REVISE
.wales

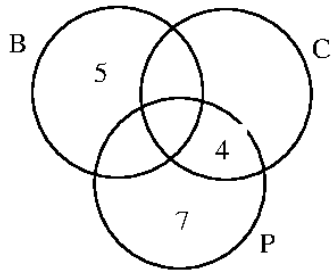
2.22 — Sample space & possibility diagrams

Mark schemes for the 2.22 question pack

Spec 3.5.5 — Unit 2

SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 31 questions in the corresponding revise.wales question pack (130 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

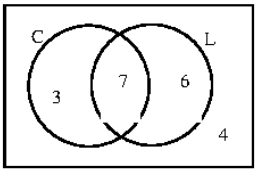
5.(a)	 5 in correct position. 4 in correct position. 7 in correct position.		B1 B1 B1	Strict FT 'their entries such that total number of students = 28. Allow 'double entries' in some parts for this FT, e.g. 'the 4 placed alongside the 1'.
5.(b)	2		B1	Allow 'double entries' in some parts for a possible FT, e.g. 'the 4 placed alongside the 2'.
5.(c)	$\frac{16}{28}$ or equivalent ISW		B2	FT 'their total number for Biology' for the numerator. Allow 'double entries'. B1 for a correct numerator in a fraction <1. B1 for a denominator of 28 in a fraction <1. Penalise −1 for only words (16 out of 28) or only ratio (16:28).

7.(a) 0·3 on 'Hereford' branch.	✓	B1	
0·7 × P(Yes) = 0·42	✓	M1	Allow their notation for P(Yes).
P(Yes) = 0·6	✓	A1	
0·6, 0·4, 0·6 and 0·4 correctly placed.	✓	A1	F.T. 'their P(Yes)', if between 0 and 1 but not 0·5
7.(b) 0·3 × 0·4		M1	F.T. 'their values' if both between 0 and 1.
= 0·12		A1	

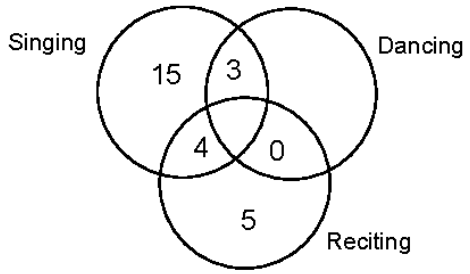
18. (Probability success at 1st attempt = 0·8) (Probability 1st success at 2nd attempt =) 0·2 × 0·8 = 0·16 Convincing statement that 0·8 = 5 × 0·16		M1 A1 A1	Must show 0·2 × 0·8 for M1. A convincing statement must refer to 0·8 and 0·16 *Alternative method* *(Probability 1st success at 2nd attempt =)* *0·2 × 0·8* *M1* *Indicates that this is 1/5th of probability of success at 1st attempt.* *A1* *'So 5 times more likely to succeed 1st time.* *A1* *(Only convincing if 0·2 stated to be 1/5)*

1.(a)	0·25 + 0·2 = 0·45 or equivalent.		M1 A1	
1.(b)	0·4 × 0·4		M1	

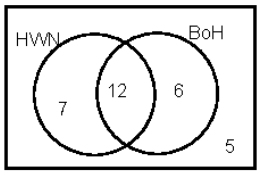
7.(a) 0·3(0) on 'box C branch'.		B1	
7.(b) Sight of 0·45 × 0·7 OR 0·25 × 0·4 OR 0·3 × 0·8 0·45 × 0·7 + 0·25 × 0·4 + 0·3 × 0·8 (0·315 + 0·1 + 0·24) = 0·655 or 131/200 or equivalent ISW		 B1 M1 A1	FT 'their 0·3' from box C branch, only if, between 0 and 1. Provided less than 1.
7.(c) $\frac{1}{3}$		B1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

