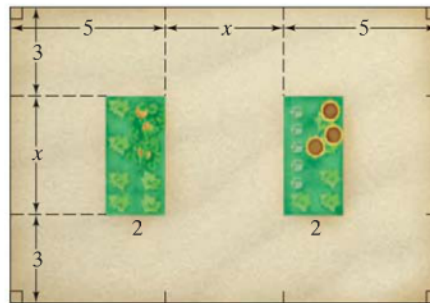


### Challenge: 10.5 Solve by factoring

- 1) Construction** You are building a rectangular patio with two rectangular openings for gardens. You have 124 one-foot-square paving stones. Using the diagram below, what value of  $x$  would allow you to use all of the stones?



- 2)** Find an equation that has the given numbers as solutions. For example, 4 and  $-3$  are solutions to  $x^2 - x - 12 = 0$ .
- a.  $-5, 8$                       b.  $3, -2$                       c.  $\frac{1}{2}, -10$                       d.  $\frac{2}{3}, -\frac{5}{7}$

Factor the expression on the left side of each equation by grouping. Then solve.

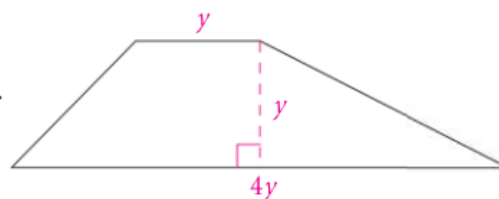
- 3)**  $x^3 + 5x^2 - x - 5 = 0$                       **4)**  $x^3 + x^2 - 4x - 4 = 0$

Jan 19-12:25 PM

### 10.4 Solve by Square Roots Challenge

- 1) Physics** The time  $t$  a pendulum takes to make a complete swing back and forth depends on the length of the pendulum. The formula  $\ell = \frac{2.45t^2}{\pi^2}$  relates the length of a pendulum  $\ell$  in meters to the time  $t$  in seconds.
- a. Find the length of the pendulum if  $t = 1$  s. Round to the nearest tenth.  
 b. Find  $t$  if  $\ell = 1.6$  m. Round to the nearest tenth.  
 c. Find  $t$  if  $\ell = 2.2$  m. Round to the nearest tenth.  
 d. **Writing** You can adjust a clock that has a pendulum by making the pendulum longer or shorter. If a clock is running slowly, would you lengthen or shorten the pendulum to make the clock run faster? Explain.

- 2) Geometry** The trapezoid has an area of  $1960 \text{ cm}^2$ . Use the formula  $A = \frac{1}{2}h(b_1 + b_2)$  to find the value of  $y$ .



Jan 30-7:43 PM

## 10.8 Discriminant Challenge

**Reasoning** For each condition given, tell whether  $ax^2 + bx + c = 0$  will have two solutions *sometimes, always, or never*.

38.  $b^2 < 4ac$

39.  $b^2 = 0$

40.  $ac < 0$

41. **Critical Thinking** The graph of a quadratic equation includes the points  $(2, -1)$  and  $(3, 2)$ . How many solutions does the related equation have? Explain.
42. **Critical Thinking** The discriminant of  $0 = 2x^2 + 6x + 7$  is  $-20$ . The discriminant of  $0 = 2x^2 + 8x + 10$  is  $-16$ . Without graphing, determine which related function has a vertex closer to the  $x$ -axis. Explain.

Jan 30-7:47 PM

## 10.7 Quadratic Formula Challenge

**Population** The function below models the United States population  $P$  in millions since 1900, where  $t$  is the number of years after 1900.

$$P = 0.0089t^2 + 1.1149t + 78.4491$$

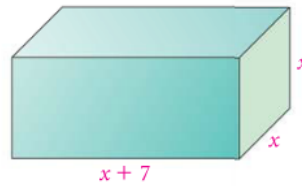
- Use the function to estimate the United States population the year you graduate from high school.
- Estimate the United States population in 2025.
- Use the function to predict when the population will reach 300 million.

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## 10.6 Completing the Square Challenge

1)

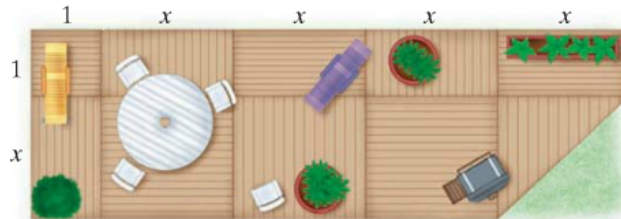
**Geometry** Suppose the prism shown at the right has the same surface area as an 8-in. cube.



- Write an expression for the surface area of the prism shown at the right.
- Write an equation that relates the surface area of the prism to the surface area of the 8-in. cube.
- Solve the equation you wrote in part (b) to find the dimensions of the prism.

2)

**Design** Suppose you want to design a patio like the one shown below.



- Write an expression for the total area.
- If you want the total area to be  $200 \text{ ft}^2$ , what is the value of  $x$ ?
- If you rounded the value of  $x$  to the nearest integer, what would the total area be?

Jan 30-8:00 PM