GCSE MARKING SCHEME

AUTUMN 2017

GCSE
MATHEMATICS – NUMERACY
UNIT 2 - HIGHER TIER
3310U60-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2017 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.

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GCSE Mathematics – Numeracy Unit 2: Higher Tier Autumn 2017 Final	Mark	Comment
1(a) Midpoints 2.5, 7.5, 15, (25,) 40	B1	Midpoint of 20 ≤ s < 30 (25) is not required for B1
10×2.5 + 16×7.5 + 4×15 + 1×40	M1	25 + 120 + 60 + 40 (= 245) FT their midpoints, including bounds, provided they fall within the classes including upper bounds. FT if 1 slip in one of 'their midpoints', (and only one, including 25) used outside the tolerance of bounds for M1, m1 only
Intention their ∑fx / 31	m1	(245/31)
7.9(0…cm)	A1	Following correct working Accept 8 cm from correct working
1(b) FALSE FALSE TRUE TRUE	B2	B1 for any 3 correct
1(c) (28 × 9 – 63) ÷ 27 or equivalent	M2	M1 for sight of 28 × 9 or 252
7 (cm)	A1	Allow M2, A1 for an unsupported answer of 7(cm) Award M0, A0 for an answer of 7(cm) from sight of 63 ÷ 9

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2(a) An appropriate calculation that could lead to an answer of approximately 32 (acres), e.g. 13 × 10000 ÷ 4046.86 (=32.12367…) 13 × 10000 ÷ 4050 (=32.098…) 10000 ÷ 4046.8 (≈ 2.5), 2.5 × 13 (= 32.5) 13 × 10000 ÷ 4000 (= 32.5) 13 ÷ 0.4 (= 32.5)	M2	M1 for a calculation such as • 13 ÷ 4046.86 (=0.0032…) • 13 ÷ 4050 (=0.0032…) • 13 × 10000 (=130000) • 10000 ÷ 4046.8 (≈ 2.5)
× any number between 4 and 6 inclusive	m1	FT from M2 only
Number of alpacas from appropriate correct calculation: Answer given as a whole number of alpacas in the inclusive range 128 to195	A2	Must be correct working FT from rounding to 32 (acres) Accept an answer as a range with bounds given as whole numbers Award A1 for • 4 and 6 used, leading to one correct and one incorrect answer • a non-whole number answer in the range 128 to 195 • an answer as a range with bounds not given as whole numbers *Note: Only accept answers outside the given range if **fully justified**, e.g. 32.5 rounded to 33 with use of 6 alpacas to give 198 alpacas*
Statement of their assumption, e.g. ‘used the mid number 5 alpacas’, ‘used a range of numbers of alpacas’, ‘used the least number of alpacas per acre’, ‘used the greatest number of alpacas per acre’, ‘all the 13 hectares are suitable for keeping alpaca’, 'used 1 acre as 4000m^2', ‘they left 6 alpacas in every acre’, ‘they would keep as many alpacas in every acre as they could’ (following use of ‘6’), 'not all their land is suitable'	E1	**The assumption must match their working** Allow, e.g. ‘as they could have many small fields, not possible to fit all the alpacas in’ (with 4 alpacas used) (fields not being hectares implied) Do not accept, e.g. ‘all alpacas weigh the same’, ‘they will be able to keep .... alpacas on 13 acres’, 'alpacas not all the same size', ‘they can afford all the alpacas’, ‘same amount of alpacas on each bit of land’ (unless accompanied by further explanation)

