REVISE
.wales

F2.20 — Probability of combined events — sample space & tree diagrams

Mark schemes for the F2.20 question pack

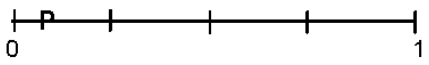
Spec 4.4.1, 4.4.2, 4.4.3, 4.4.4 — Unit 2

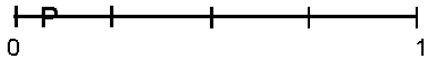
SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 16 questions in the corresponding revise.wales question pack (46 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

			SC1 for reversed answer A = 3 and B = 12.
6(a) (David – Hr Jane – Rh Mary – P) David – Hr Jane – P Mary – Rh David – Rh Jane – Hr Mary – P David – Rh Jane – P Mary – Hr David – P Jane – Hr Mary – Rh David – P Jane – Rh Mary – Hr		B2	Allow any unambiguous notation e.g. 'DH'. For all other 5 different combinations. Do not penalise repeats. B1 for 3 or 4 other <u>different</u> combinations. B0 otherwise.
6.(b) $\frac{4}{6}$ or equivalent. ISW		B2	2/3 or 4/6 gains B2 regardless of their list. B1 for x/6 (x<6) OR 4/y (y>4) F.T. 'their list' (using <u>different</u> combinations) if at least 4 to choose from for B2 or B1 as appropriate.

		3	
17.(a) 0·3(0) on 'box C branch'.		B1	
17.(b) Sight of 0·45 × 0·7 OR 0·25 × 0·4 OR 0·3 × 0·8 0·45 × 0·7 + 0·25 × 0·4 + 0·3 × 0·8 (0·315 + 0·1 + 0·24) = 0·655 or 131/200 or equivalent ISW		 B1 M1 A1	FT 'their 0·3' from box C branch, only if, between 0 and 1. Provided less than 1.
17.(c) $\frac{1}{3}$		B1	F.T. for the fraction that is the nearest to 1− 'their 0·655' provided 0<'their 0·655'<1

3.(a)	*(Summer Cottage Train)* Summer Cottage Bus Summer Cottage Car Summer Hotel Train Summer Hotel Bus Summer Hotel Car Winter Cottage Train Winter Cottage Bus Winter Cottage Car Winter Hotel Train Winter Hotel Bus Winter Hotel Car	B3	For all other 11 different combinations. Ignore repeats. B2 for 8, 9 or 10 other different combinations. B1 for 5, 6 or 7 other different combinations.
3.(b)		B1	P must be positioned strictly > 0 and < 0·25. C.A.O. Accept any indication for position of P.

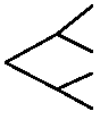
14.(a)	*(Summer Cottage Train)* Summer Cottage Bus Summer Cottage Car Summer Hotel Train Summer Hotel Bus Summer Hotel Car Winter Cottage Train Winter Cottage Bus Winter Cottage Car Winter Hotel Train Winter Hotel Bus Winter Hotel Car	B3	For all other 11 different combinations. Ignore repeats. B2 for 8, 9 or 10 other different combinations. B1 for 5, 6 or 7 other different combinations.
14.(b)		B1	P must be positioned strictly > 0 and < 0·25. C.A.O. Accept any indication for position of P.

14.(b) 9·6	B2	Mark final answer. B1 for sight of 3·2.
15. $(QR^2 =)\ 1{\cdot}41^2 + 0{\cdot}89^2$ $(QR^2) = 2{\cdot}78(02)$ or $(QR) = \sqrt{2{\cdot}78(02)}$ $(QR =)$ 1·66(…)(m) or 1·67 (m) or 1·7(m) *OR 166·7(..) cm or 167cm*	M1 A1 A1	Allow 2·8 for 2·78. FT from M1 for the correctly evaluated square root of 'their 2.78(02)' provided their answer > 1.41 *Allow working in centimetres but penalise −1 from any A marks gained if units not shown for final answer* *e.g.* $QR^2 = 27802$ *(A1) , QR = 166·74 (A1) then −1* *BUT QR = 166·74 cm OR 167 cm is M1A1A1.*
Alternative method. ***Correct** use of 'two-step' trigonometric relationship.* *(QR =) 1·66(…)(m) or 1·67 (m) or 1·7(m)*	*M2* *A1*	*A partial trigonometric method is M0.* *C.A.O.*

17.(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.
17.(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')

