Algebra CC Zoom 3

Do Now: Solve the quadratic equation using the **quadratic formula.** $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$2x^2 - 4x = 3$
$-3 \quad -3$
$2x^2 - 4x - 3 = 0$

$a=2 \quad b=-4 \quad c=-3$

$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-3)}}{2(2)}$

$= \frac{4 \pm \sqrt{16+24}}{4}$

$= \frac{4 \pm \sqrt{40}}{4}$

$\sqrt{40}$
$\sqrt{4} \cdot \sqrt{10}$
$\pm 2\sqrt{10}$

$x = \frac{4 \pm 2\sqrt{10}}{4}$

$x = 1 \pm \frac{1}{2}\sqrt{10}$

$x = \{1 - \frac{1}{2}\sqrt{10}, 1 + \frac{1}{2}\sqrt{10}\}$

Quadratic Equations by Completing The Square

1. Be sure that the coefficient of the highest power is one. If it is not, divide each term by that value to create a leading coefficient of one.
2. Move the constant term to the right hand side.
3. Prepare to add the needed value to create the perfect square trinomial. Be sure to balance the equation. The boxes may help you remember to balance.
4. To find the needed value for the perfect square trinomial, take half of the coefficient of the *middle term* (x-term), square it, and add that value to both sides of the equation.
5. Factor the perfect square trinomial.
6. Take the square root of each side and solve. Remember to consider both plus and minus results.

$x^2 + 8x - 8 = 0$
$+8 \quad +8$
$x^2 + 8x + 16 = 8 + 16$

$\left(\frac{8}{2}\right)^2 \Rightarrow 4^2$ $(x+4)(x+4)$

$x^2 + 8x + 16 = 24$

$\sqrt{(x+4)^2} = \pm\sqrt{24}$

$x + 4 = \pm\sqrt{24}$
$-4 \quad -4$

$x = -4 \pm \sqrt{24}$

$\sqrt{24}$
$\sqrt{4} \cdot \sqrt{6}$
$2\sqrt{6}$

$x = -4 \pm 2\sqrt{6}$

$x = \{-4 - 2\sqrt{6}, -4 + 2\sqrt{6}\}$

Let's try a few more examples.

1.) $\frac{3x^2}{3} + \frac{6x}{3} - \frac{21}{3} = \frac{0}{3}$

$x^2 + 2x - 7 = 0$

$+7 \quad +7$

$x^2 + 2x + 1 = 7 + 1$

$\left(\frac{2}{2}\right)^2$ half it square it square it

$\sqrt{(x+1)^2} = \pm\sqrt{8}$

$x + 1 = \pm\sqrt{8}$

$-1 \quad -1$

$x = -1 \pm \sqrt{8}$

$\sqrt{8}$

$\sqrt{4} \cdot \sqrt{2}$

$2\sqrt{2}$

$x = -1 \pm 2\sqrt{2}$

$x = \{1 - 2\sqrt{2}, -1 + 2\sqrt{2}\}$

2.) $x^2 - 10x + 7 = 0$

$-7 \quad -7$

$x^2 - 10x + 25 = -7 + 25$

$\left(\frac{-10}{2}\right)^2$

$\sqrt{(x-5)^2} = \pm\sqrt{18}$

$\sqrt{18}$

$\sqrt{9} \cdot \sqrt{2}$

$3\sqrt{2}$

$x - 5 = \pm 3\sqrt{2}$

$+5 \quad +5$

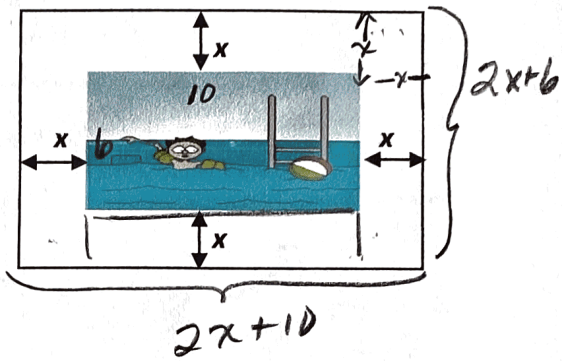
$x = 5 \pm 3\sqrt{2}$

$x = \{5 - 3\sqrt{2}, 5 + 3\sqrt{2}\}$

1) Steve wants to have a walkway installed around his rectangular pool. The pool is 10 feet long and 6 feet wide. The width of the walkway measures x feet. Together, the walkway and the pool cover an area of 192 square feet.

a) Write an equation that can be used to find the width of the walkway.

$(2x+6)(2x+10)=192$



b) Solve your equation to find the width of the walkway.

$4x^2+20x+12x+60=192$

$4x^2+32x+60=192$

$-192 \quad -192$

$4x^2+32x-132=0$

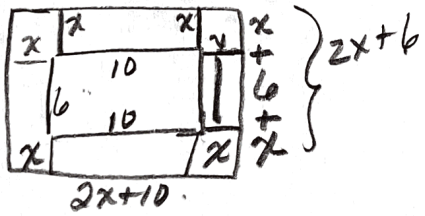
$\frac{4x^2}{4}+\frac{32x}{4}-\frac{132}{4}=0$

$4(x^2+8x-33)=0$

$4(x+11)(x-3)=0$

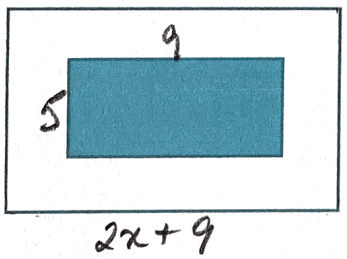
$x+11=0$	$x-3=0$
$-11 \quad -11$	$+3 \quad +3$
$x=-11$	$x=3$ ft
reject	

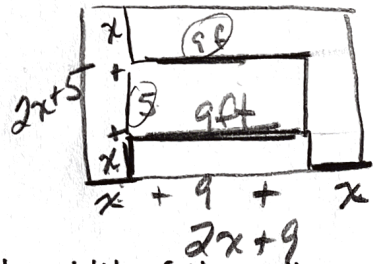
The width of the walkway is 3 feet.



2) Steve wants to have a walkway installed around his rectangular garden. The garden is 5 feet long and 9 feet wide. The width of the walkway measures x feet. Together, the walkway and the garden cover an area of 165 square feet.

a) Label the diagram pictured below to reflect the situation described.





b) Write an equation that can be used to find the width of the walkway.

$A=lw$

$(2x+5)(2x+9)=165$

$4x^2+18x+10x+45=165$

c) Solve your equation to find the width of the walkway.

$4x^2+28x+45=165$

$-165 \quad -165$

$4x^2+28x-120=0$

$4(x^2+7x-30)=0$

$4(x+10)(x-3)=0$

$x+10=0$	$x-3=0$
$-10 \quad -10$	$+3 \quad +3$
$x=-10$	$x=3$ ft
reject	