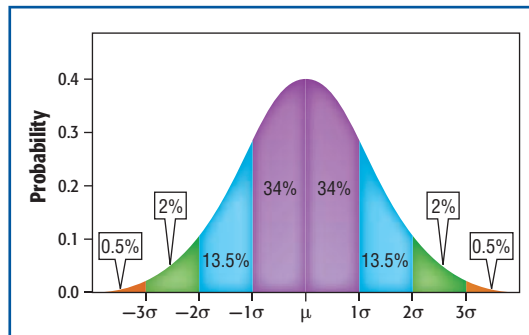


When there are a large number of values in a data set, the frequency distribution tends to cluster around the mean of the set in a distribution (or shape) called a **normal distribution**. The graph of a normal distribution is called a **normal curve**. Since the shape of the graph resembles a bell, the graph is also called a *bell curve*.

Data sets that have a normal distribution include reaction times of drivers that are the same age, achievement test scores, and the heights of people that are the same age.



You can use a Sharp EL-9900C graphing calculator to graph and analyze a normal distribution if the mean and standard deviation of the data are known.

ACTIVITY 1 Graph a Normal Distribution

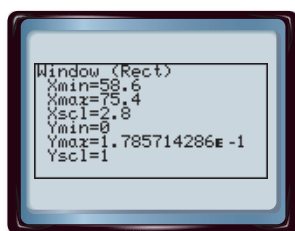
HEIGHT The mean height of 15-year-old boys in the city where Isaac lives is 67 inches, with a standard deviation of 2.8 inches. Use a normal distribution to represent these data.

Step 1 Set the viewing window after clearing the calculator memory.

KEYSTROKES: 2ndF [OPTION] ALPHA [E] 2
CL ENTER WINDOW

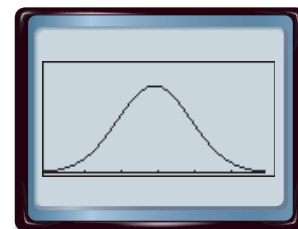
Enter the following values.

- $X_{\min} = 67 - 3 \times 2.8$
ENTER or 58.6
- $X_{\max} = 67 + 3 \times 2.8$
ENTER or 75.4
- $X_{\text{sc1}} = 2.8$
- $Y_{\min} = 0$
- $Y_{\max} = 1 \div (2 \times 2.8)$
ENTER
- $Y_{\text{sc1}} = 1$



Step 2 Enter the function for the graph of the normal curve.

KEYSTROKES: $Y=$ STAT F: DISTRI 01:
pdfnorm(ENTER X/θ/T/n ,
67 , 2.8) GRAPH



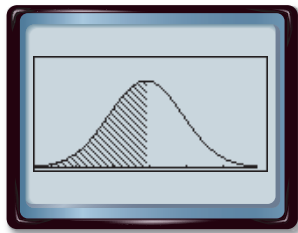
The probability of a range of values is the area under the curve.

ACTIVITY 2 Analyze a Normal Distribution

Use the graph to answer questions about the data. What is the probability that Isaac will be at least 67 inches tall when he is 15?

The sum of all the y -values up to $x = 67$ would give us the probability that Isaac will be less than or equal to 67 inches. This is also the area under the curve. We will shade the area under the curve from negative infinity to 67 inches and find the area of the shaded portion of the graph.

KEYSTROKES: 2^{nd} F [DRAW] ► 7: Shade([ENTER] 0 , [STAT] F: DISTR 01: Pdfnorm([ENTER] $X/\theta/\tau/n$, 67 , 2.8) , 0 , 67) [ENTER]



The area is given as 0.5. The probability that Isaac will be 67 inches tall is 0.5 or 50%. Since the mean value is 67, we expect the probability to be 50%.

Exercises

1. What is the probability that Isaac will be at least 6 feet tall when he is 15?
2. What is the probability that Isaac will be between 65 and 68 inches?
3. If the mean height of 15-year-old girls in the same city is 64 inches with a standard deviation of 2.1, what is the probability that Isaac's sister, Maria, will be at least 64 inches tall when she is 15?
4. What is the probability that Maria will be no taller than 5 feet when she is 15 years old?

Extension

Refer to the curve at the right.

5. Compare this curve to the normal curve in Activity 1.
6. Describe where an outlier of the data set would be graphed on this curve.

