11.3 Use Normal Distributions

TEKS a.1, 2A.1.B

Before You interpreted probability distributions.

Now You will study normal distributions.

Why? So you can model animal populations, as in Example 3.

Key Vocabulary
- **normal distribution**
- **normal curve**
- **standard normal distribution**
- ***z*-score**

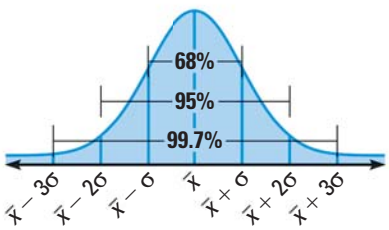
In Lesson 10.6, you studied probability distributions. One type of probability distribution is a *normal distribution*. A **normal distribution** is modeled by a bell-shaped curve called a **normal curve** that is symmetric about the mean.

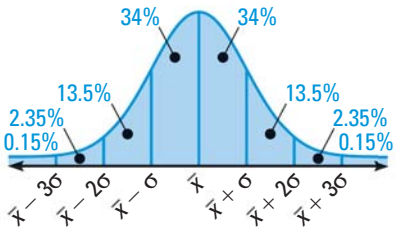
KEY CONCEPT *For Your Notebook*

Areas Under a Normal Curve

A normal distribution with mean $\bar{x}$ and standard deviation σ has the following properties:

- The total area under the related normal curve is 1.
- About 68% of the area lies within 1 standard deviation of the mean.
- About 95% of the area lies within 2 standard deviations of the mean.
- About 99.7% of the area lies within 3 standard deviations of the mean.





INTERPRET GRAPHS

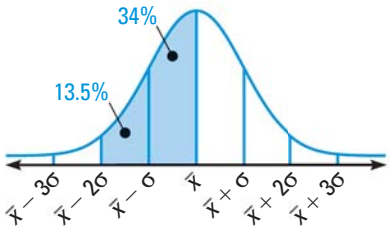
An area under a normal curve can be interpreted either as a percentage of the data values in the distribution or as a probability.

EXAMPLE 1 Find a normal probability

A normal distribution has mean $\bar{x}$ and standard deviation σ. For a randomly selected x-value from the distribution, find $P(\bar{x} - 2\sigma \le x \le \bar{x})$.

Solution

The probability that a randomly selected x-value lies between between $\bar{x} - 2\sigma$ and $\bar{x}$ is the shaded area under the normal curve shown.



$$P(\bar{x} - 2\sigma \le x \le \bar{x}) = 0.135 + 0.34 = 0.475$$

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