GCSE MARKING SCHEME

SUMMER 2022

GCSE
MATHEMATICS
UNIT 1 – HIGHER TIER
3300U50-1

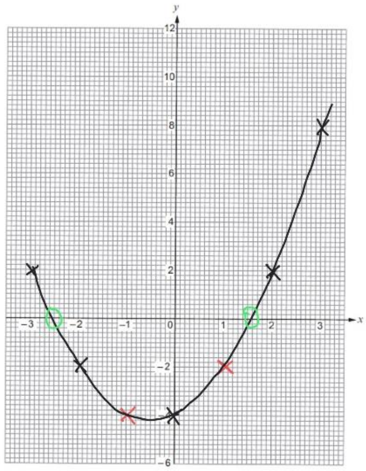
INTRODUCTION

This marking scheme was used by WJEC for the 2022 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.

Unit 1: Higher Tier	Mark	Comments
1. (BC =) 56 (km) ÷ (3 + 4) × 4 or equivalent	M1	M1 awarded for **complete** method.
32 (km)	A1	
(BC =) 32 (km) ÷ 8 × 5 or equivalent	M1	FT 'their derived 32' ÷ 8 × 5.
20 (miles)	A1	If a candidate works with AB instead of BC, then treat as a misread -1 (from A mark). <u>Example 1</u> 56 (km) ÷ (3 + 4) × 3 = 24 (km) M1A1 (-1) 24 (km) ÷ 8 × 5 = 15 (miles) M1 A1 (Total = 3 marks) <u>Example 2</u> e.g. 56 (km) ÷ (3 + 4) × 3 = 16 (km) M1A0 16 (km) ÷ 8 × 5 = 10 (miles) M1 A1 (-1) (Total = 2 marks)
<u>1. Alternative Method</u>		
(AC =) *56 (km) ÷ 8 × 5 or equivalent*	*M1*	*M1 awarded for **complete** method*
35 (miles)	*A1*	
(BC =) *35 (miles) ÷ (3 + 4) × 4 or equivalent*	*M1*	*FT 'their derived 35' ÷ (3 + 4) × 4*
20 (miles)	*A1*	If a candidate works with AB instead of BC, then treat as a misread -1 (from second A mark). *56 (km) ÷ 8 × 5 = 35 (miles) M1 A1* *35 (miles) ÷ (3 + 4) × 3 = 15 (miles) M1A1(-1)* (Total = 3 marks)
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 explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means
Accuracy of 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

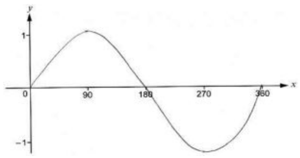
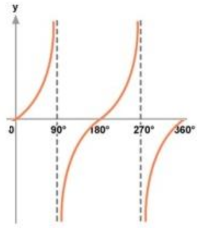
2. (a) –4 –2	B2	B1 for each
2. (b) At least 5 correct plots and no incorrect plot. A smooth <u>curve</u> drawn through their plots. 	P1 C1	FT 'their (–1,−4)' and 'their (1,−2)' Allow ± '½ a small square'. FT 'their 7 plots' OR a curve through the 5 given points **AND** (−1,–4) and (1,–2). Allow the intention to pass through their plots (within 1 small square, either horizontally <u>or</u> vertically of the point).
2.(c) –2·6 AND 1·6	B1	<u>Strict</u> FT 'their curve' only if exactly two points of intersection with the x-axis. Answers must be written to one decimal place. Allow ± 'up to but not including 1 small square'.