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2(b)(i) Line 6 cm ± 2mm from the south fence **AND** Bisector from south and east fences (±2º), or Line 6cm ± 2mm from the east fence	B2	Mark intention Any lines must be of sufficient length to find the intersection for B2 Award B2 for the unsupported or unambiguous correct location indicated provided not from incorrect working, such as spurious or incorrect arcs B1 for sight of one of the following: • Line 6 cm ± 2mm from the south fence • Bisector from south and east fences (±2º) • Line 6cm ± 2mm from the east fence
Circle with radius 1.4cm ± 2mm centred at the intersection of the 2 lines	B2	FT 'their intersection' of two straight lines B1 for sight of one of the following: • a circle centred at the intersection of the 2 lines (outside tolerance) • a circle of the correct radius seen (anywhere)
2(b)(ii) (900 litres = 900 000 cm^3) $900\,000 = \pi \times 70^2 \times$ height or $0.9 = \pi \times 0.7^2 \times$ height or equivalent	M2	May be shown in stages M1 for sight of any 1 of the following: • $\pi \times 70^2$ (× height) • $\pi \times 0.7^2$ (× height) • $900\,000 = \pi \times 140^2 \times$ height • $0.9 = \pi \times 1.4^2 \times$ height • $900\,000 = \pi \times 70^2 \times$ height or $0.9 = \pi \times 0.7^2 \times$ height *with place value errors with digits 9 and/or 7*
(Height =) $\frac{900\,000}{\pi \times 70^2}$ or $\frac{0.9}{\pi \times 0.7^2}$	m1	FT from M1 or M2 Allow for correct rearrangement (intended calculation) including place value error with digits 9 and/or 7 and use of diameter as radius
Answers in the range 58.4 to 58.5 (cm)	A1	CAO, must be in centimetres Accept 58(cm) from correct working
2(c) 80 × 19.20 ÷ 15.47 + 20 × 22.30 ÷ 15.21 + 100 × 24.50 ÷ 14.93	M2	M1 for sight of any 1 year calculation seen (£99.288…, £29.322…, £164.099..)
For any 2 of the 3 correct amounts of money (£)99.29, (£)29.32, (£)164.1(0) OR an answer in the inclusive range (£)292 to (£)293	A1	
(£)99.29 + (£)29.32 + (£) 164.1(0) leading to (£) 292.71	A1	CAO not from incorrect working

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3.

Accept rounding or truncation of 1/2p throughout

(Balls of wool per pair) 135 ÷ 20 (× 40) — M1
6.75 (balls) or 7 (balls) or — A1
270 (balls) or 280 (balls)

(Costs are 40 ×) 1.42 × 135 ÷ 20 (+(40 ×) 8) — m1

FT 135 ÷ 20 = 6.75 balls and 7 balls

Costs	*1 pair*	*40 pairs*
6.75 balls	*£9.585*	*£383.40*
7 balls	*£9.94*	*£397.60*

(Profit = Sales – Costs), e.g. — M2
(Profit per pair) 18.95 - 1.42 × 135 ÷ 20 - 8
OR
(Profit for 40 pairs)
40 × 18.95 – 40 × (1.42 × 135 ÷ 20 + 8)
OR
Appropriate amounts used to calculate
(100 ×) $\frac{\text{total sales}}{\text{total costs}}$ - 1(× 100)

Profit using 6.75 balls	
1 pair	*18.95 - 9.585 - 8 = 18.95 – 17.585 = £1.365*
40 pairs	*758 - 383.40 - 320 = 758 – 703.40 = £54.60*

Profit £, using 7 balls	
1 pair	*18.95 – 9.94 - 8 = 18.95 – 17.94 = £1.01*
40 pairs	*758 - 397.60 - 320 = 758 – 717.60 = £40.40*

M1 for any 1 amount	Amount, £
Paying sister 40 prs	320
Total sales 40prs	758
Total costs 40prs:	
6.75 balls	703.4(0)
7 balls	717.6(0)
Total cost 1 pair:	
6.75 balls	17.585
7 balls	17.94

OR
M1 for any 1 of the following:
- omitting to pay her sister:

18.95 - 1.42 × 135 ÷ 20 or
40 × 18.95 - 40 × (1.42 × 135 ÷ 20)
- inconsistent use of × 40:

40 × 18.95 - 1.42 × 135 ÷ 20 - 8 or
18.95 – 40 × (1.42 × 135 ÷ 20 + 8)

Use of appropriate amounts to calculate: — m1
(Percentage profit = 100 ×) $\frac{\text{profit}}{\text{costs}}$
or (100 ×) $\frac{\text{sales}}{\text{costs}}$ - 1(× 100)

FT from previous M1 or M2
FT $\frac{\text{18.95 – 'their cost per pair'}}{\text{'their cost per pair'}}$ *OR*

$\frac{\text{'40 × 'their 18.95' – 'their total costs'}}{\text{'their total costs'}}$
OR equivalent

7.8(%) or 5.6(%) — A1

No other FT, must be 2 s.f.
7.8% CAO comes from use of 6.75 balls,
5.6% CAO comes from use of 7 balls

See next page for OCW strands.

