REVIEW KEY VOCABULARY

- combination
- Pascal's triangle
- binomial theorem
- random variable
- probability distribution
- binomial distribution
- binomial experiment
- symmetric
- skewed

- normal distribution
- normal curve
- standard normal distribution
- z-score
- population
- sample
- unbiased sample
- biased sample
- margin of error

- biased questions
- experiment
- observational study
- controlled experiment
- control group
- treatment group
- randomized comparative experiment

VOCABULARY EXERCISES

1. Copy and complete: A(n) __?__ is a selection of r objects from a group of n objects where the order of the objects selected is not important.

2. In a controlled experiment, two groups are studied under identical conditions with the exception of one variable. The group under ordinary conditions is the __?__ .

3. Copy and complete: The __?__ for an x-value from a normal distribution represents the number of standard deviations the x-value lies above or below the mean.

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.

6.1 Use Combinations and the Binomial Theorem

EXAMPLE

Use the binomial theorem to expand $(x + 5y)^4$.

$$(x + 5y)^4 = {}_4C_0 x^4(5y)^0 + {}_4C_1 x^3(5y)^1 + {}_4C_2 x^2(5y)^2 + {}_4C_3 x^1(5y)^3 + {}_4C_4 x^0(5y)^4$$

$$= (1)(x^4)(1) + (4)(x^3)(5y) + (6)(x^2)(25y^2) + (4)(x)(125y^3) + (1)(1)(625y^4)$$

$$= x^4 + 20x^3y + 150x^2y^2 + 500xy^3 + 625y^4$$

EXERCISES

EXAMPLES 3, 5, and 6 for Exs. 10–14

Use the binomial theorem to write the binomial expansion.

1. $(t + 3)^6$
2. $(2a + b^2)^4$
3. $(w - 8v)^4$
4. $(r^3 - 4s)^5$

5. **ICE CREAM** An ice cream vendor sells 15 flavors of ice cream. You want to sample *at least* 4 of the flavors. How many different combinations of ice cream flavors can you sample?

6.2 Construct and Interpret Binomial Distributions

EXAMPLE

Find the probability of tossing a coin 12 times and getting exactly 4 heads.

$$P(k = 4) = {}_nC_k\, p^k(1 - p)^{n - k} = {}_{12}C_4(0.5)^4(1 - 0.5)^8 = 495(0.5)^4(0.5)^8 \approx 0.121$$

EXERCISES

EXAMPLE 3
for Exs. 26–29

Find the probability of tossing a coin 8 times and getting the given number of heads.

  6. 6   **7.** 4   **8.** 7   **9.** 0

6.3 Use Normal Distributions

EXAMPLE

A normal distribution has a mean of 76 and a standard deviation of 9. Use the standard normal table in the lesson to find the probability that a randomly selected x-value from the distribution is at most 64.

$$z = \frac{x - \overline{x}}{\sigma} = \frac{64 - 76}{9} \approx -1.3 \qquad \textbf{Find z-score for x = 64.}$$

$$P(x \le 64) \approx P(z \le -1.3) = 0.0968 \qquad \textbf{Use the standard normal table.}$$

EXERCISES

EXAMPLE 3
for Exs. 12–17

A normal distribution has a mean of 95 and a standard deviation of 7. Use the standard normal table in the lesson to find the indicated probability for a randomly selected x-value from the distribution.

  10. $P(x \le 89)$ **11.** $P(x \le 84)$ **12.** $P(91 < x \le 100)$

  13. $P(x \le 50)$ **14.** $P(x > 100)$ **15.** $P(50 < x \le 80)$

6.4 Select and Draw Conclusions from Samples

EXAMPLE

In a survey of 582 people, 57% said that summer is their favorite season. What is the margin of error for the survey?

$$\text{Margin of error} = \pm\frac{1}{\sqrt{n}} = \pm\frac{1}{\sqrt{582}} \approx \pm0.041 = \pm4.1\%$$

EXERCISES

EXAMPLE 4
for Exs. 18–22

Find the margin of error for a survey that has the given sample size. Round your answer to the nearest tenth of a percent.

  16. 300   **17.** 2500   **18.** 800   **19.** 4900

  20. **SURVEYS** In a Gallup Youth Survey of 517 teenagers, 34% said that their favorite way to spend an evening was to hang out with family or friends. What is the margin of error for the survey?

6.5 Compare Surveys, Experiments, and Observational Studies

EXAMPLE

Determine whether the study described in the news bulletin below is a randomized comparative experiment. If it is, describe the treatment, the treatment group, and the control group. If it is not, explain why not and discuss whether the conclusions drawn from the study are valid.

Aural Anomaly! Headphones Hurt Hearing

A study of 100 college and high school students compared their time spent listening to music using headphones with hearing loss. Twelve percent of people who listened to headphones more than 1 hour per day were found to have measurable hearing loss over the course of the three-year study. The study is not a randomized comparative experiment because the individuals were not randomly assigned to a control group and a treatment group. The study is an observational study, because no treatment was imposed. The study's conclusion that headphone use impairs hearing ability may or may not be valid. People who listen to over an hour of music per day may be more likely to attend loud concerts that are known to affect hearing.

EXERCISES

EXAMPLE 2
for Exs. 21–23

Decide whether the following are examples of observational studies, surveys, or randomized controlled experiments.

21. Preparing for an employee appreciation dinner, a human resources representative asks people to name their favorite type of sandwich bread.

22. A market researcher tracks customer data to find out which type of sandwich bread attracts the most repeat customers.

23. Various types of batteries each run a flashlight constantly until the light goes off.

24. An apple grower concerned about the of effect the orchard's new canning plant may have on the business compares the number of apples produced in each tree with the tree's distance from the canning plant.