Section 1: Working with probability

Solutions to Exercise level 3

1. (i) P(train not late) = 0.9
P(train not late on four journeys) $= 0.9^4 = 0.6561$
P(at least one train late) = 1 – 0.6561 = 0.3439

(ii) P(train not late on 10 journeys) $= 0.9^{10} = 0.3487$
P(at least one train late) = 1 – 0.3487 = 0.6513 (4 s.f.)

(iii) Assume that the train journey times are independent.

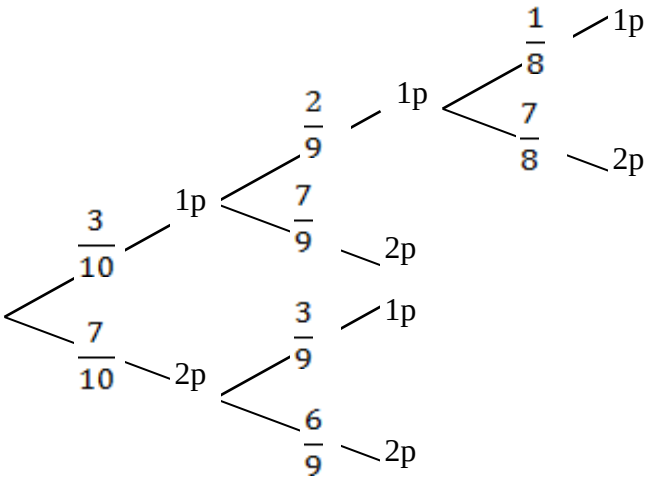
2. (i) P(all different) = P(SFK or SKF or KFS or KSF or FKS or FSK)

$$= \frac{6}{14} \times \frac{5}{13} \times \frac{3}{12} \times 6$$
$$= \frac{45}{182}$$

(ii) P(all the same) = P(SSS) + P(FFF) + P(KKK)

$$= \left(\frac{6}{14} \times \frac{5}{13} \times \frac{4}{12}\right) + \left(\frac{5}{14} \times \frac{4}{13} \times \frac{3}{12}\right) + \left(\frac{3}{14} \times \frac{2}{13} \times \frac{1}{12}\right)$$
$$= \frac{120 + 60 + 6}{2184}$$
$$= \frac{31}{364}$$

3. (i)



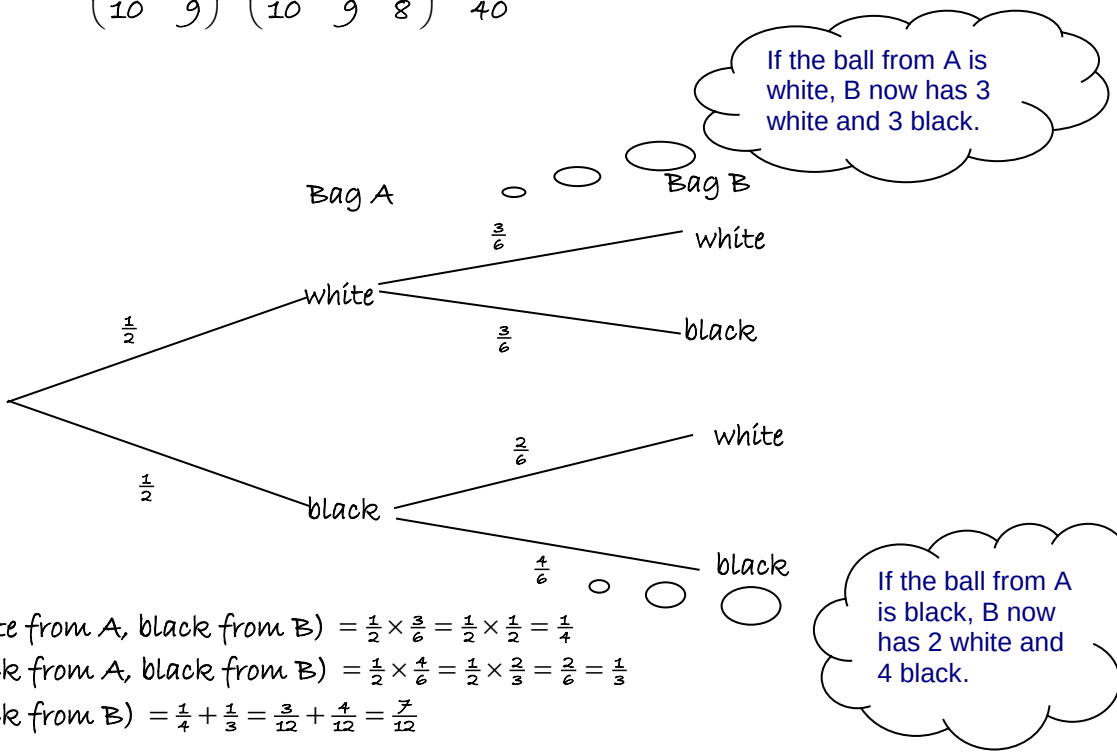
(ii) P(2 coins) = P(1,2) + P(2,1) + P(2,2)

$$= \left(\frac{3}{10} \times \frac{7}{9}\right) + \left(\frac{7}{10} \times \frac{3}{9}\right) + \left(\frac{7}{10} \times \frac{6}{9}\right) = \frac{14}{15}$$

(iii) P(4p total) = P(2,2) + P(1,1,2)

$$= \left(\frac{7}{10} \times \frac{6}{9}\right) + \left(\frac{3}{10} \times \frac{2}{9} \times \frac{7}{8}\right) = \frac{21}{40}$$

4.



P(white from A, black from B) $= \frac{1}{2} \times \frac{3}{6} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

P(black from A, black from B) $= \frac{1}{2} \times \frac{4}{6} = \frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

P(black from B) $= \frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$