

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

Applications of Mathematics January 2011 Unit 1 Foundation Tier	Mark	Comments
7. (a) Points correctly plotted Straight line through points	P1 L1	
(b) Approximately 62.5(c) Suitable method used eg 40/25 Approximately 1.6 km	B1 M1 A1 5	Accept answers in range 60 – 65 Accept use of their graph
8. (a) All 10 entries correct Square Sketch No Parallelogram No Sketch Yes Sketch Yes	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	S1 B1 B1 B1	± 2mm if 1cm used for 1m. ±2° ±2°
For measuring their line in cm Answer of 6.2m	B1 B1 6	±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.

Applications of Mathematics	Mark	Comments
January 2011 Unit 1 Foundation Tier		
12. (a) Reason, e.g. outside the gym. (b) Two boxes if you are 30.	E1 E1	Or refers to groups for younger or older people
(c) Suitable question with at least 3 boxes, no overlap and all prices from a low value upwards (to maybe £200) considered	E2	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
	QWC 2	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.
	6	
13. (a) (i) $360 - 63$	M1	
$= 297(^{\circ})$ (ii) 360 - 110 or 180 + 70	A1 M1	
(11) 500 - 110 01 180 + 70 = 250(°)	A1	SC1 for answers of 117 and 070 in (i) and (ii)
(b) 60° with construction arcs	B1	
Bisecting their angle, with arcs shown.	B1	
	6 M1	
14. $486/18 = 27$	M1 A1	
$(\pounds)54, 81, 351.$	Al Al 3	CAO

January 2011 Unit 1 Foundation TierB1 $3 - 2$ $3.1 - 0.491$ 15. One correct evaluation $3 \le x \le 4$ B1 32 $3.1 - 0.491$ 2 correct evaluations $3 \le x \le 3.1$ one either side of 0 (Some candidates may evaluate 3.1 and use knowledge of 3)B1 $3.2 - 3.168$ $3.3 - 6.037$ Correct evaluation for 3.05M1 $3.5 - 12.375 - 3.05 - 0.777$ $3.6 - 13.850$ Correct conclusion 3.1A1 $4 - 32$ Correct conclusion 3.1A1 $4 - 32$ 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 A016. (a) 6 miles (b) (0)8 : 48 (c) Sight of 14 (:) 24 or 2 (:) 24 S hours 36 minutes.B1M1Miles must be given, B0 for an answer of 6B1 Any suitable notation M1B1 Any suitable notationM1 (c) Sight of 14 (:) 24 or 2 (:) 24 S hours 36 minutes.A1(d) Explanation, e.g. graph steeper going to schoolE1(d) Explanation, e.g. graph steeper going to schoolE1	Applications of Mathematics	Mark	Comments
Foundation TierB1 $3 - 2$ 15. One correct evaluation $3 \le x \le 4$ B1 $3 - 2$ 2 correct evaluations $3 \le x \le 3.1$ oneB1 $3.2 - 3.168$ ait of 0 $3.3 - 6.037$ $3.4 - 9.104$ (Some candidates may evaluate 3.1 and use knowledge of 3) $3.5 - 12.375 - 3.05 - 0.777$ Correct evaluation for 3.05M1 $3.5 - 12.375 - 3.05 - 0.777$ Correct conclusion 3.1A1 $4 - 32$ Correct conclusion 3.1A1 $4 - 32$ Correct conclusion 4.1A1 $4 - 32$ Correct conclusion 5.1A1 $4 - 32$ Correct conclusion 5.1A1 $4 - 32$ Correct conclusion 5.1A1 $4 - 32$ Correct conclusion 6.1B1Miles must be given, B0 NOT accept the use of statements, e.g. "greater than 0". Unsupported 3.1 gets B0 B0 M0 A044B116. (a) 6 milesB1(b) (0)8 : 48 (c) Sight of 14 (:) 24 or 2 (:) 24Attempt to find the time difference 08 : 48 to 14 : 245 hours 36 minutes.A1CAO. Do not accept 05 : 36 for A mark, award B1, M1, A0. Alternative: 5 hours B1, $6 \times 6 (small squares) M1$, $5 hrs 36 minutes A1An answer of 5.6 hours is awarded B1M1 A0(d) Explanation, e.g. graph steeper going toschoolE1(d) Explanation, e.g. graph steeper going toschoolE1$		Main	Comments
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(d) Explanation, e.g. graph steeper going to schoolE15 hrs 36 minutes A1 An answer of 5.6 hours is awarded B1 M1 A0 Accept less time for the same distance			Alternative: 5 hours B1,
(d) Explanation, e.g. graph steeper going to schoolE1An answer of 5.6 hours is awarded B1 M1 A0(d) Explanation, e.g. graph steeper going to schoolE1Accept less time for the same distance			
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(d) Explanation, e.g. graph steeper going to school E1 M1 A0 Accept less time for the same distance			An answer of 5.6 hours is awarded B1
school			v
		E1	
		6	

