1. In each of the following situations, describe a sample space S for the random phenomenon.

(a) A basketball player shoots four free throws. You record the sequence of hits and misses.

(b) A basketball player shoots four free throws. You record the number of baskets she makes.

2. In each of the following situations, state whether or not the given assignment of probabilities to individual outcomes is legitimate, that is, satisfies the rules of probability. Remember, a legitimate model need not be a practically reasonable model. If the assignment of probabilities is not legitimate, give specific reasons for your answer.

(a) Roll a six-sided die and record the count of spots on the up-face:

$$P(1) = 0 \quad P(2) = 1/6 \quad P(3) = 1/3$$
$$P(4) = 1/3 \quad P(5) = 1/6 \quad P(6) = 0$$

(b) Deal a card from a shuffled deck:

$$P(\text{Clubs}) = 12/52 \quad P(\text{Diamonds}) = 12/52$$
$$P(\text{Hearts}) = 12/52 \quad P(\text{Spades}) = 16/52$$

(c) Choose a college student at random and record sex and enrollment status:

$$P(\text{Female Full-Time}) = 0.56 \quad P(\text{Male Full-Time}) = 0.44$$
$$P(\text{Female Part-Time}) = 0.24 \quad P(\text{Male Part-Time}) = 0.17$$

3. Canada's national statistics agency, Statistics Canada, says that the land area of Canada is 9,094,000 square kilometers. Of this land, 4,176,000 square kilometers are forested. Choose a square kilometer of land in Canada at random.

(a) What is the probability that the area you choose is forested?

(b) What is the probability that it is not forested?

4. Choose a new car or light truck at random and note its color. Here are the probabilities of the most popular colors for vehicles sold globally in 2010

Color	Silver	Black	White	Gray	Red	Blue	Beige, Brown
Probability	0.26	0.24	0.16	0.16	0.06	0.05	0.03

(a) What is the probability that the vehicle you choose has any color other than those listed?

(b) What is the probability that a randomly chosen vehicle is neither silver nor white?

5. There are many ways to produce crooked dice. To load a die so that 6 comes up too often and 1 (which is opposite 6) comes up too seldom, add a bit of lead to the filling of the spot on the 1 face. If a die is loaded so that 6 comes up with probability 0.2 and the probabilities of the 2, 3, 4, and 5 faces are not affected, what is the assignment of probabilities to the six faces?

6. The U.S. Census Bureau allows each person to choose from a long list of races. That is, in the eyes of the U.S. Census Bureau, you belong to whatever race you say you belong to. "Hispanic/Latino" is a separate category; Hispanics may be of any race. If we choose a resident of the United States at random, the U.S. Census Bureau gives these probabilities:

	Hispanic	**Not Hispanic**
Asian	0.001	0.044
Black	0.006	0.124
White	0.144	0.667
Other	0.005	0.009

(a) Verify that this is a legitimate assignment of probabilities.

(b) What is the probability that a randomly chosen American is Hispanic?

(c) Non-Hispanic whites are the historical majority in the United States. What is the probability that a randomly chosen American is not a member of this group?

7. Choose at random a person aged 15 to 44 years. Ask their age and who they live with (alone, with spouse, with other persons). Here is the probability model for 12 possible answers:

	age 15-19	age 20-24	age 25-34	age 35-44
Alone	0.001	0.011	0.031	0.030
With Spouse	0.001	0.023	0.155	0.216
With Others	0.169	0.132	0.142	0.089

(a) List the outcomes that make up the event

$$A = \{\text{The person chosen is either 15 to 19 years old or lives with others, or both}\}$$

(b) What is $P(A)$? Explain carefully why $P(A)$ is not the sum of the probabilities
$P(\text{The person chosen is either 15 to 19 years old})$ and $P(\text{Lives with others})$

8. Spell-checking software catches "nonword errors" that result in a string of letters that is not a word, as when "the" is typed as "teh." When undergraduates are asked to type a 250-word essay (without spell-checking), the number X of nonword errors has the following distribution:

Value of X	0	1	2	3	4
Probability	0.1	0.2	0.3	0.3	0.1

(a) Is the random variable X discrete or continuous? Why?

(b) Write the event "at least one nonword error" in terms of X. What is the probability of this event?

(c) Describe the event $X \leq 2$ in words. What is its probability? What is the probability that $X < 2$?