GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINKED PAIR APPLICATIONS UNIT 1 HIGHER 4361-02

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was 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 conference was to ensure that the marking scheme was 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' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

APPLICATIONS OF MATHEMATICS
UNIT 1 (HIGHER TIER) SUMMER 2016

Applications of Mathematics Unit 1 Higher Tier	Mark	Comments
1. 035° ±2° from Glenod	B1	Use 'their N' provided only ±2° from the given N
125° ±2° from Trefwen	B1	
Correct position of the visitor centre	B1	Accept intersection shown FT provided at least B1 previously awarded
250(°) ±2° from Hafon	B1	Use 'their N' provided only ±2° from the given N Strict FT from their position of the visitor centre
	4	
2(a) 60°, 120°, 60° and 120° in any order	B4	Any angles indicated should be appropriate B3 for 60° and 120° included in their answer B2 for the angle in the equilateral triangle as 60° and realising that the angle formed in connecting is 180°, e.g. sight of 180° - 60° B1 for indication of the angle in the equilateral triangle as 60° **or** realising that the angle formed in connecting is 180°, e.g. sight of 180° - 'their 60°', provided their 60 is from 180°÷3
(b) (Isosceles) trapezium	B1	Ignore spelling if intention clear
(c) 1	B1	CAO
	6	
3. In any order, any 3 factors: • Not from exactly same height, not from the same window • Timing may be inaccurate / different stopwatches • Ground may not be level, may not land in the same place • Someone may throw the coin up first, someone could throw with force • Gust of wind might take one of the coins • (Allow) not the same coin used	B3	B1 for each correct factor Accept any other valid factor Allow - height of window from the ground - 'weight' of coin different 'Coins are different sizes' and 'coins have different masses' is counted as 1 factor
	3	

Applications of Mathematics Unit 1 Higher Tier	Mark	Comments
4(a) Explanation that mentions no common factor (other than 1), or 13 & 17 as prime numbers, or that it is not possible to divide (to simplify) 13 & 17 by any number except 1 (to result in whole number values)	E1	Allow 'neither of these numbers are divisible by the same number', or '13 & 17 can't be divided by a smaller whole number' Do not accept 'both numbers are odd and can not be simplified further', '13 & 17 don't go into the same number', '13 does not go into 17'
(b) (Money from sales of raffle ticket – costs) 480×50p – £12 – £14 – £32 or equivalent (£182)	M1	Intention to calculate 'total raised – costs' (= 240 – 58)
÷30 ×17	M1	FT 'their derived 182'
(£)103	A2	CAO. A1 for 102 or 103.(...) Allow A1 only as a FT, provided 'their error' is not with place value, depends on previous M1 *Treat ÷30×13 as a misread (leading to 78.866... or 79)*

QWC2: Candidates will be expected to
   • present work clearly, with words explaining process or steps
   AND
   • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer
 	
QWC1: Candidates will be expected to
   • present work clearly, with words explaining process or steps
   OR
   • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer
	QWC 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
		
		QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar
		OR
		evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.
		
		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

(c) 3/478	B2 9	Ignore incorrect cancelling B1 for an answers …/478 or 3/480 or 3/477 Allow B1 for '3 in 478' or '3 out of 478'