APPLICATIONS OF MATHEMATICS

UNIT 1

HIGHER TIER

Applications of Mathematics January 2011 Unit 1 Higher Tier 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					Mark	Comments
					E1 E1 E2	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
					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.
					6	 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
2. All 17 entr	ies correct				6 B7	grammar. B6 for 15 correct.
Square				1	D/	B5 for 13 correct,
Square	Sketch	No	Yes	No		B4 for 11 correct,
Kite		No	No	Yes		B3 for 9 correct,
	Sketch	Yes	Yes	No		B2 for 7 correct,
Trapezium		No	No	No	_	B1 for 5 correct
3.(a) (i) 360	62	•		· · · · · · · · · · · · · · · · · · ·	7 M1	
3.(a) (1) 300	- 03	$= 297^{(1)}$	o)		A1	
(ii) 360 –	110 or 180				M1	
(11) 500	110 01 100	$= 250^{(1)}$	o)		A1	SC1 for answers of 117 and 070 in (i) and (ii)
(b) 60° with	construction				B1	
Bisecting	g their angle,	with arcs sh	own		B1	
					6	
4.(a) 486/18	-				M1	
=2		4 01 251			A1	CAO
(b)(i) 45 700		4, 81, 351			A1 B1	CAO
(ii) 0.07					B1 B1	
(c)(i) Identifying a common factor of both numbers			rs	M1		
30		A1				
(ii) Reasonable idea, e.g. fixed amount, a percentage			tage	E1 8		
5.(a) (i) (£) 1000		B1				
(ii) (7000-1000) / 12 or equivalent				M1		
(£) 500					A1	
(b) Draw a line through (0, 2000)					B1	
Line with correct gradient					B1	
					1	I IMP Construction and I IP of II. And I have an all constructions and the second
(c) Refers to	the same cho	oice:			F 4	FT for their graph. E.g. Hayward because cheaper overall but
(c) Refers to Possible a	the same cho				E1 E1	more deposit to pay, or Sure Way because less deposit to start only bit more expensive

