Two four-sided dice are thrown together, and the sum of the numbers shown is recorded.

a) Draw a sample-space diagram showing the possible outcomes.

b) Given that at least one dice lands on a 3, find the probability that the sum on the two dice is exactly 5.

c) State one modelling assumption used in your calculations.

\[
\begin{array}{|c|c|c|c|c|}
\hline
 & 1 & 2 & 3 & 4 \\
\hline
1 & 2 & 3 & 4 & 5 \\
2 & 3 & 4 & 5 & 6 \\
3 & 4 & 5 & 6 & 7 \\
4 & 5 & 6 & 7 & 8 \\
\hline
\end{array}
\]

b/ \[
\begin{array}{|c|c|c|c|}
\hline
 & 1 & 2 & 3 & 4 \\
\hline
1 & & & 4 & \\
2 & & 5 & & \\
3 & 5 & & 6 & 7 \\
4 & & & 7 & \\
\hline
\end{array}
\]

"Either that at least one dice lands on a 3" excludes all possibilities where no 3's are thrown.

\[
\frac{2}{7} \quad \text{two 5's exist}
\]

\[
\text{seven remaining outcomes}
\]

\[
\frac{2}{7} \quad \text{seven remaining outcomes}
\]

\[
\text{The outcome on each dice has an equal probability i.e. the dice is fair.}
\]
A school has 75 students in year 12. Of these students, 25 study only humanities subjects ($H$) and 37 study only science subjects ($S$). 11 students study both science and humanities subjects.

a) Draw a two-way table to show this information.

b) Find:
   i) $P(S' \cap H')$
   ii) $P(S|H)$
   iii) $P(H|S')$

\[
\begin{array}{c|cc}
 & SS & DNSS \\
\hline
SH & 11 & 25 & 36 \\
DNSH & 37 & 2 & 39 \\
\hline
48 & 27 & 75
\end{array}
\]

\[
\begin{array}{c|cc}
 & SS & DNSS \\
\hline
SH & 11 & 25 & 36 \\
DNSH & 37 & 2 & 39 \\
\hline
48 & 27 & 75
\end{array}
\]

\[
P(S' \cap H') = \frac{2}{75}
\]

\[
P(S|H) = \frac{11}{36}
\]

\[
P(H|S') = \frac{25}{27}
\]
Two dice are selected from a bag (without replacement) containing:

- 5 red dice
- 6 blue dice
- 7 green dice

Draw a tree diagram to illustrate the probabilities of the various possible selections.

Find the probability of:

a) Two reds being chosen

$$\frac{5}{18} \times \frac{4}{17} = \frac{20}{306} = \frac{10}{153}$$

b) At least one green being selected

$$\frac{5}{18} \times \frac{7}{17} + \frac{6}{18} \times \frac{7}{17} + \frac{7}{18} \times \frac{6}{17} + \frac{7}{18} \times \frac{5}{17} = \frac{95}{153}$$
Given that the first disc is blue, the second disc is green.

\[
\frac{\frac{3}{17}}{\frac{5}{17} + \frac{6}{17} + \frac{3}{17}} = \frac{7}{17}
\]

Unnecessary, because we knew it added up to 1.

Given that the second disc was blue, find the probability that the first was red.

\[
\frac{\frac{5}{18}}{\frac{5}{18} + \frac{6}{17} + \frac{3}{18}} = \frac{5}{51}
\]

\[
\frac{\frac{6}{18}}{\frac{5}{18} + \frac{6}{17} + \frac{3}{18}} = \frac{6}{51}
\]

\[
\frac{\frac{3}{18}}{\frac{5}{18} + \frac{6}{17} + \frac{3}{18}} = \frac{3}{51}
\]

\[
\frac{\frac{6}{17}}{\frac{5}{18} + \frac{6}{17} + \frac{3}{18}} = \frac{6}{51}
\]

\[
\frac{\frac{7}{18}}{\frac{5}{18} + \frac{6}{17} + \frac{3}{18}} = \frac{7}{51}
\]
We have discounted all outcomes in which the second disc is not blue. To perform this calculation, as before, we should select the desired outcome and divide by how much probability is left.

\[
\frac{5}{51} = \frac{5}{17}
\]

\[
\frac{5}{51} + \frac{5}{51} + \frac{3}{51}
\]