GCSE MARKING SCHEME

SUMMER 2022

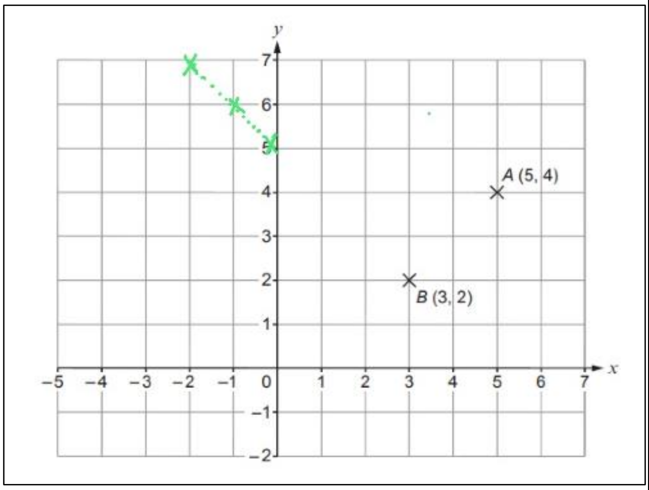
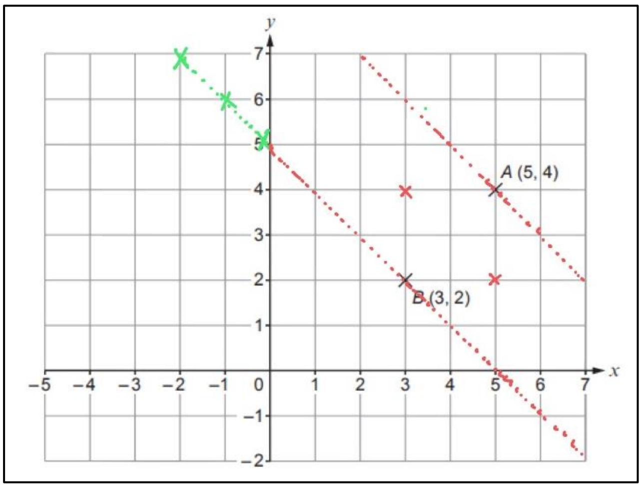
GCSE
MATHEMATICS
UNIT 2 – INTERMEDIATE TIER
3300U40-1

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 2 Intermediate Tier	Mark	Comments
1. (a) $\frac{3.5}{100} \times 159{\cdot}8$ or equivalent 5·593 or equivalent ISW	M1 A1	Award M1 for complete method. Allow 5·6 OR 5·59. Award M1 A0 for unsupported final answer of 165·393 OR 154·207.
1. (b) 5·7 or equivalent	B2	B1 for sight of 16·2 or 10·5.
2. (a) (1, 0)	B2	Award B1 for one of the following: • if *C* clearly identified on grid at (1,0) but coordinates not given or are incorrect • for an answer of (4, 3) (midpoint of *AB*) • for an answer of (1*x*, 0*y*) and point not identified.
2. (b) (-1, 6) OR (-2,7) 	B2	Award B2 for any point that satisfies the conditions e.g. (-1.5, 6.5) Award B1 for one of the following: • if *D* identified on grid in a correct position but coordinates not given or are incorrect OR • for the coordinates of any point that creates a right-angled triangle with AB as one side e.g. (0,5) (1,4) (2,3) (4,1) (5,0) (6,-1) (7,-2) (3,4) (5,2) (2,7) (3,6) (4,5) (6,3) (7,2) 

<table>
<tr><td>3.
2·73 (pints) ÷ 1·75 or 2·73 (pints) × 4/7
1·56 (litres)

1·615(0) (litres)

1·25 + 1·56 + 1·615

÷ 3
1·475 (litres) or 1·47 (litres) or 1·48 (litres)</td><td>
M1
A1

B1

M1

m1
A1</td><td>Answer lines take precedence
Allow use of 568ml or 570ml ≈ 1 pint leading to an answer of 1·55 or 1·56.

(= 4·425)
FT 1·25 + ‘their 1·56’ + ‘their 1·615’.
Award M1 for 1·25 + 2·73 + 1615.

Allow 1·5 (litres) from correct working.