Applications of Mathematics	Mark	Comments
January 2011 Unit 1		
Higher Tier 6. One correct evaluation $3 \le x \le 4$	B1	3 -2
	DI	3.1 0.491
2 correct evaluations $3 \le x \le 3.1$ one either side of 0	B1	3.2 3.168 3.3 6.037
(Some candidates may evaluate 3.1 and use knowledge of 3) Correct evaluation for 3.05	M1	3.4 9.104
	1111	3.5 12.375 3.05 -0.777 3.6 15.856
Correct conclusion 3.1	A1	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,
7.(a)(i) Quadrant at any corner indicated, radius 3 cm	4 B2	<i>e.g.</i> "greater than 0". Unsupported 3.1 gets B0 B0 M0 A0 B1 for a quadrant at any corner
(ii) $\frac{1}{4} \times \pi \times 15^2$	M1	FT for their radius for M1 only, e.g. $\frac{1}{4} \times \pi \times 3^2$
177 (m ²)	A2	A1 for not rounded, $176.7145m^2$, or A1 an answer of 7 from
(h) Director of VV	D1	working with a radius of 3. SC1 for answer of 707 (i.e. no 1/4)
(b) Bisector of XY Arc centred at X radius 6 cm	B1 B1	<u>+</u> 2mm
Correct region identified, both sides of XY	B1	FT from a straight line and an arc, i.e. similar region
	8	
8.(a) 6 miles $(b)(0)$ 48	B1 B1	Miles must be given, B0 for an answer of 6 Any suitable notation
(b) (0)8 : 48 (c) Sight of 14 (:) 24 or 2 (:) 24	B1 B1	Maybe implied in working
Attempt to find the time difference 08 : 48 to 14 : 24	M1	FT their departure and arrive times at school
5 hours 36 minutes	A1	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
(d) Explanation, e.g. graph steeper going to school	E1	Accept less time for the same distance
	6	D1.0.00.010 ²⁸
9.(a) 8×10^{27} (b) 5.4×10^{7}	B2 B1	B1 for 0.8×10^{28}
(0) 3.4 \times 10	3	
10.(a)(i) Mid points 4.5, 7, 9.5 and 12	B1	
$(4.5 \times 8 + 7 \times 34 + 9.5 \times 10 + 12 \times 2)/54$ (=393/54)	M1	FT their midpoints
7.27777 rounded or truncated (ii) Use of 5.5 or 11	A1 B1	
An answer of 5.5	B1	5.5 seen with no working, award B1 B1
(b) (i) 34, 37.2, 41.2, 38	В3	OR B2 for any 2 correct entries,
(D) D algorithm and it is a large state of the	F1	OR B1 for a correct method seen, or one correct entry
(ii) Explanation, e.g. it includes irrelevant data	E1 9	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	B1	high, of that it is related to smoothing out data
(b) Explanation, e.g "measured to the nearest cm", or "those	E1	
less than half way go in the group below" (c) Correct cumulative frequency diagram, points plotted and	B2	FT from cumulative (a). B1points plotted but not joined,
joined with a curve or straight lines	D2	correct diagram with 1 point incorrectly plotted, or correct apart
		from being a 0.5 horizontal translation.
(d) Median	B1	FT their cumulative frequency diagram
Intention to subtract horiz. readings for vert. 90 & 30 Interquartile range	M1 A1	
(e) Horizontal scale correctly indicated	B1	Do not penalise break in scale not indicated
Range correct as whiskers	B1	
LQ, median, UQ to form a box	B2 11	FT their answers. B1 if one error
12.	11	Alternative:
Strategy, equivalent to $x(x + 7) = 504$ (accept trial)	S1	Equating $x(x + 7) = 504$ or $x^2 + 7x - 504 = 0$ or equivalent
2 reasonable trials, one resulting in an answer >504 , one <504	B1	Method to solve: quadratic formula or complete square
Confirmation that the answer is between 19.2 and 19.3	B1 M1	Correct stage of working Evaluation
Confirmation (e.g. consideration of 19.25) to 1 dp Width 19.2 (cm) CAO	A1	<i>Evaluation</i> Width 19.2 (cm) (correct to 1d.p.)
Length 26.2 (cm) CAO	Al	Length 26.2 (cm)
	6	

Applications of Mathematics	Mark	Comments
January 2011 Unit 1 Higher Tier		
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 0.6, 1.6, 2.8, 7.2, 6.4, 4(.0), 0.4 Axes correct and labelled, no gaps between bars Correct histogram	M1 A1 M1 A1 5	Histogram needs to be attempted FT candidates frequency density if table completed incorrectly but the idea of frequency density is used
14.(a) Correct evaluation of at least 3 coordinates	B1 B1	t 0 1 2 3 4 5 6 v 0 5 8 9 8 5 0
Suitable axes with appropriate scale and labels 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	A count conversion other methods, α is along calculations to 1.2
 (ii) Strategy, e.g. to draw a tangent at t = 1.2 Use of difference v / difference t Their difference v / difference t 	S1 M1 A1	Accept appropriate other methods, e.g. close calculations to 1.2 Must be differences, not readings from axes
$= \dots \dots (m/s^2)$	Al	Reasonable from their graph
(c) Identifying the required area	S 1	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	



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