Review Exercises for Chapter 7
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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. A red die and a blue die are rolled.
   (a) List the event $A = \{\text{the sum of the numbers on the}
   \text{two dice is odd}\}$.
   (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 experi-
   ment.
   (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 mar-
bles. 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 ex-
actly 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 ran-
don 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 con-
sists 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 compo-
 nenents 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 give 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 per-
cent 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 proba-
bility that he will get at least three of the five answers
correct?

16. At t.u., 35% of the freshmen failed math, 20% failed En-
    glish, and 10% failed both math and English.
   (a) What is the probability that a freshman failed ex-
       actly 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 replace-
ment, 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 toasterns in a warehouse come from
the Hot-Slice Co., and of those toasterns, 3% are defective;
40% come from the Warm Morning Co., and of those 5%
are defective. What percentage of the toasterns in the
warehouse are defective?
19. Twenty people are asked to write down an integer between 1 and 50 (inclusive). Find the probability that
   (a) Everybody wrote down a different number.
   (b) 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.

1. $S = \{\text{hearts, diamonds, spades, clubs}\}$

2. (a) $A = \{(1,2), (2,1), (2,3), (3,2), (3,4), (4,3), (1,4),
      (4,1), (2,5), (5,2), (1,6), (6,1), (5,4), (4,5), (3,6),
      (6,3), (5,6), (6,5)\}$
   (b) $B = \{(1,2), (2,1), (2,2), (1,1), (3,1), (1,3)\} — A$ and $B$ are not mutually exclusive.
   (c) $A \cap B = \{(1,2), (2,1)\}$

3. (a) $S = \{\text{GGGG, GGGB, GGBG, GGBB, ...}\}$. There are $2 \times 2 \times 2 \times 2 = 16$ different elements.
   (b) $B = \{\text{BGGG, BGGB, BGBG, BGBB, BBGB, BBGG, BBBG, BBBB}\}$

4. 0.3099

5. (a) $\frac{4}{10} = 0.2353$
   (b) $\frac{5}{10} = 0.1875$
   (c) $\frac{4}{17} \times \frac{5}{18} = 0.5735$

6. 0.3125

7. 0.937

8. 0.5333

9. (a) $\frac{995}{1000} \times \frac{994}{1000} \times \frac{998}{1000} = 0.9861$
   (b) $1 - 0.9861 = 0.0139$

10. $P(\text{non-defective system}) = 0.975 \times 0.99 \times 0.96 \times 0.94 = 0.8710$
    or 87.1% of the systems are not defective. Hence 12.9% of the systems are defective.

11. (a) $0.05 \times 0.97 + 0.95 \times 0.03 = 0.077$
    (b) $0.97 \times 0.95 = 0.9215$

12. $\frac{5}{9}$

13. (a) 0.95
   (b) 0.15
   (c) $\frac{0.1 \times 0.25}{0.1 \times 0.25 + 0.9 \times 0.75} = 0.4130$

14. (a) 0.96
    (b) $\frac{6}{13} = 0.4615$

15. 0.1035

16. (a) 0.35
    (b) $\frac{10}{35} = 0.2857$

17. $\frac{5}{7}$

18. 3.8%

19. (a) $\frac{P(50, 20)}{50^{20}} = 0.01202$
    (b) $1 - \frac{P(50, 20)}{50^{20}} = 0.98798$

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