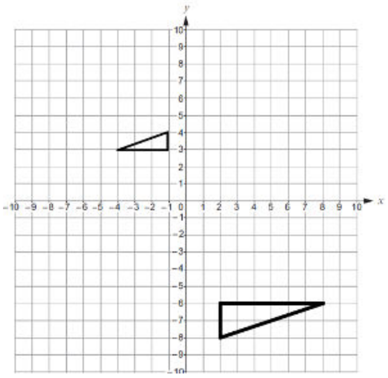
3. (0 pets angle =) 40(°) ± 2(°)	B1	*Answers may be seen on diagrams*
(Year 5: 0 pets =) $\frac{40(°) \pm 2(°)}{360} \times 36$	M1	Or equivalent *FT 'their 40'*
(Year 5: 0 pets =) 4	A1	Answer must be whole number and from correct working (e.g. not from 360 ÷ 90) An answer of 4 (may be seen as 4/36) implies B1M1A1, provided not from incorrect working.
(Year 5: 1 pet =) 9	B1	May be seen as 9/36
(Probability no more than 1 pet =) $\frac{27}{61}$ or equivalent ISW	B2	FT $\frac{\text{'their derived 4' + 'their derived 9' + 6 + 8}}{61}$ (no more than 1 pet) B1 for a numerator of 27 in a fraction < 1. FT 'their derived 4' + 'their derived 9' + 6 + 8 accurately evaluated as a numerator in a fraction < 1. B1 for a denominator of 61 in a fraction < 1. Penalise incorrect notation −1. e.g. '27 in 61'. If no marks awarded, award SC1 for sight of a correct 61. Special cases: If only 1 pet considered from Year 5 AND Year 6, an answer of $\frac{17}{61}$ would gain B0 or B1 M0A0B1B2 FT $\frac{\text{'their derived 9' + 8}}{61}$ for B0 or B1 M0A0B0B2 Last B1 for a numerator of 17 in a fraction < 1. FT 'their derived 9' + 8 accurately evaluated as a numerator in a fraction < 1. Last B1 for a denominator of 61 in a fraction < 1. Penalise incorrect notation −1. e.g. '17 in 61'. If only 0 pets considered from Year 5 AND Year 6, an answer of $\frac{10}{61}$ would gain B1M1A1B0B2 FT $\frac{\text{'their derived 4' + 6}}{61}$ for B1M1A0B0B2 Last B1 for a numerator of 10 in a fraction < 1. FT 'their derived 4' + 6 accurately evaluated as a numerator in a fraction < 1. Last B1 for a denominator of 61 in a fraction < 1. Penalise incorrect notation −1. e.g. '10 in 61'.

3. <u>Alternative method 1</u> *(0 + 1 pet angle =) 130(°) ± 2(°)*	B1	*Answers may be seen on diagrams*
(Year 5: 0 + 1 pet =) $\frac{130(°) \pm 2(°)}{360} \times 36$	M1	*Or equivalent* *FT 'their 130'*
(Year 5: 0 + 1 pet =) 13	A2	*May be seen as 13/36* *Award A1 for an answer not rounded.*
(Probability no more than 1 pet =) $\frac{27}{61}$ *or equivalent ISW*	B2	*FT* $\frac{(\text{'their derived 13'} + 6 + 8)}{61}$ *B1 for a numerator of 27 in a fraction < 1.* *FT 'their derived 13' + 6 + 8 accurately evaluated as a numerator in a fraction < 1.* *B1 for a denominator of 61 in a fraction < 1.* *Penalise incorrect notation −1. e.g. '27 in 61'.* *If no marks awarded for the whole question, award SC1 for sight of a correct 61.*

