

Figure 6.1.9 Normal Distribution of Labrador Retriever Weights (in Pounds)

In order to apply this powerful connection between the area under a normal curve and probability, we need to be able to calculate the area under a normal curve in any given region. The next two sections look at how to calculate the area under a given normal curve and hence use it to identify certain probabilities.

## 6.1 Section Exercises

### Properties of Normal Distributions

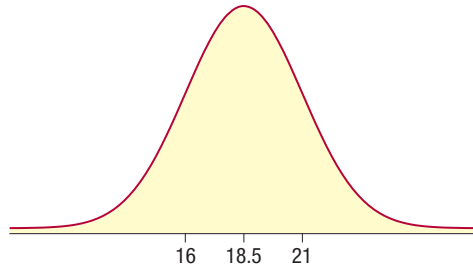
*Decide if each statement is true or false. Explain why.*

1. There are a limited number of normal distributions.
2. The total area under a normal curve changes depending on the height of the mean of the curve.
3. The mean of a normal distribution is always 0.
4. A normal distribution with a small standard deviation is “flatter” than one with a large standard deviation.
5. The area under any region of a normal curve is equal to the probability that the random variable will fall within that region.
6. For any normal distribution, the mean, median, and mode are equal.
7. The line of symmetry for a normal distribution is  $x = \mu$ .
8. The  $y$ -axis is a vertical asymptote for all normal distributions.
9. The inflection points for any normal distribution are one standard deviation on either side of the mean.
10. Normal distributions are symmetric, but they do not have to be bell-shaped.

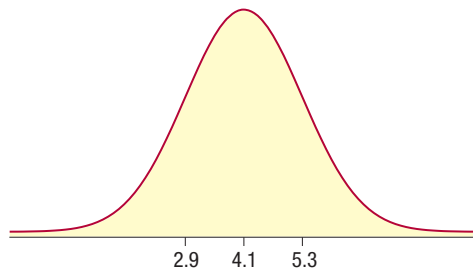
## Identifying Properties of Normal Curves

Use the normal distribution curves to answer the questions.

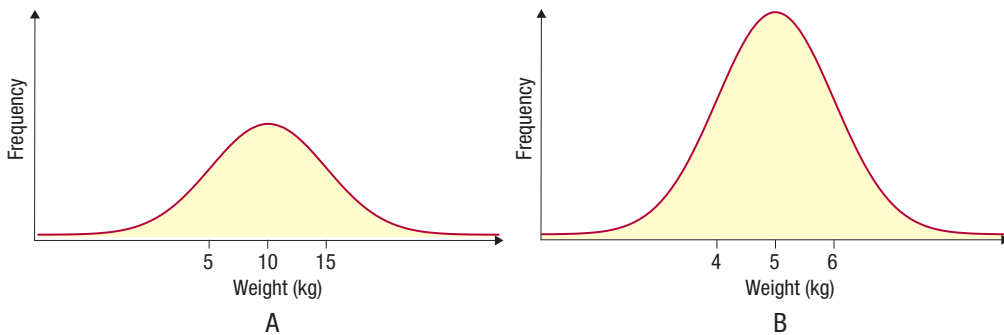
11. Use the normal distribution curve in the figure to answer the following questions.



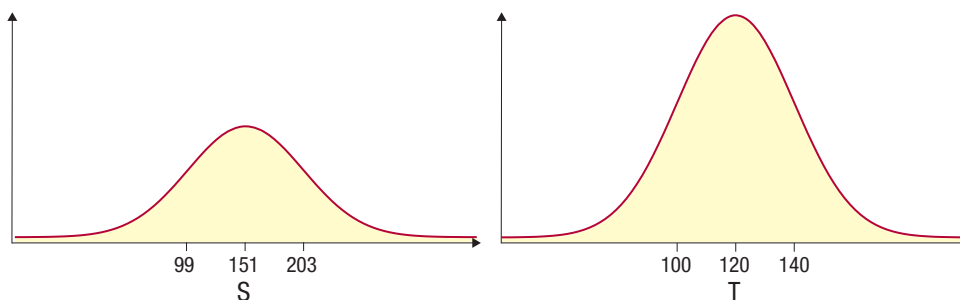
- Approximate the mean of the distribution.
  - Approximate the standard deviation of the distribution.
12. Use the normal distribution curve in the figure to answer the following questions.



- Approximate the mean of the distribution.
  - Approximate the standard deviation of the distribution.
13. Use the normal distribution curves in the figure to answer the the following questions.



- Which distribution has the larger standard deviation?
  - Which distribution has the larger mean?
14. Use the normal distribution curves in the figure to answer the following questions.



- Which distribution has the smaller standard deviation?
- Which distribution has the smaller mean?

### Drawing Normal Distributions

*Draw a normal curve with the given characteristics. Indicate the value of the mean and the location of the given  $x$ -value on the  $x$ -axis, and indicate the inflection points using vertical lines extending from the appropriate values on the  $x$ -axis to the inflection points on the curve.*

15.  $\mu = 65$  and  $\sigma = 20$ ;  $x = 40$
16.  $\mu = 5.00$  and  $\sigma = 0.25$ ;  $x = 4.80$
17.  $\mu = 10.75$  and  $\sigma = 0.35$ ;  $x = 11.15$
18.  $\mu = 15$  and  $\sigma = 2$ ;  $x = 19$
19.  $\mu = 0.023$  and  $\sigma = 0.001$ ;  $x = 0.020$
20.  $\mu = 12,000$  and  $\sigma = 2000$ ;  $x = 9,750$

### Comparing Normal Distributions

*Draw two normal distributions, on the same  $x$ -axis, that have the given characteristics.*

21. Population means that differ by 5 units
22. The same mean but different standard deviations

### Determining if a Distribution is Normal

*Determine if the following distributions could be classified as normal distributions based on the information given. Explain your answer.*

23. The distribution of long jump distances in the NCAA Outdoor Track and Field competition
24. The distribution of scores on a college entrance exam based on whole numbers 1-33
25. The distribution of the number of sick days employees took at Viant & Company over the past 10 years
26. The distribution of daily water temperatures for each of the Great Lakes