3.1.2 Discrete Random Variables

There are two important classes of random variables that we discuss in this book: *discrete random variables* and *continuous random variables*. We will discuss discrete random variables in this chapter and continuous random variables in Chapter 4. There will be a third class of random variables that are called *mixed random variables*. Mixed random variables, as the name suggests, can be thought of as mixture of discrete and continuous random variables. We will discuss mixed random variables in Chapter 4 as well.

Remember that a set A is countable if either

- A is a finite set such as $\{1, 2, 3, 4\}$, or
- it can be put in one-to-one correspondence with natural numbers (in this case the set is said to be countably infinite)

In particular, as we discussed in Chapter 1, sets such as $\mathbb{N}, \mathbb{Z}, \mathbb{Q}$ and their subsets are countable, while sets such as nonempty intervals $[a, b]$ in $\mathbb{R}$ are uncountable. A random variable is discrete if its range is a countable set. In Example 3.2, the random variables X and Y are discrete, while the random variable T is not discrete.

X is a discrete random variable, if its range is countable.