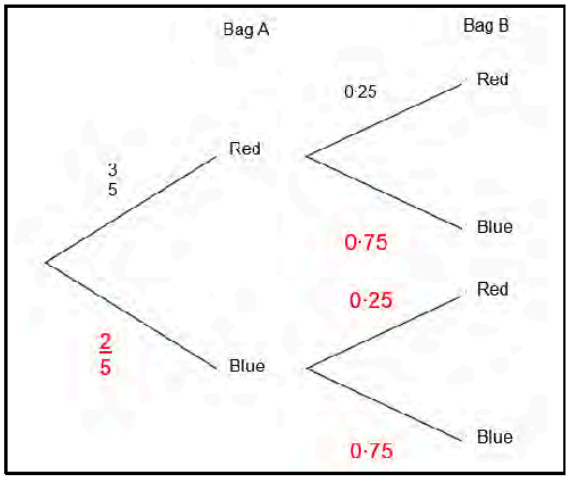
15.(a) 0·32	B1	
15.(b) Sample number from Anglesey on 2nd day = 3000 × 0·42 = 1260	 M1 A1	 Allow M1A1 for sight of 1260 e.g. 1260/3000
(Rel.Fqu. for two days =) $\frac{640 + 1260}{2000 + 3000}$ = 0·38	M1 A1	FT 'their 1260'.
15.(c) 'Answer to part (b)' noted AND Valid explanation e.g. 'more people sampled'	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.

Line drawn	*A1*	
17.(a) 0·3 shown for 'Does not visit '*Erddig Gardens*'.	B1	
Use of 0·7 × …… = 0·28	M1	Implied by sight of 0·4
P(goes to '*Bersham Heritage Centre*') = 0.4	A1	(on 'top branch' of the four on the right.)
Second set of branches 0·4, 0·6, 0·4, 0·6	A1	FT 'their 0·4' BUT **dependent** on M1 gained. (i.e. M0A0A0 for 0·28 and 0·72 on branches.)
17.(b) 0·7 × 0·6	M1	FT 0·7 × 'their 0·6' only if 0 < 'their 0·6' < 1
= 0·42 ISW	A1	0·42 gains M1A1

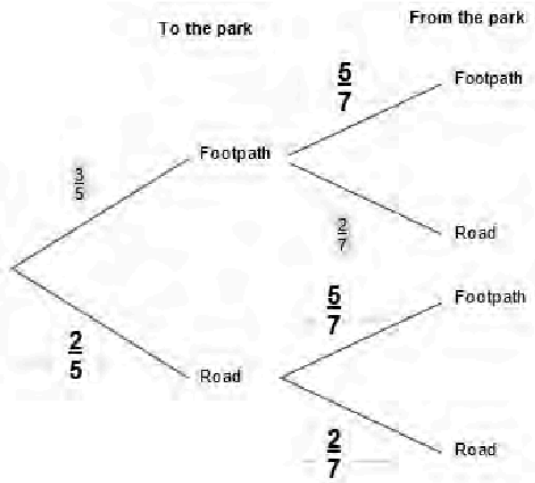
16.(a) $(x - 4)(x - 3)$ $(x =) 4$ AND $(x =) 3$	B2 B1	B1 for $(x \ldots 4)(x \ldots 3)$. Ignore '= 0'. Strict FT from their brackets. Allow the following. B2 for $x - 4 (=0)$ AND $x - 3 (=0)$ (B1) $(x =) 4$ AND $(x =) 3$ (B1) B1 for $x + 4 (=0)$ AND $x + 3 (=0)$ (B0) $(x =) -4$ AND $(x =) -3$ (B1) FT B1 if only $(x =) 4$ AND $(x =) 3$ seen. (B1)
16(b) $25x^2 - 20x + 4$	B2	Otherwise B1 for sight of $25x^2 \pm kx + 4$ (allow k = 0) B1 for sight of $25x^2 - 20x - 4$ Mark final answer.
17.(a) Correct framework 	B1	
Suitable labelling on both 1st pair of branches AND on both of at least one pair of 2nd set of branches. e.g. 'Car', 'No car', 'Before 8', 'After 8'. OR Titles of 'Car' and 'Before 8' with branch endings of 'Yes' and 'No'.	B1	Accept any unambiguous wording.
Correct probabilities on first pair of branches 0·7 AND 0·3 (for 'Car', 'No car') OR 0·4 AND 0·6 (for 'Before 8', 'After 8')	B1	Must be consistent with their labelling. Allow this B1 if no headings given, unless contradicted by, or inconsistent with, further labelling.
Correct probabilities on second two sets of branches 0·4 AND 0·6 correctly placed (following 0·7 and 0·3) OR 0·7 AND 0·3 correctly placed (following 0·4 and 0·6)	B1	Allow this B1 if no headings given, unless contradicted by, or inconsistent with, further labelling. Allow this B1 if only shown on one set of branches. Provided not contradicted on the other set of branches.
17.(b) $0·7 \times 0·4$ or equivalent. $= 0·28$ or equivalent.	M1 A1	No FT. M1A0 for a final answer of 0·28%. Mark final answer.
18.(a) PA = 12(cm) AND correct theorem given, e.g. 'tangents from an external point are equal in length'.	E1	Must use the words 'tangents' AND 'equal (identical / same)'. Do not accept e.g. 'PA = PB'. (E0) Accept alternative correct answers.
18.(b) PÂO = 90(°) AND correct theorem given, e.g. 'the tangent at any point on a circle is perpendicular to the radius at that point'.	E1	Must use the words 'tangent' AND 'radius (diameter)' Allow e.g. 'radius and tangent meet at 90'. (E1) Do not accept e.g. 'PA and OA meet at 90'. (E0)
18.(c) (Area PAOB =) $2 \times \frac{12 \times 4}{2}$ or equivalent. $= 48 (cm^2)$	M1 A1	OR FT 'their PA' × 4 / 2 + 12 × 4 / 2 M0 for 48×2 or $12 \times 4 \times 2$ (= 96) An unsupported final answer of 48 gains both marks. If no marks gained allow SC1 for sight of 24(cm²) OR a correct evaluation of ('their PA' × 4) / 2.
19.(a) $y = 2·5x + 3$	B1	
19.(b) $y = 3x - 5$	B1	
19.(c) Line D	B1	

