E Chapter 6 Exercises

Properties of Normal Distributions

Complete each statement.

1. A normal curve is single-peaked, which tells us that it has _____ mode(s). (State the number of modes.)
2. A normal curve is symmetric about its mean, which tells us that the value of the mean equals the value of the _____ and equals the value of the _____.
3. A normal curve is _____-shaped.
4. You can completely describe a normal distribution by two numbers, the _____ and the _____.
5. The total area under a normal curve equals _____. (State the numerical value.)

Probability, Area, and Standard Scores for Normal Distributions

Complete each exercise. Round your answer to two decimal places for a percentage and four decimal places for a probability.

6. What percentage of the values in a normal distribution is more than one standard deviation away from the mean?
7. What percentage of the values in a normal distribution is greater than the mean but less than two standard deviations above the mean?
8. What is the probability that a single value from a normal distribution is greater than three standard deviations above the mean?
9. What is the area under the curve of a normal distribution between one and three standard deviations below the mean?
10. What is the relative frequency of the data greater than two standard deviations above the mean of a normal distribution?
11. What percentage of the data values in a normal distribution is less than the first quartile?
12. Kanuk, the polar bear, is pregnant. If gestation periods for polar bears are normally distributed with a mean of 32.0 weeks and a standard deviation of 1.5 weeks, then what is the likelihood that Kanuk's baby will be born before 30 weeks?
13. A local pizza parlor offers a free pizza if it is not delivered in 30 minutes or less. The mean time between ordering and delivery is 24.0 minutes with a standard deviation of 3.0 minutes, and the times are normally distributed. What percentage of the pizzas will be given away?
14. Candy was surprised when the doctor told her that her baby's weight was in the 85^{th} percentile. If babies' weights are normally distributed, which of the following would be a reasonable standard score for her baby's weight?

    a. 85

    b. –2.75

    c. 1.04

    d. 0

    e. Not enough information

15. Suppose you are told that your Body Mass Index (BMI) was below the first quartile. If BMI scores are normally distributed, which of the following would be a reasonable standard score for your BMI?

a. 0

b. –2.45

c. 2.45

d. Not enough information

16. The following table gives values for four normal distributions. Find the missing value in each row of the table.

	μ	σ	x	$P(X \leq x)$
a.	22.0	1.8	24.0	
b.		0.24	116.00	0.3228
c.	0.46		0.72	0.85
d.	1052	66		0.1131

17. The following table gives values for four normal distributions. Find the missing values in each row of the table.

	μ	σ	Q_1	Q_3
a.	15.0	2.1		
b.		200	3300	
c.			55.0	85.0
d.	1.8			2.2

18. The US Department of Labor reports that in 2018, adults aged 20-24 years worked an average of 34.8 hours per week. Do you think that this variable could be represented by a normal distribution? If the distribution is not actually normal, how would you expect it to deviate from normal?

Source: Labor Force Statistics from the Current Population Survey. United States Department of Labor, Bureau of Labor Statistics. 18 Jan. 2019. https://www.bls.gov/cps/cpsaat22.htm (18 January 2019).

19. A manufacturer claims that the average lifetime hours of a LED light bulb is about 40,000 hours. Explain whether or not you think that the lifetime hours of a light bulb could be represented by a normal distribution.

20. The mean demand for electricity in the average household is 936 kilowatt hours (kWh) in any given month. Suppose the usage is described by a normal random variable with a standard deviation of 110 kWh. If this description of the demand for electricity is correct, what generating capacity per household must be available in order for the load to be met 99.5% of the time?

21. In order to ride the Death Trap at the amusement park, guidelines say that participants must be between 60 and 74 inches tall. Consider two separate groups of tourists. The mean height of group A is 64.00 inches with a standard deviation of 1.77 inches and the mean height of Group B is 69.50 inches with a standard deviation of 1.50 inches. Determine the percentage of each group that would be able to ride the Death Trap. Assume that heights are normally distributed.

Normal Distribution Approximation of Binomial Probability

Approximate the binomial probability using the normal distribution. You may safely assume that the conditions for using the normal distribution approximation have been met for each scenario.

22. A phone company reports that 51% of its customers subscribe to its high-speed Internet service. If 180 customers are randomly selected for a survey, what is the probability that more than 94 of them subscribe to the high-speed Internet service?

23. What is the probability that more than 35 out of 119 college algebra students will attend a late afternoon study session provided by their professor? Previous experience tells the professor that there is a 40% probability that a given student will attend the study session.

24. What is the probability that fewer than 45 calculus students will fail their calculus course this semester? There are 210 students currently enrolled in the class, and previous semesters indicate that there is a 28% chance of an individual student failing this course.