Note: An answer of (1618.98/3 =)
539·66 or 540 or 539·6 or 539·7 implies M1m1A1.</td></tr>
<tr><td>4. (a)
<table>
<tr><td></td><td></td><td colspan="4">Square spinner</td></tr>
<tr><td></td><td></td><td>2</td><td>4</td><td>6</td><td>8</td></tr>
<tr><td rowspan="3">Triangular Spinner</td><td>1</td><td>2</td><td>(4)</td><td>6</td><td>(8)</td></tr>
<tr><td>3</td><td>(6)</td><td>12</td><td>(18)</td><td>(24)</td></tr>
<tr><td>5</td><td>10</td><td>(20)</td><td>30</td><td>40</td></tr>
</table></td><td>B1</td><td>All six entries correct.</td></tr>
<tr><td>4. (b) Valid explanation given
e.g. “odd × even = even”
"because it’s odd times even”
“even times any whole number is always even”</td><td>E1</td><td>Do not accept
“because all the numbers on the square spinner are even”.

Allow
“as they are multiplied by even numbers which make even numbers”
"because it’s multiplied with an even number".</td></tr>
<tr><td>4. (c) $\frac{7}{12}$ ISW</td><td>B2</td><td>FT ‘their fully completed table’.
Award B2 for unsupported 58·3(333…)%.
Penalise −1 for <u>only</u> words (7 out of 12) or <u>only</u> ratio (7:12).
B1 for x/12 if x < 12.
B1 for 7/y if y > 7 (FT ‘their 7’).
B1 for unsupported 58%.</td></tr>
<tr><td>4. (d) (Amount taken = 228 × £2.50 =) (£)570

(Expected number of winners = 7/12 × 228)
133 (winners)

(Expected prize money = 133 × £3.50 =) (£)465.5(0)

(Expected profit = 228 × £2.50 – 133 × £3.50 =)
(£)104.5(0)</td><td>B1

B1

B1

B1</td><td>

If 7/12 or correct % or decimal seen in part (c), it must be used for this B1.
FT 228 × ‘their 7/12’ provided less than 1.
Allow 133/228 or ‘133 out of 228’.
Must be whole number.
Award B0 for
7/12 × 228 = 0·58(333…) × 228 = 132 winners.
Award B0 for
7/12 × 228 = 0·6 × 228 = 136 or 137 winners.

FT £3.50 ×‘their 133’ (provided < 228).

(£)570 – (£)465.5(0)
FT ‘their (£)570’ – ‘their (£)465.5(0)’.

Award B1B1B1B0 for sight of
228 × £2.50 – 133 × £3.50 with an incorrect final answer.

If the FT results in a loss, the ‘Loss’ must be stated, or the answer left as a negative.</td></tr>
</table>

4. (d) <u>Alternative Method 1</u> *(Expected number of winners = 7/12 × 228)* *133 (winners)*	*B1*	*If 7/12 or correct % or decimal seen in part (c), it must be used for this B1.* *FT 'their 7/12' if less than 1 × 228.* *Allow 133/228 or '133 out of 228'.* *Must be whole number.* *Award B0 for* *7/12 × 228 = 0·58(333…) × 228 = 132 winners.* *Award B0 for* *7/12 × 228 = 0·6 × 228 = 136 or 137 winners.*
(Expected number that don't win = 228 – 133) *95 (non-winners)*	*B1*	*FT 228 – 'their 133' (provided < 228).*
(Amount taken = 95 × £2.50 =) (£)237.5(0)	*B1*	*FT £2.50 × 'their 95' provided < 133.*
(Expected profit = 95 × £2.50 – 133 × £1 =) *(£)104.5(0)*	*B1*	*(£)237.5(0) – (£)133* *FT 'their (£)237.5(0)' – 'their (£)133'.* *Award B1B1B1B0 for sight of* *95 × £2.50 – 133 × £1 with an incorrect final answer.* *If the FT results in a loss, the 'Loss' must be stated, or the answer left as a negative.*
4. (d) <u>Alternative Method 2</u> *Working with 12 players* *(Amount taken = 12 × £2.50 =) (£)30(.00)*	*B1*	
(Expected prize money = 7 × £3.50 =) (£)24.5(0)	*B1*	*FT 'their 7' (provided < 12).*
(Expected profit for 12 players = *(£)30(.00) - (£)24.5(0) =) (£)5.5(0)*	*B1*	*FT 'their (£)30(.00)' – 'their (£)24.5(0)'.*
(Expected profit for 228 players *= $\frac{228}{12}$ × (£)5.5(0) =) (£)104.5(0)*	*B1*	*FT 19 × 'their (£)5.5(0)'.* *If the FT results in a loss, the 'Loss' must be stated, or the answer left as a negative.*
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

