GCSE MARKING SCHEME

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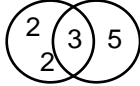
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

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

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
1.*(a) Correct plot	P1	May or may not be joined
(b)(i) 2004	B1	
(b)(ii) 2006 and 2008	B1	
(b)(iii) Any valid comparison. e.g. 'The composting percentage is always increasing but the recycling percentage increases (until 2008) but then decreases.' or 'From 2012 the recycling and composting rates are about the same.' or 'From 2002 to 2008 both rates are increasing but after 2008 the recycling rate decreases whereas the composting rate keeps on increasing.' or 'The recycling rate is more than the composting rate until 2012 but in 2014 a greater % of waste is composted than recycled.' or 'More waste is recycled than is composted until 2012. (After that there is about the same amount of each).'	E1	A comparison does not need to mention the years but must mention composting **and** recycling. Allow e.g. 'Waste recycled has eventually begun to fall where compost has continued to gradually rise, (eventually taking over recycled waste)' or 'As the percentage of composting has increased the percentage of recycling has declined from 2008' or 'More waste is being recycled and composted in 2014 than in 2002' or 'Both the waste recycling and composting have increased between 2002 and 2014'
	(4)	

2.*(a) $12x - 7x = 6 + 9$ or $x = \dfrac{15}{5}$ or equivalent $x = 3$	B1 B1	Seen or implied FT until 2nd error Mark final answer; allow embedded answer for 2
(b) $10x + 20 - (2x - 9) = 30$ or $10(x + 2) - 2x + 9 = 30$ or better $10x - 2x = 30 - 9 - 20$ or better $x = \dfrac{1}{8}$ ISW	B1 B1 B1	FT until 2nd error Seen or implied For expanding at least one pair of brackets correctly FT For collecting terms FT; if FT the common error $8x = 19$, then the answer must be 2.375 or $\dfrac{19}{8}$, not rounded to e.g. 2.3
(c)(i) $10x \leq 15$ or equivalent $x \leq 1.5$ or equivalent	M1 A1	 Mark final answer No marks for use of "=", unless finally replaced to give $x \leq 1.5$ then award M1 A1.
(ii) Solid circle at 1.5 with arrow left	B1	STRICT FT 'their (c)(i)' provided an inequality Accept any unambiguous notation provided there is no termination (so not a line with a circle at each end)
(d) No with valid explanation. e.g. 'The correct answers are $x = 3$ and $x = 2$.' or 'She has forgotten to put $x - 3$ and $x - 2$ equal to 0 and solve.' or 'When $x = -3$ the value is 30.' or 'The correct solution is $x = 3$ or $x = 2$.'	E1	Do not accept e.g. 'The values do not work' without supporting evidence. Allow 'No and $(-3 - 3) = -6$ and $(-2 - 2) = -4$'
	(9)	
3.*(a) $8n - 5$	B2	B1 for $8n + k$ where $k \neq -5$
(b) 5, 19, 57	B2	B1 for any two correct If no marks then SC1 for 3, 5, 19
	(4)	
4.(a)* Valid comment e.g. 'The groups overlap so people who spent £20 may be in different groups.' or 'His groups are too big.' or 'You cannot tell which group 40 is in.'	E1	Do not allow comments such as 'The ages in the groups are too big'
(b)(i)* $\dfrac{1}{100}$ or equivalent	B2	B1 for $\dfrac{1}{10} \times \dfrac{1}{10}$ or equivalent
(b)(ii) (£) 688.97	B1	
	(4)	
5.* Bottom left (5th) graph ticked	B1	
	(1)	

