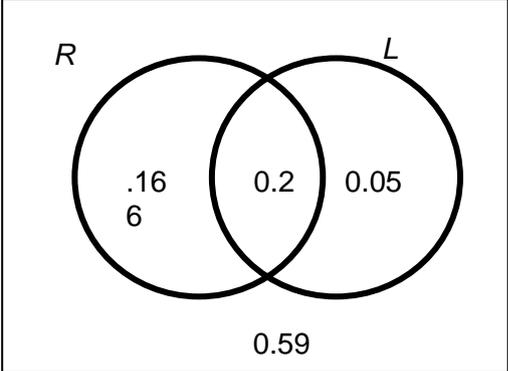
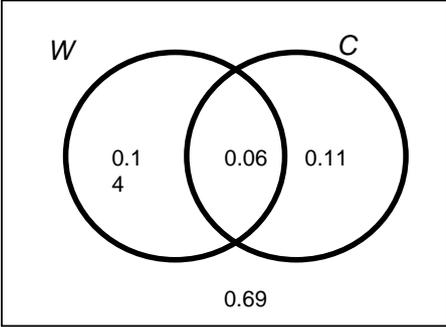


1 (i)	$a = 0.8, b = 0.85, c = 0.9.$	B1 for any one B1 for the other two	2
(ii)	$P(\text{Not delayed}) = 0.8 \times 0.85 \times 0.9 = 0.612$ $P(\text{Delayed}) = 1 - 0.8 \times 0.85 \times 0.9 = 1 - 0.612 = 0.388$	M1 for product A1 CAO M1 for $1 - P(\text{delayed})$ A1FT	4
(iii)	$P(\text{just one problem})$ $= 0.2 \times 0.85 \times 0.9 + 0.8 \times 0.15 \times 0.9 + 0.8 \times 0.85 \times 0.1$ $= 0.153 + 0.108 + 0.068 = 0.329$	B1 one product correct M1 three products M1 sum of 3 products A1 CAO	4
(iv)	$P(\text{Just one problem} \mid \text{delay})$ $= \frac{P(\text{Just one problem and delay})}{P(\text{Delay})} = \frac{0.329}{0.388} = 0.848$	M1 for numerator M1 for denominator A1FT	3
(v)	$P(\text{Delayed} \mid \text{No technical problems})$ <i>Either</i> $= 0.15 + 0.85 \times 0.1 = 0.235$ <i>Or</i> $= 1 - 0.9 \times 0.85 = 1 - 0.765 = 0.235$ <i>Or</i> $= 0.15 \times 0.1 + 0.15 \times 0.9 + 0.85 \times 0.1 = 0.235$ <i>Or (using conditional probability formula)</i> $\frac{P(\text{Delayed and no technical problems})}{P(\text{No technical problems})}$ $= \frac{0.8 \times 0.15 \times 0.1 + 0.8 \times 0.15 \times 0.9 + 0.8 \times 0.85 \times 0.1}{0.8}$ $= \frac{0.188}{0.8} = 0.235$	M1 for 0.15 + M1 for second term A1CAO M1 for product M1 for $1 - \text{product}$ A1CAO M1 for all 3 products M1 for sum of all 3 products A1CAO M1 for numerator M1 for denominator A1CAO	3
(vi)	Expected number $= 110 \times 0.388 = 42.7$	M1 for product A1FT	2
		TOTAL	18

<p>2 (i)</p>	<p>$P(R) \times P(L) = 0.36 \times 0.25 = 0.09 \neq P(R \cap L)$ Not equal so not independent. (Allow $0.36 \times 0.25 \neq 0.2$ or $0.09 \neq 0.2$ or $\neq p(R \cap L)$ so not independent)</p>	<p>M1 for 0.36×0.25 or 0.09 seen A1 (numerical justification needed)</p>	<p>2</p>
<p>(ii)</p>		<p>G1 for two overlapping circles labelled G1 for 0.2 and either 0.16 or 0.05 in the correct places G1 for all 4 correct probs in the correct places (including the 0.59) The last two G marks are independent of the labels</p>	<p>3</p>
<p>(iii)</p>	<p>$P(L R) = \frac{P(L \cap R)}{P(R)} = \frac{0.2}{0.36} = \frac{5}{9} = 0.556 \text{ (awrt 0.56)}$ This is the probability that Anna is late given that it is raining. (must be in context) Condone 'if' or 'when' or 'on a rainy day' for 'given that' but not the words 'and' or 'because' or 'due to'</p>	<p>M1 for 0.2/0.36 o.e. A1 cao E1 (indep of M1A1) Order/structure <u>must</u> be correct i.e. no reverse statement</p>	<p>3</p>
TOTAL			<p>8</p>

<p>3 (i)</p>	<p>$P(W) \times P(C) = 0.20 \times 0.17 = 0.034$ $P(W \cap C) = 0.06$ (given in the question) Not equal so not independent (Allow $0.20 \times 0.17 \neq 0.06$ or $\neq p(W \cap C)$ so not independent).</p>	<p>M1 for multiplying or 0.034 seen A1 (numerical justification needed)</p>	<p>2</p>
<p>(ii)</p>	<div style="text-align: center;">  </div> <p>The last two G marks are independent of the labels</p>	<p>G1 for two overlapping circles labelled G1 for 0.06 and either 0.14 or 0.11 in the correct places G1 for all 4 correct probs in the correct places (including the 0.69) NB No credit for Karnaugh maps here</p>	<p>3</p>
<p>(iii)</p>	$P(W C) = \frac{P(W \cap C)}{P(C)} = \frac{0.06}{0.17} = \frac{6}{17} = 0.353 \text{ (awrt 0.35)}$	<p>M1 for 0.06 / 0.17 A1 cao</p>	<p>2</p>
<p>(iv)</p>	<p>Children are more likely than adults to be able to speak Welsh or 'proportionally more children speak Welsh than adults' Do not accept: 'more Welsh children speak Welsh than adults'</p>	<p>E1FT Once the correct idea is seen, apply ISW</p>	<p>1</p>
TOTAL			8

<p>4 (i)</p>	<p>$X \sim B(8, 0.05)$</p> <p>(A) $P(X = 0) = 0.95^8 = 0.6634$ 0.663 or better</p> <p>Or using tables $P(X = 0) = 0.6634$</p> <p>(B) $P(X = 1) = \binom{8}{1} \times 0.05 \times 0.95^7 = 0.2793$</p> <p>$P(X > 1) = 1 - (0.6634 + 0.2793) = 0.0573$</p> <p>Or using tables $P(X > 1) = 1 - 0.9428 = 0.0572$</p>	<p>M1 0.95^8 A1 CAO Or B2 (tables)</p> <p>M1 for $P(X = 1)$ (allow 0.28 or better) M1 for $1 - P(X \leq 1)$ must have both probabilities A1cao (0.0572 – 0.0573)</p> <p>M1 for $P(X \leq 1)$ 0.9428 M1 for $1 - P(X \leq 1)$ A1 cao (must end in...2)</p>	<p>2</p> <p>3</p>
<p>(ii)</p>	<p>Expected number of days = $250 \times 0.0572 = 14.3$ awrt</p>	<p>M1 for $250 \times \text{prob}(B)$ A1 FT but no rounding at end</p>	<p>2</p>
TOTAL			<p>7</p>