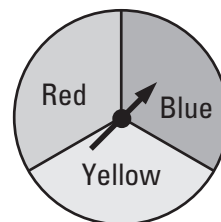
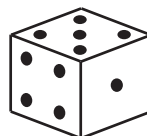


**LESSON  
MASTER****7-1****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Skills** Objective A

In 1–3, consider an experiment in which a 6-sided die is rolled and a spinner with 3 colors—red, blue, and yellow—is spun.



1. Give the experiment's sample space.

\_\_\_\_\_

\_\_\_\_\_

2. List the outcomes in the event “the number rolled is even.”

\_\_\_\_\_

3. List the outcomes in the event “the number rolled is even and the color spun is yellow.”

\_\_\_\_\_

**Skills** Objective B

In 4 and 5, use your results from Exercises 1–3. Find the probability of the given event. Assume the die is fair and the spinner is equally likely to land on any of the three colors.

4. rolling an even number

\_\_\_\_\_

5. rolling an even number and spinning the color yellow

\_\_\_\_\_

**Properties** Objective E

In 6 and 7, consider an experiment whose sample space  $S$  is a set of  $k$  equally likely outcomes and  $E$  is a subset of  $S$ .

6. What is the probability that any given outcome will occur?

\_\_\_\_\_

7. If  $P(E) = \frac{1}{3}$ , how many outcomes are in  $E$ ?

\_\_\_\_\_

**Uses** Objective H

8. Five people—A, B, C, D, and E—apply for two editorial positions at a publishing house. Applicants A and B are left-handed, while C, D, and E are right-handed. Since all applicants are well qualified, they are each equally likely to be hired.

- a. Give the sample space of the hired applicants.

\_\_\_\_\_

- b. Find the probability that one left-handed person and one right-handed person will be hired.

\_\_\_\_\_

**LESSON  
MASTER****7-2****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Skills** Objective B

In 1–5, consider rolling a single fair die. Let  $A$  be the event  $\{1, 2, 3\}$  and  $B$  be the event  $\{2, 4, 5, 6\}$ . Suppose  $\bar{B}$  is the complement of event  $B$ . Find the probability.

1.  $P(A)$       2.  $P(A \cup B)$       3.  $P(A \cap B)$       4.  $P(\bar{B})$       5.  $P(A \cap \bar{B})$

**Properties** Objective E

In 6–8, let  $A$  and  $B$  be two events in a finite sample space. *True or false.*

6. If  $P(A) + P(B) = 1$ , then  $A$  and  $B$  must be complementary. \_\_\_\_\_
7. For all  $A$  and  $B$ ,  $P(A \cap B) + P(A \cup B) = P(A) + P(B)$ . \_\_\_\_\_
8. If  $A$  and  $B$  are complementary, then  $A$  and  $B$  must also be mutually exclusive. \_\_\_\_\_

**Properties** Objective F

In 9–12, *multiple choice*. Consider rolling a fair 6-sided die. Determine whether events  $A$  and  $B$  are (a) complementary, (b) mutually exclusive but not complementary, or (c) neither mutually exclusive nor complementary.

9.  $A$ : rolling a number greater than 2  
     $B$ : rolling a number less than 2  
\_\_\_\_\_
10.  $A$ : rolling a number greater than 3  
     $B$ : rolling a number less than 6  
\_\_\_\_\_
11.  $A$ : rolling a number 4 or greater  
     $B$ : rolling a number 4 or less  
\_\_\_\_\_
12.  $A$ : rolling a number 5 or greater  
     $B$ : rolling a number less than 5  
\_\_\_\_\_

**Uses** Objective H

13. A pre-election poll suggests that the probability that the Republican candidate will win is 0.42, and the probability that the Democratic candidate will win is 0.47. Find the probability that a third-party candidate will win the election. \_\_\_\_\_
14. A survey is conducted to determine the number of households that recycle in a certain city. It is found that 32% recycle aluminum cans, 47% recycle newspaper, and 28% recycle both aluminum cans and newspaper. What is the probability that a household recycles at least one of these resources? \_\_\_\_\_
15. The estimated probability in the year 2000 that a randomly selected U.S. resident is over the age of 18 is about 74.2% and the probability that the person is under the age of 24 is 35.3%. What is the probability that the person is between the ages of 18 and 24? \_\_\_\_\_

