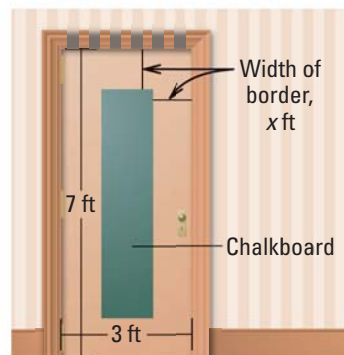




EXAMPLE 4 TAKS REASONING: Multi-Step Problem

CRAFTS You decide to use chalkboard paint to create a chalkboard on a door. You want the chalkboard to have a uniform border as shown. You have enough chalkboard paint to cover 6 square feet. Find the width of the border to the nearest inch.



Solution

STEP 1 Write a verbal model. Then write an equation. Let x be the width (in feet) of the border.

Area of chalkboard (square feet)	=	Length of chalkboard (feet)	•	Width of chalkboard (feet)
↓		↓		↓
6	=	$(7 - 2x)$	•	$(3 - 2x)$

WRITE EQUATION

The width of the border is subtracted twice because it is at the top and the bottom of the door, as well as at the left and the right.

STEP 2 Solve the equation.

$6 = (7 - 2x)(3 - 2x)$	Write equation.
$6 = 21 - 20x + 4x^2$	Multiply binomials.
$-15 = 4x^2 - 20x$	Subtract 21 from each side.
$-\frac{15}{4} = x^2 - 5x$	Divide each side by 4.
$-\frac{15}{4} + \frac{25}{4} = x^2 - 5x + \frac{25}{4}$	Add $(-\frac{5}{2})^2$, or $\frac{25}{4}$, to each side.
$-\frac{15}{4} + \frac{25}{4} = (x - \frac{5}{2})^2$	Write right side as the square of a binomial.
$\frac{5}{2} = (x - \frac{5}{2})^2$	Simplify left side.
$\pm\sqrt{\frac{5}{2}} = x - \frac{5}{2}$	Take square roots of each side.
$\frac{5}{2} \pm \sqrt{\frac{5}{2}} = x$	Add $\frac{5}{2}$ to each side.

The solutions of the equation are $\frac{5}{2} + \sqrt{\frac{5}{2}} \approx 4.08$ and $\frac{5}{2} - \sqrt{\frac{5}{2}} \approx 0.92$.

It is not possible for the width of the border to be 4.08 feet because the width of the door is 3 feet. So, the width of the border is 0.92 foot. Convert 0.92 foot to inches.

$$0.92 \text{ ft} \cdot \frac{12 \text{ in.}}{1 \text{ ft}} = 11.04 \text{ in.} \quad \text{Multiply by conversion factor.}$$

► The width of the border should be about 11 inches.



GUIDED PRACTICE for Example 4

7. **WHAT IF?** In Example 4, suppose you have enough chalkboard paint to cover 4 square feet. Find the width of the border to the nearest inch.