Probability and Statistics Notes

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Topic 1: Basic Concepts

Topic 2: Random Variables

A random variable is usually a real value which outcome is determined by the outcome of a experiment

Example: Consider the sample space $S = \{00000, 00001, \ldots, 11111\}$
here the random variable will be called X, and X has the value of the sum of the value of X. so lets say the experiment has the outcome 10101, the value of $X = 3$

in random variables, they will also usually have a range, the range is denoted as R_X for the variable X, the range of a random variable is a set of all possible values of the variable

Exercises 3.2

Find the range for each of the following random variables.

1. I toss a coin 100 times. Let X be the number of heads i observe.

   I observe that there can be 0 of the coins that are heads, while also all coins being heads and any permutation inbetween, so the result would be:

   $R_X = \{0, 1, 2, 3, \ldots, 100\}$

2. I toss a coin until the first heads appears. Let Y be the total number of coin tosses.

   $R_Y = \{1, 2, 3, 4, \ldots, \infty\}$

3. The random variable T is defined as the time (in hours) from now until the next earthquake occurs in a certain city.

   $R_T = \{0, 1, 2, 3, \ldots, \infty\}$

Discrete Random Variables

X is a discrete random variable if its range is countable

Probability Mass Function (PMF)