

5.1: Introduction

A variable or what will be called the random variable from now on, is represented by the letter X and it represents a quantitative (numerical) variable that is measured or observed in an experiment.

A random variable (usually X) is a numeric description of an event. Recall that a sample space is all the possible outcomes and an event is a subset of the sample space.

Usually we use capital letters from the beginning of the alphabet to represent events, A, B, C, etc. We use capital letters from the end of the alphabet to represent random variables, X, Y, and Z. The possible outcomes of X are labeled with a corresponding lower-case letter x and subscripts like x_1 , x_2 , etc.

For instance, if we roll two 6-sided dice the sample space is $S = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), \dots, (6,6)\}$ and the event E the sum of the two rolls is five, then $E = \{(1,4), (2,3), (3,2), (4,1)\}$.

Now, we could define the random variable X to denote the sum of the two rolls, then $X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ and event E corresponds to $x = 5$.

There are different types of quantitative variables, called discrete or continuous. Discrete random variables can only take on particular values in a range. Continuous random variables can take on any value in a range. Discrete random variables usually arise from counting while continuous random variables usually arise from measuring

A **discrete random variable** is a variable that is finite or infinitely countable.

A **continuous random variable** is a variable that has an infinite number of possible values in an interval of numbers.

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