

## Find the Area Under a Normal Curve



Use appropriate tools strategically.

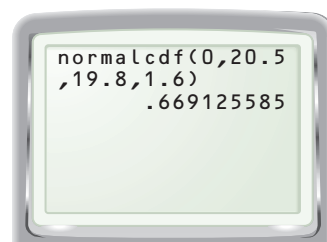
**QUESTION** How can you use a graphing calculator to find the area under a normal curve?

### EXAMPLE 1 Find a normal probability

The lengths of a group of newborn babies are normally distributed with a mean of 19.8 inches and a standard deviation of 1.6 inches. Find the probability that a randomly chosen baby in this group is at most 20.5 inches long.

**STEP 1 Clarify the problem** We want to find  $P(x \leq 20.5)$  for a normal distribution with a mean of 19.8 and a standard deviation of 1.6.

**STEP 2 Enter information** Access the “Distributions” menu by pressing **2nd** [VARS]. Select “normalcdf(,” then enter (lower bound, upper bound, mean, standard deviation). Use 0 as the lower bound. You can see at the right that the probability is about 66.9%.

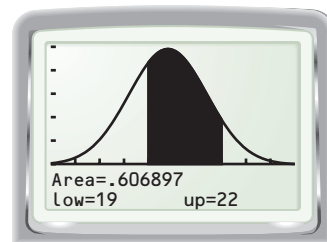


### EXAMPLE 2 Find and display an area under a normal curve

Find  $P(19 \leq x \leq 22)$  for the situation in Example 1.

**STEP 1 Enter information** In the Distributions menu, select “DRAW” at the top and then “ShadeNorm(.” You must enter (lower bound, upper bound, mean, standard deviation). Enter 19 for the lower bound and 22 for the upper bound. Do not yet press **ENTER**.

**STEP 2 Choose a viewing window** For a window that shows about 3 standard deviations to either side of the mean, let  $X_{\min} = 15$  and  $X_{\max} = 25$ . The area under the curve is 1, so the maximum Y-value will be well less than 1. Let  $Y_{\min} = -0.075$  and  $Y_{\max} = 0.25$ . Return to the home screen and press **ENTER**. You can see at the right that the area is about 0.607, so the probability is about 60.7%.



### PRACTICE

- The mean number of potatoes per 15 pound bag from a supplier is 42, with a standard deviation of 4.5. The distribution is normal. Find the probability that a randomly selected bag contains the given number of potatoes.
  - 50 or fewer
  - at least 35
  - 37 to 47
  - 40 to 44
- Scores on a qualifying exam are normally distributed with a mean score of 230 and a standard deviation of 43. A score of 250 is required to pass.
  - Find and display the area under the normal curve for passing scores.
  - Find and display the area under the normal curve for scores of 200–250. (Note: You will first need to clear the drawing from part (a).)