EXAMPLE 5 **Solve an inequality of the form** $|ax + b| \leq c$

BASEBALL A professional baseball should weigh 5.125 ounces, with a *tolerance* of 0.125 ounce. Write and solve an absolute value inequality that describes the acceptable weights for a baseball.

Solution

STEP 1 **Write** a verbal model. Then write an inequality.

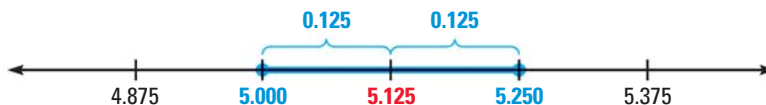| Actual weight (ounces)	−	Ideal weight (ounces)	≤	Tolerance (ounces)
w	−	**5.125**	≤	**0.125**

STEP 2 **Solve** the inequality.

$$|w - 5.125| \leq 0.125 \qquad \text{Write inequality.}$$

$$-0.125 \leq w - 5.125 \leq 0.125 \qquad \text{Write equivalent compound inequality.}$$

$$5 \leq w \leq 5.25 \qquad \text{Add 5.125 to each expression.}$$

▶ So, a baseball should weigh between 5 ounces and 5.25 ounces, inclusive. The graph is shown below.

EXAMPLE 6 **Write a range as an absolute value inequality**

GYMNASTICS The thickness of the mats used in the rings, parallel bars, and vault events must be between 7.5 inches and 8.25 inches, inclusive. Write an absolute value inequality describing the acceptable mat thicknesses.

Solution

STEP 1 **Calculate** the mean of the extreme mat thicknesses.

$$\text{Mean of extremes} = \frac{7.5 + 8.25}{2} = 7.875$$

STEP 2 **Find** the tolerance by subtracting the mean from the upper extreme.

$$\text{Tolerance} = 8.25 - 7.875 = 0.375$$

STEP 3 **Write** a verbal model. Then write an inequality.

Actual thickness (inches)	−	Mean of extremes (inches)	≤	Tolerance (inches)
t	−	**7.875**	≤	**0.375**

▶ A mat is acceptable if its thickness t satisfies $|t - 7.875| \leq 0.375$.