REVISE
.wales

2.15 — Maps, scale drawings & bearings

Mark schemes for the 2.15 question pack

Spec 3.3.1, 3.3.2, 3.3.3, 3.3.4 — Unit 3

SOLUTIONS · 2025 SPECIFICATION

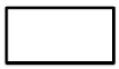
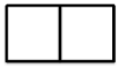
Mark schemes for the 13 questions in the corresponding revise.wales question pack (60 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

6. Sight of appropriate 31° or 59° in the diagram OR appropriate use of these angles in their calculations	B1	
(Distance from Molk to Lindat =) $\frac{24}{\sin 59(^\circ)}$ OR $\frac{24}{\cos 31(^\circ)}$	M2	FT 'their 31' or 'their 59' provided the angle <90 for M2 or M1 only. A correct method for calculating the distance Molk to Nuir using trigonometry, followed by correct use of Pythagoras is awarded M2. M1 for sin 59(°) = 24/distance OR M1 for cos 31(°) = 24/distance
= 27·9(992…) or 28 (km)	A1	CAO
(Time taken to sail from Molk to Lindat =) 27·9(992…) ÷ 20	M1	FT 'their derived 27·9(992…)' from the use of trigonometry.
= 1·4 (hours) (= 1h 24m)	A1	On FT, accept an answer that has been rounded to 1dp, but it needs to be correct to 1dp for 'their 27·9(9…)'.
(Arrival time =) 1:09pm or 13:09	A1	ISW. (Allow 13:09pm). FT 'their 1·4 hours' correctly converted provided of equivalent difficulty. On FT, their answer needs to be correct to the nearest minute for 'their 1·4'

			Ignore 'recurring dot'.
2.(a)	48°	B1	
2.(b)	East	B1	
2.(c)	288°	B1	

3(a) 190°	B1	
3(b) 332°	B1	
3(c)(i) 8400 ÷ 200 42 (population/km^2)	M1 A1	Or equivalent CAO
3(c)(ii) 5 × 8400 ÷ (3 + 4 + 5) 3500 (people)	M1 A1	Full method required Accept embedded answer, provided clearly Gwyndir

1(a) 245°	B1	
1(b)(i) 17:30	B1	
1(b)(ii) 22:10	B1	

5(a)  or  in any orientation	B1	Allow intention of straight lines and right angles Do not accept if clearly two parallelograms attached rather than rectangles If the roof is split into two rectangles, they must meet along one side and intention must be to draw two identical rectangles (or squares)
5(b) Sight of any of the following: • 4.2 × 50000(cm) • 210 000 • 4.2 × 500 (m) • 1 cm = 0.5 **km** • 2cm = 1 km • an answer to a product involving 4.2× ... with leading digits '21'	B1	Ignore inclusion of incorrect units, allow intention of × 4.2 by 50000 given, i.e allow if leading digits '21' seen
210 000 (cm) ÷ 100 ÷ 1000 or 4.2 × 0.5 or equivalent calculation that would lead to a correct answer (2.1km)	M1	FT 'their 4.2 × 50000' ÷ 100 ÷ 1000 evaluated incorrectly
2.1 (km)	A1	CAO
5(c) Correct pair of arcs (or arc) cutting the road appropriately	B1	<u>Tolerance of ± 2 mm throughout</u>
Correct use of these arc intersections to create a pair of intersecting arcs	B1	<u>Alternative for 1st two B1s:</u> B2 for arcs towards drawing a kite, e.g. from B and C with radii AB and AC respectively (no B1 possible)
Correct placement of the new turbine shown	B1	Allow this mark if arcs not shown, or spurious arcs seen. Allow for sight of intersection of a straight line with the road If B0, B0, B0 award SC1 for correct construction with arcs shown for the perpendicular bisector of the Bryn to Cwm road, then FT for possible final B1
Correct evaluation of appropriate measurement ÷ 2 3.5 (km) to 3.7(km)	B1	Allow this mark if arcs not shown, or spurious arcs seen. *(Note: if perpendicular bisector is drawn the final distance is 3.3 km to 3.5 km)*

