Algebra 2 4.5

Solve quadratic equations by using the Square Root property

Solve quadratic equations by completing the square

quadratic $x^2 + 3x - 2 = 0$

"square root property" (SRP)

EWE

perfect square number

perfect square trinomial

completing the square (CTS)

Algebra tiles

GuidedPractice

Solve each equation by using the Square Root Property.

2A. $x^2 + 8x + 16 = 20$ SRP

2B. $x^2 - 6x + 9 = 32$

$\sqrt{(x+4)^2} = \sqrt{20}$

$x + 4 = \pm 4.5$

$-4 \quad -4$

$x = -4 \pm 4.5$

$x = -4 + 4.5 = 0.5$

$x = -4 - 4.5 = -8.5$

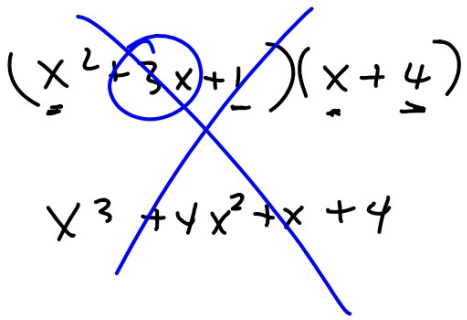
FOIL $\begin{matrix} 15 \\ \times \\ 8 \end{matrix}$ add ↓ must ↓

EWE

$(x+3)(x+5) = x^2+8x+15$

$(x+4)(x+4) = x^2+8x+16$

$(x+7)(x+7) = x^2+14x+49$



What is the pattern?

Predict...

$(x+9)(x+9) = x^2+18x+81$

$(x+10)^2 = x^2+20x+100$

4.5 p. 260 14-25

What does it mean to "complete" something?

↑
finish
do the rest

$x^2 + 6x + 5$

$x^2 + 6x + 9$

$(x + 3)^2$

Build a perfect square...

CTS $x^2 + 4x + c$

$x^2 + 4x + ?$ $c = 4$ $(x+2)^2$

$x^2 + 6x + ?$ $c = 9$ $(x+3)^2$

$x^2 + 6x + c$

Example 3 Complete the Square

Find the value of c that makes $x^2 + 16x + c$ a perfect square. Then write the trinomial as a perfect square.

$c = 64$ $(x + 8)^2$

CTS= build a perfect square...what is missing?

GuidedPractice

3. Find the value of c that makes $x^2 - 14x + c$ a perfect square. Then write the trinomial as a perfect square.

$c = 49 \quad (x-7)^2$

CTS= build a perfect square

2 Complete the Square

All quadratic equations can be solved using the Square Ro
Property by manipulating the equation until one side is a perfect square. This meth
is called **completing the square**.

Consider $x^2 + 16x = 9$. Remember to perform each operation on each side of the equation.

$x^2+16x+64 = 9+64$

$(x+8)^2 = 73$

$x =$

$x =$

exact ans. = √

Example 4 Solve an Equation by Completing the Square

Solve $x^2 + 10x - 11 = 0$ by completing the square.

+11 +11

Move constant out of the way (if necessary)
Build a perfect square.
How many more do we need?

$x^2 + 10x + 25 = 11 + 25$

$\sqrt{(x+5)^2} = \sqrt{36}$

$x + 5 = \pm 6$

$-5 \quad -5$

$x = -5 \pm 6$

$x = 1$

$x = -11$

GuidedPractice exact

Solve each equation by completing the square.

4A. $x^2 - 10x + 24 = 0$

$-24 \quad -24$

$x^2 - 10x + 25 = -24 + 25$

$(x-5)^2 = 1$

$x - 5 = \pm 1$

$+5 \quad +5$

$x = 5 \pm 1$

$x = 6$

$x = 4$

4B. $x^2 + 10x + 9 = 0$

$-9 \quad -9$

$x^2 + 10x + 25 = -9 + 25$

$(x+5)^2 = 16$

$x + 5 = \pm 4$

$-5 \quad -5$

$x = -1$

$x = -9$

$\frac{3}{2} \cdot \frac{3}{2}$ Keep as fraction

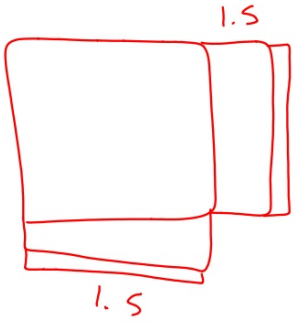
$$x^2 + 3x + \frac{9}{4} = 15 + \frac{9}{4}$$

$$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{\frac{69}{4}}$$

$$x + \frac{3}{2} = \pm \frac{\sqrt{69}}{2}$$

$$-\frac{3}{2} \quad -\frac{3}{2}$$

$$x = -\frac{3}{2} \pm \frac{\sqrt{69}}{2}$$



$$\frac{-3 + \sqrt{69}}{2}$$

$\frac{5}{2} \cdot \frac{5}{2}$

$$x^2 + 5x + 13 = 0$$
$$-13 \qquad -13$$

27
$9 \wedge 3$
$3 \quad 3$

$$x^2 + 5x + \frac{25}{4} = -13 + \frac{25}{4}$$

$$\sqrt{\left(x + \frac{5}{2}\right)^2} = \sqrt{-\frac{27}{4}}$$

$$x + \frac{5}{2} = \pm \frac{\sqrt{-27}}{2}$$

$$x \pm \frac{5}{2} = \pm \frac{\sqrt{27}\, i}{2}$$
$$-\frac{5}{2}$$
$$= -\frac{5}{2} \pm \frac{3\sqrt{3}\, i}{2}$$

$$-\frac{5}{2} \pm \frac{3\sqrt{3}\, i}{2}$$

27-41 odd

51, 52