

1

- (a) $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.4 + 0.5 - 0.3 = 0.6$ (M1 A1)
- (b) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.3}{0.5} = 0.6$ (M1 A1)
- (c) $P(A'|B') = \frac{P(A' \cap B')}{P(B')} = \frac{0.4}{0.5} = 0.8$ (M1 A1 A1)

(Total for question 1 is 8 marks)

2

- (a) $P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \frac{1}{4} = \frac{P(A \cap B)}{1/2} \Rightarrow P(A \cap B) = \frac{1}{8}$ (M1 A1)
- (b) $P(B'|A) = \frac{P(B' \cap A)}{P(A)} = \frac{3/16}{5/16} = \frac{3}{5}$ (M1 M1 A1)
- (c) $P(A' \cup B) = 1 - P(A \cap B') = 1 - 3/16 = 13/16$ (M1 A1)
- (d) If independent $P(A) \times P(B) = P(A \cap B)$. $\frac{5}{16} \times \frac{1}{2} = \frac{5}{32}$. $\frac{5}{32} \cdot \frac{5}{32} \neq \frac{1}{8}$ so they are not independent. (M1 A1 C1)

(Total for question 2 is 10 marks)

3

- (a) $P(A' \cap B') = 1 - P(A \cup B) = 1 - 0.7 = 0.3$ (M1 A1)
- (b) $P(A' \cap B) = P(A \cup B) - P(A) = 0.7 - 0.3 = 0.4$ (M1 A1)
- (c) $P(A \cap B) = 0.3 \times P(B)$. $0.3 + P(B) - 0.3P(B) = 0.7$. $0.7P(B) = 0.4 \Rightarrow P(B) = 4/7$ (M1 M1 A1 A1)
- (d) $P(A \cap B) = 0.3(4/7) = 6/35$. $P(A' \cup B') = 1 - 6/35 = 29/35$ (M1 A1)

(Total for question 3 is 10 marks)

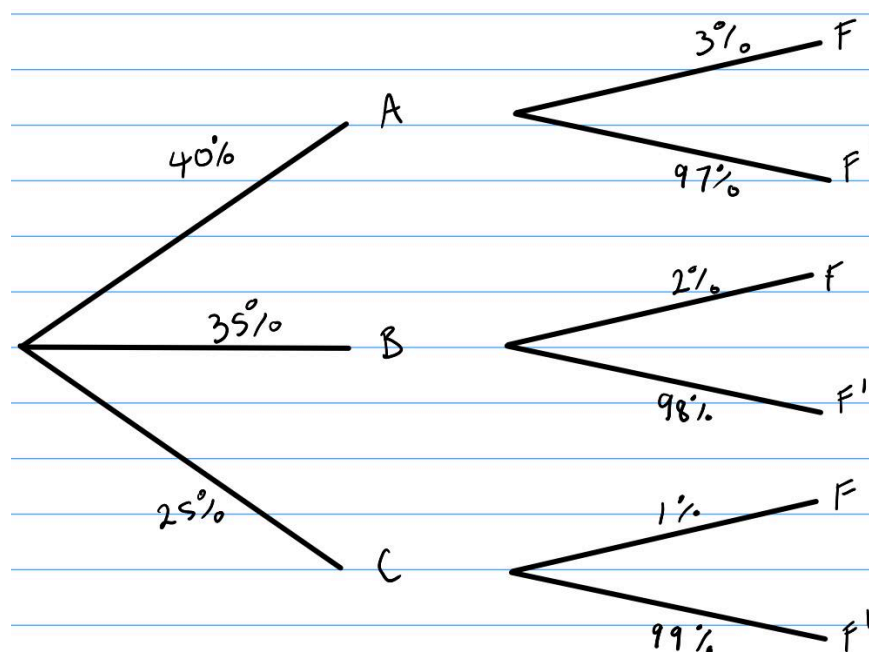
4

- (a) $P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \frac{5}{14} = \frac{1/20}{P(B)} \Rightarrow P(B) = \frac{1}{20} \div \frac{5}{14} = \frac{7}{50}$ (M1 M1 A1)
- (b) $P(A \cup B) = \frac{3}{20} + \frac{7}{50} - \frac{1}{20} = \frac{6}{25}$ (M1 M1 A1)
- (c) $P(B|A') = \frac{P(B \cap A')}{P(A')} = \frac{0.09}{0.85} = \frac{9}{85}$ (M1 M1 A1)

