Probability 5D

1 a

Bead 1   Bead 2

$\frac{3}{8}$ Red

$\frac{3}{8}$ Red $\left\langle \begin{array}{l} \frac{3}{8} \text{ Red} \\ \frac{5}{8} \text{ Blue} \end{array} \right.$

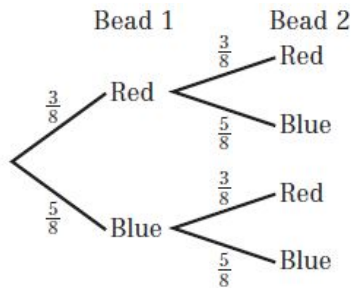$\frac{5}{8}$ Blue $\left\langle \begin{array}{l} \frac{3}{8} \text{ Red} \\ \frac{5}{8} \text{ Blue} \end{array} \right.$
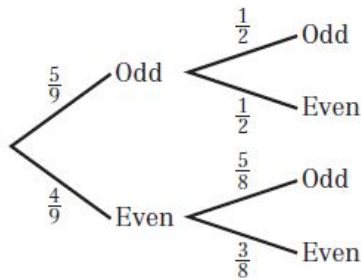
b $P(\text{both blue}) = \frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$

c $P(\text{second blue}) = \frac{3}{8} \times \frac{5}{8} + \frac{5}{8} \times \frac{5}{8} = \frac{5}{8}$
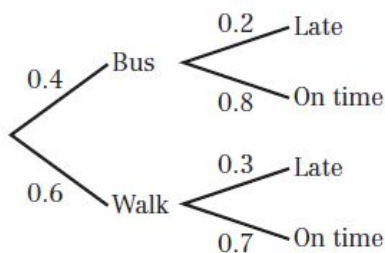
2 a

$\frac{5}{9}$ Odd $\left\langle \begin{array}{l} \frac{1}{2} \text{ Odd} \\ \frac{1}{2} \text{ Even} \end{array} \right.$

$\frac{4}{9}$ Even $\left\langle \begin{array}{l} \frac{5}{8} \text{ Odd} \\ \frac{3}{8} \text{ Even} \end{array} \right.$

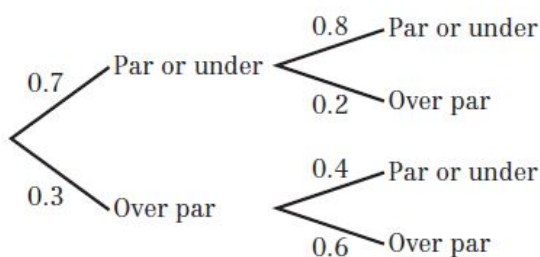**b** $P(\text{both even}) = \frac{4}{9} \times \frac{3}{8} = \frac{12}{72} = \frac{1}{6}$

c $P(\text{different parity}) = P(\text{odd then even}) + P(\text{even then odd}) = \frac{5}{9} \times \frac{1}{2} + \frac{4}{9} \times \frac{5}{8} = \frac{40}{72} = \frac{5}{9}$

3 a

0.4 Bus $\left\langle \begin{array}{l} 0.2 \text{ Late} \\ 0.8 \text{ On time} \end{array} \right.$

0.6 Walk $\left\langle \begin{array}{l} 0.3 \text{ Late} \\ 0.7 \text{ On time} \end{array} \right.$

b $P(\text{late}) = P(\text{bus and late}) + P(\text{walk and late}) = 0.4 \times 0.2 + 0.6 \times 0.3 = 0.26$

4 a

0.7 Par or under $\left\langle \begin{array}{l} 0.8 \text{ Par or under} \\ 0.2 \text{ Over par} \end{array} \right.$

0.3 Over par $\left\langle \begin{array}{l} 0.4 \text{ Par or under} \\ 0.6 \text{ Over par} \end{array} \right.$

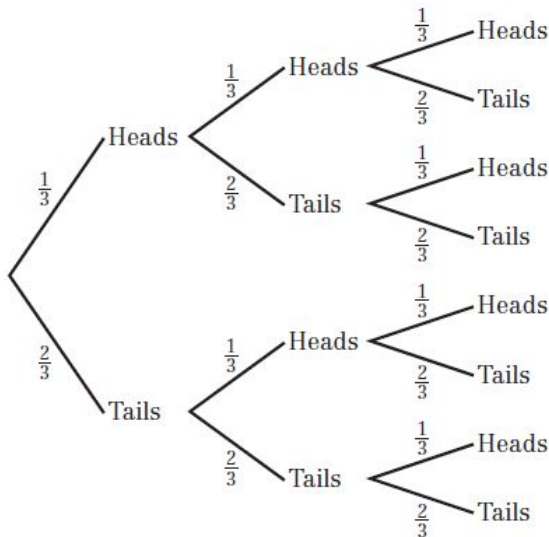**4 b** The events are not independent.

c P(par or under on exactly one hole) = P(par or under then over par) + P(over par then par or under)

= $0.7 \times 0.2 + 0.3 \times 0.4 = 0.26$

5 a

b $P(\text{HHH}) = \dfrac{1}{3} \times \dfrac{1}{3} \times \dfrac{1}{3} = \dfrac{1}{27}$

c $P(\text{one H only}) = P(\text{HTT}) + P(\text{THT}) + P(\text{TTH}) = \dfrac{1}{3} \times \dfrac{2}{3} \times \dfrac{2}{3} + \dfrac{2}{3} \times \dfrac{1}{3} \times \dfrac{2}{3} + \dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{1}{3} = \dfrac{4+4+4}{27} = \dfrac{4}{9}$

d $P(\text{HHH or TTT}) = \dfrac{1}{3} \times \dfrac{1}{3} \times \dfrac{1}{3} + \dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{2}{3} = \dfrac{1+8}{27} = \dfrac{1}{3}$

So P(HHH or TTT in both trials) $= \dfrac{1}{3} \times \dfrac{1}{3} = \dfrac{1}{9}$

6 a P(both yellow) = P(first Y) × P(second Y) = $\dfrac{6}{13} \times \dfrac{5}{12} = \dfrac{30}{156} = \dfrac{5}{26}$

b P(third Y) = $\dfrac{4}{11}$

c P(all different) = $P(BRY) + P(BYR) + P(RYB) + P(RBY) + P(YBR) + P(YRB)$

$= \dfrac{4}{13} \times \dfrac{3}{12} \times \dfrac{6}{11} + \dfrac{4}{13} \times \dfrac{6}{12} \times \dfrac{3}{11} + \dfrac{3}{13} \times \dfrac{6}{12} \times \dfrac{4}{11} + \dfrac{3}{13} \times \dfrac{4}{12} \times \dfrac{6}{11} + \dfrac{6}{13} \times \dfrac{4}{12} \times \dfrac{3}{11} + \dfrac{6}{13} \times \dfrac{3}{12} \times \dfrac{4}{11}$

$= 6 \times \left(\dfrac{4 \times 3 \times 6}{13 \times 12 \times 11} \right) = \dfrac{432}{1716} = \dfrac{36}{143}$