REVISE
.wales

3.22 — Measures of spread & IQR

Mark schemes for the 3.22 question pack

Spec 4.2.15, 4.2.16, 4.2.17 — Unit 3

SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 13 questions in the corresponding revise.wales question pack (41 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

4(a)(i) 52 hours	B1	
4(a)(ii) 10 girls	B1	
4(a)(iii) FALSE TRUE TRUE FALSE	B2	B1 for any 3 correct answers If no marks, award SC1 for an answer TRUE, TRUE, TRUE, TRUE (as it is a repeat misunderstanding/error)
4(b) Statement 1: Complete method to calculate the interquartile range Girls' IQR (59 or 58 - 33 or 32 =) 25 to 27 AND Boys' IQR (46 or 45 – 19 or 18 =) 26 to 28 AND Trefor correct if IQR boys > IQR girls or Trefor incorrect if IQR boys ≤ IQR girls Statement 2: Conclusion, e.g. 'Incorrect, as the median for the boys is 40 hours which is lower than girls median (52 hours)'	M1 A2 E1	Based on sight of method for either boys or girls, or either IQR correct provided not clearly from incorrect working A1 for either IQR correct Ignore incorrect time notation, e.g. '26.30 hours' for 26.5 hours Conclusion must include statement that 'boys' median is 40 hours' FT for a reason based on 'their 52 hours', (a)(i) and 40 hours. Accept responses based on comparisons of the modal groups 50 to 60 hours (with 52) girls and 40 to 50 hours (with 60) boys Accept comparisons of the estimated means, boys 33·8(571…hours) and girls 45·2(857…hours)

6(a) Range: Trefwen 50(mm), Nawrby 49 (mm) Median: Trefwen 30 (mm), Nawrby 28 (mm) IQR: Trefwen 25 (mm), Nawrby 30 (mm)	B4	B3 for any 5 correct entries, OR B2 for any 3 or 4 correct entries, OR B1 for any 1 or 2 correct entries
6(b) Reason, e.g. based on comparisons of **median** (with the median rainfall for Nawrby being (slightly) lower), OR little rain as lower whisker 1mm compared with Trefwen at 5mm, OR Reason based on comparison of lower quartile	E1	Values are required within a reason statement, however accept if reference is to values in (a) without restatement, e.g 'the median for Nawrby is less than the median for Trefwen' Accept 'because on average there is less mm of rainfall in Nawrby than Trefwen' (as the median is the only average in (a)) FT provided 'their median for Nawrby' < 'their median for Trefwen' provided one of the medians is correct Ignore other averages and the range, provided the median is mentioned, unless mention of comparisons of lower quartiles

6(a) April	B1	
6(b) January	B1	
6(c)(i) January and February	B1	In either order
6(c)(ii) 43	B1	
6(d) FALSE TRUE FALSE FALSE	B2	B1 for any 3 correct responses

3(a)(i) Median in the inclusive range 16.8 to 17 (minutes) Interquartile range 19 to 19.3 - 14 to 14.3 Answer in the range 4.7 to 5.3 (minutes)	B1 M1 A1	
3(a)(ii) Reason, e.g. 'the points on the diagram have been joined with straight lines', 'the data has been grouped, so actual times have been lost', 'the raw data is more detailed (than graph)', 'not exact using a cumulative frequency diagram', 'it is just an estimate using the diagram'	E1	Allow, e.g. 'the raw data is more detailed than Meirion's data' (although both Meiron's data!), 'the points could be joined by a curve' Do not accept, e.g. 'seconds can not be presented'
3(b) 34 – 12 22 (of his customers)	M1 A1	
3(c) Sight of either of the following: • (80% of 120 =) 96 (customers) **OR** (20 minutes is) 102 (customers) • (20% not cleaned in 20 minutes is) 24 (customers) **OR** 18 (customers more than 20 minutes) Sight of any of the following: • (80% of 120 =) 96 (customers) **AND** (20 minutes is) 102 (customers) • (20% not cleaned in 20 minutes is) 24 (customers) **AND** 18 (customers more than 20 minutes) • (96 customers is)19.3 to 19.8 (minutes) • (102 customers is 102/120 × 100 =) 85% • (102 customers is 102/120 × 100 =) 85% • (18 customers is 18/120 × 100 =) 15% Conclusion 'yes'	M1 M1 A1	Accept readings on the graph Accept readings on the graph CAO from correct working only and M2 awarded Accept 'no as 85% (**not** 80%) in less than 20 minutes'

