Solution

The first thing we need to do is find a z-score for the data point we are interested in of 2000 calories. Substituting into the formula, we have the following.

$$z = \frac{2000 - 2050}{175} \approx -0.29$$

Now, because we're interested in knowing the percentage that consumes more than 2000 calories, we let -0.29 be the lower bound. Our upper bound in this case is ∞. That gives us `normalcdf(-Ø.29,1E99)`. Calculating this using a TI-84 Plus gives a result of approximately `Ø.6141`. This means that 61.41% of females consume more than 2000 calories per day.

Skill Check Answers

1. $z \approx 0.68$

9.5 EXERCISES

PRACTICE

Calculate the z-score for each given value. Round your answer to the nearest hundredth.

1. $\mu = 57, \sigma = 11$
- **a.** $x_1 = 63$
- **b.** $x_2 = 38$
- **c.** $x_3 = 58$

2. $\bar{x} = 1123, s = 241$
- **a.** $x_1 = 1284$
- **b.** $x_2 = 900$
- **c.** $x_3 = 1364$
- **d.** $x_4 = 1123$

3. $\bar{x} = 3.19, s = 0.06$
- **a.** $x_1 = 3.13$
- **b.** $x_2 = 3.22$
- **c.** $x_3 = 3.00$

4. $\mu = 178.15, \sigma = 49.3$
- **a.** $x_1 = 73.9$
- **b.** $x_2 = 267.3$
- **c.** $x_3 = 199.5$

5. Scores on a test have a mean of 73 and a standard deviation of 11. Steve has a score of 68. Convert Steve's score to a z-score.

Answer each question thoughtfully.

6. The annual rainfall in a town has a mean of 47.22 inches and a standard deviation of 10 inches. Last year there was 51 inches of rain. How many standard deviations from the mean is that?

7. Mason's weekly poker winnings have a mean of \$144 and a standard deviation of \$51. Last week he won \$165. How many standard deviations from the mean is that?

Use the *z*-score formula to complete each table.

8. Find the missing value in each row of the table.

	z	x	μ	σ
a.		82.1	74.0	6.3
b.	1.05	162.3		8.9
c.	3.04		34.5	5.02
d.	–2.73	379	634	

9. Find the missing value in each row of the table.

	z	x	μ	σ
a.		4.33	6.10	2.04
b.	–2.39	–57		139.8
c.	0.58		118	21.2
d.	2.78	68	43	

Find the percentage of data points that lie below each *z*-score.

10. $z = -0.19$

11. $z = 1.46$

12. $z = 3.07$

13. $z = -2.22$

14. $z = 0$

Find the percentage of data points that lie above each *z*-score.

15. $z = 1.03$

16. $z = -1.87$

17. $z = -3.10$

18. $z = 2.84$

19. $z = 0$

Find the percentage of data points that lie between each pair of *z*-scores.

20. $z_1 = -1.00$
$z_2 = 1.00$

21. $z_1 = -2.40$
$z_2 = 1.73$

22. $z_1 = 2.00$
$z_2 = 3.00$

23. $z_1 = -3.01$
$z_2 = -0.56$

24. $z_1 = 0$
$z_2 = 2.61$

Find the percentage of data points that lie below z_1 and above z_2.

25. $z_1 = -1.10$
$z_2 = 1.10$

26. $z_1 = -2.84$
$z_2 = 2.84$

27. $z_1 = -1.75$
$z_2 = 0.53$

28. $z_1 = 1.09$
$z_2 = 2.88$

29. $z_1 = -0.01$
$z_2 = 0.02$

APPLICATIONS

30. Ava scored a 92 on a test with a mean of 71 and a standard deviation of 15. Charlotte had a score of 688 on a test with a mean of 493 and a standard deviation of 150. Which score was better with respect to their test? Assume the distributions of scores are approximately normal for both tests.

31. Avery started training to run a 5K. Her first race was a 5K for charity. She finished in 37.3 minutes. The average race time for the charity run was 36.42 with a standard deviation of 1.73 minutes. In her second race, Avery finished in 36.5 minutes. The race had a mean time of 33.02 minutes with a standard deviation of 2.45 minutes. In which race did Avery place higher in the list of finishers? Assume the distributions of finishing times are approximately normal for both races.

32. The average IQ score for adults is 100 with a standard deviation of 15. Assume that the distribution of IQ scores is approximately normal.

a. Find the percentage of adults who have an IQ score less than 90.

b. Find the percentage of adults who have an IQ score which exceeds the mean by at least 15 points.

c. Find the percentage of adults who have an IQ score between 100 and 120.

d. Find the percentage of adults who have an IQ score less than 55 or more than 145.

33. Assume the weights of offensive linemen in the NFL follow a normal distribution with a mean of 300 pounds and a standard deviation of 12.3 pounds.

a. Find the percentage of linemen in the NFL who weigh more than 320 pounds.

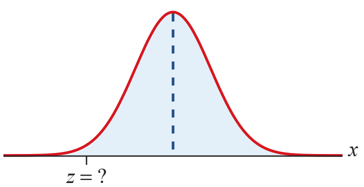
b. Find the percentage of linemen in the NFL who weigh between 275 and 325 pounds.

c. Find the percentage of NFL linemen who weigh at least 260 pounds.

d. Find the percentage of NFL linemen who weigh at most 315 pounds.

WRITING & THINKING

34. The mean score for a set of data is marked by the dotted line on the following graph. Which value is a likely z-score for the indicated value? Choose from **a.** −2.1, **b.** 0, or **c.** 2.7.



35. What is the minimum z-score that a piece of data would need to have in order to be in the top 10% of a normally distributed set of data?

36. What is an "average" z-score? Explain your answer.

37. What z-score represents the 1^{st} quartile? 2^{nd} quartile? 3^{rd} quartile?