7.(a)				Any 'blank space' to be taken as 0.
			B1 B1	For the 4 in correct position. For the 7 in correct position.
			B1	For the 3 AND 6 in correct positions. OR two of the following conditions met (i) 10 − 'their (non-zero) 7' (ii) 13 – 'their (non-zero) 7'. (iii) total of four numbers = 20. SC1 for all regions correct but using alternative notation e.g. tallies.
7.(b)	9/20 or equivalent. ISW		B2	B1 for a numerator of 9 (F.T. 'their 3' + 'their 6') in a fraction < 1. B1 for a denominator of 20 in a fraction < 1

7.(a) 0·3(0) on 'box C branch'.		B1	
7.(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.
7.(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

7.  		Allow empty space to imply 0.
5 AND 3 AND 0 in correct position. Total of 9 for 'Reciting'. Total of 22 for 'Singing'.	B1 B1 B1	C.A.O.
(Probability only took part in '*Singing*') $= \frac{15}{29}$ ISW	B2	15/29 gains all 5 marks. Otherwise, strict F.T. from 'their diagram'. B1 for a correct numerator in a fraction <1. B1 for a correct denominator in a fraction <1. Penalise -1 if incorrect notation used for probability e.g. '15 out of 29'.

8.(a) 0·13 on 'car' branch. 1/3 on 'other day' branches.	B1 B1	Do not penalise if one of branches left blank.
8.(b) $1 - 0{\cdot}87 \times \frac{2}{3}$ OR $0{\cdot}87 \times \frac{1}{3} + 0{\cdot}13 \times \frac{2}{3} + 0{\cdot}13 \times \frac{1}{3}$ $= 0{\cdot}42$	M2 A1	M1 for sight of 0·87 × 2/3. F.T. 'their 0·13' and 'their 1/3'. C.A.O. If M0 allow SC1 for sight of $0{\cdot}13 \times \frac{2}{3}$ (= 0·0866..) seen in part (b). (This for travelling by car on the first day.)

2.(a)	 12 AND 5 in correct position. Total of 18 for '*Bread of Heaven*' Overall total of 30.	 B1 B1 B1	Any 'blank space' to be taken as 0. If 'notches/tallies' are used, penalise −1 once. B0 if any other number written in the same section. Allow more than one number in the same section. Allow more than one number in the same section.
2.(b)	$\frac{19}{30}$ or equivalent. ISW	B2	B1 for a numerator of 19 OR FT 'their total for *HWN*' in a fraction < 1. B1 for a denominator of 30 OR FT 'their total' in a fraction < 1. An answer of 19/30 gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '19 in 30') −1.

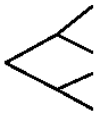
	OR 166·7(..) cm or 167cm		
6.(a)	0·58 on 'Male' branch. 0·65 and 0·35 correctly shown on both pairs of branches.	B1 B2	 B1 if correctly shown on one pair only. SC1 if 0·65 and 0·35 consistently reversed on all branches.
6.(b)	0·42 × 0·35 = 0·147 or equivalent ISW	M1 A1	FT 'their 0·35' (on 'uppermost train branch') provided less than 1

	$(3x-5)(11x-13)$ $33x^2-94x+65$		
16.	$\frac{n}{200}\times\frac{n}{200}=0.1369$	M2	Award M1 for P(Red)×P(Red)=0.1369 or equivalent, e.g. R(ed)×R(ed)=0.1369; P^2=0.1369, etc.
	$(n^2=)\ 200\times200\times0.1369$ OR $(n=)\sqrt{200\times200\times0.1369}$	m1	Where n is the number of red beads.
	(Number of red beads=) 74	A1	

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')

		e.g. $23{\cdot}8 \times 10^{-3}$ or 0·0238.
8.(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)
8.(b) 0·7 × 0·2 = 0·14 ISW	M1 A1	FT 'their values' if both between 0 and 1.

