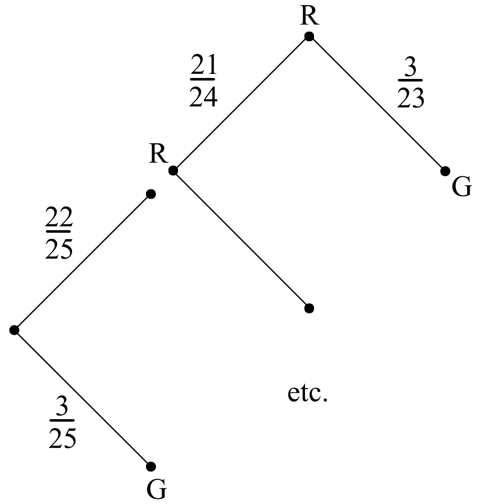
Probability 1 Answers

1) (a) $P = \frac{22}{23}\ \left(= 0.957\ (3\text{ s.f.})\right)$ ***(A2)*** ***(C2)***

(b)



(M1)

OR

$P = P(\text{RRG}) + P(\text{RGR}) + P(\text{GRR})$ ***(M1)***

$\frac{22}{25}\times\frac{21}{24}\times\frac{3}{23}+\frac{22}{25}\times\frac{3}{24}\times\frac{21}{23}+\frac{3}{25}\times\frac{22}{24}\times\frac{21}{23}$ ***(M1)(A1)***

$= \frac{693}{2300}\ \left(= 0.301\ (3\text{ s.f.})\right)$ ***(A1)*** ***(C4)***

[6 marks]

2)

(a) $P(A \cup B) = P(A) + P(B) - P(A \cap B) \Rightarrow P(A \cap B) = P(A) + P(B) - P(A \cup B)$ ***(M1)***

$= \frac{3}{11} + \frac{4}{11} - \frac{6}{11}$ ***(M1)***

$= \frac{1}{11}\ (0.0909)$ ***(A1)*** ***(C3)***

(b) For independent events, $P(A \cap B) = P(A) \times P(B)$ ***(M1)***

$= \frac{3}{11} \times \frac{4}{11}$ ***(A1)***

$= \frac{12}{121}\ (0.0992)$ ***(A1)*** ***(C3)***

[6 marks]

3) (a) Independent (I) ***(C2)***

(b) Mutually exclusive (M) ***(C2)***

(c) Neither (N) ***(C2)***

Note: Award part marks if the candidate shows understanding of I and/or M
e.g. I $P(A \cap B) = P(A)\,P(B)$ ***(M1)***
M $P(A \cup B) = P(A) + P(B)$ ***(M1)***

4) $\mathrm{P}(\mathrm{RR}) = \frac{7}{12} \times \frac{6}{11} \left(= \frac{7}{22} \right)$ *M1 A1*

$\mathrm{P}(\mathrm{YY}) = \frac{5}{12} \times \frac{4}{11} \left(= \frac{5}{33} \right)$ *M1 A1*

$\mathrm{P}(\text{same colour}) = \mathrm{P}(\mathrm{RR}) + \mathrm{P}(\mathrm{YY})$ *(M1)*

$= \frac{31}{66}\ (= 0.470\ 3\ \text{s.f.})$ *A1* *C6*

Note: Award ***C2*** for $\left(\frac{7}{12}\right)^2 + \left(\frac{5}{12}\right)^2 = \frac{74}{144}$.

5) (a) $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$ *(M1)*

$\mathrm{P}(A \cap B) = \frac{1}{2} + \frac{3}{4} - \frac{7}{8}$

$= \frac{3}{8}$ *(A1)* *(C2)*

(b) $\mathrm{P}(A|B) = \frac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)} \left(= \frac{\frac{3}{8}}{\frac{3}{4}} \right)$ *(M1)*

$= \frac{1}{2}$ *(A1)* *(C2)*

(c) Yes, the events are independent *(A1)* *(C1)*

EITHER

$\mathrm{P}(A|B) = \mathrm{P}(A)$ *(R1)* *(C1)*

OR

$\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B)$ *(R1)* *(C1)*

6) (i) (a) AA AB AC BA BB BC CA CB CC *(A1)*

[1 mark]

(b) (i) $\frac{3}{9}$ *(A1)*

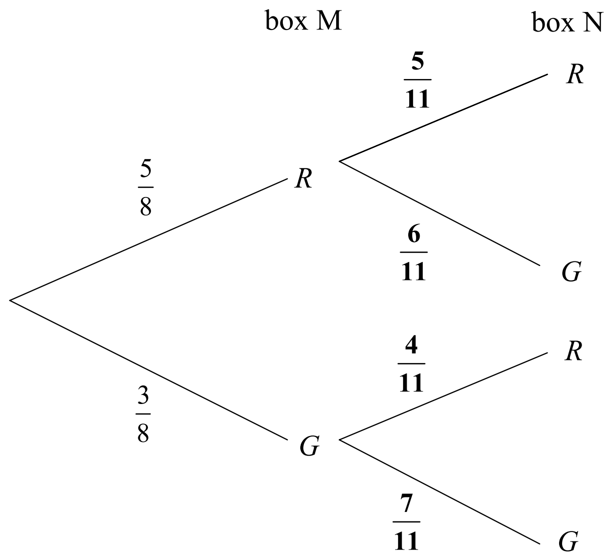
(ii) $\frac{5}{9}$ *(A1)*

(iii) $\frac{1}{9}$ *(A1)*

(iv) $\frac{7}{9}$ *(A1)*

[4 marks]

(ii) (a)



(A1)(A1)(A1)(A1)

[4 marks]

continued...

(b) P(green from box N)

$$= \frac{5}{8} \times \frac{6}{11} + \frac{3}{8} \times \frac{7}{11}$$ *(A1)(A1)*

$$= \frac{51}{88} \ (0.580)$$ *(A1)* *(N2)*

[3 marks]

(c) $$\mathrm{P}(\text{red from M} \mid \text{green from box N}) = \frac{\mathrm{P}(G \cap R)}{\mathrm{P}(G)}$$

$$\mathrm{P}(G \cap R) = \frac{30}{88}$$ *(A1)*

$$\mathrm{P}(G) = \frac{51}{88}$$ *(A1)*

$$\mathrm{P}(\text{red from M} \mid \text{green from box N}) = \frac{\frac{30}{88}}{\frac{51}{88}}$$ *(M1)*

$$= \frac{30}{51} \left(= \frac{10}{17}, 0.588 \right)$$ *(A1)* *(N3)*

[4 marks]

Total [16 marks]