Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- $\frac{1}{2} \times \frac{1}{2}$

$$= \mathbf{\frac{1}{4}}$$

2.2

- with replacement the probabilities are unchanged: $\frac{5}{8} \times \frac{5}{8}$

$$= \mathbf{\frac{25}{64}}$$

2.3

- after one red is removed, 4 reds remain out of 7 counters
- $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$

$$= \mathbf{\frac{5}{14}}$$

2.4

- $6 \times 6 = 36$ equally likely outcomes; a total of 7 comes from 6 of them, $(1,6), (2,5), \ldots, (6,1)$

$$\mathrm{P} = \frac{6}{36} = \mathbf{\frac{1}{6}}$$

2.5

- both: $0.4 \times 0.5 = \mathbf{0.2}$
- neither: $0.6 \times 0.5 = \mathbf{0.3}$

3.1

(a)

- $\frac{7}{12} \times \frac{6}{11}$

$$= \frac{42}{132} = \mathbf{\frac{7}{22}}$$

(b)

- green then yellow: $\frac{7}{12} \times \frac{5}{11} = \frac{35}{132}$
- yellow then green: $\frac{5}{12} \times \frac{7}{11} = \frac{35}{132}$
- there are TWO orders, so add them

$$\frac{70}{132} = \mathbf{\frac{35}{66}}$$

(c)

- "at least one yellow" is the opposite of "both green"

$$1 - \frac{7}{22} = \mathbf{\frac{15}{22}}$$

3.2

- rain then dry: $0.3 \times 0.7 = 0.21$
- dry then rain: $0.7 \times 0.3 = 0.21$

$$0.21 + 0.21 = \mathbf{0.42}$$

- forgetting the second order and answering 0.21 is the standard loss here

3.3

- one order, e.g. red, red, not red: $0.3 \times 0.3 \times 0.7 = 0.063$
- the non-red spin can be first, second or third: 3 orders

$$3 \times 0.063 = \mathbf{0.189}$$

3.4

(a)

- fail, fail, pass: $0.4 \times 0.4 \times 0.6$

$$= \mathbf{0.096}$$

(b)

- $1 - \mathrm{P}(\text{fails all three}) = 1 - 0.4^3$

$$= 1 - 0.064 = \mathbf{0.936}$$

3.5

- same colour: $\mathrm{P}(RR) = \frac{4}{9} \times \frac{3}{8} = \frac{12}{72}$, $\mathrm{P}(BB) = \frac{3}{9} \times \frac{2}{8} = \frac{6}{72}$, $\mathrm{P}(GG) = \frac{2}{9} \times \frac{1}{8} = \frac{2}{72}$
- $\mathrm{P}(\text{same}) = \frac{12 + 6 + 2}{72} = \frac{20}{72}$

$$\mathrm{P}(\text{different}) = 1 - \frac{20}{72} = \frac{52}{72} = \mathbf{\frac{13}{18}}$$