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Organisation and communication	OC1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means
Writing	W1	For W1, candidates will be expected to: • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

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4(a) DG = 3.2 (m) and DH = 3.4 (m)	B1	May be seen on the diagram
$(GH^2 =)\ 3.2^2 + 3.4^2$	M1	FT 'their 3.2' and 'their 3.4' provided they are ≠4.8 and ≠ 6.8(m)
$(GH)^2 = 21.8$ or $(GH =)\ \sqrt{21.8}$	M1	FT 'their 3.2' (DG) and 'their 3.4' (DH) including use of 4.8 and 6.8(m)
4.7(m) or 4.67(m) or 4.66(9…m) or 4.6(m)	A1	Allow FT from M0, M1 including use of 4.8 and 6.8(m) to give 8.3(2…m) (i.e. B0, M0, M1, A1) FT from M1, M0 for the correctly evaluated square root of 'their 21.8' provided 'their answer' > 3.4 (cm)
4(b) (Perimeter) 4.669… + 3.2 + 3.4	M1	(11.2m, 11.269..m, 11.27m or 11.3m) FT 'their derived 4.669…' (from (a)) + 'their DG <4.8' + 'their DH <6.8', however if no response in (a) accept 'their GH' if clearly stated provided >3.3 but <8.4 (m)
Cost 12 × 3.50	M1	FT 'their derived perimeter' provided: • the perimeter has been derived from the sum of 3 lengths, **AND** • rounded **up** correctly to a whole number
(£)42	A1	**Do not FT further for premature rounding of lengths to find 'their perimeter', no further marks** (Otherwise FT)
Appropriate for the perimeter 70(cm) or 73.(095….cm) or 74(cm) or 80 (cm) left over	B1	**Strict** FT 100 × ('their 12' – 'their **correctly evaluated** derived perimeter<12'), which leads to left over bit ≥ 0 e.g. 74(cm) from a perimeter 11.26m Answer **must** be in cm Accept use of rounded or truncated answers for 'their derived perimeter' *A fully correct FT for rounding lengths up prematurely, e.g. if 4.7m used:* *4.7 is 5 strips, 3.4 and 3.2 is 4 strips each, gives 13 m, so* *13 × £3.50 = (£)45.5(0) with 170(cm) left over, this is awarded* *M0, M1, A0, B0*

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5. $7500 \times 1{\cdot}0031^{n}$ $7500 \times 1{\cdot}0031^{21}$ (= (£) 8003.68(7105)) 21 (months)	B1 M1 A1	For any value of n (7500 × 1·0031 = (£)7523.25) May be implied Allow $7500 \times 1{\cdot}0031^{20}$ (=(£) 7978.95(2352)) with convincing work that (£) 8000 will be reached the following month. Answer clearly seen, not embedded in their method.
6. Sight of appropriate 31° or 59° in the diagram OR appropriate use of these angles in their calculations (Distance from Molk to Lindat =) $\frac{24}{\sin 59(°)}$ OR $\frac{24}{\cos 31(°)}$ = 27·9(992…) or 28 (km) (Time taken to sail from Molk to Lindat =) 27·9(992…) ÷ 20 = 1·4 (hours) (= 1h 24m) (Arrival time =) 1:09pm or 13:09	B1 M2 A1 M1 A1 A1	 FT 'their 31' or 'their 59' provided the angle <90 for M2 or M1 only. A correct method for calculating the distance Molk to Nuir using trigonometry, followed by correct use of Pythagoras is awarded M2. M1 for sin 59(°) = 24/distance OR M1 for cos 31(°) = 24/distance CAO FT 'their derived 27·9(992…)' from the use of trigonometry. On FT, accept an answer that has been rounded to 1dp, but it needs to be correct to 1dp for 'their 27·9(9…)'. ISW. (Allow 13:09pm). FT 'their 1·4 hours' correctly converted provided of equivalent difficulty. On FT, their answer needs to be correct to the nearest minute for 'their 1·4'
7(a) $\frac{14}{2800}$ $(\times 100)$ ×12 OR $\frac{14.07}{2814}$ $(\times 100)$ ×12 = 6(%) or 0·06	M2 A1	M1 for $\frac{14}{2800}$ $(\times 100)$ OR $\frac{14.07}{2814}$ $(\times 100)$ Or M1 for 0·005 or 0·5% A0 for 0·06%
7(b) $(1+\frac{0{\cdot}06}{12})^{12} - 1$ or equivalent = 6·17 (%)	M1 A2	FT their final answer from (a) A1 for 0·061(67…) or 0·062, OR A1 for 6·1(67…%) or 6·2(%) *Alternative methods:* *M1 for* $2800 \times 1{\cdot}005^{12}$ *M1 for* $\frac{2972.69(7873)-2800}{2800}$ $(\times 100)$ *or equivalent* *FT 'their 2972.69(7873) provided previous M1 awarded.* *A1 for 6·17 (%), OR* *M1 for* $(1+\frac{0{\cdot}06015}{6})^{6} - 1$ *A2 for 6·17 (%)* *A1 for 0·06(167…), or for a correct percentage but not correct to 2 dp.*

