

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Solving by Completing the Square

UNIT QUESTION: How are real life scenarios represented by quadratic functions?

Today's Question: When is it useful to solve quadratics by completing the square?

MCC9-12.A.REI.4b

### Solving by Completing the Square

$$r^2 + 12r - 9 = 4$$

$$r^2 + 12r + \frac{36}{2} = 4 + 9 + \frac{36}{2}$$

$$\left(\frac{12}{2}\right)^2$$

\* take half the middle and square

$$(r + 6)(r + 6) = \sqrt{(r + 6)^2} = \sqrt{49}$$

\* solve by square root method

$$r + 6 = \pm 7$$

$$r = -6 \pm 7 = 1, -13$$

Solve each equation by completing the square.

1.  $x^2 + 8x - 20 = 0$

$$x^2 + 8x + \frac{16}{2} = 20 + \frac{16}{2}$$

$$\sqrt{\left(\frac{8}{2}\right)^2} \quad x + 4 = \pm 6$$

$$\sqrt{(x + 4)^2} = \sqrt{36} \quad x = -4 \pm 6$$

$$x = -10, 2$$

2.  $x^2 + 6x - 18 = 0$

$$x^2 + 6x + \frac{9}{2} = 18 + \frac{9}{2}$$

$$\sqrt{\left(\frac{6}{2}\right)^2} \quad \sqrt{(x + 3)^2} = \sqrt{\frac{45}{2}}$$

$$x + 3 = \pm 3\sqrt{3} \quad x = -3 \pm 3\sqrt{3}$$

3.  $x^2 + 4x - 4 = 0$

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

$$\sqrt{\left(\frac{4}{2}\right)^2} \quad \sqrt{(x + 2)^2} = \sqrt{8}$$

$$x + 2 = \pm 2\sqrt{2}$$

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

4.  $x^2 - 2x - 1 = 0$

$$x^2 - 2x + \frac{1}{2} = 1 + \frac{1}{2}$$

$$\sqrt{\left(\frac{-2}{2}\right)^2} \quad \sqrt{(x - 1)^2} = \sqrt{2}$$

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

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

5.  $x^2 - 8x + 36 = 0$

$$x^2 - 8x + \frac{16}{2} = -36 + \frac{16}{2}$$

$$\sqrt{\left(\frac{-8}{2}\right)^2} \quad \sqrt{(x - 4)^2} = \sqrt{-20}$$

no real soln

6.  $x^2 + 6x = -34$

$$x^2 + 6x + \frac{9}{2} = -34 + \frac{9}{2}$$

$$\sqrt{\left(\frac{6}{2}\right)^2} \quad \sqrt{(x + 3)^2} = \sqrt{-25}$$

no real soln