

6.10: Discrete Random Variables (1 of 5)

Learning Objectives

- Distinguish between discrete random variables and continuous random variables.

In our previous discussion of probability distributions, we did not distinguish between probability distributions for categorical and quantitative variables. Our focus was on developing the rules of probability. We looked at the probability distribution for the categorical variable *blood type*. We also looked at the probability distribution for the quantitative variable *number of boreal owl eggs in a nest*. The probability rules apply in both situations.

Now we focus more closely on probability distributions for quantitative variables. These distributions will be very important when we study statistical inference. Examples of such variables are:

- number of boreal owl eggs in a nest
- number of times a college student changes major
- shoe size
- weight of a student
- foot lengths for adults

When the outcomes are quantitative, we call the variable a random variable. In this section, we discuss the probability distributions of discrete random variables and random variables.

Discrete random variables have numeric values that can be listed and often can be counted. For example, the variable *number of boreal owl eggs in a nest* is a discrete random variable. Shoe size is also a discrete random variable. Blood type is not a discrete random variable because it is categorical.

Continuous random variables have numeric values that can be any number in an interval. For example, the (exact) weight of a person is a continuous random variable. Foot length is also a continuous random variable. Continuous random variables are often measurements, such as weight or length. We view measurements as continuous even though the limitations of a ruler or a scale give discrete measurements. For example, imagine weighing yourself on a digital scale that gives weights to the nearest tenth of a pound. You will get measurements that are rounded to the nearest tenth, such as 152.3 or 165.8. Actual weights could theoretically be any value in an interval, such as 152.345612555 or something like that. So with a discrete variable, you can count the possible values for the variable without rounding off. With a continuous variable, you cannot.

Comment

The word *random* here means that the outcomes are uncertain in the short run but have a regular distribution or predictable pattern in the long run. In statistics, we reserve the term *random variable* for quantitative variables. This can be a bit confusing because categorical variables can also describe random outcomes.

Now we investigate the probability distributions for discrete random variables.

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