8.(a) 0·92 written on the 'Not a Saturday' branch. Sight of 1 − 0·15 − 0·45 OR 0·4 or 0·40 0·4(0) on both 'car' branches AND 0·15 AND 0·45 correctly shown on lower branches.	B1 B1 B1	 Allow this B1 if shown on working lines.
8.(b) Sight of 0·08 × 0·15 OR 0·08 × 0·4 or equivalent. (P(Sat and 'plane or car') =) 0·08 × 0·15 + 0·08 × 0·4 or equivalent = 0·044 or equivalent. ISW	 B1 M1 A1	 FT 'their P(car)' if <1. 0·08 × 0·55 implies previous B1.
Alternative method (P(Sat and 'plane or car') =) 1 – (0·92 + 0·08 × 0·45) or equivalent = 0·044 or equivalent. ISW	M2 A1	FT 'their 0·92'. M1 for intent P(Sat and 'plane or car') = 1 – P('not Saturday') – P('Saturday and train')

2. Intent to square at least two of the three values.	S1	*(Note: $12{\cdot}8^2 = 163{\cdot}84$, $22{\cdot}7^2 = 515{\cdot}29$ and $25{\cdot}6^2 = 655{\cdot}36$)*
Comparing $(25{\cdot}6)^2$ with $(12{\cdot}8)^2 + (22{\cdot}7)^2$ or Any intent to compare any other relevant values. (e.g. $(25{\cdot}6)^2 - (22{\cdot}7)^2$ with $(12{\cdot}8)^2$ or $\sqrt{[(12{\cdot}8)^2 + (22{\cdot}7)^2]}$ (with 25·6))	M1	The comparison attempted must show <u>both</u> intended calculations e.g. $(25{\cdot}6)^2$ AND $(12{\cdot}8)^2 + (22{\cdot}7)^2$ unless intention is to compare with a given side e.g. $\sqrt{[(12{\cdot}8)^2 + (22{\cdot}7)^2]}$ with 25·6
Correct evaluation of value(s) to be compared. (e.g 'sight of 655·36 WITH 679·13' or 'sight of 140·07 WITH 163·84' or 'sight of 26·06 (WITH 25·6)')	A1	C.A.O. but allow evaluated answers to be given to the nearest whole number. e.g. 655 WITH 679.
Statement that it is NOT possible	A1	Allow FT if M1 awarded. *If all marks gained ISW.*
2. <u>Alternative method 1</u> *Intent to use two right-angled trig ratios **using 2 <u>different pairs</u> of given sides***	S1	*i.e. In order to find the value of either the same angle OR two different angles, whilst sufficient to show that it isn't a right-angled triangle.*
*Correct right-angled trig ratio used **twice**, **using 2 <u>different</u> given sides**, in order to compare* • *the values of the same angle or* • *the sum of the two angles with 90°.*	M1	
Correct evaluation of value(s) to be compared. e.g. sight of any two of 30(°), 27.5…(°) and 29.4…(°) OR sight of 30(°) and 60.58…(°) (and the sum to be compared with 90°)	A1	*CAO* **Ratio / Opp / Adj / Hyp / Angle** Sin 12.8 25.6 30(°) Cos 22.7 25.6 27.5…(°) Tan 12.8 22.7 29.4…(°) Sin 22.7 25.6 62.46…(°) Cos 12.8 25.6 60(°) Tan 22.7 12.8 60.58…(°)
Statement that it is NOT possible	A1	*If comparing the sum of two angles (with 90°), the sum must be shown. Allow FT if M1 awarded. If all marks gained ISW.*
2. <u>Alternative method 2</u> (using the cosine rule)		*<u>NOTE</u> The cosine rule is not on the intermediate tier specification, but as it is a common question, it may be seen by Higher tier candidates.*
(cos A =) $(12.8^2 + 22.7^2 - 25.6^2) / (2\times12.8\times22.7)$ (= 2377/58112 or 0·0409..)	*M2*	*M1 for $25.6^2 = 12.8^2 + 22.7^2 - 2\times12.8\times22.7\times\cos A$*
(A =) 87(.6557…°)	*A1*	
Statement that it is NOT possible	*A1*	*If all marks gained ISW.*

