

Solutions to Exercises 6

1. Independent/Dependent:

- (a) E and F are **dependent**: Rumour has it that you have to be intelligent to get to University! Someone with a high IQ is more likely to be accepted for a University place than someone with a low IQ.
- (b) A and B are **independent**: There is no reason why a student who plays table tennis should be good or bad at maths.
- (c) E_1 and E_2 are **dependent**: An individual's financial position is likely to affect a bank's decision to extend his overdraft.

2. (a) $P(\text{male and aged } 30\text{--}44) = \frac{20}{200} = 0.1.$

(b) $P(\text{Male}|\text{aged } 30\text{--}44) = \frac{20}{50} = 0.4.$

(c) $P(\text{younger than } 45|\text{Female}) = \frac{40+30}{80} = 0.875.$

3. (a) $P(C) = 0.5.$

(b) $P(\bar{C}) = 1 - P(C) = 0.5.$

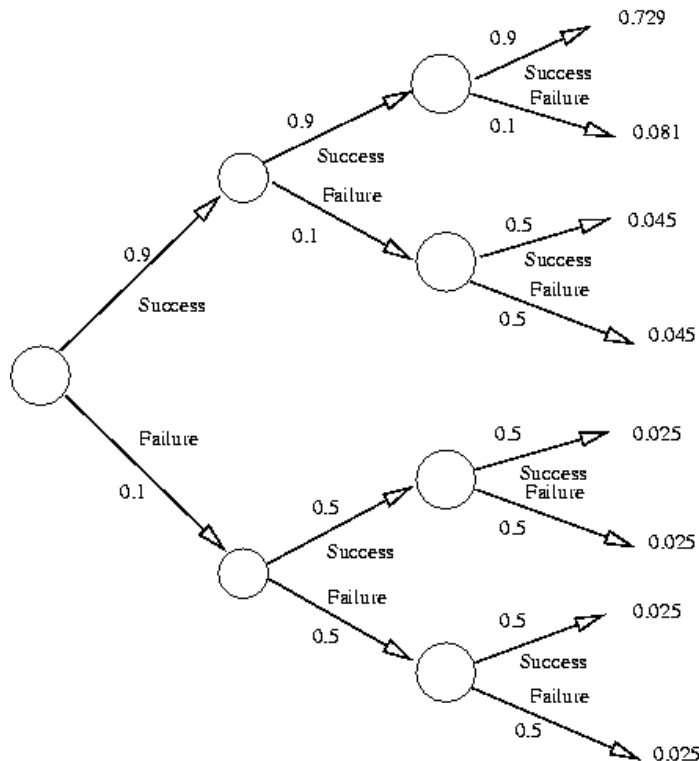
(c) $P(\bar{B}|C) = 1 - P(B|C) = 1 - 0.6 = 0.4.$

(d) $P(\bar{B}|\bar{C}) = 1 - P(B|\bar{C}) = 1 - 0.3 = 0.7.$

(e) $P(C \text{ and } B) = P(C) \times P(B|C) = 0.5 \times 0.6 = 0.3.$

(f) $P(B) = P(C \text{ and } B) + P(\bar{C} \text{ and } B) = 0.5 \times 0.6 + 0.5 \times 0.3 = 0.45.$

4. The probability tree is



Therefore

(a) $P(SSS) = 0.9 \times 0.9 \times 0.9 = 0.729.$

(b) $P(FSS) = 0.1 \times 0.5 \times 0.5 = 0.025.$

(c)

$$\begin{aligned}P(\text{only one } S) &= P(SFF \text{ or } FSF \text{ or } FFS) \\&= 0.9 \times 0.1 \times 0.5 + 0.1 \times 0.5 \times 0.5 + 0.1 \times 0.5 \times 0.5 \\&= 0.045 + 0.025 + 0.025 \\&= 0.095.\end{aligned}$$

(d) $P(FFF) = 0.1 \times 0.5 \times 0.5 = 0.025.$