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8. (Length of circular arc =) $\frac{20}{360} \times 2 \times \pi \times 10$	M1	Or equivalent
= 3·48(888…) to 3·5 (cm)	A1	(OR $10\pi/9$ or equivalent)
(Length^2 =) $4^2 + (3{\cdot}48(888\ldots)$ to $3{\cdot}5)^2$	M1	FT 'their derived 3·48…'
Length^2 = 28·1104 to 28·25 or (Length =) √(28·1104 to 28·25)	A1	
(Length =) 5·3 to 5·32 (cm)	A1	FT the square root of 'their 28·…' provided their answer is the longest length of their triangle. On FT, accept an answer that is correct to 1dp for 'their 3·48(888…)'.
(Total length of piping needed =) $\frac{360}{20} \times$ (5·3 to 5·32)	M1	FT 'their 5·3…' provided previous M1 awarded.
= 95·4 to 95·8 (cm)	A1	
9(a) False True False False	B2	B1 for 3 correct
9(b) • Number the engineers from 01 to 50 • Consider successive 2-digit numbers • Use numbers in the range 1 to 50 • Ignore repeats	E2	All 4 needed for E2 Allow an equivalent numbering system e.g. 00 to 49. E1 for any 2 or 3 correct statements.
(The engineers chosen would be) 29, 45, 07, 24, 39, 17, 03, ~~24~~, 49, 12 ISW	B1	Needs to be written in this order *Alternative method:* • *Number the engineers from 01 to 50* • *Consider successive 2-digit numbers* • *Divide each number by 50 and use the remainder to choose an engineer* • *Ignore repeats. When the remainder is 0, engineer 50 is selected* *E2 for all 4 statements* *E1 for any 2 or 3 statements* *B1 for* *29, 47, 45, 04, ~~29~~, 07, 24, 33, 39, 49 ISW*

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9(c) Sight of 24·5 or 12·25 AND 43·5	B1	Accept use of ·49 repeated and 12·249 repeated throughout, but not ·49 and 12·249
(S.area of half-hemisphere =) $(4 \times \pi \times 12{\cdot}25^2) \div 4$ or equivalent	B1	(= 471 to 471·6… (m^2)) FT 'their 12·25' provided it is $\geq$ 11·5 and $\leq$ 12·5
(Curved surface area of cylinder =) $(\pi \times 24{\cdot}5 \times 43{\cdot}5) \div 2$ or equivalent	B1	(= 1673 to 1674·75 (m^2)) FT 'their 24·5' or 'their 12·25' and 'their 43·5' including use of 24 or 12, 43 and their lower bounds.
(Total surface area =) $(4\times\pi\times12{\cdot}25^2)\div4 + (\pi\times24{\cdot}5\times43{\cdot}5)\div2 + (\pi\times12{\cdot}25^2)\div2$	M2	*(Area of semicircle 235·5 to 235·8…)* Upper bounds need to be correct. M1 for summing 3 terms, with 2 being correct.
= 2379·5 to 2382 (m^2)	A1	CAO
(Number of tins needed =) (2379·5 to 2382) ÷ 39·5	M1	(= 60·2… to 60·3) FT their total area provided at least M1 awarded.
= 61	A1	FT a correctly rounded up answer to their calculation.

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