**Activity 7.1.1 Sample Spaces**

The sample space of a random process is the set of all possible outcomes. In cases where the outcomes can be listed, we often specify the sample space using set notation as follows:

*S* = {list of outcomes of random process}.

Use set notation to specify the sample spaces for each situation described in questions 1 – 3.

1. a. Roll a die once and record the number of dots on the side that lands face up. 

b. Roll two dice and record the sum of the dots on the sides that land face up. 

2. Record the hair color of the next person who enters the room. (Don’t expect a single correct answer to this question.)

3. A basketball player throws a free throw.

4. Suppose you convince one of your parents to play Mega Millions in hopes of winning the jackpot. If your focus is only on the jackpot, the sample space is *S* = {parent wins jackpot, parent does not win jackpot}. However, there are other prizes your parents might win even if they do not win the jackpot. Expand the sample space to include all the possible amounts they could win. Assume your parents do not pay the extra dollar for Megaplier.

Go to: [www.ctlottery.org/Modules/Games/default.aspx?id=11&accidx=3](http://www.ctlottery.org/Modules/Games/default.aspx?id=11&accidx=3)

Click on Prize Payout Table. (Use the table for without Megaplier.)

5. Suppose a student buys a new cell phone. Before completing the purchase, the student is asked whether or not he/she wants to purchase insurance in case the phone is damaged or stolen within two years of its purchase. Replacing a damaged, lost or stolen phone within this two-year window is really expensive.

This situation involves two random processes:

* The student might or might not buy insurance. We won’t know until the purchase is completed.
* The phone might or might not be damaged or stolen within two years of its purchase. We won’t know the outcome until the two years are up.

Draw a tree diagram showing all possible outcomes (the sample space) of the two random processes. Then express the sample space using set notation.

6. Your mathematics teacher decides to give a pop quiz with three multiple choice questions. For each question a student’s answer is either correct (C) or incorrect (I). Draw a tree diagram to help identify the sample space, the set of all possible outcomes, for this quiz.   
  
Use the notation IIC to represent a quiz for which the answers on the first two questions are incorrect and the answer to the third question is correct.

7. Each year the study *Monitoring the Future: A Continuing Study of American Youth* surveys students on a wide range of topics. Two of the questions were:

* What is your gender?

Male Female

* During an average week, how much do you usually drive a car, truck, or motorcycle?

None 1 to 10 miles 11 to 50 miles 51 to 100 miles more than 100 miles

a. Explain why each student’s responses to each of these survey questions can be viewed as a random process.

b. In questions 5 and 6, you used a tree diagram to identify the sample space of two random processes. In this case, a table provides another useful way to specify all possible outcomes of two random processes. Table 1 gives the results from the 2012 survey given to 12th-grade students.

|  |  |  |
| --- | --- | --- |
| Driving | Female | Male |
| None | 1597 | 1344 |
| 1 – 10 miles | 696 | 611 |
| 11 – 50 miles | 1795 | 1598 |
| 51 – 100 miles | 1254 | 1467 |
| Over 100 miles | 1161 | 1438 |

Table 1. Responses to questions on driving distances and gender.

What is the sample space for this situation?