

Warm-up:

Part 1: Find the solutions by factoring.

1) $x^2 - 8x = 0$

2) $3x^2 - 20 = -4x$

Part 2: Find the solutions using the quadratic formula.

3) $x^2 + 8x = 11$

4) $2x^2 + 4 = x$

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ACT/SAT Practice:

27) What are the factors of $12c^2 + cd - 6d^2$?

F. $(4c + 3d)(3c - 2d)$

G. $(4c - 3d)(3c + 2d)$

H. $(6c + d)(2c - 6d)$

J. $6(2c - d)(c + d)$

K. $6(2c + d)(c - d)$

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Unit 2 ~ Quadratics

Objective: A.REI.4a

Day 3: Solving Quadratics by Completing the Square

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Examples of perfect square trinomials

$x^2 + 6x + 9$

$x^2 + 4x + 4$

$x^2 + 8x + 16$

*You can form a perfect square **trinomial** from $x^2 + bx$ by adding $(\frac{b}{2})^2$.

Example 1: What value completes the square for $x^2 + 14x$?

$$x^2 + 14x + (\frac{14}{2})^2$$

$$x^2 + 14x + 49$$

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

Your Turn: What value completes the square for $x^2 - 6x$?

$$x^2 - 6x + (\frac{-6}{2})^2$$

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

$$(x - 3)(x - 3) = (x - 3)^2$$

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***STEPS for Solving an Equation by Completing the Square:**

1) Rewrite the equation in the form $x^2 + bx = c$.

*All variables should be on the left side and all constants on the right.

*If the coefficient with x^2 is not 1, divide all the terms by the coefficient.

2) Complete the square by adding $(\frac{b}{2})^2$ to both sides.

3) Simplify.

4) Factor the left side. $(x + \underline{\hspace{1cm}})^2$

5) Take the square root of both sides. (Don't forget \pm on the right side!)

6) Solve for x .

Example 1: Solve $x^2 + 4x - 6 = 0$ by completing the square.

$$x^2 + 4x - 6 = 0$$

1. $ax^2 + bx = c$

$$x^2 + 4x - 6 = 0$$

$$\frac{\quad + 6 \quad + 6}{x^2 + 4x \quad 4} = 6 + 4$$

2. $(\frac{b}{a})^2 = (\frac{4}{2})^2 = 4$

3. $x^2 + 4x + 4 = 10$

4. $\begin{array}{c} 4 \\ \times \\ a \quad a \\ \hline 16 \end{array}$ $(x+2)^2 = 10$

Example 2: Solve $3x^2 - 18x - 3 = 0$ by completing the square.

$$\frac{3x^2 - 18x - 3}{3} = 0$$

$$3(x^2 - 6x - 1) = 0$$

$$3(x^2 - 6x + 9) = 1 + 9$$

$$(\frac{-6}{2})^2 = (-3)^2 = 9$$

$$3(x^2 - 6x + 9) = 10$$

$$\begin{array}{c} 9 \\ \times \\ -3 \quad -3 \\ \hline -6 \end{array} \quad (x-3)^2 = 10$$

Your Turn: Find the solution of $x^2 - 10x + 4 = 0$ by completing the square.

$$x^2 - 10x + 4 = 0$$

$$\frac{\quad - 4 \quad - 4}{x^2 - 10x + 25} = -4 + 25$$

$$(\frac{-10}{2})^2 = 25$$

$$x^2 - 10x + 25 = 21$$

$$(x-5)^2 = 21$$

Practice Problems:

Part 1: Complete the Square

$$1) \underline{x^2 + 22x + 121}$$
$$\left(\frac{22}{2}\right)^2 = 121$$

$$2) \underline{x^2 - 30x + 225}$$
$$\left(\frac{-30}{2}\right)^2 = 225$$

Part 2: Solve each quadratic equation by completing the square.

$$3) \underline{x^2 + 10x - 1 = 0}$$
$$\begin{array}{r} +1 \quad +1 \\ \hline x^2 + 10x + 25 = 1 + 25 \\ \left(\frac{10}{2}\right)^2 = 25 \\ x^2 + 10x + 25 = 26 \\ (x+5)^2 = 26 \end{array}$$

$$4) \underline{2x^2 - 4x - 14 = 0}$$
$$\begin{array}{r} 2 \\ \hline 2(x^2 - 2x + 1) = 7 + 1 \\ \left(\frac{-2}{2}\right)^2 = 1 \\ 2(x-1)^2 = 8 \end{array}$$

