

- (1) A student club has 30 members. Four three person committees have to be chosen. How many possibilities are there if
  - (a) The same person can not serve in the first and second committee (but there are no restrictions about joint membership in other committees)
  - (b) If for each pair of committees there should be a unique person (the liaison) serving on those two committees and each person should serve on exactly two committees.
- (2) A school has 5 classes with 20 students each. How many four different student committees are possible if
  - (a) All students need to be from different classes
  - (b) The students can be chosen from the same class but at least two classes need to be represented?
- (3) Four numbers are chosen from the set  $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$  (the order is important).
  - (a) Find the probability that 2 is chosen.
  - (b) Find the probability that both 2 and 3 are chosen and 2 is chosen before 3 is chosen.
- (4) Ann, Boris, Cecilia, Doug, Elaine, Fatima and Gary are seated randomly at a round table. Find the probability that
  - (a) Boris sits next to either Ann or Cecilia
  - (b) All women sit together.
- (5) 4 balls are chosen at random from a box containing 3 red, 4 blue and 5 green balls. Find the probability that at least one red and at least one blue ball are chosen if the balls are taken
  - (a) without replacement
  - (b) with replacement.
- (6) Among the viewers of a certain TV channel 11 % watch volleyball, 13% watch soccer, 15% watch boxing, 21% watch soccer or volleyball, 5% watch soccer and boxing, 22% watch volleyball or boxing and 28% watch at least one of the above sports. Which percentage of the viewers watches
  - (a) boxing only
  - (b) all three sports.
- (7) A coin is tossed six times.
  - (a) Find the probability that the among first four tosses there will be at least one tail.
  - (b) Find the probability that there will be four heads in a row.

- (8) In bridge a player is dealt 13 cards out of the standard 52 card deck. We call the hand *strong* in a certain suit if the player has both ace and king in that suit.
- (a) Find the probability that the hand is strong in diamonds.
  - (b) Find the probability that the hand is strong in at least one suit.
- (9) There are two coins. The first one is fair while the second lands on head 60 percent of the time. One coin is selected at random and tossed two times.
- (a) Find the probability that 2 heads appear;
  - (b) If two heads had appeared, what is the probability that the next toss will be head?
- (10) To check for a certain illness two tests are used. If the person is ill the first test gives positive result 99% of times but it gives false positive 10% of times. The second test gives positive result 90 % of times when the person is ill and it gives a false positive 3% of times. It is known that 10% of patients have the illness.
- (a) Suppose only one test is performed and comes positive. In which case the patient is more likely to be ill: if they took test 1 or test 2?
  - (b) Suppose that the outcomes of two tests are independent. If both tests come positive how likely the patient to be ill?
- (11) Three balls are drawn from three urns. The first urn contains 1 blue and 5 red balls, the second urn contains 2 blue and 4 red balls, and the third urn contains 3 red and 3 green balls.
- (a) Find the probability that 2 red balls are chosen;
  - (b) Let  $X$  be the number of different colors chosen. Find the probability that  $X = 3$ .