6.*(a) Valid explanation e.g. 'Correlation does not imply causation.' or 'The manager has confused correlation with causation.' or 'Something else may have made the number of hat and hot drinks increase together, such as the weather getting colder.'	E1	Allow e.g. 'Both increased over 10 days but not because of each other' or 'The graph does not provide evidence that one has caused the other, there could be a common cause for the two.'
(b)(i) Correct line of best fit drawn	B1	Following trend with points above and below; must be ruled
(b)(ii) Answer in the range 28 to 33	B1	FT 'their line of best fit'
(b)(iii) Valid comment e.g. 'It will give a negative number of drinks.' or 'It may not be very accurate as there is not much data.' or 'Even though the correlation is negative, you cannot be sure of the pattern.' or 'Other things may influence the sale of the drinks besides the weather so it may not be very accurate.' or 'It is outside the data given.'	E1	Do not accept 'Not suitable at all' without justification. Accept comments that imply e.g. the relationship is not linear. Allow e.g 'It is only based on findings from 10 days' Do not allow e.g. 'Not suitable as not enough information'
	(4)	
7.* Any valid reason e.g. 'Nia has found the circumference.' or 'Circumference circle = $\pi \times 24$.' or 'She has used the diameter, not the radius squared'. or 'Area circle = $\pi \times 144$'	E1	Allow e.g. 'Area of circle should be $\pi \times r^2$' or 'Area circle = $\pi \times 12^2$.' Do not allow e.g. 'Area circle = $\pi \times r^2$ and Circumference = $\pi \times d$' or Area = $\pi \times r^2$ without further evidence e.g. correct method shown
$\left(\dfrac{\pi \times 144}{8} =\right) 18\pi$ (cm^2)	B2	B1 for (area sector =) $\dfrac{\pi \times 12^2}{8}$ or equivalent; Allow use of $\pi = 3.14$ for E1 and B1
	(3)	

8.(a)* (soup =) 5 (water =) 4	B2	B1 for sight of 3×4 and 3×5 or equivalent or for (LCM =) 60 or for a correct Venn diagram of primes factors or for 4 and 5 (values reversed) or for answers of $5n$ and $4n$ where n is an integer > 1
(b) $12 \times \frac{3}{4} x + 16 \times x (=125)$ or equivalent, seen or implied	M2	implied by $12 \times 3.75 + 16 \times 5 = 125$ from trials or costs in the ratio 9 : 16 seen or implied M1 for (pack of sausages cost) $\frac{3}{4} x$ or equivalent or for sight of (packs of sausages =) 12 or for 'their 12' $\times$ 'their $\frac{3}{4} x$' $+ 16 \times x = 125$, provided 'their x' $\neq 1$
$(x =) 5$ or equivalent, seen or implied	A1	CAO
£3.75	B1	FT ¾ of 'their 5' or equivalent, provided 'their 5' is not an integer multiple of 4
	(6)	
9.(a) Arc, centre P, radius 6 cm	B1	Allow ±2mm
Correct perpendicular bisector of AB with appropriate arcs	B2	B1 for correct arcs NB No arcs, no marks; if two full arcs used there must be daylight between the overlapping sections Tolerance ±2°
Correct line segment indicated	B1	FT provided at least the first B1 awarded and a perpendicular bisector attempted (may not have arcs)
(b) Midpoint of AB clearly identified as S	B1	
	(5)	

10. Two correct angles or $x + y + DCE = 180$ (Angles in a triangle (sum to 180°)) $DCE = DBF$ (Corresponding angles (are equal) $w + DBF = 180$ (Angles on a straight line (sum to 180°))	B1	May be shown on diagram; angles need to be indicated in some way Angle $DFB = y$ or Angle $DFA = y$ (Corresponding angles (are equal)) and Angle $DBF = 180 - x - y$ (Corresponding angles (are equal) or Angles in a triangle (sum to 180°)) or Angle $DCE = 180 - x - y$ (Angles in a triangle (sum to 180°)) or Angle $DCE = 180 - w$ (Corresponding angles (are equal)) and Angle $DBF = 180 - x - y$ (Corresponding angles (are equal) or Angles in a triangle (sum to 180°)) or Angle $DBF = 180 - w$ (Angles on a straight line (sum to 180°))
A correct reason linked to a correct statement	B1	
Fully correct and justified complete argument to prove $w = x + y$	B1	Must be fully justified with all valid reasons
		Alternative method: Angle $DFB = y$ or Angle $DFA = y$ Corresponding angles are equal or angle $BCE = w$ alternate angle are equal *B1* $w = x + y$ The exterior angle is equal to the sum of the two opposite interior angles *B2*
	(3)	

