GCSE MARKING SCHEME

SUMMER 2018

**GCSE (NEW)
MATHEMATICS - NUMERACY
UNIT 2 - HIGHER TIER
3310U60-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2018 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.

WJEC GCSE MATHEMATICS - NUMERACY (NEW)

SUMMER 2018 MARK SCHEME

GCSE Mathematics – Numeracy Unit 2: Higher Tier Summer 2018	Mark	Comment
1(a) (Period of time is) 3 years 4 months or 40 months	B1	*No marks if no working shown* Accept 3 years 3 months 30 days or 3 years 3 months 29 days
Use of an amount between £16.8 and £22 million inclusive *(£19.35 million being the mean of the values given in the question)*	M1	Ignore incorrect interpretation of 'million', including omission of 'million' Accept sight of an amount in this range used in any calculation
(Amount given to charity per month is) An amount between (£)16.8 and (£)22 million inclusive divided by (number of months) 40	M1	FT from M1 FT 'their 40' provided it is within the inclusive range of 36 to 52 months Ignore incorrect interpretation of 'million', including omission of 'million'
From correct calculation of an answer in the range (£)0.4 to (£)0.55 **million** inclusive or (£)400 000 to (£)550 000 inclusive	A1	Do not accept omission of the word 'million' FT depends on M1, M1 previously awarded If working shown, this must be from correct calculation Ignore any additional rounding Accept a range given as an answer provided it falls within the answer range given Accept an answer rounded as an estimate, from working, provided it falls within the range given *(FT within the inclusive range of 36 to 52 months gives an answer in the inclusive range £0.32 to £0.62 million)*
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.

1(b) Impact, e.g. 'more in September 2012 than in September 2014 as the number of 5p bags bought is falling over time', 'less given to good causes', 'decreases', 'less (given)'	E1	
2(a) (Rhodri's time is) 5.5/22 = 0.25 (hours) or 15 mins	M1 A1	Use of 0.25 hours as 25 minutes is A0 otherwise if not used, ignore incorrect conversion to minutes
Megan's time is 0.25 (hrs) – 5 mins (10 minutes or $\frac{1}{6}$ hour or 0.166…hour)	M1	For the idea, irrespective of inconsistent units FT 'their 0.25 hours' or 'their 15 minutes', including use of 0.25 hours, e.g. as 25 minutes
(Megan's route is) 12 × 10 (÷ 60)	M1	FT 'their time used', written in hours or minutes provided at least M1 previously awarded
= 2 (miles)	A1	CAO No marks for an unsupported answer of 2 (miles)
2(b) 66 (km/h)	B1	
3(a)(i) $(x^2 =) 3^2 + 12^2$ $x^2 = 153$ or $(x =) \sqrt{153}$ 12.4 (cm)	M1 A1 A2	Or alternative full method Or accurate first stage of alternative full method Must be 3 s.f. A1 for sight of (x =) 12.40 or 12.3(69…cm), NOT for 12 (cm) FT from M1 for the correctly evaluated square root of 'their 153' provided 'their answer' > 12 (cm)

3(a)(ii) (y=) $\tan^{-1}3/12$ or $\tan^{-1}0.25$, or $\cos^{-1}12/12.4$ or $\cos^{-1}0.967..$ or $\cos^{-1}0.97..$, or $\sin^{-1}3/12.4$ or $\sin^{-1}0.24…$,
 	
   (y =)14(.0..°)   (which is < 15°)
	M2
	
	A1
		FT 'their 12.4' provided > 12 (cm)
		M1 for $\tan y = 3/12$ or $\cos y = 12/12.4$
		     or $\sin y = 3/12.4$
		
		Accept 14.(59...°) from use of 12.4 cm

3(b) 12 × 4.5 ÷ 3 or 4.5/tan14(.0..°) 18(cm) or 18.0(… cm)	M1 A1	FT 'their angle y' ISW to calculate the hypotenuse
4(a) (2 ×) 65 × 5 650 (m^2)	M1 A1	

