REVISE
.wales

F2.19 — Relative & experimental frequency

Mark schemes for the F2.19 question pack

Spec 4.3.7, 4.3.8, 4.3.9, 4.3.10 — Unit 2

SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 8 questions in the corresponding revise.wales question pack (19 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes.

	OR 10, 11 and 18.			
6.(a)	−3, −1 and 1		B2	B1 for any two correct in the correct positions OR B1 for −5, −3 and −1 OR B1 for −1, 1 and 3.
6.(b)	4n + 3		B2	B1 for sight of 4n or n4 (but not $4n^k$ k≠1). Mark final answer

				Mark final answer.
18.(a)	0·26		B1	B0 for 13/50, 26/100 etc.
18.(b)	$\frac{7}{50} \times 3000$	or equivalent	M1	Only allow misread if 300 or 30000 used.
		= 420	A1	420/3000 gains M1A0. Mark final answer.
18.(c)	$\frac{1}{6} \times 3000$	or equivalent	M1	Only allow misread if 300 or 30000 used.
		= 500	A1	500/3000 gains M1A0. Mark final answer. Allow M1A0 for 480 or 510 or 498 as implying

17.(a)	0·32	B1	
17.(b) (i)	600 × 0·34 = 204	M1 A1	
17.(b)(ii)	204 – 600/6 =104	M1 A1	FT 'their 204'. M1A1 for '104 out of 600' BUT M1A0 for '104/600'. FT for A1 provided answer is a positive integer.

15.(a) 0·32	B1	
15.(b) Sample number from Anglesey on 2nd day = 3000 × 0·42 = 1260	 M1 A1	 Allow M1A1 for sight of 1260 e.g. 1260/3000
(Rel.Fqu. for two days =) $\frac{640 + 1260}{2000 + 3000}$ = 0·38	M1 A1	FT 'their 1260'.
15.(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'.
16.(a)(i) 425 kg	B1	
16.(a)(ii) 21·5 s	B1	
16.(a)(iii) 83 people	B1	
16(b) $2{\cdot}38 \times 10^{-2}$	B2	B1 for sight of a correct answer but not in standard form. e.g. $23{\cdot}8 \times 10^{-3}$ or 0·0238.
17.(a) 5n < 3n + 7 or equivalent ISW	B2	2n < 7 OR n < 7/2 implies B2. Ignore use of a different letter e.g. 5x < 3x + 7. Use of '≤' is B1. B1 for sight of 3n + 7 in an inequality.
17.(b) 2n < 7 OR n < 7/2 (Greatest amount =) (£)3	B1 B1	FT 'their inequality' if of equivalent difficulty. May be seen in part (a). FT 'their n < k'. B0 if they have 'n>k'. B0 if it leads to n<1 An answer of (£)3 gains B1B1 (unless from incorrect algebra work).
18.(a) 0·7 shown for 'Does not go on tour bus'. Use of 0·3 × …… = 0·24 P(sees show) = 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 'sees show' branches. FT 'their 0·8' **only** if M1 awarded. (0·24, 0·76, 0·24, 0·76 is M0A0A0)
18.(b) 0·7 × 0·2 = 0·14 ISW	M1 A1	FT 'their values' if both between 0 and 1.

11.(a)

Throws	20	40	60	80	100
Heads	11	18	24	30	**37**
Rel. Fq.	0·55	0·45	**0·4**	0·375	0·37

B1

B1

11.(b) (Mid-points are) 4·5, 14·5 and 24·5. B1

(Estimated total =) F.T. 'their mid-points' if within group.

$3 \times 4{\cdot}5 + 5 \times 14{\cdot}5 + 2 \times 24{\cdot}5$ (= 135) M1

$\div 10$ m1

(Estimated mean =) $= 13{\cdot}5$ A1 C.A.O.

(Difference = 15·2 – 13·5 =) 1·7 B1 F.T. for difference between 15·2 and 'their derived estimated mean (≠15·2)'. Allow –1·7

10.(a) $\frac{1}{6} \times \frac{1}{4}$ or equivalent	M1	
$= \frac{1}{24}$ ISW	A1	Accept 0·0416... or 0·0417 or 0·042 for M1A1 M1A0 for '1 in 24', '1:24'.
10.(b) $\frac{1}{5} + \frac{1}{10}$ or equivalent.	M1	
$= \frac{3}{10}$ or equivalent. ISW	A1	
11. $(AC^2 =)\ 10{\cdot}8^2 + 14{\cdot}4^2$	M1	Accept equivalent of using cos rule (as cos 90 = 0).
$AC^2 = 324$ or $(AC =) \sqrt{324}$	A1	
$(AC =)$ 18(cm)	A1	F.T. √'their 324' provided M1 gained. Final answer of AC = 324 is M1A0A0. *Alternative method to find AC* *A correct and complete method (using two trigonometric relationships)* *M2* *AC = 18(cm)* *A1*
(Area ACD =) $\frac{24 \times 18}{2}$	M1	FT 'their stated AC'. (May be shown on the diagram) Accept equivalent of using ½ × 24 × 18 × sin 90 (as sin 90 = 1).
$= 216\ (cm^2)$	A1	
12.		*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* *Look out for equating $x^3 - 5x = 350$*
One correct evaluation $7{\cdot}2 \le x \le 7{\cdot}3$	B1	
2 correct evaluations $7{\cdot}275 \le x \le 7{\cdot}295$, one < 0, one > 0.	B1	
2 correct evaluations $7{\cdot}275 \le x \le 7{\cdot}285$, one < 0, one > 0.	M1	
$x = 7{\cdot}28$	A1	