(Total for question 4 is 9 marks)

5

(a)

**B3**

(b) $0.4 \times 0.03 + 0.35 \times 0.02 + 0.25 \times 0.01 = \frac{43}{2000}$ **M1 A1**

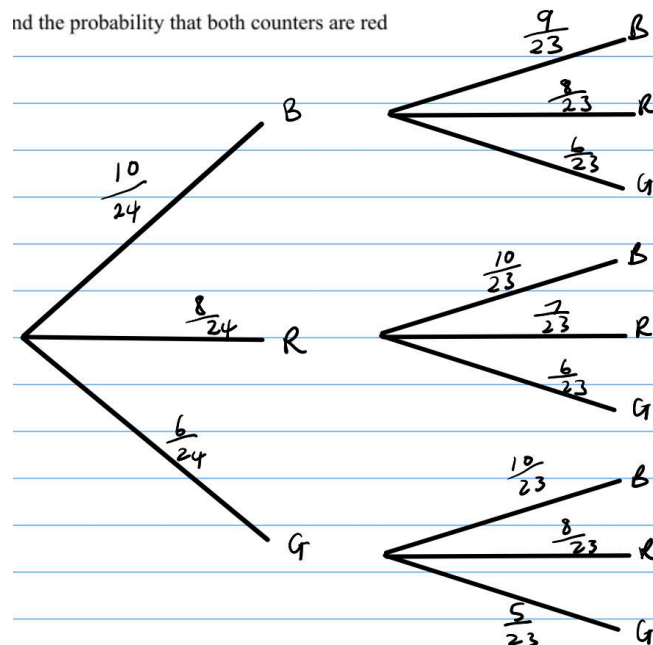
(c) $\frac{0.25 \times 0.01}{43/2000} = \frac{5}{43}$ **M1 M1 A1**

(Total for question 5 is 8 marks)

6

(a)

and the probability that both counters are red



(B3)

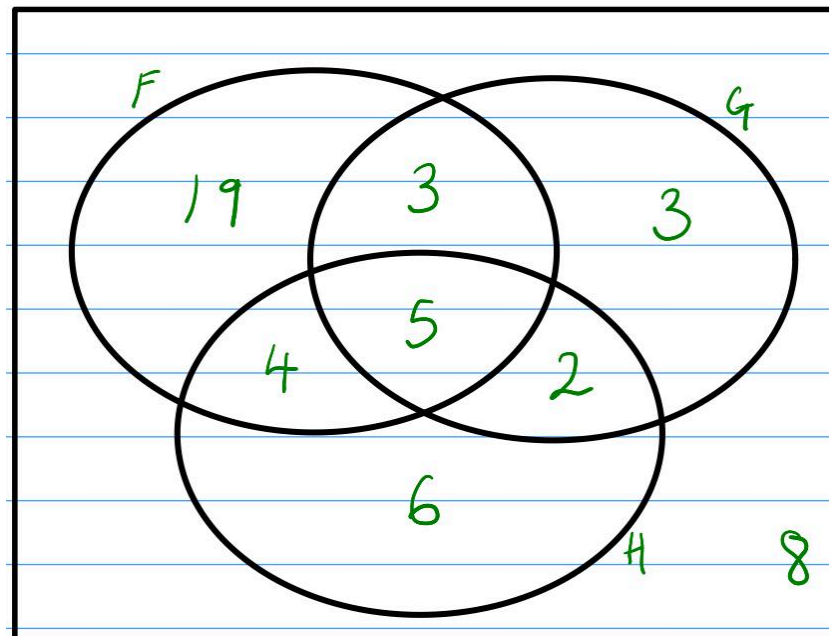
(b) $P(GG) = \frac{6}{24} \times \frac{5}{23} = \frac{5}{92}$ (M1 A1)