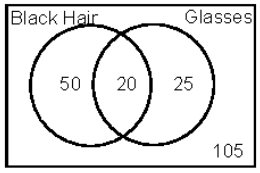
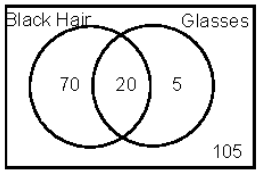
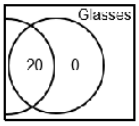
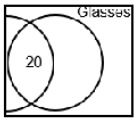
6.(a) 0·3 shown for 'Does not visit '*Erddig Gardens*'. Use of 0·7 × …… = 0·28 P(goes to '*Bersham Heritage Centre*') = 0.4 Second set of branches 0·4, 0·6, 0·4, 0·6	B1 M1 A1 A1	 Implied by sight of 0·4 (on 'top branch' of the four on the right) F.T. 'their 0·4' BUT **dependent** on M1 gained. (i.e. M0A0A0 for 0·28 and 0·72 on branches.)
6.(b) 0·7 × 0·6 = 0·42 ISW	M1 A1	F.T. 0·7 × 'their 0·6' only if 0 < 'their 0·6' < 1 0·42 gains M1A1.
7. (area) Volume Length Volume None Area	B3	*Must use the terminology given in the question.* B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.
8.(a) $(x + 7)(x - 3)$ $(x =) -7$ AND $(x =) 3$	B2 B1	B1 for $(x \ldots 7)(x \ldots 3)$. Strict F.T. from their brackets. Allow the following. B2 for x + 7 (=0) AND x − 3 (=0) (B1) (x =) −7 AND (x =) 3 (B1) B1 for x − 7 (=0) AND x + 3 (=0) (B0) (x =) 7 AND (x =) −3 (B1) FT B1 if only (x =) −7 AND (x =) 3 seen. (B1)
8.(b) Correct method for clearing all three fractions. Accurate clearing of fractions AND expansion of brackets on lhs. 24x = 36 or equivalent. x = 36/24 or equivalent	M1 A1 A1 A1	FT until 2nd error. May be seen in stages. Allow if all over a common denominator. May be seen in stages For collection of terms. FT from 'their ax = b' ONLY if M1 gained AND no more than one previous error. If no marks, allow SC1 for sight of 2(2x – 3) + 5(4x + 5) or equivalent. (10) If FT answer is a whole number then it must be shown as an integer. Allow a correct embedded answer of 1·5 or 1½ BUT penalise −1 if followed by x ≠ 1·5 or 1½. Note : An answer of 1·5 that is found without gaining M1 OR that is not embedded is zero marks.
9.(a) 40·5	B1	
9.(b) (25·5 + 25·5 =) 51	B1	
9.(c) (11·5 + 11·5=) 23	B1	

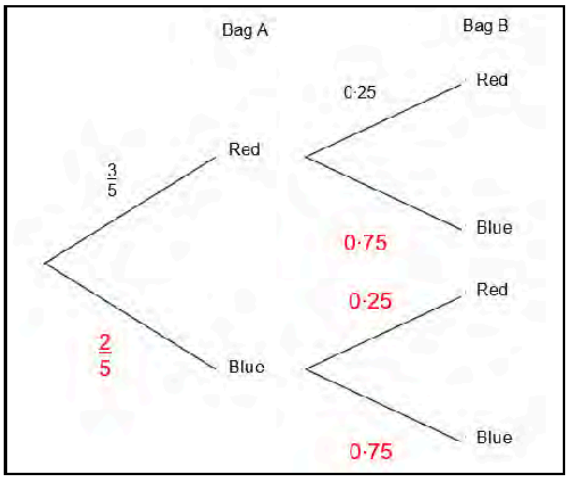
7.(a) Correct framework 	B1	
Suitable labelling on both 1st pair of branches AND on both of at least one pair of 2nd set of branches. e.g. 'Car', 'No car', 'Before 8', 'After 8'. OR Titles of 'Car' and 'Before 8' with branch endings of 'Yes' and 'No'.	B1	Accept any unambiguous wording.
Correct probabilities 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.
7.(b) 0·7 × 0·4 or equivalent. = 0·28 or equivalent.	M1 A1	No FT. M1A0 for a final answer of 0·28%. Mark final answer.
8.(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.
8.(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)
8.(c) (Area PAOB =) $2 \times \frac{12 \times 4}{2}$ or equivalent. = 48 (cm^2)	M1 A1	OR FT 'their PA' × 4 + $\frac{12 \times 4}{2}$ M0 for 48 × 2 or 12 × 4 × 2 (= 96) An unsupported final answer of 48 gains both marks. If no marks gained allow SC1 for sight of 24(cm^2) OR a correct evaluation of ('their PA' × 4) / 2.
9.(a) y = 2·5x + 3	B1	
9.(b) y = 3x − 5	B1	
9.(c) Line D	B1	
10.(a) $t \propto 1/g$ OR $t = k/g$ 36 = k / 25 OR k = 900 $t = 900/g$	B1 M1 A1	Allow $t \propto k/g$ FT from $y \propto 1/x^n$ with $n \neq 1$, n>0 No FT from direct proportion M1 implies B1. May be seen explicitly in part *(b)*. Do not allow $t \propto 900/g$ for the A mark
10.(b) (900/20 =) 45 (days)	B1	FT 'their formula' only if non-linear.
10.(c) Sight of 900/40 22 (goats)	M1 A1	FT 'their formula' only if non-linear and of equivalent difficulty M1 A0 for an answer of 22·5 or 23 For A1, FT for equivalent difficulty i.e. need to round down an answer with a decimal part of 0.5 or over. Allow use of trial and improvement for M1, provided 22 or 23 seen. A0 for incorrect working e.g. 90/4 given as 22.2, leading to 22.
11. (a) $(\sqrt[3]{m})^2$	B1	
11. (b) $p^{\frac{1}{4}}$	B1	