WJEC GCSE MATHEMATICS

AUTUMN 2021 MARK SCHEME

Unit 2: Higher Tier	Mark	Comments
1. $4(3a - 7) + 2(5a + 4)$ or equivalent. $= 12a - 28 + 10a + 8$ or equivalent. $= 22a - 20$ (cm) or $2(11a - 10)$ (cm)	B1 B1 B1	For a correct expression for the perimeter. For removal of brackets FT only from $2(3a - 7) + (5a + 4)$ or equivalent OR $2(3a - 7) + 2(5a + 4)$ or equivalent. For collection of terms FT if of equivalent difficulty. Mark final answer.
Alternative approach *$2[2(3a - 7) + (5a + 4)]$* *$= 12a - 28 + 10a + 8$ or $2(6a - 14 + 5a + 4)$* *$= 22a - 20$ (cm) or $2(11a - 10)$ (cm)*	*B1* *B1* *B1*	*For a correct expression for the perimeter.* *For removal of brackets (within 'square brackets')* *FT only from* *$2[2(3a - 7) + 2(5a + 4)]$ or equivalent.* For collection of terms *FT only from* *$2[2(3a - 7) + 2(5a + 4)]$ or equivalent.* *FT if of equivalent difficulty.* *Mark final answer*
2. (number of part-time in North Wales =) $\frac{90}{360} \times 96$ OR (number of full-time in North Wales =) $\frac{144}{360} \times 150$ (number of part-time in North Wales =) 24 (number of full-time in North Wales =) 60 (Probability from North Wales =) $\frac{84}{246}$ or equivalent ISW	M1 A1 A1 A1	Or equivalent *Answers may be seen on the diagram.* An answer (or sight) of 24 implies M1. An answer (or sight) of 60 implies M1. FT ('their 24' + 'their 60') /246 provided M1 gained and ('their 24' + 'their 60') < 246. Penalise incorrect notation −1. e.g. '84 in 246'.
3. One correct evaluation $2 \leq x \leq 3$ 2 correct evaluations $2{\cdot}25 \leq x \leq 2{\cdot}45$, one < 20, one > 20. 2 correct evaluations $2{\cdot}25 \leq x \leq 2{\cdot}35$, one < 20, one > 20. $x = 2{\cdot}3$	 B1 B1 M1 A1	*Correct evaluation regarded as enough to identify if <20 or >20. If evaluations not seen accept 'too high' or 'too low'.* *Look out for testing $x^3 + 3x - 20 = 0$* x / $x^3 + 3x$ 2 / 14 2·1 / 15·561 2·2 / 17·248 **2·3 / 19·067** **2·4 / 21·024** 2·5 / 23·125 2·6 / 25·376 2·7 / 27·783 2·8 / 30·352 2·9 / 33·089 3 / 36 2·25 / 18·140…. **2·35 / 20·027….** 2·45 / 22·056…. *Note* *Evidence for M1 must be **seen** before A1 can be awarded.*

