Algebra 1 9.4

Complete the square to write perfect square trinomials

Solve equations by completing the square

trinomial

perfect square trinomial

quadratic term

linear term

constant term

$x^2+6x+?\ 9$

$(x+3)^2$

Complete the square. Write in factored form.

16. $x^2 - 22x + 121$

$(x - 11)^2$

17. $x^2 - 15x + \frac{225}{4}$

$\frac{15}{2} \cdot \frac{15}{2}$

$\left(x - \frac{15}{2}\right)^2$

18. $x^2 + 24x + 144$

$(x + 12)^2$

How do you solve?

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

$\sqrt{x^2} = \sqrt{81}$

$x = \pm 9$

$\sqrt{(x-2)^2} = \sqrt{16}$

$x - 2 = \pm 4$

$x - 2 = 4$ $\quad +2 \quad +2$ $\quad x = 6$

$x - 2 = -4$ $\quad +2 \quad +2$ $\quad x = -2$

$\sqrt{(x+5)^2} = \sqrt{49}$

$x + 5 = \pm 7$

$x + 5 = 7$ $\quad -5 \quad -5$ $\quad x = 2$

$x + 5 = -7$ $\quad -5 \quad -5$ $\quad x = -12$

GuidedPractice

2. Solve $x^2 - 12x + 3 = 8$ by completing the square.

$-3 \quad -3$

$x^2 - 12x + 36 = 5 + 36$

$\sqrt{(x-6)^2} = \sqrt{41}$

$x - 6 = \pm 6.4$

$+6 \quad +6$

$x = 6 \pm 6.4$

$6 + 6.4 = 12.4$

$6 - 6.4 = -0.4$

1. Clear the construction zone.
2. What else do I need to build a perfect square?
3. What has to happen (to both sides)?
4. Write in factored form.
5. Solve.

Example 2 Solve an Equation by Completing the Square

Solve $x^2 - 6x + 12 = 19$ by completing the square.

$-12 \quad -12$

$x^2 - 6x + 9 = 7 + 9$

$\sqrt{(x-3)^2} = \sqrt{16}$

$x - 3 = \pm 4$

$+3 \quad +3$

$x = 3 \pm 4$

$x = 3 + 7 = 4$

$= 3 - 4 = -1$

What do I need to build a perfect square?
What has to happen (to both sides)?
Write in factored form

$x+2=8$
$-2\quad -2$

Solve each equation by completing the square. Round to the nearest tenth if necessary.

5. $x^2 + 4x = 6$

$x^2+4x+4 = 6+4$

$\sqrt{(x+2)^2} = \sqrt{10}$

$x+2 = \pm 3.2$
$-2 \quad -2$
$x = -2 \pm 3.2$

6. $x^2 - 8x = -9$

$x^2-8x+16 = -9+16$

$\sqrt{(x-4)^2} = \sqrt{7}$

$x-4 = \pm\sqrt{7}$
$+4 \quad +4$

$x = 4 \pm 2.6$

$x = 6.6$
$x = 1.4$

What do I need to build a perfect square?
What has to happen (to both sides)?
Write in factored form

19 $x^2 + 6x - 16 = 0$

$+16 \quad +16$

$x^2+6x+9 = 16+9$

$\sqrt{(x+3)^2} = \sqrt{25}$

$x+3 = \pm 5$

$-3 \quad -3$

$x = -3 \pm 5$

$x = 2$

$x = -8$

20. $x^2 - 2x - 14 = 0$

$+14 \quad +14$

$x^2-2x+1 = 14+1$

$\sqrt{(x-1)^2} = \sqrt{15}$

$x-1 = \pm\sqrt{9}$

$+1 \quad +1$

$x = 1 \pm \sqrt{9}$

$x = 4.9$

$x = -2.9$

What do I need to build a perfect square?
What has to happen (to both sides)?
Write in factored form

21. $x^2 - 8x - 1 = 8$

$\frac{3}{2} \cdot \frac{3}{2}$

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22. $x^2 + 3x + 21 = 22$

$-21 \quad -21$

$x^2 + 3x + \frac{9}{4} = 1 + \frac{9}{4}$

$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{\frac{13}{4}}$

$x + \frac{3}{2} = \pm\frac{\sqrt{13}}{2}$

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

$x = -\frac{3}{2} \pm \frac{\sqrt{13}}{2}$

$x = -\frac{3}{2} \pm 1.8$

$x = -1.5 \pm 1.8$

$x = 0.3$

$x = -3.3$

23. $x^2 - 11x + 3 = 5$

$-3 \quad -3$

$\frac{2}{1} = \frac{8}{4}$

$x^2 - 11x + \frac{121}{4} = 2 + \frac{121}{4}$

$\sqrt{\left(x - \frac{11}{2}\right)^2} = \sqrt{\frac{129}{4}}$

$x - \frac{11}{2} = \pm \frac{\sqrt{129}}{2}$

$+\frac{11}{2} \quad +\frac{11}{2}$

$x = \frac{11}{2} \pm 5.7$

$x = 5.5 \pm 5.7$

$= 11.2$

$= -0.2$

WB Prac 9.4
1-12 all