GCSE MARKING SCHEME

AUTUMN 2018

GCSE
MATHEMATICS – COMPONENT 1 (HIGHER TIER)
C300UA0-1

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.

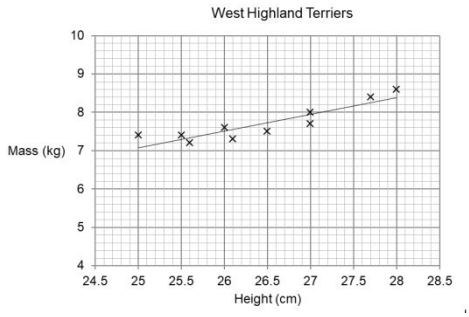
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

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

GCSE MATHEMATICS

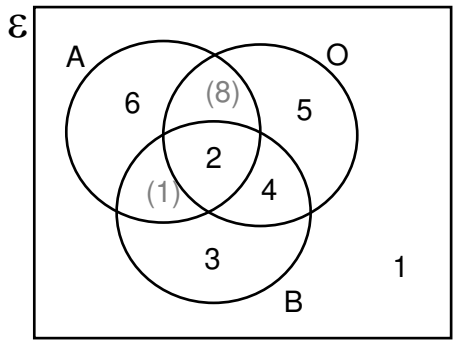
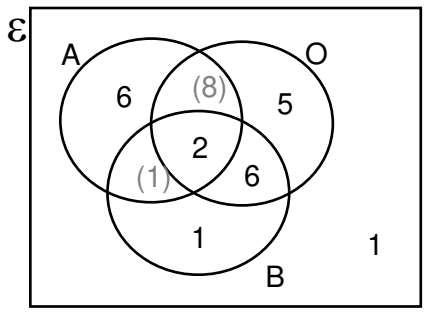
COMPONENT 1 - HIGHER TIER

AUTUMN 2018 MARK SCHEME

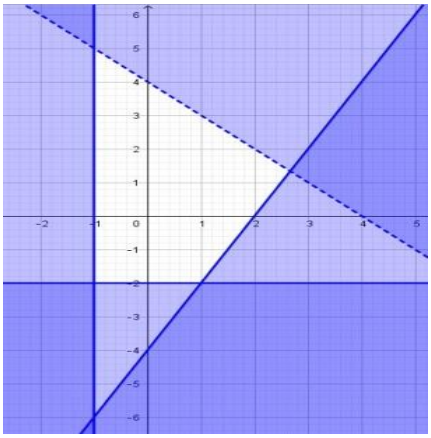
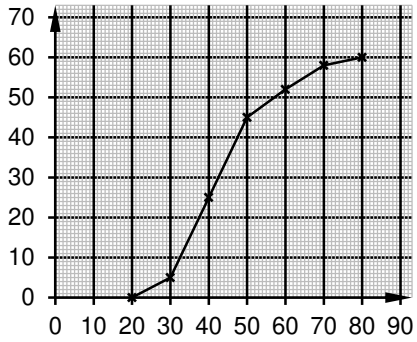
GCSE (9-1) Mathematics Component 1: Higher Tier		**Mark**	**Comment**
1.*(a)	Correct line of best fit	B1	Following trend with some points above and below 
(b)	Answer in the range 7.5 to 8 (kg)	B1	Or FT their line for an answer outside this range
(c)	No with valid reason e.g. 'It is too tall' or 'A dog of mass 8.2 kg should have a height of about 27.5 cm'	E1	Allow e.g. 'For a dog of 35 cm, 8.2 kg is not heavy enough.' or 'Its height does not match its weight.' Allow e.g. 'It is too far off the line of best fit.' provided B1 has been awarded in (a).
		(3)	
2.*(a)	(£)18(.00)	B1	
(b)(i)	They are in direct proportion indicated	B1	
(b)(ii)	4.5 The cost (in £) per mile	B2 B1	B1 for $\frac{45}{10}$ or equivalent or equivalent Allow £ per mile NB An answer of £4.5(0) per mile earns 3 marks
		(5)	
3.	$(3 \times 10^5 =)\ 300\,000$ or $(40\,000 =)\ 4 \times 10^4$ $\frac{3\times10^5}{4\times10^4}$ or $\frac{300\,000}{40\,000}$ $= 7.5$ (so more than 7)	B1 B1	***Alternative method 1:*** *$7 \times 40000 = 280\,000$* *B1* *$(3 \times 10^5 =)\ 300\,000$ (so more than 7)* *B1* ***Alternative method 2:*** $\frac{7\times40\,000}{300\,000}$ *M1* $\frac{280\,000}{300\,000}$ *(which is less than 1)* *A1*
		(2)	