Unit 1: Higher Tier	Mark	Comments
1. (BC =) 56 (km) ÷ (3 + 4) × 4 or equivalent 32 (km) (BC =) 32 (km) ÷ 8 × 5 or equivalent 20 (miles)	M1 A1 M1 A1	M1 awarded for **complete** method. FT 'their derived 32' ÷ 8 × 5. If a candidate works with AB instead of BC, then treat as a misread -1 (from A mark). Example 1 56 (km) ÷ (3 + 4) × 3 = 24 (km) M1A1 (-1) 24 (km) ÷ 8 × 5 = 15 (miles) M1 A1 (Total = 3 marks) Example 2 e.g. 56 (km) ÷ (3 + 4) × 3 = 16 (km) M1A0 16 (km) ÷ 8 × 5 = 10 (miles) M1 A1 (-1) (Total = 2 marks)
1. Alternative Method (AC =) *56 (km) ÷ 8 × 5 or equivalent* *35 (miles)* (BC =) *35 (miles) ÷ (3 + 4) × 4 or equivalent* *20 (miles)*	*M1* *A1* *M1* *A1*	*M1 awarded for **complete** method* *FT 'their derived 35' ÷ (3 + 4) × 4* 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. Accuracy of writing.	OC1 W1	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 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) Whale indicated or implied on bearing 010° from Aberporth and 280° from Aberystwyth.	B2	Accept indication from one bearing line drawn with the second bearing shown on this line, including one line terminating at the correct intersection point B1 for either of the bearings correctly shown or unambiguously indicated, e.g. by an unambiguous mark on the correct bearing
Region in the sea inside a circle, centred at the whale, of correct (4cm) radius ± 2mm	B2	FT 'their position of the whale' For B2 the region must be entirely within the sea or on FT indicated as a region within the sea Allow intention of circle provided it lies completely within the tolerance given by the overlay B1 for (intention of a) circle, radius out of tolerance but within ± 4 mm, centred at the whale including any region on the land
2(b) $20 \times 12 \times 2.5 \div 100$	M2	M1 for any 3 of these 4 terms correct in a calculation which may be shown in stages
6 (m)	A1	CAO Answer given within the statement takes precedence Sight of 600 is awarded M1 and also SC1 provided not from incorrect working
2(c)(i) $\frac{13}{20}$ (× 100) or $\frac{12.5}{20}$ (× 100) or $\frac{12.8}{19}$ (× 100) or $\frac{12}{20}$ (× 100) or $\frac{12}{19}$ (× 100) or $\frac{12.8}{20}$ (× 100) or $\frac{13}{19}$ (× 100) or equivalent OR A trial and improvement method, considering percentages or decimals of 19 or 20 with a correct calculation shown between (60% of 19) 0.6 × 19 (= 11.4) and (70% of 20) 0.7 × 20 (= 14) inclusive	B1	Allow: • fraction written as division, e.g. 13 ÷ 20 • inclusion of consistent change of place value • a similar suitable fraction, e.g. 12/18
An answer in the inclusive range 60(%) to 70(%)	B1	Only award if B1 previously awarded, however allow B2 for an unsupported answer in this range. If no marks, award SC1 for any of the following answers: • 50(%) from $\frac{10}{20}$ (× 100) or equivalent • 52(%) to 53(%) from $\frac{10}{19}$ (× 100) or equivalent

2(c)(ii) $(19 - 0.1 \times 19) \times 1000\,000\,000$ or $(19 - 0.1 \times 19) \times (1) \times 10^9$ or $0.9 \times 19 \times 1000\,000\,000$ or $1.9 \times 10^{10} \times 9 \times 10^{-1}$ or equivalent	M2	Must have engaged with at least one stage of interpretation of the size of 'billion' in figures M1 for any one of the following: • for sight of digits 171 irrespective of place value • $19 - 0.1 \times 19$ • 19 billion $- 0.1 \times 19$ billion • $(19 - 0.1 \times 19) \times 1000$ million • 0.9×19 • 1.9×10^{10} (19 billion in standard form) • 1.9×10^9 only if clearly calculated from 10% of 19 billion
1.71×10^{10}	A2	A1 for any of the following: • 17 100 000 000 • 1.71×10^4 million • equivalent correct value not given correctly in standard form, e.g. 17.1×10^9 • an answer of 1.7×10^{10} OR A1 for FT from M1 or M2 • 'their number' given correctly in standard form provided it is $> 1.71 \times 10^6$ (including for the number in the last bullet point listed for M1) A0 for 17.1 billion or 17 100 million (M1 A0) Treat use of an estimate of 19 as a MR-1 from an accuracy mark, e.g. use of 20 gives an answer of 1.8×10^{10}, award (M2 A2 MR-1) 3 marks