3. *<u>Alternative method 2</u>*		*Answers may be seen on diagrams*
(Each child is represented by $\frac{360(°)}{36}$ *=) 10(°)*	*B1*	
(Year 5: 0 pets angle = 40(°) ± 2(°)	*B1*	
(Year 5: 0 pets = $\frac{40(°) \pm 2(°)}{10(°)}$ *=) 4*	*B1*	*FT 'their 40'* *Answer must be whole number and from correct working (e.g. not from 360 ÷ 90)* *An answer of 4 (may be seen as 4/36) implies B1B1B1, provided not from incorrect working.*
(Year 5: 1 pet =) 9	*B1*	*May be seen as 9/36*
(Probability no more than 1 pet =) $\frac{27}{61}$ *or equivalent ISW*	*B2*	*FT* $\frac{(\text{'their derived 4'} + \text{'their derived 9'} + 6 + 8)}{61}$ *B1 for a numerator of 27 in a fraction < 1.* *FT 'their derived 4' + 'their derived 9' + 6 + 8 accurately evaluated as a numerator in a fraction < 1* *B1 for a denominator of 61 in a fraction < 1.* *Penalise incorrect notation −1. e.g. '27 in 61'.* *If no marks awarded, award SC1 for sight of a correct 61.* *<u>Special cases:</u>* *<u>If only 1 pet considered from Year 5 AND Year 6</u>, an answer of* $\frac{17}{61}$ *would gain B0 or B1 M0A0B1B2* *FT* $\frac{\text{'their derived 9'} + 8}{61}$ *for B0 or B1 M0A0B0B2* *Last B1 for a numerator of 17 in a fraction < 1.* *FT 'their derived 9' + 8 accurately evaluated as a numerator in a fraction < 1.* *Last B1 for a denominator of 61 in a fraction < 1.* *Penalise incorrect notation −1. e.g. '17 in 61'.* *<u>If only 0 pets considered from Year 5 AND Year 6</u>, an answer of* $\frac{10}{61}$ *would gain B1M1A1B0B2* *FT* $\frac{\text{'their derived 4'} + 6}{61}$ *for B1M1A0B0B2* *Last B1 for a numerator of 10 in a fraction < 1.* *FT 'their derived 4' + 6* accurately evaluated *as a numerator in a fraction < 1.* *Last B1 for a denominator of 61 in a fraction < 1.* *Penalise incorrect notation −1. e.g. '10 in 61'.*

4. (a) 0·4 shown on 'A does not occur' branch Use of 0·6 × ………… = 0·48 P(B occurs) = 0·8 Second set of branches 0·8, 0·2, 0·8, 0·2	B1 M1 A1 A1	 Allow M1A1 if 0·8 seen on one of the 'B occurs' branches. FT 'their 0·8' only if M1 awarded. (0·48, 0·52, 0·48, 0·52 is M0A0A0)
4. (b) 0·4 × 0·2 = 0·08 ISW	M1 A1	FT 'their 0·4' × 'their 0·2' provided both between 0 and 1.
5. (a) (CE =) $8 \times \frac{15}{10}$ or $8 \div \frac{10}{15}$ = 12 (cm)	M1 A1	Or equivalent M1 for correct use of linear ratio.
5.(b) (AB =) $10{\cdot}5 \times \frac{10}{15}$ or $10{\cdot}5 \div \frac{15}{10}$ or equivalent = 7 (cm)	 M1 A1	 Or equivalent M1 for correct use of linear ratio. FT 'their scale factor' from (a) provided not 1.
6. Method to eliminate one variable e.g. 'equal coefficients AND appropriate intention to add or subtract' or use a method of substitution First variable found $x = 4$ or $y = 7$. Substitute to find the 2nd variable. Second variable found.	 M1 A1 m1 A1	 Allow one error in one term (not the term with equal coefficients). CAO. Award A0 for an answer that leads to a whole number, but not expressed as a whole number (e.g. y = 161/23 or x = 92/23) FT substitution of their '1st variable' if M1 gained. If FT leads to a whole number answer, it must be shown as a whole number. Otherwise accept a fraction. If no marks gained, allow SC1 for both answers of $x = 4$ AND $y = 7$.
7. (a) $7{\cdot}2 \times 10^6$ cm^3	B1	
7. (b) 6	B1	
8. 0·2	B2	If B2 not awarded, award B1 for one of the following: • sight of 150 000 or • sight of 3×10^4 or • 2×10^{-1} or • $\frac{1}{5}$ or $\frac{3}{15}$ (or equivalent fraction)