(c) $P(\text{At least one red}) = 1 - P(\text{No red}) = 1 - \left(\frac{16}{24} \times \frac{15}{23}\right) = \frac{13}{23}$. $P(RR) = \frac{8}{24} \times \frac{7}{23} = \frac{7}{69}$.
 $\frac{7}{69} \div \frac{13}{23} = \frac{7}{39}$ (M1 M1 A1)

(Total for question 6 is 8 marks)

7

(a)



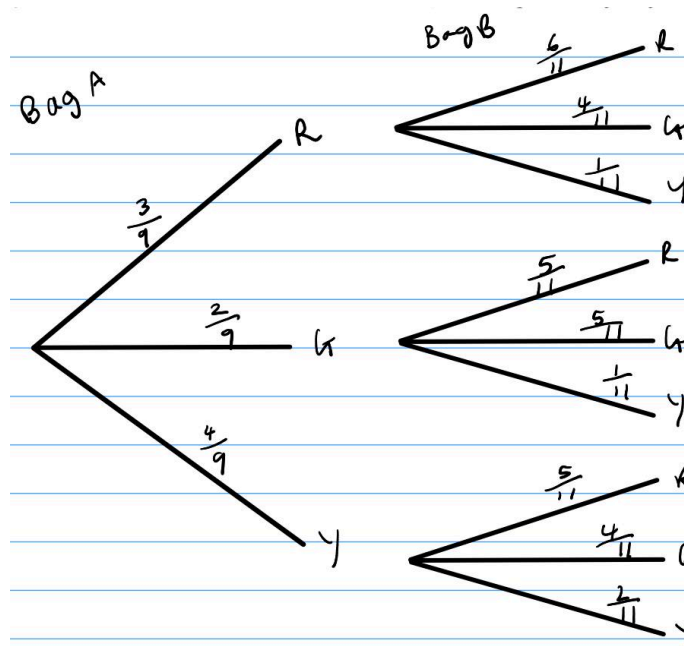
(B3)

(b) Total football = 31. Football and not hockey = $19 + 3 = 22$. Prob = $22/31$ (M1 M1 A1)

(Total for question 7 is 6 marks)

8

(a)



(B2)

$$(b) \quad P(RR) + P(GG) + P(YY) = \frac{3}{9} \times \frac{6}{11} + \frac{2}{9} \times \frac{5}{11} + \frac{4}{9} \times \frac{2}{11} = \frac{4}{11} \quad \text{(M1 A1)}$$

$$(c) \quad P(YY) = 8/99. \quad P(YY|\text{Same}) = \frac{8/99}{4/11} = \frac{2}{9} \quad \text{(M1 A1)}$$

(Total for question 8 is 6 marks)

9

(a) A and C (B1)

$$(b) \quad P(A) = 0.18 + 0.12 = 0.3. \quad 0.3 \times P(B) = 0.12 \Rightarrow P(B) = 0.4. \quad p = 0.4 - 0.12 - 0.04 = 0.24. \quad q = 1 - (0.18 + 0.12 + 0.04 + 0.24) = 0.42 \quad \text{(M1 A1 A1)}$$

(Total for question 9 is 4 marks)

10

(a) A and C (B1)

$$(b) \quad 0.25 = \frac{p}{p+0.3} \Rightarrow 0.25p + 0.075 = p \Rightarrow 0.75p = 0.075 \Rightarrow p = 0.1 \quad \text{(M1 A1)}$$

$$(c) \quad P(A) \times P(B) = P(A \cap B) \Rightarrow (0.08 + q)(0.38 + q + p) = q. \quad \text{With } p = 0.1: (0.08 + q)(0.48 + q) = q. \quad q^2 - 0.44q + 0.0384 = 0 \Rightarrow q = 0.12. \quad r = 1 - (0.08 + 0.12 + 0.38 + 0.1 + 0.3) = 0.02 \quad \text{(M1 M1 A1 A1)}$$

(Total for question 10 is 7 marks)