## PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

### UNDERSTAND

7. **Communicate Precisely** Explain how to use the Empirical Rule to find the percentage of the population that falls in a given interval of values.

8. **Mathematical Connections** How could you use the standard normal curve to verify the Empirical Rule? Show your computations.

9. **Error Analysis** The cost of movie tickets at several movie theaters is normally distributed with a mean ticket price of $10 and a standard deviation of $0.50. Kenji bought a movie ticket for $9.25. Explain and correct the error in finding the *z*-score.

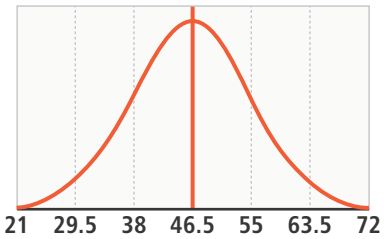
$$z = \frac{\text{mean - data value}}{\text{standard deviation}}$$

$$z = \frac{\$10 - \$9.25}{\$0.5} = 1.5$$

✗

10. **Higher Order Thinking** Skyler took an English test and a French test. The mean score for both tests was 84. Skyler got an 88 on the English test and a 92 on the French test. What condition would have to exist so that Skyler's score on the English test was more impressive relative to her classmates' scores than on the French test?

11. **Use Structure** The graph of normally distributed data is shown. What are the mean and standard deviation of the data? Explain how you know.




12. **Reason** The monthly cost of joining a gym is normally distributed with a mean of $50 and a standard deviation of $5. The cost of the gym Tyler joined was exactly two standard deviations away from the mean.

   a. What are possible *z*-scores of Tyler's cost?

   b. If the mean or standard deviation change, how would your answer to part (a) be affected?

### PRACTICE

**The lifespan of a certain brand of car tires is approximately normally distributed. The car tires have a mean lifespan of 50,000 miles and a standard deviation of 7,500 miles.** SEE EXAMPLE 1

13. What range of car tire lifespan contains the 95% closest to the mean?

14. What would the lifespan be for the 2.5% of the tires with the greatest lifespan in the population?

**The price of a certain brand of printers is normally distributed with mean cost of $215 and standard deviation $35.** SEE EXAMPLE 2

15. What proportion of printers cost between $110 and $320?

16. What proportion of printers cost less than $145?

17. What proportion of printers cost more than $250?

18. In their last basketball game, Holly scored 25 points and Juanita scored 16 points. The mean number of points Holly scores is 20 with a standard deviation of 2. The mean number of points Juanita scores is 12 with a standard deviation of 1.25. Whose score is better relative to her average number of points per game? SEE EXAMPLE 3

**Find the percentage of all values in a normal distribution for each *z*-score.** SEE EXAMPLE 4

19. $z \leq 2.15$

20. $z \leq 1.25$

21. $z \geq 0.62$

22. $z \leq 0.48$

23. $z \geq -1.39$

24. $z \leq -2.26$

**Given the mean $\mu$ and standard deviation $\sigma$, find the *z*-score for each data point *x*.**

25. $\mu = 0$; $\sigma = 2$; $x = 3$

26. $\mu = 1$; $\sigma = 0.15$; $x = 0.70$

27. $\mu = 100$; $\sigma = 15$; $x = 70$

28. $\mu = 2.7$; $\sigma = 0.5$; $x = 3.0$

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Mixed Review Available Online

### APPLY

**29.** **Make Sense and Persevere** Mrs. Burleson surveyed the students in her class to find the number of minutes they spent doing homework each night. She found that the data was normally distributed with $\mu = 30$ min and $\sigma = 10$ min.

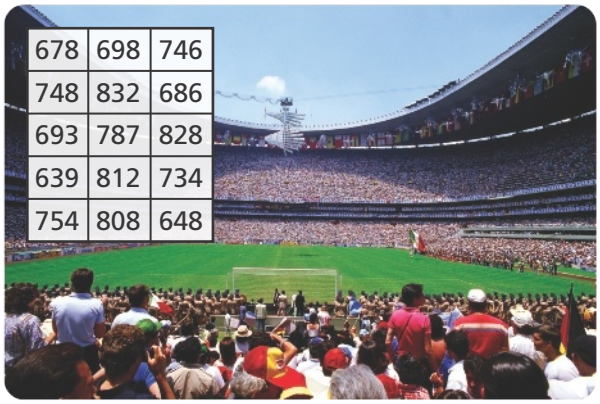
**a.** What range of time spent doing homework contains the 68% closest to the mean?

**b.** How much time spent on homework would you expect from the 2.5% of the students with the least time spent on homework?

**c.** Jeffrey studied 25 min last night. What percent of the students studied fewer minutes than Jeffrey? Round to the nearest hundredth.

**30.** **Reason** A random sample of attendance numbers for last year's soccer matches for a local team are shown.

| | | |
|---|---|---|
| 678 | 698 | 746 |
| 748 | 832 | 686 |
| 693 | 787 | 828 |
| 639 | 812 | 734 |
| 754 | 808 | 648 |



**a.** Find the mean and standard deviation of the attendance numbers to the nearest tenth.

**b.** Use the data given in the problem to find what percent of last year's games had at least 808 people in attendance. Round to the nearest tenth of a percent.

**c.** Given that the data is normally distributed, estimate the percent of games that will have at least 808 people in attendance.

**31.** Anna scored an 89 on an exam with $\mu = 68$ points and $\sigma = 10$ points. Damian scored a 95 on an exam with $\mu = 76$ points and $\sigma = 12$ points. If both exams had normally distributed scores, what was the *z*-score for each student? Who did better on their exam? Explain.

### ASSESSMENT PRACTICE

**32.** A normally distributed data set has a mean of 35 and a standard deviation of 5.23. Complete the table to find the probability that a randomly selected value is in the given interval. Round to the nearest hundredth percent, if necessary.

| Interval | Probability (%) |
|---|---|
| at most 43 | |
| at least 48 | |
| between 32 and 38 | |
| at least 41.6 | |
| between 30.2 and 42.6 | |
| at most 36.25 | |

**33.** **SAT/ACT** In a set of data that is normally distributed, the value that is 1 standard deviation above the mean is 93. The value that is 2 standard deviations below the mean is 39. What is the mean of the set of data?

Ⓐ 3 Ⓑ 18 Ⓒ 57 Ⓓ 75

**34.** **Performance Task** Outliers can be identified using the interquartile method. Multiply the interquartile range by 1.5. If a data value has a distance below the first quartile or above the third quartile greater than this product, it is an outlier. Another way is to use the *z*-score method. If a data value falls more than 3 standard deviations from the mean, the data value is an outlier. The table shows the high temperature for 14 days.

| | | | | | | |
|---|---|---|---|---|---|---|
| 81°F | 78°F | 77°F | 75°F | 80°F | 81°F | 80°F |
| 77°F | 74°F | 75°F | 49°F | 71°F | 72°F | 80°F |

**Part A** Identify the mean, standard deviation, first quartile, third quartile, and interquartile range of the data.

**Part B** Which data values, if any, are outliers using the interquartile method? Explain your reasoning.

**Part C** Which data values, if any, are outliers using the *z*-score method? Explain your reasoning.