4. $4\pi\left(\frac{3}{4}\right)^2$	M1	Allow the omission of the brackets
$\frac{9}{4}\pi$ or 2.25π or $2\frac{1}{4}\pi$	A1	Or an equivalent multiple of π; mark final answer
	(2)	
5.(a) $\begin{pmatrix}24\\12\end{pmatrix}$	B2	Mark final answer B1 for each element or for $\mathbf{p}+\mathbf{q}=\begin{pmatrix}6\\3\end{pmatrix}$ or $4\mathbf{p}=\begin{pmatrix}-4\\20\end{pmatrix}$ or $4\mathbf{q}=\begin{pmatrix}28\\-8\end{pmatrix}$ seen or for $\begin{pmatrix}\frac{24}{12}\end{pmatrix}$ as final answer or for a correct answer seen then spoiled
(b) 3	B2	Mark final answer; allow embedded answers e.g. $\begin{pmatrix}-2\\10\end{pmatrix}+3\begin{pmatrix}7\\-2\end{pmatrix}=\begin{pmatrix}19\\4\end{pmatrix}$ B1 for $-2+7x=19$ or $10-2x=4$ or for $x\begin{pmatrix}7\\-2\end{pmatrix}=\begin{pmatrix}21\\-6\end{pmatrix}$ or for $\begin{pmatrix}-2\\10\end{pmatrix}+3\begin{pmatrix}7\\-2\end{pmatrix}=\begin{pmatrix}19\\4\end{pmatrix}$ seen with an incorrect final answer
	(4)	
6.* 5 park keepers pruning after 1 hour	B1	seen or implied
10 trees left to prune	B1	seen or implied
Fully correct method in steps or statements e.g. P/keepers | Hours | Trees 3 | 2 | 6 1 | 2 | 2 5 | 2 | 10	M1	seen or implied; FT 'their derived 10' or $2\times\frac{3}{5}\times\frac{10}{6}$ Allow equivalent working in minutes
2 (hours)	A1	Seen or implied
3 (hours)	A1	FT 'their 2' provided M1 has been awarded
	(5)	

7.*(a)	$x = -1.6$ or -1.7	B1	
	$y =$ 1.3 or 1.4	B1	If no marks then SC1 for a value of x between -1.6 and -1.7 and a value of y between 1.3 and 1.4 or for correct values given as coordinates
(b)	$2a+3c=72$ and $3a+c=66$	B1	May use other letters or words throughout this part
	Method to eliminate an unknown e.g. equal coefficients and subtraction	M1	FT their equations provided one is correct and the other is linear in the same pair of unknowns or rearranges one equation and substitutes into the other Allow one error in one term, not in the equated coefficients
	Finds one unknown	A1	CAO; $a=18$ or $c=12$
	Finds the other unknown	A1	FT 'their a' or 'their c' used in one of their equations
	(£)15(.00)	B1	FT 2('their derived a') + 2('their derived c') – 45 provided 2('their derived a') + 2('their derived c') is greater than 45
			Alternative method: Adult ticket costs £18, child ticket costs £12 found using trials *B4* (£)15(.00) FT 2('their derived a') + 2('their derived c') – 45 provided 2('their derived a') + 2('their derived c') is greater than 45 *B1*
		(7)	
8.*(a)	$(x-3)(x+5)$	B2	B1 for $(x \ldots 3)(x \ldots 5)$
(b)	3, –5	B1	Correct or correct FT; FT 'their $(x \pm a)(x \pm b)$' from (a)
		(3)	

9. (a)  	B3	B2 for any 4 or 5 correct or B1 for any 2 or 3 correct FT where possible for B2 or B1 NB common solution for B2 will be 
(b) $\frac{1}{30}$ or equivalent	B1	ISW FT 'their 1', which may be zero or empty
(c) $\frac{7}{17}$	B2	FT 'their 6' + 1 (not their 17 as this is given) B1 for denominator of 17 or numerator of 7 or 'their 6' + 1, provided the fraction is < 1 or B1 for correct answer with wrong notation e.g. 7 out of 17 or 7 : 17
	(6)	