<table>
<tr>
<td>5.
length = 2 × width

Area = width × length

Area correctly evaluated AND > 60 (cm^2)

Perimeter = 2 × (width + length) or equivalent

Perimeter correctly evaluated AND < 40 (cm)</td>
<td>B1

M1

A1

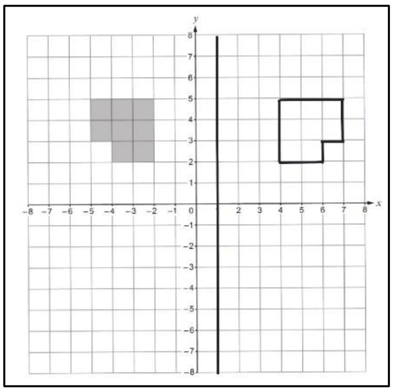
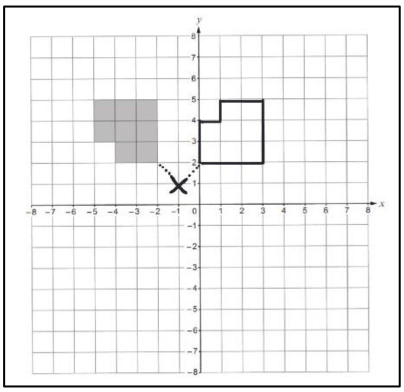
M1

A1</td>
<td>Answer lines take precedence
Note: correct answer 5·47…(cm) ≤ width ≤ 6·66..(cm)
Must be in the correct order for B1.

M1 for using the correct method (not for stating the formula).
FT ‘their width’ × ‘their length’.

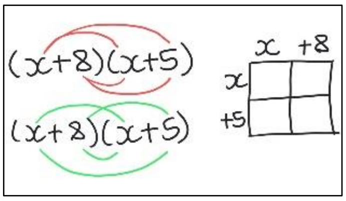
M1 for using the correct method (not for stating the formula).
FT 2 × (‘their width’ + ‘their length’).

If answer space is left blank:
award full marks if correct length, width, area and perimeter clearly identified in working space or
penalise -1 if correct length, width, area and perimeter not clearly identified in working space.
Penalise -1 if area and perimeter are reversed on the answer line but correct area and perimeter clearly identified in working space.

Note: (W and L need not be whole numbers)<table><tr><td>W</td><td>L</td><td>Area</td><td>Perimeter</td></tr><tr><td>6</td><td>12</td><td>72</td><td>36</td></tr></table></td>
</tr>
<tr>
<td>6. (a) Correct reflection in $x = 1$.
</td>
<td>B2</td>
<td>B1 for correct reflection in $y = 1$ OR
B1 for sight of line $x = 1$ (must be unambiguous).</td>
</tr>
<tr>
<td>6. (b) Correct rotation.
</td>
<td>B2</td>
<td>B1 for either a:
90° anticlockwise rotation about (−1,1)
90° clockwise rotation about (1,-1).</td>
</tr>
</table>

7. (a) $12p - 20$	B1	Must be an expression. Mark final answer.
7. (b) $8m = w + 3$ or $w + 3 = 8m$ or $-8m = -w - 3$ $m = \frac{w+3}{8}$ or $\frac{w+3}{8} = m$ or $m = \frac{-w-3}{-8}$	 B1 B1	 Allow $-8m = -(w + 3)$. FT only from $\pm 8m = \pm w \pm 3$, stated or implied. (note: $8m = w + 3$ or $-8m = -w - 3$ will have already gained the previous B1). B1B0 for $-m = \frac{-3-w}{8}$ or equivalent. Mark final answer. <u>Note</u> Allow B1B0 for $m = (w + 3) \div 8$ with or without brackets. Allow B1B0 for $\frac{w+3}{8}$ ('$m =$' missing).
7. (c) $y^2 + y - 20$ ISW	B2	Allow $y^2 + 1y - 20$. Award B1 for one of the following: • $y^2 + 5y - 4y - 20$ • $y^2 + 5y - 4y + - 20$ • $y^2 + 5y + - 4y - 20$ • $y^2 + 5y + - 4y + - 20$ • $y^2 + ky - 20$ (where $k \neq 0$ or 1) • $y^2 + (1)y + t$ (where $t \neq -20$) • for sight of y^2 AND $+5y$ AND $-4y$ AND -20 but not in an expression.
8. corresponding angles	B1	
9. Use of 129·5 / time 129·5 ÷ 3·5 or equivalent 37 (miles per hour)	 M1 M1 A1	 Allow M1 even for e.g. 129·5/3 hours 30 mins or 129·5/3·3(0) or 129·5/210. Must be a complete and correct method e.g. 129·5/210 × 60. CAO. Award M1M0A0 for sight of unsupported 0·61(6666….) (use of 129·5/210) OR 39·24(2424…) (use of 129·5/3·3).