**LESSON  
MASTER****7-3****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Skills** Objective B

1. What is the probability of flipping 7 fair coins and getting 7 tails? \_\_\_\_\_

**Skills** Objective C

2. Suppose a bag contains 5 balls numbered 1 through 5.
- In how many ways can you select 5 balls from the bag if you replace the ball after each selection? \_\_\_\_\_
  - In how many ways can you select 5 balls from the bag if there is no replacement after selection? \_\_\_\_\_
  - List one arrangement that you could get from the selection process in part a that you could not get from the selection process in part b. \_\_\_\_\_
3. An octal (base 8) number is a number whose digits can be any of the numbers 0 through 7. In each case, determine how many 4-digit octal numbers are possible.
- The first digit can be 0. \_\_\_\_\_
  - The first digit cannot be 0. \_\_\_\_\_

**Skills** Objective D**In 4–6, evaluate without using a calculator.**

4.  $1!$  \_\_\_\_\_
5.  $\frac{1}{3!}$  \_\_\_\_\_
6.  $\frac{7958!}{7957!}$  \_\_\_\_\_
7. Evaluate  $\frac{117!}{114!}$ . \_\_\_\_\_

**Uses** Objective I

8. The first row of a football team picture includes the eleven starters in the offensive unit, the place kicker, and the coach. The coach stands in the center with six players to his right and six to his left. In how many different ways could the photographer arrange the group with the coach in the center? \_\_\_\_\_
9. Each strand of human DNA consists of millions of nucleotides linked together to form a chain. Each nucleotide contains one of four nitrogenous bases—adenine, guanine, thymine, or cytosine. Sequences of these bases determine our genetic code. How many different possible sequences are there for a segment of DNA 100 nucleotides long? \_\_\_\_\_

**LESSON  
MASTER****7-4****Questions on SPUR Objectives**  
See pages 482–485 for objectives.**Skills** Objective C

1. List all the permutations of all the letters M, I, L, and K.

2. How many permutations are there of all the letters in the English alphabet? \_\_\_\_\_

3. How many permutations consisting of 3 letters each can be formed from the letters of GRAPHIC? \_\_\_\_\_

**Skills** Objective D**In 4–6, evaluate.**

4.  ${}_8P_7$   
\_\_\_\_\_

5.  ${}_{100}P_2$   
\_\_\_\_\_

6.  ${}_{498}P_1$   
\_\_\_\_\_

7. True or false.  ${}_{10}P_5 = {}_5P_{10}$  \_\_\_\_\_

**Skills** Objective G**In 8–13, solve.**

8.  $\frac{x!}{8!} = 90$   
\_\_\_\_\_

9.  $\frac{6}{x!} = \frac{1}{120}$   
\_\_\_\_\_

10.  $\frac{x!}{(x+1)!} = 1$   
\_\_\_\_\_

11.  $\frac{x!}{x} = (x-1)!$   
\_\_\_\_\_

12.  ${}_nP_8 = 13 \cdot {}_nP_7$   
\_\_\_\_\_

13.  ${}_nP_6 = 90 \cdot {}_nP_4$   
\_\_\_\_\_

**Uses** Objective I

14. A researcher conducted an opinion poll in which he asked people to rank their top 5 preferences for mayor from a list of 20 potential candidates. How many such rankings are possible? \_\_\_\_\_

15. How many ways can 120 passengers be seated in an airplane with 150 seats? \_\_\_\_\_

**LESSON  
MASTER****7-5****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Properties** Objective E

1. Prove: If  $A$  and  $B$  are independent events in a finite sample space, then  $P(A \cup B) = P(A) + P(B) - P(A)P(B)$ .

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2. *True or false.* Mutually exclusive events are never independent. Justify your answer.

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**Properties** Objective F

In 5–7, consider the experiment of rolling two fair dice. Determine whether or not the two given events  $A$  and  $B$  are *independent* or *dependent*. Use the sample space shown on page 427 of your textbook if necessary.

