

Review Exercises for Probability in Chapter 1
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1. Give the sample space of an experiment that consists of drawing a card from a standard deck and recording its suit.
2. Toss a red die and draw a ball from a box containing 3 green and 5 yellow.
 - (a) List the event $A = \{\text{a green ball is drawn}\}$.
 - (b) List the event $B = \{\text{a three is rolled}\}$.
 - (c) List the outcomes in $A \cap B$.
 - (d) Are A and B mutually exclusive?
3. 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?
4. 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?
5. 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?
6. 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?
7. 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?
8. 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?
9. 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?
10. 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?
11. 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?
12. 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. A student from the school is selected at random.

What is the probability that a member of this chef's school

 - (a) What is the probability that the student is male or likes eating crab legs for dinner?
 - (b) If the student likes eating crab legs for dinner, what is the probability that the student is female?
 - (c) What percentage of the students like eating crab legs for dinner?
13. 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 fails Math, what is the probability that they failed English?
14. 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?
15. 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?

Solutions.

1. $S = \{\text{hearts, diamonds, spades, clubs}\}$
2. (a) $A = \{(1,g), (2,g), (3,g), (4,g), (5,g), (6,g)\}$
(b) $B = \{(3,g), (3,y)\}$
(c) $A \cap B = \{(3,g)\}$
(d) no
3. 0.3099
4. (a) $\frac{4}{17} = 0.2353$
(b) $\frac{3}{16} = 0.1875$
(c) $\frac{13}{17} * \frac{12}{16} = 0.5735$
5. 0.937
6. 0.5333
7. (a) $\frac{995}{1000} * \frac{993}{1000} * \frac{998}{1000} = 0.9861$
(b) $1 - 0.9861 = 0.0139$
8. $P(\text{ non-defective system}) = 0.975 * 0.99 * 0.96 * 0.94 = 0.8710$
or 87.1% of the systems are not defective. Hence 12.9% of the systems are defective.
9. (a) $0.05 * 0.97 + 0.95 * 0.03 = 0.077$
(b) $0.97 * 0.95 = 0.9215$
10. $\frac{13}{30}$
11. (a) 0.95
(b) 0.15
(c) $\frac{0.1*0.95}{0.1*0.95+0.9*0.15} = 0.4130$
12. (a) 0.96
(b) $\frac{6}{13} = 0.4615$
(c) 78%
13. (a) 0.35
(b) $\frac{10}{35} = 0.2857$
14. $\frac{5}{7}$
15. 3.8%