**Activity 7.3.2: Calculating Probabilities Involving Independent Events**

1. a. In Monopoly, if you roll doubles, you get to roll again. What is the probability that Josh rolls a pair of dice and gets doubles in each of his first two rolls in the game of Monopoly?

b. If you roll doubles three times in a row, you get sent to jail. What is the probability that Josh rolls doubles in each of his first three rolls?

2. In question 4 of Activity 7.3.1, you discovered that when rolling a die, the events *A* = “rolling an even number” and *B* = “rolling a multiple of 3” were independent. Use the Multiplication Rule for Independent Events to show that the complements of these events,  and , are also independent events.

**Independence of Complementary Events**

If events *A* and *B* are independent, then

* events  and  are independent
* events  and  are independent
* events  and  are independent

In question 2 you verified the first of these.

3. In the U.S. people travel to work in many different ways. Table 1 presents a probability model for modes of transportation to work, which is based on data from a Bureau of Transportation survey.

|  |  |
| --- | --- |
| Means of travel | Proability |
| Drives self | 0.77 |
| Carpool | 0.10 |
| Public transportation | 0.05 |
| Walks or bicycles | 0.03 |
| Other | 0.01 |
| Works at home | ? |

Table 1. Probability model for travel to work.

a. What probability should replace “?” in the probability model?

b. What is the probability that a randomly selected worker walks/bikes to work or uses public transportation?

c. What is the probability that a randomly selected worker does not drive him/herself to work?

4. Assume that two U.S. workers, Worker 1 and Worker 2, are randomly selected.

a. Let event *A* be that Worker 1 drives self to work and event *B* be that Worker 2 drives self to work. Explain why events *A* and *B* are independent.

b. is the event that both workers drive themselves to work. Find . Explain how you determined your answer.

c. What is the probability that neither of the workers drives themselves to work?

d. What is the probability that exactly one of the two workers drives self to work?

5. Human blood comes in different types. Each person has a specific ABO type (A, B, AB, and O) and Rh factor (positive or negative). Hence, if you are O+, your ABO type is O and Rh factor is positive. Blood types are not evenly distributed. Table 2 shows the probability distribution of different blood types in the U.S.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | ABO  | type |  |
| Rh factor | A | B | AB | O |
| + | 0.357 | 0.085 | 0.034 | 0.374 |
| - | 0.066 | 0.063 | 0.015 | 0.006 |

Table 2. Probabilities for blood types in U.S.

a. Blood type becomes very important when a blood transfusion is needed. Patients must receive a blood type that is compatible with their own or they might die. Any patient with Rh-positive blood (A+, B+, AB+, or O+) can safely receive a transfusion of type O+ blood. What is the probability that a randomly selected person could receive a transfusion of type O+ blood?

Two people are selected at random.

b. What is the probability that both could receive a transfusion of type O+ blood?

c. What is the probability that neither of them could receive a transfusion of type O+ blood?

d. What is the probability that at least one of them could receive a transfusion of type O+ blood?