5.  $A$ : rolling a sum of 7  
 $B$ : rolling an even number on the second die

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6.  $A$ : rolling doubles  
 $B$ : rolling a 3 on the first die

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7.  $A$ : rolling doubles  
 $B$ : rolling a 3 on either die

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**Uses** Objective H

8. During the 1996–97 season, Michael Jordan made 83.3% of the free throws he attempted. Assume independence of free-throw attempts and find the probability that MJ would
- make two of two free throws.
  - miss two of two free throws.
  - make at least one of two free throws.
9. Suppose a car manufacturer knows that the probability that a defect will cause an accident is 0.01 and that the probability an accident will be caused by human error is 0.50. If the probability that an accident is caused by human error *and* a defect is 0.05, are the events independent? Justify your answer.

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**LESSON  
MASTER****7-6****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Representations** Objective L

1. *Multiple choice.* In which table is  $P$  not a probability distribution? \_\_\_\_\_

(a) $x$	1	2	3
$P(x)$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

(b) $x$	1	2	3
$P(x)$	$\frac{1}{2}$	$\frac{1}{2}$	0

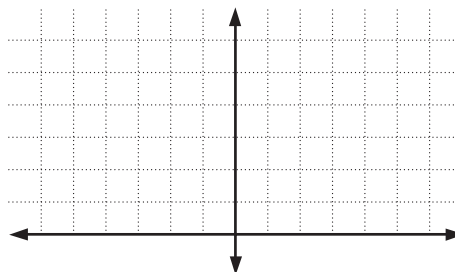
(c) $x$	1	2	3
$P(x)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{3}$

(d) $x$	1	2	3
$P(x)$	$\frac{3}{8}$	$\frac{7}{24}$	$\frac{1}{3}$

2. A researcher collects the following data about the incubation time of a certain disease.

$x = \text{Number of days}$	1	2	3	4	5	6	7
$P(x)$	$\frac{1}{14}$	$\frac{3}{28}$	$\frac{3}{14}$	$\frac{1}{28}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$

- a. What is the random variable? \_\_\_\_\_
- b. Find the mean incubation time. \_\_\_\_\_
3. Consider the experiment of rolling two fair 6-sided dice.
- a. Construct a probability distribution table in which the value of the random variable is calculated by subtracting the value showing on the second die from the value showing on the first die.
- b. Graph the distribution in part a as a scatterplot.
- c. Find the expected value of the probability distribution.  
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**LESSON  
MASTER****Questions on SPUR Objectives**  
See pages 482–485 for objectives.

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**Vocabulary**

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1. What is a Monte Carlo method?

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**Uses Objective J**

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2. Suppose a basketball player makes free-throw shots  $\frac{5}{6}$  of the time.
- a. Design a simulation using a fair 6-sided die which will estimate the probability that the basketball player will make at least 2 free throws in 3 attempts. Be sure to define a trial.

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- b. Use 25 trials to calculate the estimated probability of making at least 2 of 3 free throws. \_\_\_\_\_
- c. The actual probability of making at least 2 free throws in 3 attempts is about 0.93. How could you increase the accuracy of your estimation?

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3. A conservationist is attempting to repopulate a lake with trout. Each fish released has a 0.4 chance of surviving. Five fish are released at a time.
- a. Use the Table of Random Numbers in the Appendix of your textbook to design a simulation to estimate the probability that all 5 fish in a release will survive. Be sure to define a trial.

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- b. Use 50 trials to estimate the probability that all 5 fish in a release will survive. (The actual probability is close to 0.01.) \_\_\_\_\_

**LESSON  
MASTER****7-8****Questions on SPUR Objectives**

See pages 482–485 for objectives.

**Uses** Objective K

1. A college has places for 225 entering freshmen. The dean of admissions has statistics that show that about 32% of those students offered admission will choose to not enroll. To compensate for this, the dean offers admission to 310 students.

- a. Design a simulation using a computer or calculator to estimate the probability that more than 225 students will try to enroll.

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- b. Run your simulation and record the estimated probability.

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2. Estimate the area under the curve  $y = x^3$  between  $x = 0$  and  $x = 1$ .

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3. Estimate the area under the graph of  $y = \cos x$  between 0 and  $\frac{\pi}{4}$ .

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4. A pharmaceutical company reported that 83% of people afflicted with the flu recover within one week when given a certain antibiotic. A doctor is currently treating 63 of his patients with this drug.

- a. Design a simulation using a calculator or computer to estimate the average number of the doctor's patients who will recover within one week of taking the antibiotic.

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- b. Run your simulation and record the estimate.

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