10.* (Proportion of tagged fish in sample is) $\frac{10}{100}\left(=\frac{1}{10}\right)$ or equivalent or (Proportion of sample tagged is) $\frac{10}{50}$ or equivalent	M1	Allow for e.g. '10 tagged out of 50'
$\frac{10}{50}=\frac{100}{500}$ or $\frac{10}{100}=\frac{50}{500}$ or 20% (of population) is 100 (fish) or equivalent	M1	Implies the first M1; allow for e.g. '100 tagged out of 500'; allow $\frac{100}{x}=\frac{10}{50}$ or $\frac{50}{x}=\frac{10}{100}$ or equivalent to score M1 M1
500 (fish) and do not allow fishing ticked or indicated	A1	CAO
	(3)	
11. 1.01×0.9	M1	
0.909 or equivalent	A1	
$1-0.909$ or 0.091 or equivalent	m1	FT 'their 0.909' or 'their 90.9(%)'
9.1%	A1	If M1 A… m0 then SC1 for a final answer of 'their 90.9%', FT 'their 0.909'
	(4)	
12.(a) Method to find prime factors with two correct prime factors seen before the second error	M1	
2, 2, 2, 2, 5	A1	Ignore 1's
$2^4 \times 5$	B1	Implies all 3 marks
(b) 24 336	B2	B1 for $2^4 \times 3^2 \times 13^2$ or 8112×3
	(5)	
13. (a) Valid explanation e.g. '$3^4 = 81$ (and $2.75 < 3$ and rounds to 3 to 1 sf)' or '($2.75^4 < 3^4$ and) $3^4 = 81$'	B1	
(b)(i) 8	B1	-8 is B0
(b)(ii) 125	B2	B1 for 5^3
(b)(iii) 8	B2	not from wrong working; allow ± 8 for B2 B1 for $4096^{\frac{1}{4}}$ or 2^3
	(6)	

14.	Lines $x = -1$ AND $y = -2$ drawn correctly	B1	
	Line $y = 2x - 4$ drawn correctly	B1	
	Line $y = 4 - x$ drawn correctly	B1	Allow solid line used for this mark only
	Region indicated with correct marking of boundaries	B1	$y = 4 - x$ must be shown as dotted or indicated that it is not included. FT 'their 4 lines' provided at least B2 previously awarded. 
		(4)	
15.(a)	8	B1	
(b)	7 points plotted correctly	B2	B1 for 5 or 6 points plotted correctly tolerance ± 1mm
	All points joined with a smooth curve or with line segments	B1	last point must not be joined to the axis; tolerance ± 1mm 
(c)	(median =) 42 to 43	B1	FT 'their attempt at a cf diagram'
	(IQR =) 50 – 35	M1	FT 'their graph' for lower quartile; Upper quartile must be exact as it is a given value
	15	A1	

(d)(i)	22	B2	Award B1 for ½ × 20 × 1.6 or 30 × 0.2 or sight of 16 or 6 If B0 then SC1 for misreading scale, (½ × 20 × 1.7 + 30 × 0.4 =) 29
	(22 − 8 =) 14	B1	FT 'their 22' – 'their 8' from part (a); provided at least one mark previously awarded
(d)(ii)	Valid explanation e.g. 'No as she has not asked sufficient people.' or 'No as she has only asked technology students.' or 'She only asked them about 1 day'	E1	
		(11)	
16.(a)	(Angle *BAD* =) 62°	B1	May be seen in diagram.
	(Angle *BDA* =) 51° or (Angle Q*BD* =) 62°	B1	
	(w =) 67	B1	
(b)	Angle *FHE* = 180 – 2x (Angles in a triangle)	B1	Allow angle *G* for angle *FGH* or angle *E* for angle *HEF.*
	Angle *FGH* = y (Triangle *FGH* is isosceles) AND Angle *GHF* = 180 – 2y (Angles in a triangle)	B1	Do not allow angle *H* for e.g. angle *GHF*.
	Angle *EHG* = 360 – (180 – 2x + 180 – 2y) = 2x + 2y or 2(x + y) (Angles at a point) (Therefore the angle at the centre is twice the angle at the circumference.)	B1	***Alternative method for B marks:*** *(ignoring angle FHE =… and extending the line FH and using a naming convention to identify the exterior angle in the proof e.g. I for the end of the extension or marking the exterior angle as e.g. a)* *Angle EHI = 2x (exterior angle)* *B1* *Angle FGH = y(Triangle FGH is isosceles)* *Angle IHG = 2y (exterior angle)* *B1* *Angle EHG= Angle EHI + Angle IHG = 2x + 2y* *B1*
	At least two correct reasons stated appropriately and all steps included in the proof.	E1	
		(7)	