3. 6 −2 At least 5 correct plots and no incorrect plot. A smooth curve drawn through their plots.	B2 P1 C1	B1 for each. F.T. 'their (−1,6)' AND 'their (3,−2)'. Allow ±'$\frac{1}{2}$ a small square'. F.T. 'their 7 plots' OR a curve through the 5 given plots AND (−1,6) AND (3,−2). Allow for the intention to pass through their plots (within 1 small square, either horizontally **or** vertically of the point).
4. (Curved length =) 3·14 × 4 or equivalent = 12·56 (cm) (Perimeter =) 20·56 (cm)	M1 A1 B1	Do not allow M1 if subsequently divided by 2. Allow 4π for M1A1. Allow SC1 for an answer of 25·12 (whole circle). (If 12·56 shown, but then doubled, only award the SC1.) FT 'their derived 12·56' + 8 (even 'an area' + 8). Allow 4π + 8.
5.(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) ÷ 3 with or without brackets.* *Allow B1B0 for* $\frac{p-2}{3}$ *('k' missing)*
5.(b) (Midpoint =) (5, 17) Showing that 17 = 3 × 5 + 2 (convincing) AND 'Yes'	B2 B1	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). FT 'their stated midpoint', but not (3,15) nor (7,19), with consequent calculation AND decision.
6.(a) $5{\cdot}8 \times 10^{-3}$	B1	
6.(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.
7.(a) P(South Wales =) 1 − 0·3 − 0·25 = 0·45 AND shown on relevant branch. 0·2 and 0·8 shown on all relevant branches.	M1 A1 B1	
7.(b) 0·45 × 0·2 or equivalent = 0·09 or equivalent	M1 A1	FT 'their completed tree diagram' for values 0<p<1.

4. (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)
4. (b) 0·4 × 0·2 = 0·08 ISW	M1 A1	FT 'their 0·4' × 'their 0·2' provided both between 0 and 1.

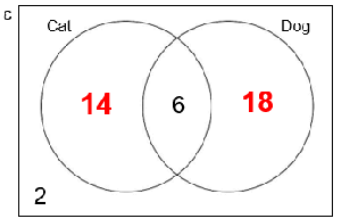
17.(b) Alternative method #2 *P(one blue, two not blue OR two blue, one not blue OR three blue)*	*S1*	*May be implied by subsequent working.*
$= \frac{5}{10}\times\frac{5}{9}\times\frac{4}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{5}{8} \times 3 + \frac{5}{10}\times\frac{4}{9}\times\frac{3}{8}$	*M1*	*Complete method. (Missing x3 is S1 M0 A0.)*
$= \frac{660}{720}$ *(* $= \frac{11}{12}$ *) or equivalent*	*A1*	*ISW* *FT from part (a) consistent use of a wrongly calculated denominator.* *If no other marks awarded,* *SC1 for sight of* $\frac{875}{1000}$ *or* $\frac{660}{1000}$ *or equivalent.*

