Worksheet 9

1. A weather forecaster in Brooklyn reports the following: The probability it will snow today is .7. The probability it will snow tomorrow is .5. The probability it will snow today and tomorrow is .3. The probability it will snow today or tomorrow is .9. Define an appropriate sample space, write these expressions in terms of unions and intersections of subsets of the sample space, and assess if this is a reasonable statement to make.

2. **original** A family has three children. Assume that the probability of each child being a boy or girl is 50% each.

   (a) What is the probability the family has exactly two girls if there is at least one girl?

   (b) What is the probability the family has exactly two girls if the oldest child is a girl?

3. **7.2.29** A group of 6 people are playing a game of "odd person out" to determine who will buy refreshments. Each person flips a fair coin. If there is a person whose outcome is not the same as that of any other member of the group, this person has to buy the refreshments. What is the probability that there is an odd person out after the coins are flipped once?

4. **original** Suppose that 20% of the population of Berkeley eats Smarties candy and 30% of those people get stomach aches after eating them. Suppose that the rate of stomach aches is 10% of the Berkeley population. What is the probability that someone with a stomach ache eats Smarties?

5. **7.2.11** Suppose that E and F are events such that $p(E) = 0.7$ and $p(F) = 0.5$. Show that $p(E \cup F) \geq 0.7$ and $p(E \cap F) \geq 0.2$.

6. **original** Suppose you roll a die 4 times

   (a) Describe the sample space Ω and calculate $|\Omega|$.

   (b) What is the probability that the sum is less than 6?

   (c) What is the probability that you roll at least one 2?

   (d) What is the probability that at least one of these two events happens; namely rolling less than 6 or rolling at least one 2?

7. **7.2.38** A pair of dice is rolled in a remote location and when you ask an honest observer whether at least one die came up six, this honest observer answers in the affirmative.

   (a) What is the probability that the sum of the numbers that came up on the two dice is seven, given the information provided by the honest observer?

   (b) Suppose the honest observer tells us that at least one die came up five. What is the probability the sum of the numbers that came up on the dice is seven?

8. **original challenge**

   (a) How can I replicate a probability of 1/3 by flipping a fair coin repeatedly?

   (b) **mega challenge** How can I replicate any decimal probability between zero and one by flipping a fair coin repeatedly?

Source: Rosen's *Discrete Mathematics and its Applications*.