1. A cafeteria offers a three-course meal consisting of an entree, a starch, and a dessert. The possible choices are given in the following table:

Course	Choices
Entree	Chicken or roast beef
Starch	Pasta or rice or potatoes
Dessert	Ice cream or Jello or apple pie or a peach

A person is to choose one course from each category.

(a) How many outcomes are in the sample space?

(b) Let A be the event that ice cream is chosen. How many outcomes are in A?

(c) Let B be the event that chicken is chosen. How many outcomes are in B?

(d) List all the outcomes in the event AB.

(e) Let C be the event that rice is chosen. How many outcomes are in C?

(f) List all the outcomes in the event ABC.

2. A customer at an ice-cream shop will order a vanilla scoop with probability 0.30, strawberry scoop with probability 0.28 and pista scoop with probability 0.35. He will order both vanilla and strawberry with probability 0.19, both strawberry and pista with probability 0.22, both vannila and pista with probability 0.18. He will order all three flavours of ice-creams with probability 0.15. What is the probability that he buys

(a) none of these flavours?

(b) two among these flavours?

3. A deck of cards is dealt out. What is the probability that the 14th card dealt is an ace? What is the probability that the first ace occurs on the 14th card?

4. Let A denote the event that the midtown temperature in Los Angeles is 70°F, and let B denote the event that the midtown temperature in New York is 70°F. Also, let C denote the event that the maximum of the midtown temperatures in New York and in Los Angeles is 70°F. If $P(A) = .3, P(B) = .4$, and $P(C) = .2$, find the probability that the minimum of the two midtown temperatures is 70°F.

5. From an ordinary deck of 52 cards, five cards are randomly drawn. What is the probability that

(a) the fifth drawn card is the first King to be drawn?

(b) all four Kings in the deck are drawn?

6. Urn A contains 3 red and 3 black balls, whereas urn B contains 4 red and 6 black balls. If a ball is randomly selected from each urn, what is the probability that the balls will be the same color?

7. In a state lottery, a player must choose 8 of the numbers from 1 to 40. The lottery commission then performs an experiment that selects 8 of these 40 numbers. Assuming that the choice of the lottery commission is equally likely to be any of the $\binom{40}{8}$ combinations, what is the probability that a player has

(a) all 8 of the numbers selected by the lottery commission?

(b) 7 of the numbers selected by the lottery commission?

(c) at least 6 of the numbers selected by the lottery commission?

8. From a group of 3 first-year students, 4 sophomores, 4 juniors, and 3 seniors, a committee of size 4 is randomly selected. Find the probability that the committee will consist of

(a) 1 from each class;

(b) 2 sophomores and 2 juniors;

(c) only sophomores or juniors.

9. For a finite set A, let $N(A)$ denote the number of elements in A.

(a) Show that

$$N(A \cup B) = N(A) + N(B) - N(AB)$$

(b) More generally, show that

$$N\left(\bigcup_{i=1}^{n} A_i\right) = \sum_i N(A_i) - \sum_{i<j}\sum N(A_iA_j) + \cdots + (-1)^{n+1} N(A_1 \cdots A_n)$$

10. Consider an experiment that consists of 6 horses, numbered 1 through 6, running a race, and suppose that the sample space consists of the 6! possible orders in which the horses finish. Let A be the event that the number-1 horse is among the top three finishers, and let B be the event that the number-2 horse comes in second. How many outcomes are in the event $A \cup B$?

11. Two cards are drawn successively from a deck of 52 cards. Find the probability that the second card is higher in rank than the first card.
Hint: Show that $1 = P(higher) + P(lower) + P(same)$ and use the fact that $P(higher) = P(lower)$.

12. A basketball team consists of 6 frontcourt and 4 backcourt players. If players are divided into roommates at random, what is the probability that there will be exactly two roommate pairs made up of a backcourt and a frontcourt player?