**Firefighters** A smoke jumper jumps from a plane that is 1700 ft above the ground. The function $y = -16t^2 + 1700$ gives the jumper's height $y$ in feet at $t$ seconds.

**a.** How long is the jumper in free fall if the parachute opens at 1000 ft?

**b.** How long is the jumper in free fall if the parachute opens at 940 ft?

a. $1000 = -16t^2 + 1700$

$-1700 \qquad -1700$

$\frac{-700}{-16} = \frac{-16t^2}{-16}$

$t^2 = \frac{700}{16} \longrightarrow t = \sqrt{\frac{700}{16}} = \pm 6.61 = 6.61 \text{ sec}$

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**a.** How long is the jumper in free fall if the parachute opens at 1000 ft?

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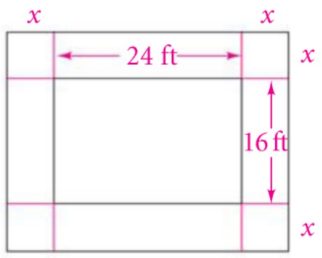
b. $940 = -16t^2 + 1700$

$-1700 \qquad -1700$

$\frac{-760}{-16} = \frac{-16t^2}{-16}$

$t^2 = \frac{760}{16} \longrightarrow t = \sqrt{\frac{760}{16}} = \pm 6.89 = 6.89 \text{ sec}$

**Gardening** Suppose you want to expand the garden shown at the right by planting a border of flowers. The border will be of the same width around the entire garden. The flowers you bought will fill an area of 276 ft$^2$. How wide should the border be?

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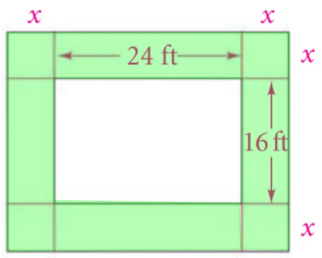


Area of the border = 276

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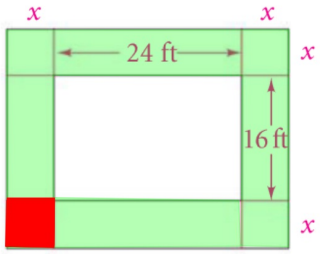
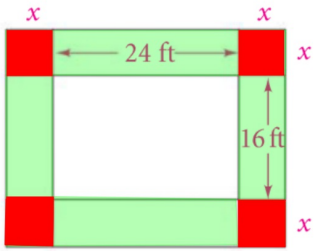



What is the area of each corner?
$x^2$
How many of these are there? 4

$4x^2$ + = 276

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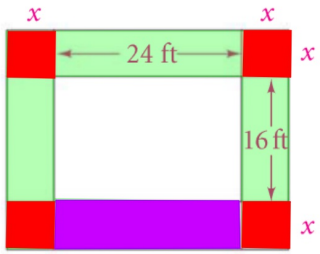
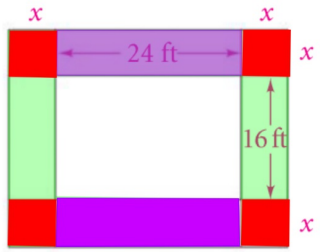



What is the area of each horizontal rectangle? 24x

How many of these are there? 2

$4x^2 + 48x$ = 276



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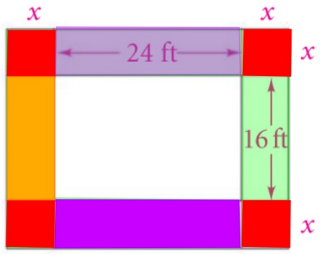


What is the area of each vertical rectangle? 16x

How many of these are there? 2

$4x^2 + 48x + 32x = 276$

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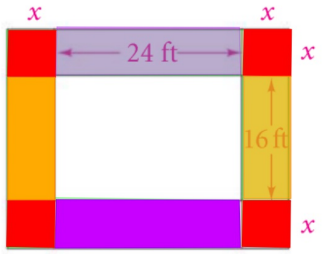


$4x^2 + 48x + 32x = 276$

$4x^2 + 80x - 276 = 0$

$4(x^2 + 20x - 69) = 0$

$4(x + 23)(x - 3) = 0$

$x = -23, 3$

Since x can't be negative the only reasonable answer is 3. The border should be 3 feet wide.

If the x-intercepts of a parabola are -9 and 5 what factors did they come from?

$(x + 9)(x - 5)$

1. Find the equation of a quadratic, in Standard Form, with the following x-intercepts:

4 and -3

$(x - 4)(x + 3) = x^2 - x - 12$

| | x | -4 |
|---|---|---|
| x | $x^2$ | -4x |
| +3 | +3x | -12 |

2. Find the equation of a quadratic, in Standard Form, with the following x-intercepts:

$\frac{5}{2}$ and $\frac{-1}{4}$

$(2x - 5)(4x + 1) = 8x^2 - 18x - 5$

| | 2x | -5 |
|---|---|---|
| 4x | $8x^2$ | -20x |
| +1 | +2x | -5 |