14.(a) $3k = p - 2$ or $p - 2 = 3k$ or $-3k = -p + 2$ $k = \frac{p-2}{3}$ or $\frac{p-2}{3} = k$ or $k = \frac{-p+2}{-3}$	B1 B1	F.T. only from $\pm 3k = \pm p \pm 2$, stated or implied. ($3k = p - 2$ will have already gained the previous B1.) B1B0 for $-k = \frac{-p+2}{3}$ or equivalent. Mark final answer. *Note* *Allow B1B0 for $k = (p - 2) \div 3$ with or without brackets.* *Allow B1B0 for $\frac{p-2}{3}$ ('k' missing)*
14.(b) (Midpoint =) (5, 17)	B2	B1 for each coordinate. May be given as $x = 5$ and $y = 17$. Accept use of $x = 5$ and $y = 17$ in $y = 3x + 2$. Allow B1 for sight of $\frac{3+7}{2}$ or $\frac{7-3}{2} + 3$ OR $\frac{15+19}{2}$ or $\frac{19-15}{2} + 15$ Allow SC1 for unsupported (17, 5).
Showing that $17 = 3 \times 5 + 2$ (convincing) AND 'Yes'	B1	FT 'their stated midpoint', but not (3,15) nor (7,19), with consequent calculation AND decision.
15.(a) $5{\cdot}8 \times 10^{-3}$	B1	
15.(b) 7×10^{5}	B2	B1 for sight of correct value not in standard form e.g. $0{\cdot}7 \times 10^{6}$ or 700000. Mark final answer.
16.(a) P(South Wales =) $1 - 0{\cdot}3 - 0{\cdot}25$ $= 0{\cdot}45$ AND shown on relevant branch. 0·2 and 0·8 shown on **all** relevant branches.	M1 A1 B1	
16.(b) $0{\cdot}45 \times 0{\cdot}2$ or equivalent $= 0{\cdot}09$ or equivalent	M1 A1	FT 'their completed tree diagram' for values $0<p<1$.
17. Showing $4x + 3y = 19$ or equivalent. Showing $6x - y = 12$ or equivalent. A correct method to eliminate one variable e.g. 'equal coefficients AND appropriate addition or subtraction'. OR ' method of substitution'. First variable found , $x = 2\frac{1}{2}$ or $y = 3$. Second variable found	B1 B1 M1 A1 A1	$2x + 2x + 3y = 19$ is an equivalent answer. *Workings must be shown for M1A1A1.* FT to solve for simultaneous equations if of equivalent difficulty. Allow one error in one term (not the term with equal coefficients.) C.A.O. for their equations FT substitution of their '1st variable' if M1 gained If NO (i.e. none of the five) marks gained, allow SC1 for both answers of $x = 2\frac{1}{2}$ AND $y = 3$