8(a) (Distances travelled up to 11:00 =) 135 (km) AND 157.5 (km)	B1	Check diagram
(Distance =) $\sqrt{135^2 + 157.5^2 - 2\times135\times157.5\times cos49(^o)}$ $(=\sqrt{15132.33\ldots})$	M2	FT their distances for M2 or M1 Allow use of 30 and 35 M1 for $135^2 + 157.5^2 - 2\times135\times157.5\times\cos49(^o)$
= 123(.01…) (km)	A1	Must come from M2 and provided 30 and 35 not used in the cosine rule
(Time taken for Explorer to reach Magellan =) 123(.01…) ÷ 30	M1	Can only be awarded provided at least M1 previously awarded FT 'their derived 123(.01…)'
= 4.1(…) (hours) or 4 hrs 6 mins = 15:06 or 3:06 p.m.	A1 A1	FT from M1A0 for 'their 4.1(…) (hours)' provided of equivalent difficulty (not quarter or half hours involved) On FT, needs to be correct to the nearest minute, rounded or truncated If final M0A0A0 awarded, SC2 for an answer of 14:31 or 2:31 p.m. from the division by 35 OR SC1 for 3.5(1…) hours from the division by 35
8(b) (Angle at top of triangle =) $\sin^{-1}\left(\frac{sin49(^o)}{123(.01\ldots)}\times157.5\right)$ OR $\cos^{-1}\left(\frac{135^2+123(.01\ldots)^2-157.5^2}{2\times135\times123(.01\ldots)}\right)$	M2	FT their values consistently used from (a) M1 for $\frac{\sin \text{angle}}{157.5} = \frac{\sin49(^o)}{123(.01\ldots)}$ or equivalent OR M1 for $157.5^2 = 135^2+123(.01)^2 - 2\times135\times123(.01)\times\cos$ angle
75(.08…) to 75.105 (º)	A1	Must come from M2
(Bearing =) 360 – (180 – 51) – 75(.08…) or 180 – (75(.08…) – 51) or 231 – 75(.08…)	M1	FT 'their derived 75(.08…)'
= 156 (º)	A1	Allow an answer of 155.9(19…)(º)
8(b) Alternative method: *(Angle at right of triangle =)* $sin^{-1}\left(\frac{sin49(^o)}{123(.01\ldots)}\times135\right)$ OR $cos^{-1}\left(\frac{157.5^2+123(.01\ldots)^2-135^2}{2\times157.5\times123(.01\ldots)}\right)$	*M2*	*FT their values consistently used from (a)* *M1 for $\frac{\sin \text{angle}}{135} = \frac{sin49(^o)}{123(.01\ldots)}$ or equivalent OR* *M1 for* $135^2=157.5^2+123(.01)^2 -2\times157.5\times123(.01)\times\cos$ angle
= 55.9(19…) to 56 (º)	*A1*	*Must come from M2*
(Bearing =) *360 – (180 – 51) – (180 – 49 – 55.9(19…)) or* *51 + 49 + 55.9(19…) or* *100 + 55.9(19…)*	*M1*	*FT 'their derived 55.9(19…)'*
= 156 (º)	*A1*	*Allow an answer of 155.9(19…)(º)*

9(a) 160 + 20 + 73 or 180 + 73 or 180 – 73 = 107 AND 360 – 107	B1	Allow 160 + 93
9(b) (Distance Swansea to Port Talbot =)		

3(a) B and H in either order	B2	B1 for either B or H selected
3(b)(i) $\frac{42-30}{30}$ (× 100) or $\frac{42}{30}$ (× 100) – 1 (× 100) 40 (%)	M1 A1	Or full reverse method, e.g. • 20% of £30 is 30 ÷ 5 = £6, with either 6 × 2 = (£)12 or 6 × 7 = (£)42 • 10% of £30 is 30 ÷ 10 = £3, with either 3 × 4 = (£)12 or 3 × 14 = (£)42 Allow an answer of £40 from correct working If no marks, award SC1 for an answer of 140(%)
3(b)(ii) (Percentage profit is) $\frac{9\times42-10\times30}{10\times30}$ (× 100) or $\frac{9\times12-30}{10\times30}$ (× 100) or $\frac{9\times42}{10\times30}$ (× 100) – 1 (× 100) or $\frac{378}{300}$ (× 100) – 1 (× 100) or 1.26 (× 100) – 1 (× 100) or equivalent 26 (%) **AND** states 'profit'	M2 A2	Allow a reverse method of finding percentages of 300 used, these percentages must be correct and when added (or subtracted) could lead to an answer of 26% e.g. (2 × 10% =) 20% of 300 is 60 and 6% of 300 is 18 M1 for any one of the following: • (difference between sales and costs) 9 × 42 – 10 × 30 (= 378 – 300) • (sales) (£) 378 AND (cost) (£) 300 • (difference between sales and costs) (£) 78 Mark final answer A1 for any one of the following: • 26(%) • $\frac{78}{300}$ (× 100) or equivalent • $\frac{378}{300}\times 100 = 126$ (%) • $\frac{378}{300} = 1.26$ • $\frac{\text{('their } 9\times42' - 10\times30)}{10\times30}\times 100$ correctly evaluated and given as a percentage, allow if an error in the decimal part of their answer
3(b)(iii) 8	B1	

End of solutions