1. In the expansion of \((3x + y + 2z)^5\) what is the coefficient in front of the term \(xyz^3\)?

2. Let \(N\) be the number of throws of a usual six-sided die that is needed for the sum of the scores on these throws to be at least 3. Find \(P(N = 1), P(N = 2)\) and \(P(N = 3)\).

3. An urn contains 3 balls, one black, one red and one white. Balls are selected with replacement from the urn until at least one black, one red and one white has been seen. Let \(N\) be the number of times a selection is made. Find \(P(N = 4)\).

4. In how many ways can 3 math books, 2 sociology books and 2 history books be arranged on a 3-level bookshelf if the mathematics books must be together and the history books must be together?

5. At a circular table 8 people sit in 8 chairs so that everyone is sitting next to two people. I am one of these people and I sit in my favorite chair. Label the other people A,B,C,D,E,F,G.
   
   (a) How many different ways can these other people sit at the table?
   
   (b) How many different ways can these other people sit at the table if A must sit next to B?
   
   (c) How many different ways can these other people sit at the table if C must not sit next to D?

6. In a 10 digit number each digit is one of the digits 1 to 9. How many such numbers are there if one of the digits occurs exactly 4 times, another of the digits occurs exactly 3 times and there are no other repeats?

7. There are two Urns, Urn A and Urn B. In Urn A there is 1 black ball and 2 white balls. In Urn B there are 2 black balls and 1 white ball. Toss a fair coin. If it is heads select balls with replacement from Urn A until you see a white ball. If it is tails select balls with replacement from Urn B until you see a white ball. Let \(N\) be the number of balls selected. Given that \(N = 5\) what is the chance that the coin is heads?

8. A deck of cards is dealt out. What is the chance that the first ace occurs on the 13th card?

9. Four balls are chosen, without replacement, from an urn that contains 4 red, 5 green, and 7 white balls. Find the probability that at least one ball of each color is chosen.

10. An insurance company classifies people into three classes: low risks, average risks and high risks. People in the low risk category have a probability of 0.05 of having an accident. Those in the average risk category have a probability of 0.1 of having an accident and those in the high risk category have a probability of 0.2 of having an accident. Suppose that 25% of the population is in the low risk category, 60% is in the average risk category and 15% are in the high risk category. Select a person at random. What is the chance that this person has an accident?

11. There are 100 balls and 100 urns. Each ball is placed at random into an urn so that each urn is equally likely to receive that ball. The placement of each ball is independent of the placement of all the other balls. In particular there is no restriction on the number of balls that may be placed in any given urn.
   
   (a) What is the probability that there are exactly two balls placed in the first urn?
   
   (b) What is the probability that there are exactly two balls placed in the first urn and exactly three balls placed in the second urn?
   
   (c) What is the probability that there are exactly two balls placed in the first urn given that there are at least two balls placed in the first urn?