ST3009 Weekly Questions 2

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Question 1

a) Each die can roll 6 different number and we roll 3 die, so the total number of outcomes is 6^3 which is equal to 216.

b) The set of outcomes with at least one 2 rolled is the same as the total set of outcomes minus the all the outcomes with no 2 in them. In terms of probability, it means that the probability of at least one 2, is 1 minus the probability of no 2 rolled: $1 - \frac{5^3}{6^3} = 0.421$

c) The MATLAB simulation gives a similar result

d) There are 3 possibilities for the dice rolls to sum up to 17, there is (6,6,5), (6,5,6) and (5,6,6). So the probability for that is $\frac{3}{216} = 0.013888$

e) If the first roll was a 1, it means that the two other rolls need to add up to 11, and so that gives us (5,6) and (6,5) but this time, out of only 6^2 possibilities, so the probability for that is $\frac{2}{36} = 0.0555$

Question 2

a) The probability for the second roll to be a five is sum of the probability of first rolling a 1 and then a 5 using the 6 sided die, and the probability of rolling anything but a 1 and finally rolling a 5 using the 20 sided die. That is because these two cases are mutually exclusive because of the first roll. So we get:

$$P(Second throw is 5) = \frac{1}{6} \times \frac{1}{6} + \frac{5}{6} \times \frac{1}{20}$$
$$P(Second throw is 5) = 0.0694$$

b) Same process here but since we want the second roll to be equal to 15, only the 20 sided die can achieve such a roll, so the probability to roll 15 if the first roll is 1, is equal to 0 and we can just ignore that probabibility, so we get

$$P(Second throw is 15) = 0 + \frac{5}{6} \times \frac{1}{20}$$
$$P(Second throw is 15) = 0.0416$$