

Statistics 1 Probability Answers

2(a)	$P(X) = 0.3 \quad P(Y) = 0.4 \quad P(Z) = 0.2$			
(i)	$P(X \cap Y \cap Z) = 0.3 \times 0.4 \times 0.2 = 0.024$	M1	1	
(ii)	$P(X' \cap Y' \cap Z') = 0.7 \times 0.6 \times 0.8$ $= 0.336$	M1 A1	2	At least 2 correct terms CAO
(iii)	$P(X' \cap Y' \cap Z) = 0.7 \times 0.6 \times 0.2$ $= 0.084$	M1 A1		Correct numerical expression CAO
(b)	$P(W Z) = 0.9 \quad P(W Z') = 0.25$			
(i)	$P(Z \cap W) = 0.2 \times 0.9$ $= 0.18$	M1 A1	2	Correct numerical expression CAO
(ii)	$P((Z \cap W') \cup (Z' \cap W))$ or $1 - [P((Z \cap W) \cup (Z' \cap W'))]$ $= 0.2 \times (1 - 0.9)$ + $(1 - 0.2) \times 0.25$	M1 M1		0.2×0.9 or (b)(i) $(1 - 0.2) \times (1 - 0.25)$ Cannot score an M1 in both methods
	$= 0.02 + 0.20$ $= 0.22$	A1	3	$1 - (0.18 + 0.60)$ CAO
Total			11	

6		0 (R)	1 (S)	2 (T)	≥ 3	T			
	D (D)	24	32	41	23	120			
	SD (D')	40	37	88	35	200			
	T	64	69	129	58	320			
(a)(i)	$P(D) = \frac{120}{320}$ or $\frac{3}{8}$ or 0.375						B1	1	CAO; or equivalent
(ii)	$P(D \cap R) = \frac{24}{320}$ or $\frac{3}{40}$ or 0.075						B1	1	CSO; or equivalent
(iii)	$P(D \cup T) = \frac{120+88}{320} = \frac{129+24+32+23}{320}$ $= \frac{208}{320}$ or $\frac{13}{20}$ or 0.65						M1		
							A1	2	CAO; or equivalent
(iv)	$P(D R) = \frac{P(D \cap R)}{P(R)} = \frac{(ii)}{P(R)} = \frac{24/(320)}{64/(320)}$ $= \frac{24}{64}$ or $\frac{3}{8}$ or 0.375						M1		M0 if independence assumed
							A1	2	CAO; or equivalent
(v)	$P(R D') = \frac{P(R \cap D')}{P(D')} = \frac{40/(320)}{200/(320)}$ $= \frac{40}{200}$ or $\frac{1}{5}$ or 0.2						M1		numerator
							M1		allow independence assumed
							A1	3	denominator
(b)(i)	R and S or R and T or S and T						B1	1	not D and D'
(ii)	$P(D) = 0.375 = P(D R)$ or (i) = (iv) so YES						M1		$P(D) \times P(R) = 0.375 \times 0.2$ $= 0.075 = P(D \cap R)$ or (ii) or $P(R D) = P(R) = 0.2$, etc
							A1	2	
(c)(i)	A semi-detached house or two children (or both)						B1		CAO
							B1	2	or equivalent
(ii)	A detached house and/or less than two children						B1		CAO
							B1	2	(0 or 1 must not include 'both')
	Total							16	

5(a)	$P(D' \cap E' \cap F') = 0.4 \times 0.3 \times 0.2$	M1		At least 1 probability correct
	$= 0.024$	A1	2	CAO; OE
(b)	$P(D' \cap E' \cap F) = 0.4 \times 0.3 \times 0.8$	M1		At least 2 probabilities correct
	$= 0.096$	A1	2	CAO; OE
(c)	$P(\text{One}) =$ $(b) + P(D \cap E' \cap F') + P(D' \cap E \cap F')$	M1		Use of 3 possibilities; ignore multipliers
	$= (b) + (0.6 \times 0.3 \times 0.2) + (0.4 \times 0.7 \times 0.2)$	M1		At least 1 new term correct
	$= 0.096 + 0.036 + 0.056 = 0.188$	A1	3	CAO; OE
(d)	$P(\text{One or two})$ $= (c) + (3 \text{ terms each of 3 probabilities})$ or $= 1 - (a) - (1 \text{ term of 3 probabilities})$	M1		$(c) + P(\text{Two})$ Used; OE; ignore multipliers $1 - (a) - P(\text{Three})$
	$= 0.188 + (0.6 \times 0.7 \times 0.2) +$ $(0.6 \times 0.3 \times 0.8) + (0.4 \times 0.7 \times 0.8)$ $= 0.188 + 0.084 + 0.144 + 0.224$			
	or $= 1 - 0.024 - (0.6 \times 0.7 \times 0.8)$ $= 1 - 0.024 - 0.336$	M1		At least 1 new term correct
	$= 0.64$	A1	3	CAO; OE
Total			10	

2	Ratios: Penalise first occurrence only of a correct answer			
(a)(i)	$P(\text{Welsh back}) = \frac{7}{50}$ or 0.14	B1	1	CAO; OE
(ii)	$P(\text{English}) = \frac{14+8}{50} =$	B1		Correct expression; PI
	$\frac{22}{50}$ or $\frac{11}{25}$ or 0.44	B1	2	CAO; OE
(iii)	$P(\text{not English}) = 1 - (ii) =$			
	$\frac{28}{50}$ or $\frac{14}{25}$ or 0.56	B1✓	1	✓ on (ii) if used; $0 < p < 1$
(iv)	$P(\text{Irish} \text{back}) =$ $\frac{P(\text{Irish} \cap \text{back})}{P(\text{back})} = \frac{6}{\sum(\text{back})} =$	M1		Used; may be implied by values or answer
	$\frac{6}{23}$ or 0.26 to 0.261	A1	2	CAO/AWFW ($6/50 \Rightarrow 0$)

(v)	$P(\text{forward} \mid \text{not Scottish}) = \frac{P(\text{forward} \cap \text{not Scottish})}{P(\text{not Scottish})} =$ $\frac{14+5+6}{50-4} = \frac{27-2}{50-4} =$ $\frac{25}{46} \text{ or } 0.54 \text{ to } 0.544$	M1		Used; OE May be implied by values or answer
(b)	$P(4 \times \text{English}) =$ $\left(\frac{22}{50}\right) \times \left(\frac{21}{49}\right) \times \left(\frac{20}{48}\right) \times \left(\frac{19}{47}\right) =$ $\frac{175560}{5527200} \text{ or } \frac{209}{6580}$ $\text{or } 0.0317 \text{ to } 0.032$	M1 M1	2	CAO/AWFW (25/50 \Rightarrow 0)
		A1	3	CAO/AWFW
	Total		11	