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Applications of Mathematics Unit 1 Higher Tier	Mark	Comments
5(a) Use of £5 per 1000 cards	M1	For example 1000 ÷ 5 (= 200 cards for £1), or sight of 200 (cards) with £1, or 5 ÷ 1000 (= £0.005 per card)
£0.5(0) or 50p (per 100 cards)	A1	If units are given they must be correct, allow £0.50p *SC1 for misread as GoPrint with answer £1*
(b) Use of £10 per 1000 cards for 1300 cards	M1	Or sight of 1800÷100 − 5, or equivalent
£13 (for 1800 cards)	A1	*If no marks, award SC1 for an answer of £18*
(c) GoPrint: Any 2 points correctly plotted	M1	
(Dotted) straight line correctly drawn from (500, 0) to beyond 4000 cards	A1	
MyPrint: Any 2 points correctly plotted	M1	
(Dotted) straight line correctly drawn starting from (1000, 20) to beyond 4400 cards	A2	A1 for correct (dotted) straight line but drawn for values less than (1000, 20) to beyond 4400 cards, OR for line correctly drawn starting from (1000, 20) to 4400 cards (not beyond)
(d) Intention to interpret the intersection of the two graphs OR correct interpretation from the table	M1	FT their graphs provided at least one of the lines is straight
Correct reading for the number of cards or 4000 cards	A1	Answer of the cost implies M1 only, however accept an answer including the cost e.g. '4000 cards is £35'
	11	
5(e)(i) 20 + 5(56500 − 1000)/1000	M1	
(£)297.5(0)	A1	
(ii) Reason, e.g. 'formula only for number of cards greater than 1000', 'n − 1000 is negative', 'don't know charges for less than 1000 cards', 'don't take orders for less than 1000 cards', 'because 800 − 1000 is negative', or 'as 800 − 1000 = -200'	E1	Ignore any additional incorrect statement included Do not accept 'they can use it, the cost would be £19'
(f) Variable for charge and number of cards defined, e.g. 'C is charge (in £) & n is (number of) cards' stated	B1	FT their graph if equivalent level of difficulty Allow 'C is the charge and n is the number'
$C = 0.01(n − 500)$ or equivalent	B2	B1 for equivalent of $0.01 \times ....$ or for $... \times (n-500)$, or $n − 500 ÷ 100$ (missing brackets)
	6	
6(a) Angle at knee 105°±2°	B1	
Knee to ankle line 8cm ±2mm	B1	
(b) Hip to ankle measured on the diagram	M1	FT for their diagram measurement ±2mm
Measurement (13.5±2mm × 5 =) 67.5 (cm ±1cm)	A1	FT 5×'their appropriate measurement' accurately calculated ±2mm
	4	
7(a) (Total surface area of the pond is) 3.8×5÷2	M2	M1 for calculation of surface area of clear water 3.8×3÷2 (= 5.7m²) or sight of 5.7(m²)
9.5(m²)	A1	Allow an answer of 9.50(m²)
(Pond surface area) $9.5 = \pi r^2$	M1	FT 'their derived surface area of the pond' $= \pi r^2$
(Radius) $r = \sqrt{(9.5/\pi)}$	m1	Isolation of r
$= 1.738...(m)$	A1	Depends on M1, m1. Accept rounded or truncated
(Diameter of the pond is) 3.5 (m)	B1	Must be correct to 2 significant figures. FT 'their *r*' × 2 evaluated provided 'their *r*' has been given (and used) to at least 2d.p. and rounded to 2 sig figs provided M1, m1 previously awarded
	7	

Applications of Mathematics Unit 1 Higher Tier	Mark	Comments
7(b)(i) Reason 'No, data is destroyed' or 'Yes, not many very small or very large diameters of water lilies'	E1	Needs to give a decision with logic/reasoning explained
(ii) Any 3 correct frequency densities 0.25, 2, 5, 8, 7, 2, 0.5	M1 A1	
Axes correct and labelled, no gaps between bars	B1	'Histogram' needs to be attempted. Do not accept labels as blocks or groups, e.g. 0 – 4, etc.
Correct histogram	B1 5	FT if correctly drawn without axes labelled for 'their non linear' groups shown FT candidates frequency density if table completed incorrectly but the <u>idea of frequency density must be used</u>
8(a) 'week 3 to week 5' and 'week 4 to week 6' 92, 102, 84, 75	B1 B3	OR B2 for any two correct entries, OR B1 for a correct method seen, or one correct entry
(b)Plots correct for their data at the mid interval with a line of best fit drawn	B2	B1 for correct plots at mid interval (ignore if joined dot to dot), or consistent translated plots with a line of best fit drawn
(c) Explanation, e.g. ' Week 5 has impacted on the trend line', 'there was just the one poor week', 'only a 6 week period considered, this is only a short period'	E1 7	Accept 'by week 6 sales increase again' Allow 'sales increase again in week 6' Do not accept 'line increases again in week 6', 'business may increase over the summer period'
9(a)Points ((0,0),) (5, 1), (10, 15), (18, 30), (24, 45), (30,55), (40, 60) plotted	B6	B1 for each correct point plotted Ignore additional points for intervals
Points joined with a curve or straight line	B1	Only FT if at least B3 previously awarded and all plots are cumulative
(b) Reason, e.g. 'do not know all the results for each of the intervals'	E1	Ignore additional incorrect details
(c) Correct box-and-whisker diagram	B3 11	Candidates may use original information Only FT their appropriate <u>cumulative</u> frequency graph (if possible) (not from bars) FT must be the best of consistency for either original or 'their graph' Ends of whiskers must be shown B2 for attempt box-and-whisker with • both ends correct and any 2 of LQ, median, UQ correct, or • one end correct and LQ, median & UQ all correct B1 for attempt box-and-whisker with • both ends correct with any 1 one of LQ, median, UQ correct, or • one end correct with any 2 of LQ, median, UQ correct, or • LQ, median, UQ all correct