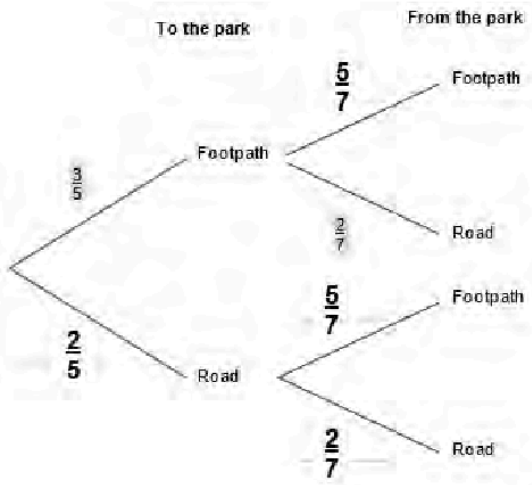
Unit 1: Higher Tier	Mark	Comments
1.(a)  20 AND 105 in correct position Total of 70 for *Black Hair* Overall total of 200	 B1 B1 B1	If 'notches/tallies' are used, penalise −1 once. B0 if any other number written in the same section. FT 'their 50' + 'their 20', provided both are non-zero values. Note: The answer below is awarded B1B0B1. 
1.(b) $\frac{45}{200}$ or $\frac{9}{40}$ or equivalent. ISW	B2	For B2 or B1, the numerator and denominator must be a whole number. FT $\frac{\text{'their 20'} + \text{'their 25'}}{200}$ provided both sections not blank. Award B1 for one of the following: • a numerator of 45 in a fraction < 1 • FT 'their 20' + 'their 25', provided both sections are not blank, as a numerator in a fraction < 1 • a denominator of 200 in a fraction < 1. An answer of $\frac{45}{200}$ gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '45 in 200') −1. Note:  An answer of $\frac{20}{200}$ is awarded B2.  An answer of $\frac{20}{200}$ is awarded B1.

8. (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.
8. (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

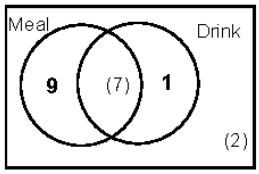
2.(a) P(Bronze) = 0·2 **AND** P (No Prize) = 0·6 or equivalent	B2	The values in the table takes precedence. Award B1 for one of the following: • P(Bronze) = 0·2 (must be clearly identified) • P(No Prize) = 0·6 • P(Bronze) + P(No Prize) = 0·8 • P(Bronze) = ⅓ P(No Prize) provided both <1.
2.(b) 15 ÷ 0·02 × 0·18 or 15 × 9 or equivalent = 135	M1 A1	Must be for a complete method e.g. • 15 ÷ 2 = 7·5 7·5 × 18 = 135 • 750 – (450 + 150 + 15) • 0·02 : 0·18 15 : 135 (e.g 0·18 × 750, or 15 × 9) Award M1 A1 for a final answer of 15 : 135. Sight of 135 as a numerator in a fraction < 1 implies M1A0.

7.(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.
7.(b)	0·25 × 0·04 or equivalent = 0·01 or equivalent	M1 A1	 CAO

5. [n(just dog) =] 18 [n(just cat) =] 14  	B2 B1	Diagram takes precedence. Entries must be whole numbers. B1 for sight of $(\frac{3}{5} \times 40 =)$ 24 from correct working. FT 32 – 'their 18', provided all sections not blank or 0.

