

Question 7 (5 marks)

a. $\Pr(A') = 1 - \Pr(A)$

$$\Rightarrow 8(1 - \Pr(A)) + 3\Pr(B) = 8$$

$$8 - 8\Pr(A) + 3\Pr(B) = 8$$

$$8\Pr(A) = 3\Pr(B)$$

$$\therefore \Pr(A) = \frac{3}{8}\Pr(B) \text{ as required}$$

A1

b. $\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$

$$\Pr(A \cap B) = \Pr(A) \times \Pr(B), \text{ as } A \text{ and } B \text{ are independent}$$

$$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A) \times \Pr(B)$$

$$\Pr(A) = \frac{3}{8}\Pr(B) \text{ from part a.}$$

$$\therefore \Pr(A \cup B) = \frac{3}{8}\Pr(B) + \Pr(B) - \frac{3}{8}\Pr(B) \times \Pr(B) = \frac{3}{4}$$

M1

$$\text{Let } b = \Pr(B).$$

$$\frac{3}{8}b + b - \frac{3}{8}b \times b = \frac{3}{4}$$

$$\frac{11}{8}b - \frac{3}{8}b^2 = \frac{3}{4}$$

M1

$$3b^2 - 11b + 6 = 0$$

$$(3b - 2)(b - 3) = 0$$

$$b = \frac{2}{3} \text{ or } b = 3$$

$$\therefore \Pr(B) = \frac{2}{3}, \text{ as } \Pr(B) < 1$$

A1

c. $\Pr(A' \cap B) = \Pr(B) - \Pr(A \cap B)$

$$= \Pr(B) - \Pr(A) \times \Pr(B)$$

$$= \Pr(B) - \frac{3}{8}\Pr(B) \times \Pr(B)$$

$$= \frac{2}{3} - \frac{3}{8} \times \frac{2}{3} \times \frac{2}{3}$$

$$= \frac{1}{2}$$

A1