

1. Give the sample space of an experiment that consists of drawing a card from a standard deck and recording its suit.
2. A red die and a blue die are rolled.
 - (a) List the event $A = \{\text{the sum of the numbers on the two dice is odd}\}$.
 - (b) List the event $B = \{\text{the sum is less than five}\}$. Are A and B mutually exclusive?
 - (c) List the outcomes in $A \cap B$.
3. A family has four children.
 - (a) Give an appropriate sample space for this experiment.
 - (b) List the event $B = \{\text{the oldest child is a boy}\}$.
4. Jim has a drawer containing eight blue, five black, and six white socks. If he pulls out two socks at random, what is the probability that Jim will draw a matching pair of socks?
5. A box contains four red, five white, and eight yellow marbles. A marble is drawn.
 - (a) What is the probability that the marble is red?
 - (b) Assuming that the first marble is red and is not replaced, what is the probability that the second marble drawn is red?
 - (c) Assuming that the first marble is not replaced, what is the probability that a red marble is not drawn in neither the first nor second draw?
6. Five coins are tossed. What is the probability that exactly two of them will be heads?
7. The weather forecaster at station WIBV is correct 82% of the time; the forecaster at neighboring station WILA, 65% of the time. What is the probability that on a given occasion, one of the two (or both) will be correct?
8. If Nancy selects a security from a list of three growth stocks, seven income stocks, and five bonds, what is the probability that she will select a bond or a growth stock?
9. A manufacturer of automobiles receives 1000 car radios from each of three different suppliers. Unknown to the manufacturer, there are five defective radios from supplier A, seven from supplier B, and only two from supplier C. As a means of quality control, one radio is selected at random from each of the shipments. What is the probability that
 - (a) All the radios selected are in working order?
 - (b) At least one of the selected radios is defective?
10. A computer from the Electronic Computer company consists of a keyboard, a monitor, a CPU, and a printer. The suppliers for these four units claim to have a percentage-of-defects record of 2.5%, 1%, 4%, and 6%, respectively. What claim of reliability can the Electronic Computer company make, in terms of the percentage of its components that are probably defective?
11. A retailer receives two shipments of TV sets. The first shipment, from company A, is known historically to be 5% defective. The second, from company B, is known to be 3% defective. If one item is selected from each shipment,
 - (a) What is the probability of selecting one good TV and one defective TV?
 - (b) What is the probability of selecting two good TVs?
12. Box A contains three red marbles and two white marbles; box B contains four red marbles and six white marbles; and box C contains three red marbles and seven white marbles. If a box is selected at random and a marble is drawn from this box, what is the probability the marble is red?
13. A new test for Alzheimer's Disease will detect the disease 95% of the time in a person who has Alzheimer's. In addition, the test will falsely detect the disease 15% of the time in a healthy person. If the test is given to a person selected at random from a group of people, 90 of whom are healthy and 10 of whom have Alzheimer's, what is the probability that
 - (a) Alzheimer's will be detected if the person has the disease?
 - (b) Alzheimer's will be falsely detected if the person does not have the disease?
 - (c) the person has Alzheimer's if the test detects the disease?
14. A chef's school is 60% male and 40% female. Seventy percent of the males and 90% of the females like eating crab legs for dinner. What is the probability that a member of this chef's school
 - (a) is male or likes eating crab legs for dinner?
 - (b) is female, given that the member likes eating crab legs for dinner?
15. Doug takes a history quiz and guesses on every question (he forgot to study). The quiz has five questions, and each question has four possible answers. What is the probability that he will get at least three of the five answers correct?
16. At t.u., 35% of the freshmen failed math, 20% failed English, and 10% failed both math and English.
 - (a) What is the probability that a freshman failed exactly one of the courses?
 - (b) If a freshman fail Math, what is the probability that they failed English?
17. Two marbles are selected in succession, without replacement, from a box containing five blue and three green marbles. What is the probability that the second marble is blue, given that the first marble was green?
18. Sixty percent of the toasters in a warehouse come from the Hot-Slice Co., and of those toasters, 3% are defective; 40% come from the Warm Morning Co., and of those 5% are defective. What percentage of the toasters in the warehouse are defective?

19. Twenty people are asked to write down an integer between 1 and 50 (inclusive). Find the probability that
- Everybody wrote down a different number.
 - At least two people wrote down the same number.
20. Fifty people are asked to write down an integer between 1 and 40 (inclusive). Find the probability that at least two people wrote down the same number.

Solutions.

- $S = \{\text{hearts, diamonds, spades, clubs}\}$
- $A = \{(1,2), (2,1), (2,3), (3,2), (3,4), (4,3), (1,4), (4,1), (2,5), (5,2), (1,6), (6,1), (5,4), (4,5), (3,6), (6,3), (5,6), (6,5)\}$
 - $B = \{(1,2), (2,1), (2,2), (1,1), (3,1), (1,3)\}$ — A and B are not mutually exclusive.
 - $A \cap B = \{(1,2), (2,1)\}$
- $S = \{\text{GGGG, GGGB, GGBG, GGBB, ...}\}$. There are $2 * 2 * 2 * 2 = 16$ different elements.
 - $B = \{\text{BGGG, BGGB, BGBG, BGBB, BBGB, BBGG, BBBG, BBBB}\}$
- 0.3099
- $\frac{4}{17} = 0.2353$
 - $\frac{3}{16} = 0.1875$
 - $\frac{13}{17} * \frac{12}{16} = 0.5735$
- 0.3125
- 0.937
- 0.5333
- $\frac{995}{1000} * \frac{993}{1000} * \frac{998}{1000} = 0.9861$
 - $1 - 0.9861 = 0.0139$
- $P(\text{non-defective system}) = 0.975 * 0.99 * 0.96 * 0.94 = 0.8710$
or 87.1% of the systems are not defective. Hence 12.9% of the systems are defective.
- $0.05 * 0.97 + 0.95 * 0.03 = 0.077$
 - $0.97 * 0.95 = 0.9215$
- $\frac{13}{30}$
- 0.95
 - 0.15
 - $\frac{0.1 * 0.95}{0.1 * 0.95 + 0.9 * 0.15} = 0.4130$
- 0.96
 - $\frac{6}{13} = 0.4615$
- 0.1035
- 0.35
 - $\frac{10}{35} = 0.2857$
- $\frac{5}{7}$
- 3.8%
- $\frac{P(50,20)}{50^{20}} = 0.01202$
 - $1 - \frac{P(50,20)}{50^{20}} = 0.98798$
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