4(b) (Area of both ends) π×20² - π×15² or equivalent (=549.7.....)	M2	(= 1256.(...) – 706.(...)) M1 for ½ × π × 20² - ½ × π × 15² or 2 × π × 20² - 2 × π × 15²
+ 650	m1	FT adding 'their (a)' FT provided at least M1 previously awarded
An answer in the range 1199 (m²) to 1200 (m²)	A1	Accept 175π + 650 (m²) FT from M2, m1 previously awarded
4(c) Area × (0.)20 ÷ 3 £80	M1 A1	FT 'their area' from 4(b) Must be correct to the nearest £ An answer of 8000 implies M1, A0
5. $C = \dfrac{300 \times (60 - 32)}{32 - 8}$	M2	M1 for any 3 or 4 values substituted correctly
= 350 (litres)	A1	CAO
$T = \dfrac{350 + 300}{26}$	M1	FT 'their derived 350' and 'their 300' (used as H)
= 25 (minutes)	A1	If no marks, award SC1 for all 5 of the following correctly matched, i.e. H = 300, M = 32, X = 60, Y = 8, F = 26
6(a) Midpoints 20.5, 21.5, 22.5, 23.5 Missing 10 days for 23 ≤ t < 24	B1 B1	
20.5×4+21.5×8+22.5×8+23.5×10 (= 82 + 172 + 180 + 235 = 669)	M1	FT 'their 10' provided ≠0 Allow with incorrect midpoints provided each one is within the correct interval including 'bounds'
÷ 30	m1	FT 20 + 'their 10'
22.3(°C)	A1	Allow 22(°C) from correct working If no marks or first B1 only, award SC1 for an answer of 21.7 (°C) (from working with the 20 days given)
6(b) Suitable assumption stated, e.g. 'used the midpoints (to represent each group)', 'I used a value in each of the groups to represent the group', 'the temperature is between the 2 values each time'	E1	FT from 'their points' used in (a)
6(c) Suitable reason given, e.g. 'many of the temperatures were less than the midpoint of the group in which they were recorded', 'the temperatures were often towards the lower end of the groups'	E1	Do not accept e.g. 'mid points were used', 'Faryl used exact values', 'raw data was used by Faryl', 'Faryl found the actual mean' without further explanation

7(a) A time between 9 and 9·5 seconds inclusive	B1	
7(b) Tangent drawn at 10 seconds	M1	Attempt to draw a tangent at time 10 seconds
Idea of increase in y ÷ increase in x	M1	Needs to come from a tangent to the curved part of the graph Ignore signs for M1 only
Correctly evaluated gradient for their tangent	A1	Dependent on M1M1 awarded
7(c)(i) $2 \times 1{\cdot}75 \times 60 \div 8$	M2	May be seen in stages M1 for the correct <u>use of 2</u> with any 2 operations

$= 26{\cdot}25$ (gallons/min)	A1	FT only from M2
		Accept 26 (gallons/min) from correct working
		
		Alternative method:
		M2 for <u>2 × 60</u> May be seen in stages
		    4·5(46)
		      M1 for correct use of 2 with 4·5(46)
		A1 for 26(·…) FT only from M2
		Accept 26 (gallons/min) from correct working
		Note: Accept an answer of 27 (gallons/min) from use of 4·5

7(c)(ii) $90 \div 26{\cdot}25$	M1	FT 'their derived 26·25'
$= 3{\cdot}4(2857\ldots)$ (min) AND e.g. 'Yes'	A1	*Alternative methods:* *M1 for 26·25 × 3·5* *FT 'their derived 26·25'* *A1 for 91(·875) (gallons) AND e.g. 'Yes'* *OR* *M1 for 90 ÷ 3·5* *A1 for 25·7(142…) or 26 (gallons/min) AND e.g. 'Yes'* *FT 'their derived 26·25'*

8. Sight of 14·75 (cm) and 15·25 (cm) OR sight of 2005 (cm) and 2015 (cm)	B1	Accept use of $15 \cdot 24\dot{9}$ and $2014 \cdot \dot{9}$ throughout, but do not accept use of 15·249 and 2014·9
(Smallest number of pictures =) $\dfrac{2005}{15 \cdot 25}$	M1	FT 'their 2005 cm' provided $2000 \leq l < 2010$ cm, and 'their 15·25 cm' provided $15 < w \leq 15 \cdot 5$ cm
= 131	A1	CAO Accept unsupported 131 provided 2005 (cm) and 15·25 (cm) seen
(Greatest number of pictures =) $\dfrac{2015}{14 \cdot 75}$	M1	FT 'their 2015 cm' provided $2010 < l \leq 2020$ cm, and 'their 14·75 cm' provided $14 \cdot 5 \leq w < 15$ cm
= 136	A1	CAO Accept unsupported 136 provided 2015 (cm) and 14·75 (cm) seen
9(a) True False False False	B2	B1 for any 3 correct
9(b) (Amount =) $\sqrt{\dfrac{1036}{1000}} \times 1000$ or 1·017(84…) × 1000	M3	Could be seen in stages M2 for $\sqrt{\dfrac{1036}{1000}}$ M1 for 1000 × multiplier^2 = 1036 or M1 for $(1 + i/2)^2 - 1 = 0 \cdot 036$
(Amount after 6 months =) (£) 1017.84	A1	An unsupported £1018 is awarded M0A0 Note: A final answer of (£) 1017.85 can be awarded M3A0 provided no incorrect work seen

10(a) (Volume of 500 supports =)
   $\pi \times 3^2 \times 9$ + (8 × 8)/2 × 10
  (81π or 254·…)   (320)
                         × 500
     = 287 170 to 287 251 (mm^3)
	M2
	
	 m1
	 A1
		M1 for summing 2 terms, with 1 correct
		
		 FT from M1 for m1 only
		 Or 500(320 + 81π) (mm^3) or
		      160000 + 40500π (mm^3)
		 ISW

