11 CHAPTER REVIEW

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- Multi-Language Glossary
- Vocabulary Practice

REVIEW KEY VOCABULARY

- outcome, event
- sample space
- probability of an event
- theoretical, experimental probability
- odds in favor, odds against
- permutation
- *n* factorial
- combination
- compound events
- overlapping events
- disjoint or mutually exclusive events
- independent events
- dependent events
- conditional probability

VOCABULARY EXERCISES

Copy and complete the statement.

1. An event that combines two or more events is a(n) ___?___.
2. A possible result of an experiment is a(n) ___?___.
3. **WRITING** *Compare* theoretical probability and experimental probability.

REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of this chapter.

11.1 Find Probabilities and Odds

EXAMPLE

A bag contains 15 red checkers and 15 black checkers. You choose a checker at random. Find the probability that you choose a black checker.

$$P(\text{black checker}) = \frac{\text{Number of black checkers}}{\text{Total number of checkers}} = \frac{15}{30} = \frac{1}{2}$$

EXERCISES

EXAMPLE 2 for Exs. 4–5

4. **CHECKERS** In the example above, suppose an extra red checker is added to the bag. Find the probability of randomly choosing a black checker.
5. **BAG OF LETTERS** A bag contains tiles. Each tile has one letter from the word HAPPINESS on it. You choose a tile at random. What is the probability that you choose a tile with the letter S?

11.2 Find Probabilities Using Permutations

EXAMPLE

You need to enter a 4 digit code in order to enter the building where you work. The digits are 4 different numbers from 1 to 5. You forgot the code and try to guess it. Find the probability that you guess correctly.

STEP 1 **Write** the number of possible outcomes as the number of permutations of 4 out of the 5 possible digits. This is ${}_5P_4$.

$${}_5P_4 = \frac{5!}{(5-4)!} = \frac{5!}{1!} = 5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

STEP 2 **Find** the probability. Because only one of the permutations is the correct code, the probability that you guess the correct code is $\frac{1}{120}$.

EXERCISES

EXAMPLE 2 for Exs. 6–10

Evaluate the expression.

6. ${}_7P_6$ **7.** ${}_6P_2$ **8.** ${}_8P_5$ **9.** ${}_{13}P_{10}$

10. MUSIC You downloaded 6 songs. You randomly choose 4 of these songs to play. Find the probability that you play the first 4 songs you downloaded in the order in which you downloaded them.

11.3 Find Probabilities Using Combinations

EXAMPLE

For your government class, you must choose 3 states in the United States to research. You may choose your states from the 6 New England states. How many combinations of states are possible?

The order in which you choose the states is not important. So, to find the number of combinations of 6 states taken 3 at a time, find ${}_6C_3$.

$${}_6C_3 = \frac{6!}{(6-3)! \cdot 3!}$$ Combinations formula

$$= \frac{6 \cdot 5 \cdot 4 \cdot \cancel{3!}}{\cancel{3!} \cdot (3 \cdot 2 \cdot 1)}$$ Expand factorials. Divide out common factor, 3!.

$$= 20$$ Simplify.

EXERCISES

EXAMPLE 2 for Exs. 11–15

Evaluate the expression.

11. ${}_7C_6$ **12.** ${}_6C_2$ **13.** ${}_8C_5$ **14.** ${}_{13}C_{10}$

15. TICKETS You win 5 tickets to a concert. In how many ways can you choose 4 friends out of a group of 9 to take with you to the concert?

11 CHAPTER REVIEW

11.4 Probabilities of Disjoint and Overlapping Events

EXAMPLE

Let A and B be events such that $P(A) = \frac{2}{3}$, $P(B) = \frac{1}{2}$, and $P(A \text{ and } B) = \frac{1}{3}$. Find $P(A \text{ or } B)$.

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = \frac{2}{3} + \frac{1}{2} - \frac{1}{3} = \frac{5}{6}$$

EXAMPLES 2 and 4 for Exs. 16–18

EXERCISES

Let A and B be events such that $P(A) = 0.32$, $P(B) = 0.48$, and $P(A \text{ and } B) = 0.12$. Find the indicated probability.

16. $P(A \text{ or } B)$ **17.** $P(\overline{A})$ **18.** $P(\overline{B})$

11.5 Probabilities of Independent and Dependent Events

EXAMPLE

Find the probability of selecting a club and then another club from a standard deck of 52 cards if (a) you replace the first card before selecting the second, and (b) you do *not* replace the first card.

Let event A be "the first card is a club" and B be "the second card is a club."

a. $P(A \text{ and } B) = P(A) \cdot P(B) = \frac{13}{52} \cdot \frac{13}{52} = \frac{1}{16} = 0.0625$

b. $P(A \text{ and } B) = P(A) \cdot P(B|A) = \frac{13}{52} \cdot \frac{12}{51} = \frac{1}{17} \approx 0.0588$

EXAMPLE 5 for Exs. 19–21

EXERCISES

Find the probability of randomly selecting the given marbles from a bag of 5 red, 8 green, and 3 blue marbles if (a) you replace the first marble before drawing the second and (b) you do *not* replace the first marble.

19. red, then green **20.** blue, then red **21.** green, then green