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Applications of Mathematics Unit 1 Higher Tier	Mark	Comments
10. $5\times2 + 14\times8 + 23\times4 + 32\times\ldots + 39\times\ldots = 30\times27$ or equivalent	S1	Allow with incorrect midpoints provided each one is within the correct interval Maybe written as ÷30 with '=27', or sight of $(27 \times 30 =)$ 810 with $(810 - 214 =)$ 596
Missing frequencies sum is 16, e.g. sight of 16 (more days)	S1	
Trial of any two values, e.g. $(10+112+92 + 32\times? + 39\times??)÷30$, with '?' the same value or different, not necessarily with sum 16	M1	e.g. $214 + 32\times? + 39\times?? = 810$ where ? and ?? are any values FT for their mid points for M1 only
4 and 12 respectively	A1	CAO Do not accept in reverse order Do not accept from obvious incorrect working $(10+ 112 + 92 + 32\times4 + 39\times12 = 30\times27)$ (128 468) *Alternative (although not in specification)* *$32x + 39y = 596$ and $x + y = 16$ S1, M1* * ($32x + 39y = 596$ alone S1, M0)* *Method to solve m1* *4 and 12 A1*
	4	
11(a) $3 \times 10^4 \times5 ÷ 600$ or equivalent	M1	
2.5×10^2 (grains of rice)	A1	An answer of 250 implies M1
(b) $1000 ÷ (2\times10^{-5})$ or equivalent	M1	
5×10^7 (grains of sugar)	A2	A1 for 50 000 000 or 50 million
	5	
12. $y = 8 / ½^2$	M1	
$y = 32$ hence looking for $y = 16$	m1	FT for their value of y then halved
$16 = 8/x^2$ or $x^2 = 8/16$	m1	FT using their halved value of y used
$x = 0.707\ldots$ or equivalent	A1	Allow ±0.707 or 0.7 from correct working
	4	

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Applications of Mathematics Unit 1 Higher Tier	**Mark**	**Comments**

13(a) Correct evaluation of at least 3 coordinates   B1

        Suitable axes with appropriate scale and labels   B1

t	0	1	2	3	4	5	6	7
v	0	6	10	12	12	10	6	0

      Plotting at least 6 correct points   M2

FT for their axes if reasonable.
M1 for plotting between 3 and 5 correct points

      Joining all 8 points with a curve   A1

(b)(i) (At t =) 3.5   B1

FT from 'their graph'.
If FT from straight lines used then '3 to 4 seconds' is the required answer as a range

 (ii) Strategy, e.g. Draw a tangent at t = 5.2   S1

Use of difference v / difference t   M1

            = - A1

Must be differences, not readings from axes
Must be from a tangent, negative and reasonable from their graph

           m/s^2 U1

Independent mark

(c) Identifying the required area   S1

Maybe shown on their graph
Working with additional area is S0, however FT for possible M marks, but A0

     Splitting area into areas that can be approximated   M1

     Complete calculation for the area required   M1

e.g $\frac{1}{2}$ (6+10) + $\frac{1}{2}$ (10+12) + 1×12 + $\frac{1}{2}$ (10+12)
        = 8+11+12+ 11, or
$\frac{1}{2}$ (6 + 10 + 2×(10 + 12 + 12))

     Accurately calculated (42m)   A1

Their answer may differ slightly from 42m, this is only a guide

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GCSE Applications of Mathematics
Unit 1 Higher Tier MS Summer 2016