17. (Flow = $25 \times 12 \times 5$ =) 1500 (cm^3/s) (3 litres takes) 2 (secs to exit pipe) (Takes $40 \div 5$ =) 8 (secs along pipe) (Total time = 2 + 8 =) 10 (secs)	B1 B1 B1 B1	FT 'their 2' + 'their 8' providing at least B2 previously awarded ***Alternative method 1:*** *$25 \times 12 \times$ length = 3000* *B1* *(Length =) 10 (cm)* *B1* *(Distance = 40 + 10 =) 50 (cm) seen or implied* *B1* *(Time taken = $50 \div 5$ =) 10 (secs)* *B1* ***Alternative method 2:*** *(Whole pipe holds = $25 \times 12 \times 40$ =) 12 (litres) or equivalent* *B1* *(Takes $40 \div 5$ =) 8 (secs along pipe)* *B1* *(3 litres takes) 2 (secs to exit pipe)* *B1* *(Total time = 2 + 8 =) 10 (secs)* *B1*
	(4)	
18. $I \propto \frac{1}{d^2}$ or $I = k \times \frac{1}{d^2}$ or equivalent $7 = \frac{k}{2^2}$ $k = 28$ or $I = \frac{28}{d^2}$ $(I =) \frac{28}{4^2}$ $(I =) 1.75$ (candela) CAO	B1 M1 A1 M1 A1	 FT their equation providing it is non-linear FT their equation providing it is non-linear FT 'their 28' ***Alternative method:*** *7×2^2 seen or implied in later working* *B1* *Forms $7 \times 2^2 = I \times 4^2$* *M2* *or M1 if one error* $I = \frac{7 \times 4}{16}$ *seen or implied; FT 'their equation of equivalent difficulty'* *M1* $(I =) 1.75$ *(candela)CAO* *A1*
	(5)	

19.(a)	$\sqrt{3}$	B1	
(b)	$8\sqrt{7}$	B2	Allow k = 8; B1 for $3\sqrt{7}$ or $5\sqrt{7}$ seen
(c)	–2	B2	B1 for 3 out of 4 correct in $8+4\sqrt{5}-4\sqrt{5}-2(5)$ or for sight of all 4 terms e.g. listed
(d)	$(x-\sqrt{3})(x+\sqrt{3})$	B1	seen or implied
		(6)	
20.(a)	$0.41\dot{6}$	B1	
(b)(i)	$100x$ = 127.2$\dot{7}$ and x = 1.2$\dot{7}$ and attempt to subtract	M1	or equivalent
	$\frac{126}{99}$ or equivalent	A1	Allow $1\frac{27}{99}$
(ii)	$\frac{14}{11}\times\frac{14}{11}$ with an attempt to multiply	M1	or equivalent e.g. $\frac{126}{99}\times\frac{126}{99}$; FT 'their derived $\frac{126}{99}$,
	$1\frac{75}{121}$	A1	CAO
		(5)	
21. (a)	No implied or indicated with valid explanation e.g. '(All the y-coordinates change sign so) it is a reflection in the x- axis'	E1	
(b) Valid criticism e.g.	'The graphs are not labelled so you cannot tell which is which' or 'None of the branches should cross the x-axis'	E1	Allow e.g. 'There is no scale so she might have drawn something like $\frac{2}{x}$ and $-\frac{2}{x}$.'
		(2)	

22.(a)	$g^{-1}(x)=\frac{4-x}{3}$	B2	B1 for $x=\frac{4-y}{3}$ or equivalent unless x and y interchanged later or SC1 for y or $g^{-1}(x)=\frac{4+y}{3}$ or equivalent
	$4-x=3x+6$ or equivalent	M1	
	$x=-\frac{1}{2}$	A1	***Alternative method:*** $x=g(x+2)$ *B1* $x=4-3(x+2)$ *B1* $x=-2-3x$ or equivalent *M1* $x=-\frac{1}{2}$ *A1*
(b)	$4-3(4-3x)$	M1	
	$9x-8$	A1	
(c)	Valid explanation e.g. '$h(-1)=h(1)=6$ so both are equal to $g(6)$.'	E1	Allow '1^2 is the same as $(-1)^2$'. Allow for working out $gh(-1)$ and $gh(1)$ and showing they are both e.g. −14.
		(7)	
23.(a) Correct sine graph over full domain with maxima and minimum at 1 and −1 respectively		B2	B1 for correct shape over full domain but 1 and −1 not marked or for correct roots, maxima and minimum but incorrect shape e.g. ruled sections or for the correct curve from 0° to 360° with 1 and −1 marked
(b)	4	B1	
		(3)	
24.(a)	5040	B2	B1 for 7! or $7\times6\times5\times4\times3\times2$ ($\times1$) or equivalent
(b)	210	B2	FT 'their 5040' $\div(4\times3\times2(\times1))$ B1 for $7\times6\times5$ or $\frac{7!}{4!}$
		(4)	

25.(a)	$-0.49, -0.46$	B1	
(b)	Valid explanation e.g. 'There is a change of sign (so the value will be in this range).'	E1	
(c)	$0.74^2 - 0.5$ or $0.74^2 = 0.5476$ $(0.5476 - 0.5 =)$ 0.0476 AND valid conclusion e.g. 'The answer is between 0.7 and 0.74' or '0.0476 > 0'	B1 B1	
		(4)	
26.(a)	$\sqrt{144} - \sqrt{4} = 10$ or $12 - 2 = 10$	B2	B1 for $\sqrt{144} - \sqrt{4}$ or for (radius of outer circle =)12 or (radius of inner circle =) 2 seen
(b)	$y = -12$	B1	
		(3)	