5(a)(i) Orange pippin and 57 (mm)	B1	Accept 'orange' or 'pippin' as indication of the correct tree
5(a)(ii) 41 (mm)	B1	
5(a)(iii) Pink Lady and 33 (mm)	B2	B1 for any of the following: • Gala with 30 (mm) • Orange pippin 29 (mm) • Pink Lady with 79 – 46 • No apple indicated but IQR answer 33 (mm)
5(b) Gala selected with a reason e.g. '(highest) upper quartile', '25% over 80 mm' **OR** Pink Lady selected with a reason e.g. '(highest) median', 'half are over 63 mm'	 B1	Ignore units throughout Do not accept reasons based on range or IQR Do not ignore any additional statements of range, IQR, lower quartile Ignore an incorrect median stated for Pink Lady, e.g. 66mm, provided it is >61 and <67(mm)

13(a) Appropriate bar of height 4·8	B2	B1 for sight of 24 ÷ 5 or 4·8
13(b) 10×0·6 + 10×2 + 5×6 + 5×8 (+ 24) + 20×1 = 140	 M1 A1	 Allow M1 for at least 4 correct products CAO *Alternative method:* *M1 for 10×0·6 + 10×2 + 5×6 + 1·75×8* *Allow M1 for 3 correct products which must include 1·75×8* *A1 for 70 CAO*
Search for height in the group 145 to 150	S1	FT 'their 140' ÷ 4, and M1 previously awarded
6x = 9 OR 6x = 21 x = 1·5 OR x = 3·5 (Lower quartile =) 146·5 (cm)	M1 A1 A1	OR $\frac{9}{30} \times 5$ OR $\frac{21}{30} \times 5$ Or equivalent

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6(a) Uniform scale from at least 5 (seconds) to at least 65 (seconds), **AND** time label	B1	Accept 'seconds' as the time label, do not accept if only attached to values on the scale
Correct format of a box-and-whisker	B1	Do not ignore additional lines drawn End stopper lines omitted can be ignored FT for unambiguous indications of the following:
Showing least time 5 seconds	B1	On the graph paper
Showing UQ 55 seconds	B1	On the graph paper
Correct plotting upper end whisker at 65 seconds, LQ at 23 seconds AND median at 45 seconds	B1	On the graph paper
6(b) 0.75 × 240 or equivalent 180 (text messages)	M1 A1	Allow sight of '75% of 240' If no marks, award SC1 for an answer of 60 (text messages)

	= 480 A1	C.A.O. Allow 483 2 if 30 2 used.
6.(a) 0·32	B1	
6.(b) Sample number from Anglesey on 2nd day = 3000 × 0·42 = 1260 (Rel.Fqu. for two days =) $\frac{640 + 1260}{2000 + 3000}$ = 0·38	 M1 A1 M1 A1	 Allow M1A1 for sight of 1260 e.g. 1260/3000 FT 'their 1260'.
6.(c) 'Answer to part (b)' noted AND Valid explanation e.g. 'more people sampled'	E1	Explanation must refer to the sample being the largest. Allow e.g 'from both days', 'number of people added', 'frequencies are added'. Do not accept 'relative frequencies are added'.

3(a) Whiskers at 3 m and 22 m	B1	Ignore if lines omitted from the ends of the whiskers Must be the least and greatest values shown
Unambiguous values or box with LQ 5 m and UQ 20 m	B1	May be seen in working, must be clearly LQ and UQ Check cumulative frequency diagram If not clearly labelled in working or on the graph, they must be no other values given between • the least and the LQ, and • the greatest and the UQ
Median at 15 m	B1	May be seen in working, must be clearly the median Check cumulative frequency diagram If not an unambiguous unique line or point, i.e. not clearly labelled in working or on the graph, allow for a line (or point) indicated that is not the least or greatest value shown Only if B1 B1 B1 awarded, <u>penalise -1</u> if a correct format for a box-and-whisker diagram is not shown
3(b)(i) 0.75 × 68 or equivalent 51 (yachts)	M1 A1	Answer space takes precedence If no marks, award SC1 for sight of 17 (from 0.25 × 68)
3(b)(ii) Conclusion 'Eog' with sight of (Eog IQR 20 – 5 =) 15 (m) AND (Clwyd IQR 18 – 10 =) 8 (m)	B2	FT 'their UQ – LQ' from (a) box-and–whisker diagram B1 for either IQR correct
3(b)(iii) Conclusion 'Can't tell' with reason, e.g. 'only know that 25% of yachts in Clwyd Marina are greater than 18m' 'we don't know if any of the yachts in Clwyd Marina are greater than 22(metres, the longest in Eog Marina)' 'we don't know if a yacht in Clwyd Marina is greater than 22(metres)' 'it doesn't say maximum length of Clwyd Marina's results'	E1	Ignore any additional incorrect or spurious statements Allow 'Can't tell' with a reason, e.g. 'no raw data' 'don't know this information' 'doesn't show anywhere the biggest yacht in Clwyd Marina' 'we are only given some of the lengths of the yachts in the marinas' 'doesn't show Clwyd Marina's results' 'not specified' 'not specific' 'range not given for the Clwyd Marina (so can't identify the longest yacht)' Do not accept, e.g. 'don't know how many yachts in the marinas' 'not mentioned for either marina'

