1. In the Big Game Mega Millions Lottery, players must choose 5 distinct numbers from the numbers 1, 2, . . . , 52 and another “Mega Ball” number from the numbers 1, 2, . . . , 52. To choose the winning numbers, 5 distinct numbers are chosen at random from the numbers 1, 2, . . . , 52, and then the “Mega Ball” number is chosen independently, again from the numbers 1, 2, . . . , 52. Note that the “Mega Ball” number can match one of the other 5 numbers.

   (a) If a player matches all 5 numbers plus the “Mega Ball” number, he wins the jackpot. Compute the probability that this happens. (HINT: First compute the probability that the player matches all 5 numbers, then compute the probability that the player matches the “Mega Ball” number, then multiply the answers since the draws are independent.) ANS:

   (b) If a player matches all 5 numbers but doesn’t match the “Mega Ball” number, he wins $175,000. Compute the probability that this happens. (HINT: First compute the probability that the player matches all 5 numbers, then compute the probability that the player does not match the “Mega Ball” number, then multiply the answers since the draws are independent.)

   (c) If a player matches exactly 4 of the 5 numbers and matches the “Mega Ball” number, he wins $5000. Compute the probability that this happens.

   (d) If a player matches exactly 1 of the 5 numbers and matches the “Mega Ball” number, he wins $3. Compute the probability that this happens.

   (e) If a player matches none of the 5 numbers but matches the “Mega Ball” number, he wins $2. Compute the probability that this happens.

2. In the same setting as Problem 1, a player decides to play the Big Game Lottery every week until he wins the jackpot. Compute the expected number of weeks until his first victory.

3. In the same setting as Problem 1, a player decides to play the Big Game Lottery for 20 weeks. With some work, it is possible to compute that the probability of winning in any way (there are more ways than we looked at in Problem 1) is about 0.0233.

   (a) Compute the probability that the player wins at least once during the 20 weeks.

   (b) Compute the expected number of wins for the player during the 20 weeks.
4. In order to motivate his workers to use good safety practices on the job, a foreman vows that he will not shave as long as the workers have no serious injuries. He believes that each day, independently, there is a 0.005 probability that a worker will have a serious injury. After making this vow, he worries that he may grow a long beard, so he asks his friend, who has taken STT 315, to figure out how long it will be before he can shave.

(a) What is the probability that the foreman gets to shave after only one day?
(b) What is the expected number of days that the foreman has to grow his beard?

5. A shipment of parts contains 50 parts, of which 5 are defective. An inspector is supposed to check all 50 parts, and reject the shipment if any are defective. Being lazy, he decides to choose 10 parts at random and check these 10 parts. If any are defective, he will send back the shipment. If not, he will accept it.

(a) What is the probability that exactly 1 of the 10 parts is defective?
(b) What is the expected number of defective parts in the 10?
(c) What is the probability that the inspector (correctly) sends back the shipment?

6. Problem 3-45 (a, b) from the text.

7. Problem 3-46 (a) from the text.

8. Problem 3-74 from the text.