be approximated	M1	
Complete calculation for the area required	M1	
Accurately calculated	A1	
	14	

t	0	1	2	3	4	5	6
v	0	5	8	9	8	5	0

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