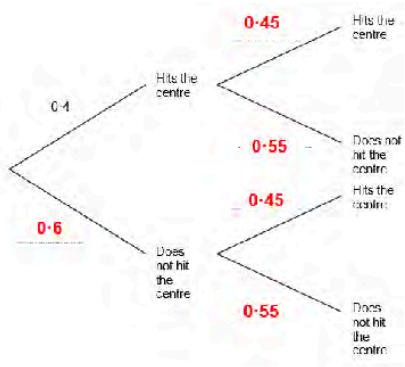
14. (a) 0·4 shown on 'A does not occur' branch Use of 0·6 × ..... = 0·48 P(B occurs) = 0·8 Second set of branches 0·8, 0·2, 0·8, 0·2	B1 M1 A1 A1	 Allow M1A1 if 0·8 seen on one of the 'B occurs' branches. FT 'their 0·8' only if M1 awarded. (0·48, 0·52, 0·48, 0·52 is M0A0A0)
14. (b) 0·4 × 0·2 = 0·08 ISW	M1 A1	FT 'their 0·4' × 'their 0·2' provided both between 0 and 1.

18. (a) Complete diagram  	B2	Award B1 for **one** of the following: • 2/5 or equivalent on 'Blue' Bag A branch • 0·75 or equivalent on a correct 'Blue' Bag B branch.
18. (b)		Check diagram for answers. FT 'their 2/5' from bag A blue branch, only if between 0 and 1. FT 'their 0.75' from bag B blue branch, only if between 0 and 1.
Sight of $\frac{3}{5} \times 0{\cdot}25$ **OR** $\frac{2}{5} \times 0{\cdot}75$ or equivalent	B1	Award B1 for sight of 0·15 **OR** 0·3 or equivalent.
$\frac{3}{5} \times 0{\cdot}25$ + $\frac{2}{5} \times 0{\cdot}75$ or equivalent	M1	Award M1 for 0·15 + 0·3.
0·45 or 9/20 or equivalent ISW	A1	Only FT, provided answer is less than 1.

17.(a)	P(Bus =) 1 − 0·25 − 0·45 = 0·3 AND shown on relevant branch. 0·96 shown on <u>all</u> three branches.	M1 A1 B1	 Award M1A0 for 0·3 in working space and not on diagram.
17.(b)	0·25 × 0·04 or equivalent = 0·01 or equivalent	M1 A1	 CAO

16. (a) Complete diagram 	B2	**If B2 not awarded**, award B1 for **one** of the following: • 2/5 or equivalent on Road to the park branch • 5/7 on a Footpath from the park branch.
16.(b) $\frac{3}{5} \times \frac{5}{7}$ or equivalent $\frac{15}{35}$ or equivalent ISW	M1 A1	FT $\frac{3}{5}$ × 'their $\frac{5}{7}$' (on 'uppermost footpath home branch') provided less than 1.

15.(a) $\frac{5}{8}$ on 'Bus B' branch.	B1	Numerator and denominator must be integers. Allow any equivalent to $\frac{5}{8}$ e.g. 0·625. Do not allow 0·63.
$\frac{1}{2}$ or $\frac{4}{8}$ or 0·5 on **all** 'seat branches'	B1	Allow any equivalent to $\frac{1}{2}$.
15.(b) $\frac{5}{8} \times \frac{1}{2}$ or equivalent	M1	FT 'their $\frac{5}{8}$' × 'their $\frac{1}{2}$' provided both values < 1.
$= \frac{5}{16}$ or $\frac{20}{64}$ or $\frac{25}{80}$ or equivalent ISW	A1	Do not allow rounded or truncated answers if decimal given. Numerator and denominator must be integers.

15.(a) 0·6 or equivalent on correct Evan branch. 0·45 and 0·55 or equivalent correctly shown on both pairs for Jane. Evan Jane  	B1 B2	Award B1 for one of the following: • 0·45 and 0·55 or equivalent correctly shown on one pair of Jane's branches only • 0·45 and 0·55 or equivalent consistently reversed on all Jane branches.
15.(b) 0·4 × 0·45 or equivalent 0·18 or equivalent ISW	M1 A1	FT 0·4 × 'Jane's probability of hitting the centre' provided less than 1.

End of solutions