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11. (a) 4 parts = (£)6400 or 6400 ÷ 4 or $5x - x = 6400$ or equivalent	M1	Accept $\frac{4}{13}$ is 6400 or equivalent
(1 part = £) 1600	A1	
(Total cost = £) 1600 × 13 or (Total cost = £) 11200 + 8000 + 1600	m1	for 'their 1600'× 7 + 'their 1600' × 5 + 'their 1600' or for 'their 1600' × 13 or for sight of 9600 or 8000
= (£) 20800	A1	CAO If no marks, award SC2 for an answer of (£)16640 or SC1 for sight of 6400 × 13 ÷ 5 or equivalent
(b) (labour =) $7200 \times \frac{5}{3}$ (= 12000)	M1	Or equivalent full method.
(materials =) 6000 × 2.5 (= 15000)	M1	Or equivalent full method.
(professional fees =) $30800 - 7200 \times \frac{5}{3} - 6000 \times 2.5$ (= 30800 – 12000 – 15000)	M1	FT 'their $7200 \times \frac{5}{3}$ and 'their 6000 × 2.5' provided one is correct.
(professional fees =) 3800 (which is just over 3 × 1200)	A1	CAO
	(8)	
12. (a)(i) $\frac{1}{3}$	B1	Accept $\pm\frac{1}{3}$
(a)(ii) 5	B2	B1 for $\frac{5^{10}}{5^9}$ or for $\frac{625}{125}$ or $5^4 \times 5^{-3}$ or equivalent
(b) $16a^4b^{12}$	B2	B1 for any 2 correct elements of the product e.g. $2^4 a^4 b^{12}$
(c) Any answer in the range (16 , 20)	B2	B1 for sight of $4^3 = 64$ or $5^3 = 125$ or $64^{\frac{2}{3}}$ or $125^{\frac{2}{3}}$ or equivalent or for $\left(\sqrt{16}\right)^3$ or $\left(\sqrt{25}\right)^3$
	(7)	

13.		
For squaring both sides e.g $(x+y)^2 = 2(xy+w)$ or equivalent, seen or implied	B1	FT until second error where possible; a first line of $x^2 + y^2 = 2(xy + w)$ implies the first B1
$x^2 + y^2 + xy + yx = 2xy + 2w$ or better	B2	FT B1 FT for 3 out of 4 terms correct in $(x+y)^2 = x^2 + xy + yx + y^2$ or for $x^2 + y^2 + 2xy = 2xy + w$ or for $x^2 + y^2 + 2xy = 4xy + 2w$ Omission of $(2)xy$ in expansion of $(x+y)^2$ counts as one error
$x^2 = 2w - y^2$	B1	FT for collection of 'their x terms' to one side and all other terms to the other
$x = \pm\sqrt{2w - y^2}$ CAO	B1	Mark final answer Allow $x = \sqrt{2w - y^2}$; the final subject must be x If B1 B2 B0, allow SC1 for a final answer of $x = \pm\sqrt{2w + y^2}$
	(5)	
14.		Marks can only be awarded for description of a single transformation.
Rotation 90° clockwise or equivalent (about) (2, −2)	B3	B2 for rotation about (2, −2) or for rotation, 90° clockwise or equivalent about 'their (2, −2)' provided 'their (2, −2)' is not (0, 0) B1 for rotation about 'their (2, −2)' provided 'their (2, −2)' is not (0, 0) If no marks award SC1 for any clear diagram showing a complete correct transformation of a triangle (which may not be scalene).
	(3)	
15.		
(**AD** =) $3\mathbf{q}$	B1	may be on diagram
(**DC** =) $-3\mathbf{q} + 3\mathbf{p} + \mathbf{q}$	M1	− 'their $3\mathbf{q}$' + $3\mathbf{p} + \mathbf{q}$
$3\mathbf{p} - 2\mathbf{q}$	A1	CAO
	(3)	

16.(a) Left whisker 1.5 and right at 5	B1	
LQ 2.5	B1	Seen or implied
LQ 2.5, median 4 and UQ 4.5 in a box plot	B1	Must be seen in a correct box plot, FT their LQ; if no LQ is stated and it is not at 2.5 allow this mark provided 1.5 < LQ < 4;
(b) No with valid explanation e.g. 'Box plots do not show the individual data points.' or 'box plots only show summary statistics'	E1	Allow e.g. 'a box plot only summarises the data' or 'it does not show every value recorded' Do not allow e.g. 'There is no data for days in the box plot' or 'There is no indication of the number of days Ellie took to accumulate the data.'
	(4)	
17. (a) $P \propto \dfrac{1}{A}$ or $P = \dfrac{k}{A}$ or equivalent	B1	seen or implied; if variables seen, must be P and A but allow any other letter for k; may be implied by e.g. $x \div 0.08 = 30$
$(k =)\ 0.08 \times 30$	M1	
$P = \dfrac{2.4}{A}$ or $P = \dfrac{12}{5A}$ or equivalent	A1	CAO
(b) $\left(A=\right)\dfrac{2.4}{80}$ or equivalent	M1	FT 'their 2.4' , provided k is not an integer.
$\left(A=\right)0.03\ (\text{m}^2)$ or equivalent ISW	A1	FT
	(5)	