5(a)(i) King Edward and 90(g)	B1	
5(a)(ii) (90 – 52 =) 38(g)	B2	Do not award from sight of any incorrect working B1 for sight of any of the following: • 52 **and** 90 • Sight of 90 and 50 < 'their lowest mass' ≤ 54 **and** 90 – 'their lowest mass' correctly evaluated • Answer of 35(g) **and** unambiguous selection of ○ (King Edward) 98 and 63 or ○ (Desiree) 88 and 53
5(b) Selects: Desiree, **and** Interquartile range **and** less than for the other 2 varieties	E1	

9(a) 5 $\times \frac{240}{100}$ or $\times 2.4$ or equivalent	M1	<u>A table method altering all 3 in the same manner at the same time is M0</u> M marks may be seen in either order e.g. <u>Time</u> <u>Houses</u> <u>Vans</u> 4 240 12
$\times \frac{4}{3}$ or $\times 1.333\ldots$ or equivalent	M1	FT from M0 previously awarded Must be from use of 5 e.g. if this calculation is performed first <u>Time</u> <u>Houses</u> <u>Vans</u> 3 100 6.66…
= 16 (delivery vans)	A1	CAO

Unit 1: Higher Tier	Mark	Comments
4(a)(i) 200 – 80 or 90 + 30 120 (customers)	M1 A1	
4(a)(ii) 32 seconds	B1	
4(a)(iii) $\frac{200-170}{200}$ or $\frac{30}{200}$ or $\frac{15}{100}$ $\frac{3}{20}$	M1 A1	Award M1 for 0.15 or 15% Only ignore further working if written as 0.15 or 15% If no marks, award SC1 for an answer of $\frac{17}{20}$ (from 40 seconds or less)
4(b)(i) 36	B1	
4(b)(ii) 46 – 20 26	M1 A1	Allow 20 – 46
4(c) 'No' unambiguously stated or implied AND a reason, e.g. 'upper quartile is higher this year' '75% reading higher this year' 'interval was 37 (or 38) to 50 seconds last year, this year it is 46 to 50 seconds'	E1	Do not ignore incorrect values for the upper quartiles given, E0 if 'upper quartile' or '75%' stated with incorrect upper quartile readings Allow 'No' with a reason, e.g. '(last year) 38, (this year) 46' '(last year) 37.(…), (this year) 46' Do not accept, e.g. 'range greater this year' 'lower quartile is lower this year' 'median higher this year' 'customers still waiting at 50 seconds'

4(a)(i) States 80 (and) 100 (seconds) AND indicates 'Yes'	B1	Allow written as 100 and 80 Answer space takes precedence
4(a)(ii)I. (80 – 75 =) 5 (seconds)	B1	Not from incorrect working Answer space takes precedence
4(a)(ii)II. Answer in the inclusive range 12 to 14 (seconds)	B2	Allow in this range only provided it not from incorrect working Answer space takes precedence B1 for sight of 92 – 60 (– 20) to 94 – 60 (– 20) or 32 (–20) to 34 (– 20)
4(b) 96 (seconds)	B3	Answer space takes precedence B2 for sight of or indication of 64 (squirrels), B1 any one of the following: • for sight of or indication of 16 (squirrels) • (use of 16 squirrels) answer of 52 (seconds) B0 for 64 seconds from incorrect working, 20% of 120 = 24, with time 64 seconds B0 for 96 seconds from incorrect working, 80% of 120 = 96, with time 96 seconds