x	$x^3 - 5x - 350$		
7·2	−12·75(2)		
7·21	−11(·2..)		
7·22	− 9(·7...)		
7·23	− 8(·2...)		
7·24	− 6(·6...)		
7·25	−5(·1...)		
7·26	− 3(·6...)	7·275	−1(·3....)
7·27	− 2(·1...)	7·284	0(·04..)
7·28	**−0·5(7..)**	**7·285**	**0·1(9..)**
7·29	**0·9(7..)**	7·295	1(·7....)
7·3	2·5(17)		

13.(a) an expression	B1	
13.(b) an equation	B1	
14. (Mid-points) 2·5, (7·5), 12·5 and 17·5.	B1	Allow for sight of mid-points.
$8 \times 2{\cdot}5 + (0 \times 7{\cdot}5) + 7 \times 12{\cdot}5 + 5 \times 17{\cdot}5$ $(20 + 0 + 87{\cdot}5 + 87{\cdot}5 = 195)$	M1	F.T. 'their mid-points' including bounds, provided they fall within the classes (including lower and upper bounds and used consistently).
$\div 20$	m1	
$= 9.75$	A1	C.A.O.
15. $(x =) \frac{360}{15}$ or $180 - \frac{(15-2) \times 180}{15}$ or equivalent	M1	May be seen in parts.
$= 24(°)$	A1	
(BR =) $8 \times \cos 24$ or $8 \times \sin (90 - 24)$	M2	FT 'their stated value for x' (x < 90°) M1 for $\frac{BR}{8} = \cos 24$ or $\frac{BR}{8} = \sin (90 - 24)$ Accept equivalent of using sin rule (as sin 90 = 1).
= 7·3(0...)(cm) or 7·31(cm)	A1	
		Alternative method to find BR *A correct and complete method (using two trigonometric relationships and possibly Pythagoras's theorem)* *M2* *BR = 7·3(0...)(cm) or 7·31(cm)* *A1*

12 (a) $\frac{2}{15}$	B2	For B2, the answer must be in its simplest form. Award B1 for sight of $\frac{40}{300}$ or equivalent.
12. (b) YES ticked and a valid explanation e.g. "you would expect to get (approximately) equal frequencies if it was unbiased" "you would expect (approximately) 50 of each number" "6 was thrown a lot of times" "4 was not thrown a lot of times" "the frequencies are not the same" "All the frequencies are different."	E1	Award E1 if Yes or No box ticked but explanation clearly explains that the dice is biased. Allow: "they are not equal" "they are not the same".
12. (c) $\frac{110}{300} \times 2400$ or equivalent $= 880$	M1 A1	May be shown in stages. $\frac{880}{2400}$ gains M1A0. Mark final answer

16.(a) Sight of 0·032 or equivalent e.g. 3·2% or $\frac{160}{5000}$	B1	Answer line takes precedence. ISW. Allow incorrect probability notation e.g. 160 out of 5000.
Explanation e.g. 'all data used', 'last point plotted', 'the number of batteries checked was the highest'.	E1	Accept any indication that the final reading should give the best estimate. Allow 'the more times you repeat an action, the more accurate the estimate is'.

16.(b)			May be done in any order.
$3000 \times 0{\cdot}033 \times 0.026$ or $3000 \times 0{\cdot}033 \times 2.6$		M2	May be seen in stages or implied in later working. Award M1 for sight of one of the following, allowing one place value error in 0·033 or 0.026 (may be embedded): • $3000 \times 0{\cdot}033$ • 99 • $3000 \times$ (£)0.026 • $3000 \times$ 2.6(p) • (£)78 or 7800(p) • $0.026 \times 0{\cdot}033$ • $2.6 \times 0{\cdot}033$ • 0·000858 • 0·0858. Award M1 for sight of the consecutive digits 99 or 78 or 858 in a number involving a place value error e.g. 990 but not 8990.
(£)2.57(4) or 257(.4)(p) ISW		A1	CAO. Allow (£)2.58 or 258(p) (If units are given they must be correct). Incorrect units may imply M2 A0. Award M1 A0 for one of the following answers: Answer / From 2(.)34 / $(3000 \times 0.026 \times 0{\cdot}03)$ 2(.)10(6) or 2(.)11 / $(3000 \times 0.026 \times 0{\cdot}027)$ 2(.)62(2) / $(3000 \times 0.026 \times 0{\cdot}029)$ 2(.)49(6) or 2(.)50 / $(3000 \times 0.026 \times 0{\cdot}032)$

End of solutions