9.(a) 	C1	Clear intention to draw a curve. Curve must pass through (0,0), (180,0) and (360,0). AND intention to have maximum at (90,1) and minimum at (270,-1). Ignore curve shown for values $x < 0°$ or $x > 360°$.
9.(b) 	C1	Clear intention to draw a curve with positive gradient. Curve must pass through (0,0), (180,0) and (360,0). AND have inflection point at (180,0). There must be an intention not to cross the asymptotes at $x = 90º$, $x = 270º$. Ignore curve shown for values $x < 0°$ or $x > 360°$.
10. $5x + yx = t - 4$ or $4 - t = - yx - 5x$ $x(5 + y) = t - 4$ or $4 - t = x(-y - 5)$ $x = \frac{t-4}{5+y}$ or equivalent	 B1 B1 B1	FT until 2nd error provided equivalent difficulty (requiring factorisation). Collecting *x* terms. Factorising. Allow B1 for $4 - t = -x(y + 5)$. Dividing. Allow $x = \frac{4-t}{-y-5}$ Mark final answer.
11. $W \alpha \frac{1}{f}$ OR $W = \frac{k}{f}$ $0.5 = \frac{k}{1200}$ OR $k = 600$ $W = \frac{600}{f}$ or $10 = \frac{600}{f}$ or equivalent (f =) 60 [The frequency is 60 (Hz)]	B1 M1 A1 B1	Allow $W \alpha \frac{k}{f}$ M1 implies B1. F.T. for use of $W \alpha \frac{1}{f^n}$ with $n > 0$. May be implied by further work. FT for 'their k' provided M1 awarded.
Alternative method *1200 ÷ 2 ÷ 10 or 1200 ÷ 20 or equivalent* *(f =) 60* [The frequency is 60 (Hz)]	*M3* *A1*	*A complete method (based on multiplying and dividing)* *M1 for* *W = 1 when f = 600 Hz OR W = 2 when f = 300 OR W = 5 when f = 120, i.e. where Wf = 600 provided W > 0.5 (i.e. f < 1200)* *No marks for 1200 × 20 = 24 000 Hz (using direct proportion)*

12. Correct enlargement 	B2	B1 for triangle enlarged with scale factor -2 (with correct orientation) in incorrect position (entirely within correct quadrant) OR consistent use of an incorrect **negative** scale factor (using correct centre) OR two (or three) correct vertices (not necessarily joined)
13. $\frac{6x+5}{x} = 2x+3$ or $\frac{6x+5}{2x+3} = x$ or $6x+5 = x(2x+3)$	B1	Correct use of 'speed = distance / time', using three expressions. May be implied by further working.
$6x + 5 = 2x^2 + 3x$ or $6x + 5 - 2x^2 - 3x$ [= 0] or $2x^2 + 3x - 6x - 5$ [= 0] or equivalent	M1	Expanding brackets FT 'their equation' if of equivalent difficulty
$2x^2 - 3x - 5$ (=0)	A1	Collecting like terms and re-arranging quadratic equation. Ignore presence of a denominator (provided correct).
$(x + 1)(2x - 5)$ (= 0)	B2	B1 for $(x\ldots..1)(2x\ldots.5)$ FT their quadratic equation, provided of equivalent difficulty.
(Marian takes) 2.5 (hours) or equivalent	B1	Mark final answer. FT provided first B1 awarded and an algebraic method used to solve quadratic equation. Ignore negative solution ($x = -1$). Strict FT 'their <u>derived</u> brackets'. No marks for a trial and improvement method. No marks for starting with $(2x + 3)(6x + 5)[= 0]$.
13. <u>Alternative method to solve quadratic equation</u>		*FT their quadratic equation, provided of equivalent difficulty.*
$(x =) \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2(2)}$	*M1*	*Allow one error, in sign or substitution, but not in formula*
$x = \frac{3 \pm \sqrt{49}}{4}$	*A1*	
(Marian takes) 2.5 (hours) or equivalent	*A1*	*Mark final answer. FT provided first B1 awarded. Ignore negative solution ($x = -1$).*
14. $\frac{1}{5}$ or 0·2	B2	B1 for 5^{-1} or $\frac{1}{125^{1/3}}$ or $\frac{1}{\sqrt[3]{125}}$ or $\left(\frac{1}{125}\right)^{\frac{1}{3}}$ or $\sqrt[3]{\frac{1}{125}}$. Mark final answer