10. (Diameter =) 24·8 ÷ 2 × 3 OR (Radius =) 24·8 ÷ 2 × 3 ÷ 2 or equivalent	M1	
(Diameter =) 37·2 (cm) OR (Radius =) 18·6 (cm)	A1	Sight of 1086 to 1087 (cm^2) (base area calculated with radius 18·6) OR 4345 to 4348 (cm^2) (base area calculated with diameter) implies first M1 A1. If diameter AND radius given and radius ≠ 18·6 either: • award M1A0 (for sight of diameter = 37·2) if their stated radius is then used to find the volume of the cylinder (2nd M mark is awarded) or • award M1A1 (for sight of diameter = 37·2) if their incorrect radius is not used to find the volume of the cylinder (2nd M mark is not awarded).
$\pi \times \left(\frac{37.2}{2}\right)^2 \times 24{\cdot}8$ or $\pi \times 18{\cdot}6^2 \times 24{\cdot}8$	M1	May be seen in parts. Accept $3{\cdot}14 \times 18{\cdot}6^2 \times 24{\cdot}8$ or equivalent. FT 'their stated radius' OR 'their stated diameter', provided it is halved at the appropriate stage.
= 27 000 (cm^3)	A2	For A2, must be correct to 2sf. A1 for an answer between 26 940 and 26 960 (cm^3) inclusive. Note: (Diameter =) 24·8 ÷ 5 × 3 OR (Radius =) 24·8 ÷ 5 × 3 ÷ 2 M0 (Diameter =) 14·88 (cm) OR (Radius =) 7·44 (cm) A0 $\pi \times 7{\cdot}44^2 \times 24{\cdot}8$ M1 4300 (cm^3) A2 A1 for answer between 4310 and 4314 (cm^3) inclusive If M0 (2nd M mark) then award SC1 for an answer of either: • 110 000 (cm^3) (from use of $\pi \times 37{\cdot}2^2 \times 24{\cdot}8$ rounded correctly) OR • 17 000 (cm^3) (from use of $\pi \times 14{\cdot}88^2 \times 24{\cdot}8$ rounded correctly). FT 'their stated diameter' correctly rounding to 2sf for this SC1.

11. $(BC^2 =)\ 9{\cdot}6^2 + 12{\cdot}8^2$ or equivalent $(BC^2 =)\ 256$ or $(BC =)\ \sqrt{256}$ $(BC =)$ 16 (cm) $CD = 2 \times 60 \div 16$ or equivalent (CD =) 7·5 (cm)	M1 A1 A1 M2 A1	note: $(BC^2 =)$ 92·16 + 163·84 (ignore place values for M1) *Award M1 for the correct values substituted into the Cosine rule.* Allow $(BC =)$ ±16 (cm). FT from M1 for the correctly evaluated square root of 'their 256' provided their answer > 12·8. FT 'their derived BC' **OR** 'their stated 16' (not derived) provided 12·8 < 'their stated 16' < 22·4. Award M1 for $60 = ½ \times 16 \times CD$ or equivalent. Allow M2A1 for a correct embedded answer BUT M2A0 if contradicted by CD ≠ 7·5 (cm).
11. <u>Alternative method:</u> ***Correct** use of 'two-step' method* *(BC =) 16 (cm)* *$CD = 2 \times 60 \div 16$ or equivalent* *(CD =) 7·5 (cm)*	*M2* *A1* *M2* *A1*	*A partial trigonometric method is M0.* *FT 'their derived BC'* ***OR*** *'their stated 16' (not derived) provided* *12·8 < 'their stated 16' < 22·4.* *Award M1 for $60 = ½ \times 16 \times CD$ or equivalent.* *Allow M2A1 for a correct embedded answer BUT M2A0 if contradicted by CD ≠ 7·5 (cm).*
12. (a) $2x(4x + 3y)$	B2	Award B1 for $2x(4x \pm \ldots\ldots)$ or $2x(\ldots\ldots + 3y)$ Award B1 for a partial factorisation. i.e. $2(4x^2 + 3xy)$ or $x(8x + 6y)$. Mark final answer.
12. (b)(i) $(x + 8)(x + 5)$ ISW	B2	B1 for $(x \ldots 8)(x \ldots 5)$.
12. (b)(ii) Any valid explanation e.g. "you could expand the two brackets" "expanding is the opposite of factorising" "multiply the brackets together" "solve $(x + 8)(x + 5) = 0$, and then substitute the value(s) of x into $x^2 + 13x + 40$. It should give 0." "replace x in the brackets and expression with the same value. You should get the same answer."	E1	Allow "the two numbers need to add to 13, but multiply to make 40" "Use FOIL (CAMO) to check" or other names explaining the method. Allow method shown to expand brackets for example:  Do not accept "$(x + 8)(x + 5) = x^2 + 13x + 40$" without further working "taking out the brackets" "reverse the calculation"

