Week 6 Assignment

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Problem Set 1

1) The number of out comes from 3 consecutive die rolls can be expressed as:

$$6^3 = 216$$

Note that this is assuming that the order matters. IE, the set of rolls { 3,6,1 } is one outcome while { 6, 3 ,1 } is another. If an outcome is defined as a sum of the rolls (which it doesn't appear to be in the question), the answer changes.

2) A sum of 3 can be obtained in 2 ways: Die 1 =2 and Die 2 = 1 OR Die 1 = 1 and Die 2 = 2. This probability can be calculated as follows:

$$P(Y == 3) = \left(\frac{1}{6}\right)\left(\frac{1}{6}\right) + \left(\frac{1}{6}\right)\left(\frac{1}{6}\right) = \frac{1}{18} = 0.056$$

3) Let $\bar{p}(n)$ be the probability that all birthdays in the room are distinct.

$$\bar{p}(n) = \left(1 - \frac{1}{365}\right)\left(1 - \frac{2}{365}\right)\left(1 - \frac{3}{365}\right)\ldots\left(1 - \frac{n-1}{365}\right)$$

$$\bar{p}(n) = \frac{365!}{365^n(365-n)!}$$

The probability that there will be a pair of birthdays is the complement:

$$p(n) = 1 - \frac{365!}{365^n(365-n)!}$$

For 25 people:

$$p(25) = 1 - \frac{365!}{365^{25}(365-25)!}$$

$$p(25) = 0.57$$

For 50 people:

$$p(50) = 1 - \frac{365!}{365^{50}(365-50)!}$$

$$p(50) = 0.97$$