4(c) (24 ÷ 21 500) × 1 000 000 (squirrels per km^2)	M2	Accept using estimation: (24 ÷ 20 000) × 1 000 000 M1 for any one of the following, including if embedded: • 24 ÷ 21500 (= 0.001116… squirrels per m^2) • (estimate) 24 ÷ 20 000 (= 0.0012 squirrels per m^2) • 1 000 000 ÷ 21 500 (= 46.5….) • (estimate) 1 000 000 ÷ 20 000 (= 50)
1116(.27...) (squirrels per km^2) AND Conclusion indicated or unambiguously implied 'Oak'	A1	Accept 1200 from estimating, i.e. (24 ÷ 20 000) × 1 000 000 =1200 (squirrels per km^2) If no marks, award SC1 for appropriate sight of a calculation of 24 ÷ 'a number with only non-zero digits 215', provided not embedded in further working apart from multiplication or division by powers of 10
4(c) Alternative method: *(If **oak**, number of squirrels likely in Maesgwyn Forest) 21 500 × 1200 ÷ 1 000 000*	*M2*	*Allow M2 for (If chestnut) 21 500 × 100 ÷ 1 000 000 (= 2.15)* *or (if pine) 21 500 × 45 ÷ 1 000 000 (= 0.9675)* *M1 for any one of the following, including if embedded:* • *(if oak) 21 500 × 1200 (= 25 800 000)* • *(If chestnut) 21 500 × 100 (= 2 150 000)* • *(if pine) 21 500 × 45 (= 967 500)* • *21 500 ÷ 1 000 000 (= 0.0215)* • *20 000 ÷ 1 000 000 (= 0.02)*
25.8 (squirrels) AND 'Oak' indicated as conclusion	*A1*	*Allow from correct working either* *2.15 (squirrels for Chestnut so must be) Oak, or* *0.9675 or 1 (squirrels for Pine so must be) Oak* *If no marks, award SC1 for appropriate sight of **any 1** of the following calculations:* • *'a number with only non-zero digits 215' ×1200* • *'a number with only non-zero digits 215' × 45* *provided not embedded in further working apart from multiplication or division by powers of 10*

8(d) Sight of base of triangle = 3h	B1	Any letter or word may be used for the height Needs to be convincing. May be seen on diagram
$\left(\frac{\pi \times h^2}{4} + 4h^2 + \frac{3h^2}{2}\right) \times 2 = 0.1$ or $\frac{2\pi \times h^2}{4} + 8h^2 + \frac{6h^2}{2} = 0.1$ or (12.57 to 12.571)h^2 = 0.1 or equivalent	M2	Ignore a place value error from an incorrect attempt to convert m^3 into cm^3 and/or m into cm for M and m marks only but A0 Allow omission of ×2 for M2 or M1 and possibly m1 M1 for: • the sum of appropriate terms equated to 0.1, with no more than 1 error in the terms • $\left(\frac{\pi \times h^2}{4} + 4h^2 + \frac{3h^2}{2}\right) \times 2$ or equivalent
$h^2 = \frac{0.1}{2(\frac{\pi}{4}+5.5)}$ or equivalent	m1	FT if possible from M1 provided h^2 in every term Note: $\pi/4 + 5.5 = 6.285$ to 6.2855 $\pi/2 + 11 = 12.57$ to 12.571
h = 0.089 to 0.0892 (m) or equivalent	A2	CAO Ignore an incorrect attempt to convert to cm or mm Accept 0.09 (m) from correct working A1 for h = $\sqrt{\frac{0.1}{2(\frac{\pi}{4}+5.5)}}$ or $\sqrt{\frac{1}{5\pi+110}}$ or h = $\sqrt{0.00795\ldots}$

6(a) 76 (g)	B1	Answer space takes precedence
6(b) 3 × 400 × 25 ÷ 100 or ¾ × 400 or equivalent 300 (little gulls)	M1 A1	If no marks, award SC1 for (¼ × 400 =) 100 (gulls)
6(c) 25(%)	B1	Answer space takes precedence
6(d)(i) Slender(-billed gulls)	B1	
6(d)(ii) Lower quartile	B1	Strictly depends on B1 previously awarded in (d)(i)

End of solutions