18. (a) $(\pounds)\ 2500 \times \dfrac{6}{5} \times \dfrac{3}{2}$ or equivalent	M2	Allow for sight of
		     6 waiters earn £1500 for 1 week or
		     1 waiter earns £750 for 3 weeks
		 M1 for $(\pounds)2500 \times \dfrac{3}{2}$ or $(\pounds)2500 \times \dfrac{6}{5}$ or equivalent or for $\dfrac{2500}{5 \times 2}$ or for sight of (1 waiter earns) (£)250 (per week)

$(\pounds)\ 4500$	A1	
18.(b)(i) $(\pounds \text{ per hour} =)\ \dfrac{m}{5x}$	B1	Accept unsimplified e.g. $\dfrac{m \div 5}{x}$
(b)(ii) $(\pounds)\ 7\left(\dfrac{m}{5x} + y\right)$ or equivalent, ISW	B2	FT 'their (b)(i)' B1 for sight of 'their $\dfrac{m}{5x}$'$+ y$
	(6)	

19. $10-3\sqrt{5}=\dfrac{1}{2}\times base\times\sqrt{5}$	B1	Any clear notation is acceptable.	
$(base=)\dfrac{10-3\sqrt{5}}{\frac{1}{2}\times\sqrt{5}}$ or equivalent	B1	Allow $\dfrac{10-3\sqrt{5}}{\sqrt{5}}=\dfrac{1}{2}\times base$ or $10\sqrt{5}-3\times5=\dfrac{1}{2}\times base\times5$ or $20=\sqrt{5}(base+6)$	
$(base=)\dfrac{20}{\sqrt{5}}-6$ or better or $(base=)\dfrac{2\times10\sqrt{5}-2\sqrt{5}\times3\sqrt{5}}{\left(\sqrt{5}\right)^2}$ or better	M1	Allow $\dfrac{10}{\sqrt{5}}-3=\dfrac{1}{2}\times base$ or better or $\dfrac{10\sqrt{5}-3\sqrt{5}\times\sqrt{5}}{\left(\sqrt{5}\right)^2}=\dfrac{1}{2}\times base$ or better	
$(base=)4\sqrt{5}-6$	A1	Allow $-6+4\sqrt{5}$	
	(4)		
20. (a) $0.04\overset{..}{5}$	B1	Allow 0.04545…	
(b) $1000x-x=5258.25\overset{.}{8}-5.25\overset{.}{8}$	M1	or equivalent	
$\dfrac{5253}{999}$ ISW or $5\dfrac{258}{999}$	A1	or equivalent	
	(3)		
21.(a) 720	B2	B1 for $6\times5\times4\times3\times2\ (\times1)$ or 6! or equivalent	
(b) 240	B2	FT $\dfrac{\text{'their 720'}}{3}$ B1 for $2\times5\times4\times3\times2\ (\times1)$ or $(6\times5\times4\times3\times2\ (\times1))\div3$ or $\dfrac{6!}{3}$ or 120 + 120 or $\dfrac{2}{6}\times$'their 720' or equivalent	
	(4)		
22. (a) Correct tangent graph over full domain	B2	B1 for asymptotes at $x=90°$ and $x=270°$ and correct shape for at least one complete and continuous section; be generous with shape	
(b) 45(°) and 225(°)	B2	with no extras in range B1 for either, ignoring extras, or for 180 + 'their 45' providing 'their 45' is acute If no marks then SC1 for sight of tan45 = 1	
	(4)		