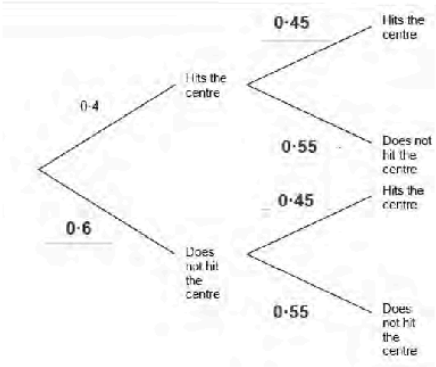
8.*(a)* Complete diagram 	B2	**If B2 not awarded,** award B1 for **one** of the following: • 2/5 or equivalent on Road to the park branch • 5/7 on a Footpath from the park branch.
8.(b) $\frac{3}{5} \times \frac{5}{7}$ or equivalent $\frac{15}{35}$ or equivalent ISW	M1 A1	FT $\frac{3}{7}$ × 'their $\frac{5}{7}$'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

17.(a) $\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}$ $=\frac{6}{280}\left(=\frac{3}{140}\right)$ ISW	M1 A1	 Accept a decimal answer of 0·021(4…). Allow an answer of 0.02 from correct working.
17.(b) [1–'all pass to the left'–'all pass to the right'] $1-\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)-\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ ISW	M2 A1	Award only M1 if further incorrect work seen. FT from part (a) provided <1. M1 for any one of the following: $1-\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)\left[=\frac{137}{140}\right]$ $1-\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\left[=\frac{9}{14}\right]$ $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\left[=\frac{53}{140}\right]$ CAO Accept a decimal answer of 0·62(1…)
17.(b) Alternative method 1 *['2 pass left and 1 right'+'2 pass right and 1 left']* $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)$ $+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. M1 for any one of the following: $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)\left[=\frac{7}{40}\right]$ $\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)\left[=\frac{125}{280}\right]$ CAO *Accept a decimal answer of 0·62(1…)*
17.(b) Alternative method 2 *[G no ball + D no ball + H no ball]* *P(G no ball) + P(D no ball) + P(H no ball) =* $\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)$ $+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)$ $+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. *M1 for any one of the following:* *P(G no ball)*=$\left(\frac{1}{5}\times\frac{2}{7}\times\frac{5}{8}\right)+\left(\frac{4}{5}\times\frac{2}{7}\times\frac{5}{8}\right)$ *or* $\left(\frac{2}{7}\times\frac{5}{8}\right)\left[=\frac{5}{28}\right]$ *P(D no ball)*=$\left(\frac{4}{5}\times\frac{2}{7}\times\frac{3}{8}\right)+\left(\frac{4}{5}\times\frac{5}{7}\times\frac{3}{8}\right)$ *or* $\left(\frac{4}{5}\times\frac{3}{8}\right)\left[=\frac{3}{10}\right]$ *P(H no ball)*=$\left(\frac{1}{5}\times\frac{5}{7}\times\frac{3}{8}\right)+\left(\frac{1}{5}\times\frac{5}{7}\times\frac{5}{8}\right)$ *or* $\left(\frac{1}{5}\times\frac{5}{7}\right)\left[=\frac{1}{7}\right]$ CAO *Accept a decimal answer of 0·62(1…)*
17.(b) Alternative method 3 *[G receives 2 balls + D receives 2 balls + H receives 2 balls]* *P(H left, D right)+P(G left, H right)+P(D left, G right) =* $\left(\frac{3}{8}\times\frac{5}{7}\right)+\left(\frac{1}{5}\times\frac{5}{8}\right)+\left(\frac{2}{7}\times\frac{4}{5}\right)$ $=\frac{174}{280}\left(\frac{87}{140}\right)$ *ISW*	*M2* *A1*	Award only M1 if further incorrect work seen. *M1 for any one of the following:* *P(H left, D right)* = $\left(\frac{3}{8}\times\frac{5}{7}\right)\left[=\frac{15}{56}\right]$ *P(G left, H right)* = $\left(\frac{1}{5}\times\frac{5}{8}\right)\left[=\frac{1}{8}\right]$ *P(D left, G right)* = $\left(\frac{2}{7}\times\frac{4}{5}\right)\left[=\frac{8}{35}\right]$ CAO *Accept a decimal answer of 0·62(1…)*

