Question 5 **(25 marks)**

(a) **(i)** In an archery competition, the team consisting of John, David, and Mike will win 1st prize if at least two of them hit the bullseye with their last arrows. From past experience, they know that the probability that John, David, and Mike will hit the bullseye on their last arrow is $\frac{1}{5}$, $\frac{1}{6}$, and $\frac{1}{4}$ respectively.
Complete the table below to show all the ways in which they could win 1st prize.

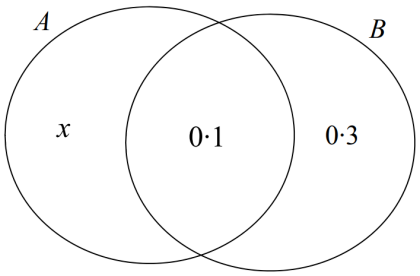
	Way 1	**Way 2**	**Way 3**	**Way 4**
John	✓			
David	✓			
Mike	×			

✓ = Hit

× = Miss

(ii) Hence or otherwise find the probability that they will win the competition.

(b) Two events, A and B, are represented in the diagram.
$P(A \cap B) = 0{\cdot}1$, $P(B \setminus A) = 0{\cdot}3$ and $P(A \setminus B) = x$.
Write $P(A)$ in terms of x and hence, or otherwise, find the value of x for which the events A and B are independent.



Q5	Model Solution – 25 Marks	Marking Notes
(a) (i)	<table><tr><td>John</td><td>✓</td><td>✓</td><td>×</td><td>✓</td></tr><tr><td>David</td><td>✓</td><td>×</td><td>✓</td><td>✓</td></tr><tr><td>Mike</td><td>×</td><td>✓</td><td>✓</td><td>✓</td></tr></table>	Scale 5B (0, 2, 5) *Partial Credit* • 1 correct column
(a) (ii)	$P(win) = \left(\frac{1}{5} \times \frac{1}{6} \times \frac{3}{4}\right) + \left(\frac{1}{5} \times \frac{5}{6} \times \frac{1}{4}\right)$ $+ \left(\frac{4}{5} \times \frac{1}{6} \times \frac{1}{4}\right) + \left(\frac{1}{5} \times \frac{1}{6} \times \frac{1}{4}\right)$ $= \frac{13}{120}$	Scale 10C (0, 3, 7, 10) *Low Partial Credit* • one correct triple (numerical or descriptive) • probability of any one *Miss* *High Partial Credit* • 4 correct triples (numerical)
(b)	$P(A \cap B) = P(A) \times P(B)$ $0{\cdot}1 = (x + 0{\cdot}1) \times 0{\cdot}4$ $0{\cdot}4x = 0{\cdot}06$ $x = 0{\cdot}15$ **or** $P(A\|B) = P(A)$ $\frac{0{\cdot}1}{0{\cdot}4} = x + 0{\cdot}1$ $x = 0{\cdot}15$	Scale 10C (0, 3, 7, 10) *Low Partial Credit* • formula written or implied • writes P(*A*) = $x + 0{\cdot}1$ *High Partial Credit* • formula fully substituted