1. (a) (i) $P(A \cup B) = P(A) + P(B) = 0.7$ A1

(ii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (M1)
$= P(A) + P(B) - P(A)P(B)$ (M1)
$= 0.3 + 0.4 - 0.12 = 0.58$ A1

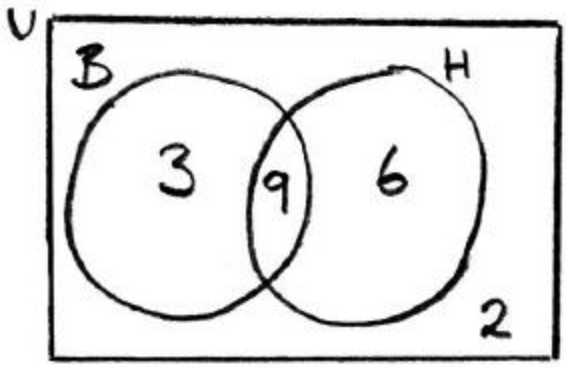
(b) $P(A \cap B) = P(A) + P(B) - P(A \cup B)$
$= 0.3 + 0.4 - 0.6 = 0.1$ A1

$P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$ (M1)

$= \dfrac{0.1}{0.4} = 0.25$ A1

[7]

2. (a)



A1A1

Note: Award A1 for a diagram with two intersecting regions and at least the value of the intersection.

(b) $\dfrac{9}{20}$ A1

(c) $\dfrac{9}{12}\left(=\dfrac{3}{4}\right)$ A1

[4]

3. **EITHER**

Using $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$ (M1)

$0.6P(B) = P(A \cap B)$ A1

Using $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ to obtain
$0.8 = 0.6 + P(B) - P(A \cap B)$ A1

Substituting $0.6P(B) = P(A \cap B)$ into above equation M1

OR

As $P(A \mid B) = P(A)$ then A and B are independent events M1R1

Using $P(A \cup B) = P(A) + P(B) - P(A) \times P(B)$ A1

to obtain $0.8 = 0.6 + P(B) - 0.6 \times P(B)$ A1

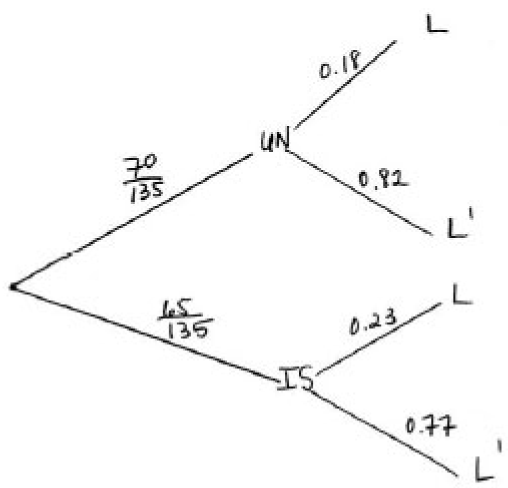
THEN

$0.8 = 0.6 + 0.4P(B)$ A1

$P(B) = 0.5$ A1 N1

[6]

4. **METHOD 1**



(M1)

Let P(I) be the probability of flying IS Air, P(U) be the probability flying UN Air and P(L) be the probability of luggage lost.

$$\mathrm{P}(I \mid L) = \frac{\mathrm{P}(I \cap L)}{\mathrm{P}(L)}$$

$$\left(\text{or Bayes' formula, } \mathrm{P}(I \mid L) = \frac{\mathrm{P}(L \mid I)\mathrm{P}(I)}{\mathrm{P}(L \mid I)\mathrm{P}(I) + \mathrm{P}(L \mid U)\mathrm{P}(U)}\right)$$ (M1)

$$= \frac{0.23 \times \frac{65}{135}}{0.18 \times \frac{70}{135} + 0.23 \times \frac{65}{135}}$$ A1A1A1

$$= \frac{299}{551} \left(= 0.543, \text{accept } 0.542\right)$$ A1

METHOD 2

Expected number of suitcases lost by UN Air is $0.18 \times 70 = 12.6$ M1A1

Expected number of suitcases lost by IS Air is $0.23 \times 65 = 14.95$ A1

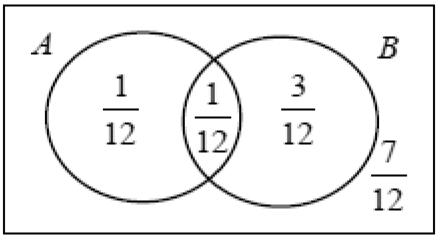
$$\mathrm{P}(I \mid L) = \frac{14.95}{12.6 + 14.95}$$ M1A1

$= 0.543$ A1

[6]

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

$$= \frac{2}{12} + \frac{4}{12} - \frac{5}{12} = \frac{1}{12}$$ A1



M1A1

$$\mathrm{P}(A'/B') = \frac{\mathrm{P}(A' \cap B')}{\mathrm{P}(B')} = \frac{\frac{7}{12}}{\frac{8}{12}} = \frac{7}{8}$$ M1A1

[6]

6. (a) $P(RR) = \left(\frac{2}{5}\right)\left(\frac{1}{4}\right)$ (M1)

$= \frac{1}{10}$ A1 N2

(b) $P(RR) = \frac{4}{4+n} \times \frac{3}{3+n} = \frac{2}{15}$ A1

Forming equation $12 \times 15 = 2(4 + n)(3 + n)$ (M1)

$12 + 7n + n^2 = 90$ A1

$\Rightarrow n^2 + 7n - 78 = 0$ A1

$n = 6$ AG N0

(c) **EITHER**

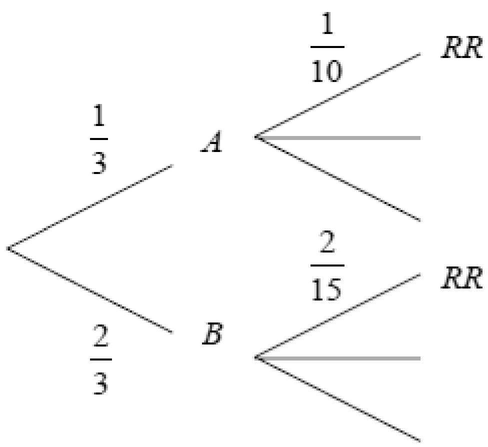
$P(A) = \frac{1}{3}$ $P(B)\frac{2}{3}$ A1

$P(RR) = P(A \cap RR) + P(B \cap RR)$ (M1)

$= \left(\frac{1}{3}\right)\left(\frac{1}{10}\right) + \left(\frac{2}{3}\right)\left(\frac{2}{15}\right)$

$= \frac{11}{90}$ A1 N2

OR



A1

$P(RR) = \frac{1}{3} \times \frac{1}{10} + \frac{2}{3} \times \frac{2}{15}$ M1

$= \frac{11}{90}$ A1 N2

(d) $\text{P}(1\text{or } 6) = \text{P}(A)$ M1

$\text{P}(A \mid RR) = \dfrac{\text{P}(A \cap RR}{\text{P}(RR)}$ (M1)

$= \dfrac{\left[\left(\frac{1}{3}\right)\left(\frac{1}{10}\right)\right]}{\frac{11}{90}}$ M1

$= \dfrac{3}{11}$ A1 N2

[13]