Unit 2: Higher Tier	Mark	Comments
3.(a)  	B2	Answers on diagram take precedence. For 9 AND 1 in correct position. Do not award B2 if more than one number is shown in the same section. Ignore 2 and 7 duplicated (in the correct place) for this B2. If B2 not awarded, award B1 for one of the following, provided no sections are blank and values are whole numbers: • 'their 9' + 'their 1' = 10 • 7 + 'their 9' = 2 × (7 + 'their 1'). A B1 may be awarded even if more than one number is shown in the same section as long as the total for awarding a B1 is correct.
3.(b) $\frac{16}{19}$ or equivalent. ISW	B2	FT $\frac{\text{'their 9'} + 7}{19}$ in a fraction < 1, provided Meal only not blank. If not B2, award B1 for one of the following in a fraction < 1: • a numerator of 16 • a numerator of 'their 9' + 7, provided Meal only section not blank • a denominator of 19 • a denominator of 'their 9' + 'their 1' + 9. An answer of $\frac{16}{19}$ gains B2 regardless of 'their Venn diagram'. Penalise incorrect notation (e.g. '16 in 19') −1.

18. Area scale factor: $\left(\sqrt[3]{3821/569}\right)^2$ (= 3·559…) OR $\left(\sqrt[3]{569/3821}\right)^2$ (= 0·280…) or equivalent.	M2	May be seen in parts. Allow $\left(\sqrt[3]{3821}\right)^2 : \left(\sqrt[3]{569}\right)^2$, or equivalent (written as a ratio). Award M1 for: • $\sqrt[3]{3821/569}$ (= 1·886…) • $\sqrt[3]{569/3821}$ (= 0·530…) • $(3821/569)^2$ (= 45·095…) • $(569/3821)^2$ (= 0·022...) • $\left(\sqrt[3]{3821}\right)^2$ (= 244·409…) AND $\left(\sqrt[3]{569}\right)^2$ (= 68·665…)
Cross-sectional area of larger solid = $29 \times \left(\sqrt[3]{3821/569}\right)^2$ OR $29 \div \left(\sqrt[3]{569/3821}\right)^2$ or equivalent.	m1	Must be from M2.
103·2(…cm^2)	A1	CAO. Accept answers in the range 103·2(cm^2) to 103·3(cm^2). Allow 103 provided not from premature approximation.

6.(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 $\frac{1}{2}$.
6.(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.

$w = 12{\cdot}6$	A1	An unsupported answer of 12·6 is awarded M1A1.
6.(a) 0·6 or equivalent on correct Evan branch. 0·45 and 0·55 or equivalent correctly shown on both pairs for 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.
6.(b) $0{\cdot}4 \times 0{\cdot}45$ or equivalent 0·18 or equivalent ISW	M1 A1	FT $0{\cdot}4 \times$ 'Jane's probability of hitting the centre' provided less than 1

17. (Probability =) 0·7 + 0·3 × 0·7 OR 1 − 0·3 × 0·3	M2	Accept 0·7 × 0·7 + 0·7 × 0·3 + 0·3 × 0·7 M1 for sight of 0·3 × 0·7 or 0·7 × 0·3 or 0·3 × 0·3. May be seen alongside tree diagram.
= 0·91 AND Yes ticked or implied.	A1	

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made.

UNIT 1: NON-CALCULATOR, HIGHER TIER

GCSE Mathematics Unit 1: Higher Tier		Mark	Comments
1. (a)	$1 - (0{\cdot}45 + 0{\cdot}1 + 0{\cdot}25)$	M1	
	$= 0{\cdot}2$	A1	
(b)	$0{\cdot}1 + 0{\cdot}25$	M1	
	$= 0{\cdot}35$	A1	
(c)	$0{\cdot}1 \times 0{\cdot}25$	M1	
	$= 0{\cdot}025$	A1	
		6	

	4	
16.(a) (i) Indicates sequence as 'Miss', 'Miss', 'Hit'. 0·7 × 0·7 × 0·3 = 0·147	 S1 M1 A1	
(ii) Indicates three possible situations HMM or MHM or MMH 0·441 Less than a 50% chance.	 M1 A1 A1	May be indicated by 0·3×0·7×0·7 × 3 or equivalent. F.T. 'their 0·147' × 3 F.T. 'their 0·441'
(b) Indicates that the first ball selected is returned to the box before the second ball is selected OR the two attempts are independent.	B1	
	7	

End of solutions