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10(b) Sight of area of 1 of the curved surfaces $\pi \times 4 \times 1{\cdot}2$ OR $\pi \times 1{\cdot}8 \times 3$	B1	

$(\pi \times 2^2) \times 2 \;+\; \pi\times4\times1{\cdot}2 \;+\; \pi\times1{\cdot}8\times3$
   (25·1…)   (15·07..)   (16·9…)
    (8π)   (4·8π)   (5·4π)
	M2	Or equivalent
		M1 for a calculation involving 3 or more terms with at least the equivalent of 2 of **these terms** correct

$= 57{\cdot}07$ to $57{\cdot}24$ (cm^2)	A1	Or 18·2π or equivalent. CAO
(% reduction =) $\dfrac{\pi \times 0{\cdot}9^2}{57({\cdot}\ldots)}$ (×100) OR $\dfrac{2{\cdot}5({\cdots})}{57({\cdot}\ldots)}$ (×100) OR $\dfrac{0{\cdot}81\pi}{18{\cdot}2\pi}$ (×100)	M1	FT 'their derived 57·07 to 57·24' $(\pi \times 0{\cdot}9^2 = 2{\cdot}5(434)$ to $2{\cdot}55)$
$= 4{\cdot}3(67\ldots)$ to $4{\cdot}5$ (%)	A1	Accept an answer of 4(%) from correct working *Alternative method for % reduction:* *M1 for $1(\times100) - \dfrac{((57({\cdot}\ldots) - 2{\cdot}5({\cdot}\ldots))(\times100)}{57({\cdot}\ldots)}$* *FT 'their derived 57·07 to 57·24'* *A1 for 4·3(67…) to 4·5 (%)* *Accept an answer of 4(%) from correct working*
11(a) $(BE^2 =) \; 2^2 + 5{\cdot}5^2$	M1	
$BE^2 = 34{\cdot}25$ or $(BE =) \sqrt{34{\cdot}25}$ or $(BE =) 5{\cdot}8(5\ldots)$	A1	
$(AB^2 =) \; 34{\cdot}25 + 3{\cdot}2^2$ or $5{\cdot}8(5\ldots)^2 + 3{\cdot}2^2$	M1	FT 'their derived BE'

$(AB =) \; 6{\cdot}67(00..)$ (m)	A1	Accept an answer that would round to 6·67 (m)
		Accept an answer of 6·7 (m) provided $\sqrt{44{\cdot}42}(...)$ to $\sqrt{44{\cdot}55}(...)$ seen in workings
		
		Alternative method:
		M1 for $(AD^2 =) \; 3{\cdot}2^2 + 5{\cdot}5^2$
		A1 for $AD^2 = 40{\cdot}49$ or $(AD =) \sqrt{40{\cdot}49}$ or
		     $(AD =) 6{\cdot}3(6\ldots)$
		M1 for $(AB^2 =) \; 40{\cdot}49 + 2^2$ or $6{\cdot}3(6\ldots)^2 + 2^2$
		  FT 'their derived AD'
		A1 for $(AB =) 6{\cdot}67(00..)$ (m)
		Accept an answer that would round to 6·67 (m)
		Accept an answer of 6·7 (m) provided $\sqrt{44{\cdot}42}(...)$ to $\sqrt{44{\cdot}55}(...)$ seen in workings

(Dist = 6·67(00..) – 0·2 =) 6·47(00..) (m) AND e.g. 'Yes, it will detect movement at B'	E1	FT correct interpretation of 'their 6·67(00..)' – 0.2 provided M1M1 awarded Allow 'Yes as distance < 6.5 (m)'

11(b) (BÂE =) cos⁻¹(3.2 ÷ 6·67(00..) or tan⁻¹ (5·8(523…) ÷ 3·2) or sin⁻¹ (5·8(523…) ÷ 6·67(00..))	M2	M1 for cos (BÂE) = (3.2 ÷ 6·67(00…) or tan (BÂE) = (5·8(523..) ÷ 3·2) or sin (BÂE) = (5·8(523..) ÷ 6·67(00..)) FT "their derived 5·8(523..) and 'their derived 6·67(00…)' Do not allow use of 20 for 'their 6·67(00…)'
(BÂE =) 61·3(306…) (°)	A1	CAO Accept an answer that rounds to 61·3(°) *Alternative method:* $M2 \text{ for } \cos^{-1}\dfrac{6·67(...)^2 + 3·2^2 - 5·8(5...)^2}{2 \times 6·67(...) \times 3·2}$ $M1 \text{ for } \cos(angle) = \dfrac{6·67(...)^2 + 3·2^2 - 5·8(5...)^2}{2 \times 6·67(...) \times 3·2}$ *FT "their derived 5·8(523..) and 'their derived 6·67(00…)'* *Do not allow use of 20 for 'their 6·67(00…)'* *A1 for (BÂE =) 61·3(306…) (°) CAO* *Accept an answer that rounds to 61·3(°)*