15. 10	B2	B1 for • (numerator of) 20√2 <u>or</u> 10× 2× √2 <u>or</u> • (denominator of) 2√2 or √8 <u>or</u> • appropriate factorisation of both numerator and denominator e.g. $\frac{\sqrt{2}\times\sqrt{2}\times\sqrt{2}\times\sqrt{100}\ (\text{or } \sqrt{100})}{\sqrt{2}\times\sqrt{2}\times\sqrt{2}}$
16 - 6√7	B2	B1 for 3 or 4 correct terms within 9 - 3√7 - 3√7 + 7 (e.g. B0 for '2', from 2 sign errors) + √49 might be seen instead of +7. –6√7 is equivalent to 'two correct terms'.
26 - 6√7 AND irrational indicated.	B1	Mark final answer. FT for equivalent difficulty (requiring collection of terms) provided either of B2s is awarded AND final answer is irrational AND requires no further simplification.
16. (a) $y = -f(x)$	B1	Correct notation. Allow $y = -f\,x$
16. (b) $y = f(x-4)$	B1	Must be unambiguous e.g. not missing brackets.
17. (a) $\frac{5}{10}\times\frac{4}{9}\times\frac{1}{8}$ or equivalent $\frac{20}{720}\ (=\frac{1}{36})$ or equivalent	M1 A1	Accept e.g. $\frac{5\times4\times1}{10\times9\times8}$ ISW
17.(b) 1 – P(no blue) $= 1 - \frac{5}{10}\times\frac{4}{9}\times\frac{3}{8}$ $= \frac{660}{720}\ (=\frac{11}{12})$ or equivalent	S1 M1 A1	May be implied by subsequent working. <u>Complete</u> method. ISW FT from part (a) consistent use of a wrongly calculated denominator. If no other marks awarded, SC1 for sight of $\frac{875}{1000}$ or $\frac{940}{1000}$ or equivalent.
17.(b) <u>Alternative method #1</u> *1 – P(three red) – P(two red, one green)* $= 1 - \frac{4}{10}\times\frac{3}{9}\times\frac{2}{8} - \frac{4}{10}\times\frac{3}{9}\times\frac{1}{8}\times 3$ $(= 1 - \frac{24}{720} - \frac{36}{720}$ *or* $1 - \frac{1}{30} - \frac{1}{20})$ $= \frac{660}{720}\ (=\frac{11}{12})$ *or equivalent*	*S1* *M1* *A1*	*May be implied by subsequent working.* *<u>Complete</u> method. (Missing x3 is S1 M0 A0.)* *ISW* *FT from part (a) consistent use of a wrongly calculated denominator.* *If no other marks awarded,* *SC1 for sight of* $\frac{888}{1000}$ *or* $\frac{940}{1000}$ *or equivalent.*

17.(b) <u>Alternative method #2</u> *P(one blue, two not blue OR two blue, one not blue OR three blue)* $= \frac{5}{10}\times\frac{5}{9}\times\frac{4}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{5}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{3}{8}$ $=\frac{660}{720}$ $(=\frac{11}{12})$ *or equivalent*	*S1* *M1* *A1*	*May be implied by subsequent working.* *<u>Complete</u> method. (Missing x3 is S1 M0 A0.)* *ISW* *FT from part (a) consistent use of a wrongly calculated denominator.* *If no other marks awarded,* *SC1 for sight of* $\frac{875}{1000}$ *or* $\frac{660}{1000}$ *or equivalent.*
17. (b) <u>Alternative method #3</u> *P(two red, one blue OR one red, one green, one blue OR two blue, one red OR two blue, one green OR three blue)* $=\frac{4}{10}\times\frac{3}{9}\times\frac{5}{8} \times 3 + \frac{4}{10}\times\frac{1}{9}\times\frac{5}{8} \times 6$ $+ \frac{5}{10}\times\frac{4}{9}\times\frac{4}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{1}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{3}{8}$ $=\frac{660}{720}$ $(=\frac{11}{12})$ *or equivalent*	*S1* *M1* *A1*	*May be implied by subsequent working.* *<u>Complete</u> method.* *(Missing x3 and / or x6 is S1 M0 A0.)* *ISW* *FT from part (a) consistent use of a wrongly calculated denominator.* *If no other marks awarded,* *SC1 for sight of* $\frac{860}{1000}$ *or* $\frac{660}{1000}$ *or equivalent.*
18. (Numerator) 3 (2x - 5) (Denominator) (2x + 5) (2x − 5) $\frac{3}{2x+5}$	B1 B2 B1	 B1 for (2x ….. 5) (2x ….. 5) FT from one error, provided equivalent difficulty. Mark final answer.