2.7 Conditioning

The conditional PMF of the random variable X, conditioned on the event A with $P(A) > 0$ is defined by:

$$p_{X|A}(x|A) = P(X = x|A) = \frac{P(\{x = X\} \cap A)}{P(A)}$$

Show that $p_{X|A}$ is a legitimate PMF. (Expand $P(A)$ using the total probability theorem)

Ex: Let X be the outcome of one roll of a tetrahedral die, and A be the event that we did not get 1.

Ex: Ali will take the motorcycle test again and again until he passes; however, he is only allowed n chances to take the test. Suppose each time Ali takes the test, his probability of passing is p, irrespective of what happened in the previous attempts. What is the PMF of the number of attempts, given that he passes?