baby. We can use the formula for x that we saw previously.

$$\begin{aligned} x &= z \cdot \sigma + \mu \\ &= (0.67)(1.2) + 20.0 \\ &\approx 20.8 \end{aligned}$$

TI-83/84 Plus: We can find the value of the normally distributed variable in one step using the function syntax `invNorm(area,μ,σ)`, where *area* is the area to the left.

Here we have

$$\begin{aligned} area &= 0.7500 \\ \mu &= 20.0 \\ \sigma &= 1.2 \end{aligned}$$

Enter `invNorm(0.7500, 20, 1.2)`, as shown in the screenshot in the margin. This gives a value of 20.8 rounded to one decimal place.

```
invNorm(0.7500,2
0,1.2)
        20.8093877
```

Therefore, the minimum length a baby can be and still be in the top 25% of lengths of full-term newborn babies is approximately 20.8 inches.

6.4 Section Exercises

Finding the *z*-Value That Corresponds to a Given Area

Find the indicated value of z.

1. What z-value has an area of 0.0038 to its left?
2. What z-value has an area of 0.9803 to its left?
3. What z-value has an area of 0.9738 to its left?
4. What z-value has an area of 0.0212 to its left?
5. What z-value represents the 95th percentile?
6. What z-value represents the 30th percentile?
7. What value of z is the 25th percentile?
8. What z-value represents the 75th percentile?
9. What z-value has an area of 0.0838 to its right?
10. What z-value has an area of 0.0049 to its right?
11. What z-value has an area of 0.9706 to its right?
12. What z-value has an area of 0.5987 to its right?
13. Find the value of z such that the area between $-z$ and z is 0.99.
14. Find the value of z such that the area between $-z$ and z is 0.80.
15. Find the value of z such that the area between $-z$ and z is 0.98.
16. Find the value of z such that the area between $-z$ and z is 0.95.
17. Find the value of z such that the area to the left of $-z$ plus the area to the right of z is 0.5686.
18. Find the value of z such that the area to the left of $-z$ plus the area to the right of z is 0.7642.
19. Find the value of z such that the area to the left of $-z$ plus the area to the right of z is 0.0286.
20. Find the value of z such that the area to the left of $-z$ plus the area to the right of z is 0.0040.
21. What z-value represents the third quartile?
22. What z-value represents the first quartile?

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Applications

Answer each question for the given scenario.

23. If a normal distribution has a mean of 95.0 and a standard deviation of 8.8, what is the value of the random variable X that has an area to its right equal to 0.0526?

24. If a normal distribution has a mean of 38.0 and a standard deviation of 1.25, what is the value of the random variable X that has an area to its right equal to 0.3121?

25. If a normal distribution has a mean of 33.7 and a standard deviation of 10.5, what is the value of the random variable X that has an area to its left equal to 0.9904?

26. If a normal distribution has a mean of 152.1 and a standard deviation of 22.0, what is the value of the random variable X that has an area to its left equal to 0.8238?

27. The body temperatures of adults are normally distributed with a mean of 98.60 °F and a standard deviation of 0.73 °F. What temperature represents the 85th percentile?

28. Heights of river birch trees at a large nursery are approximately normally distributed with a mean of 92.3 inches and a standard deviation of 4.1 inches. What is the cutoff height for birch trees in the tallest 10%?

29. The weights of Jersey cows offered at auction in one region are normally distributed with a mean of 825.0 pounds and a standard deviation of 74.8 pounds. One rancher endeavors to only bid on cows that are in the top 5% of weight. What is the lowest weight cow that the rancher should bid on?

30. Suppose that the weights of college students are normally distributed with a mean of 150 pounds and a standard deviation of 20 pounds. What weight represents the first quartile for college students?

31. The cruising altitudes for the fleet of one commercial airliner are normally distributed with a mean of 34,950 feet and a standard deviation of 1830 feet. What cruising altitude represents the 80th percentile?

32. In one region of the Caribbean Sea, daily water temperatures are normally distributed with a mean of 77.9 °F and a standard deviation of 2.4 °F. What is the third quartile for water temperatures in this region?

33. During one season of racing at the Talladega Superspeedway, the mean speed of the cars racing there was found to be 158.900 mph with a standard deviation of 6.700 mph. What speed represents the 30th percentile for speeds of race cars at Talladega? Assume that the racing speeds are normally distributed.

34. Suppose that preschoolers spend a mean of 25 hours per week in day care with a standard deviation of 5 hours per week. A newspaper journalist wants to point out that preschoolers are staying in day cares too long, from his perspective. If he only looks at the extreme end of the distribution, that is, the top 3%, what's the minimum number of hours per week those preschoolers spend in day care? Assume that the number of hours per week that preschoolers spend in day care are normally distributed.

35. School-age children should drink approximately 40.5 oz of water per day according to a recent report. Suppose the amounts of water that schoolchildren actually consume in a day are approximately normally distributed with a mean of 32.0 oz and a standard deviation of 7.1 oz.

a. What is the probability that a randomly selected student will drink less than the suggested amount of water in a day?

b. If the standard deviation remained the same and the daily water intakes were still normally distributed, how much would the mean need to increase so that only 5% of students drink less than 36 oz per week?

36. Pop-It popcorn maker has a mean time before failure of 36 months with a standard deviation of 5 months, and the failure times are normally distributed. What should be the warranty period, in months, so that the manufacturer will not have more than 10% of the poppers returned?

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