13. (a) (x =) $14{\cdot}5 \times \sin 42$ = $9{\cdot}7(02….)$	M2 A1	Award M2 for $14{\cdot}5 \times \cos 48$ or $\frac{14{\cdot}5 \times \sin 42}{\sin 90}$ M1 for $\sin 42 = \frac{x}{14{\cdot}5}$ or $\cos 48 = \frac{x}{14{\cdot}5}$ or $\frac{x}{\sin 42} = \frac{14{\cdot}5}{\sin 90}$ Allow 10 from correct working. Award M2 A0 for an unsupported answer of –13·2895… (radians) or 8·88715…. (gradians).
13. (a) Alternative method: ***Correct** use of 'two-step' method.* *(x) = 9·7(02…)(cm)*	*M2* *A1*	*A partial trigonometric method is M0.* *Accept an answer that rounds to 9·7(cm)* *Award M2 A0 for an answer of -13·2895… (radians) or 8·88715…. (gradians).*
13. (b) (y =) $\cos^{-1} \frac{13{\cdot}5}{15{\cdot}8}$ Correct evaluation in the range 31·3 to 31·4	M2 A1	M1 for $\cos y = \frac{13{\cdot}5}{15{\cdot}8}$ (= 0·854..) Allow 31 from correct working. Allow correct angles given in radians (0·5463..) or gradians (34·7812….) Note: $\cos y = 0{\cdot}85$ $y = 31{\cdot}788…$ is awarded M2A0.
13. (b) Alternative method: ***Correct** use of 'two-step' method.* *Correct evaluation in the range 31·3 to 31·4*	*M2* *A1*	*A partial trigonometric method is M0.* Allow 31 from correct working. *Allow correct angles given in radians (0·5463..) or gradians (34·7812….)*
14. (a) Any intention of length × width × height = 132 e.g. $5x(x^2 + 3) = 132$ $5 \times x \times (x^2 + 3) = 132$ or $5x \times (x^2 + 3) = 132$ or equivalent	B1	Must be = 132. May be seen in parts. Do not allow missing brackets e.g. $5 \times x \times x^2 + 3 = 132$.
14. (b)(i) One correct evaluation $2 \le x \le 3$ 2 correct evaluations $2{\cdot}55 \le x \le 2{\cdot}75$, (one value < 132, one value > 132) 2 correct evaluations $2{\cdot}55 \le x \le 2{\cdot}65$, (one value < 132, one value > 132) $x = 2{\cdot}6$	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if <132 or >132. If evaluations not seen accept 'too high' or 'too low'.* *Look out for testing* $5x^3 + 15x – 132 = 0$ *or* $x^3 + 3x = 26{\cdot}4$ *or equivalent* x — $5x^3 + 15x$ 2 — 70 2.1 — 77.805 2.2 — 86.24 2.3 — 95.335 2.4 — 105.12 2.5 — 115.625 ; 2.55 — 121.1568… **2.6 — 126.88** ; **2.65 — 132.798…..** **2.7 — 138.915** ; 2.75 — 145.234…... 2.8 — 151.76 2.9 — 165.445 3 — 180
14. (b)(ii) An answer in the range 9·76 to 10·16 (cm)	 B1	Answer may be shown on the diagram. FT 'their 2·6'^{2} + 3. FT 132 ÷ (5 × 'their x').