23.(a)(i) $g(64)$ 14	M1 A1	or for $gf(x) = \dfrac{x^2 + 6}{5}$ seen or implied CAO
(a)(ii) $g^{-1}(x) = 5x - 6$	B2	Allow $y = \ldots$ etc B1 for $x = 5y - 6$ if x and y not interchanged later or SC1 for y or $g^{-1}(x) = 5x + 6$ or equivalent
(b) Translation through $\begin{pmatrix} 0 \\ k \end{pmatrix}$ where $k > 0$ $A(-2, 1)$ and $B(2, 5)$ seen or scales marked	B1 B1	
	(6)	
24.(a) (Probability 1st round draw =) $\left(\dfrac{4}{6} \times \dfrac{2}{5}\right) + \left(\dfrac{2}{6} \times \dfrac{4}{5}\right)$ or $1 - \dfrac{2}{6} \times \dfrac{1}{5} - \dfrac{4}{6} \times \dfrac{3}{5}$ or equivalent, seen or implied $\dfrac{16}{30}\left(= \dfrac{8}{15}\right)$ or $\dfrac{4}{15} + \dfrac{4}{15}\left(= \dfrac{8}{15}\right)$ or $1 - \dfrac{2}{30} - \dfrac{12}{30}$ or equivalent	M2 A1	Allow for a complete and correct sample space M1 for $\dfrac{4}{6} \times \dfrac{2}{5}\left(= \dfrac{8}{30}\right)$ or equivalent, seen or implied or M1 for sight of $1 - \dfrac{2}{6} \times \dfrac{1}{5}$ or for sight of $1 - \dfrac{4}{6} \times \dfrac{3}{5}$ or equivalent Evidence must be seen as $\dfrac{8}{15}$ is given e.g. $\dfrac{2}{6} \times \dfrac{1}{5} + \dfrac{4}{6} \times \dfrac{3}{5} = \dfrac{14}{30} = \dfrac{7}{15}$ so answer is $\dfrac{8}{15}$ implies M2 but is A0.
(b) Combines the probabilities correctly. $\dfrac{8}{15} \times \dfrac{2}{6} \times \dfrac{1}{5}$ $\dfrac{16}{450}$ or equivalent ISW	M2 A1	M1 for sight of (Probability Steve wins =) $\dfrac{2}{6} \times \dfrac{1}{5}$ oe or $\dfrac{2}{30}$ oe Equivalent e.g. $\dfrac{8}{225}$
	(6)	

25.(a) Valid comment e.g. 'An estimate of the acceleration (at 40 seconds).' or 'How fast the vehicle was accelerating (at 40 seconds).'	E1	Allow acceleration or deceleration only without reference to 'at 40 seconds'. Allow e.g. 'How fast the vehicle was decelerating (at 40 seconds).'
(b)(i) Valid explanation e.g. 'The rectangles are all bigger than the area they are estimating.' or 'The rectangles she has chosen give an overestimate.' or 'The area is overestimated.' or 'It is an overestimate.'	E1	
(b)(ii) Valid improvement e.g. 'She could use some triangles as well as rectangles.' or 'She could use trapezia.' or 'She could use thinner rectangles.' or 'She could lower the height of the first 3 and the last 2 bars so that the top went through a cross.' or 'She could use the trapezium rule.'	E1	Check diagram for information to further explain their comment e.g. drawing the positions of new rectangles
	(3)	
26. Clears the fractions $4(x+2)+12(2x-3)=7(2x-3)(x+2)$	M2	May be seen or implied later e.g. $28x-28=7(2x^2+x-6)$ M1 for $\dfrac{4(x+2)+12(2x-3)}{(2x-3)(x+2)}$ $[=7]$ For first M1 or M2, allow recovery from omission of brackets e.g. $4\times x+2+12\times 2x-3=7\times 2x-3\times x+2$
Expands the brackets and collects all terms on one side $[4x+8+24x-36=7(2x^2+x-6)]$ $[28x-28=14x^2+7x-42]$ $14x^2-21x-14=0$ or $2x^2-3x-2=0$	M2	For M2 and M1 allow one error in expansion or collection M1 for 'their $28x-28$' = 'their $14x^2+7x-42$' FT for M2 or M1 only if of equivalent difficulty, so e.g. if brackets have been omitted, they must 'work as if they are there' for these marks
Factorises or solves their 3-term quadratic equation $(2x+1)(x-2)[=0]$ or equivalent	M1	May use the quadratic formula; must be correct for their equation; their equation must have real roots.
$x=-\dfrac{1}{2}$, $x=2$	A1	CAO
	(6)	