Section 1.4 Worksheet

1. Identify each of the following random variables as discrete, continuous, or neither.
   (a) X = the amount of time a person spends waiting for the bus or "N/A" if the person didn't take the bus
   (b) X = the letter grade a student gets in a class
   (c) X = a baseball player's batting average
   (d) X = the number of spades we get when we draw 5 cards from a deck
2. Suppose we choose a letter at random from the word MISSISSIPPI. Let X be the letter we chose. What is the distribution of X?
3. Describe an example of a random variable that has a geometric distribution.
4. Consider an experiment consisting of flipping an unfair coin, which has probability p of coming up heads, until either a head occurs or a total of n flips are made. Let X denote the number of times the coin is flipped.
   (a) What is the distribution function of X?
   (b) What is $P\left(\bigcup_{i=1}^{n}\{X = i\}\right)$?

5. (Extension) Suppose you are at a carnival. After standing suspiciously close to a carnival game, documenting the results of 100 games, you estimate that the probability of gaining or losing money is as shown in the table below.

Outcome ($)	-5	-3	-2	0	1	3	4	6	9
Probability	0.2	0.1	0.05	0.15	0.1	0.2	0.05	0.1	0.05

If they were to let you play the game after all the time you spent obviously counting the outcomes next to the booth, what is the probability you would lose money?

6. Suppose we choose 2 cards from a deck. Let A=1, J=11, Q=12, K=13. Let X be the sum of the "numbers" on the two cards. What is the distribution of X?

Real World Example: Example 1.17 in your book describes a distribution known as Benford's Law. In 2015, computer scientist Jennifer Golbeck found that Benford's Law could be applied to detect fraudulent or suspicious activity on Twitter, by counting the network of individuals' friends. You can read more about it at:

- News article:
`technologyreview.com/s/536906/how-benfords-law-reveals-suspicious-activity-on-twitter`
- Journal article: `https://doi.org/10.1371/journal.pone.0135169`