Factor:

1) $x^2 + 11x + 24$

2) $2x^2 + 11x + 12$

Worked Example

You can calculate the roots for the quadratic equation $x^2 - 4x = -3$.

$$x^2 - 4x = -3$$
$$x^2 - 4x + 3 = -3 + 3$$
$$x^2 - 4x + 3 = 0$$
$$(x - 3)(x - 1) = 0$$

$$(x - 3) = 0 \quad \text{and} \quad (x - 1) = 0$$
$$x - 3 + 3 = 0 + 3 \quad \text{and} \quad x - 1 + 1 = 0 + 1$$
$$x = 3 \quad \text{and} \quad x = 1$$

1. Consider the worked example. Why is 3 added to both sides in the first step?

2. Determine each student's error and then solve each equation correctly.

Jana

$x^2 + 6x = 7$

$x(x + 6) = 7$

$x = 7$ and $x + 6 = 7$

$x = 1$

Reese

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

$(x + 2)(x + 3) = 6$

$x + 2 = 6$ and $x + 3 = 6$

$x = 4$ and $x = 3$

3. Use factoring to solve each quadratic equation, if possible.

a. $x^2 - 8x + 12 = 0$

b. $x^2 - 5x - 24 = 0$

c. $x^2 + 10x - 75 = 0$

d. $x^2 - 11x = 0$

e. $x^2 + 8x = -7$

f. $x^2 - 5x = 13x - 81$

g. $\frac{2}{3}x^2 - \frac{5}{6}x = 0$

h. $f(x) = x^2 + 10x + 12$

4. Describe the different strategies and reasoning that Deon and Kayla used to solve $4x^2 - 25 = 0$.

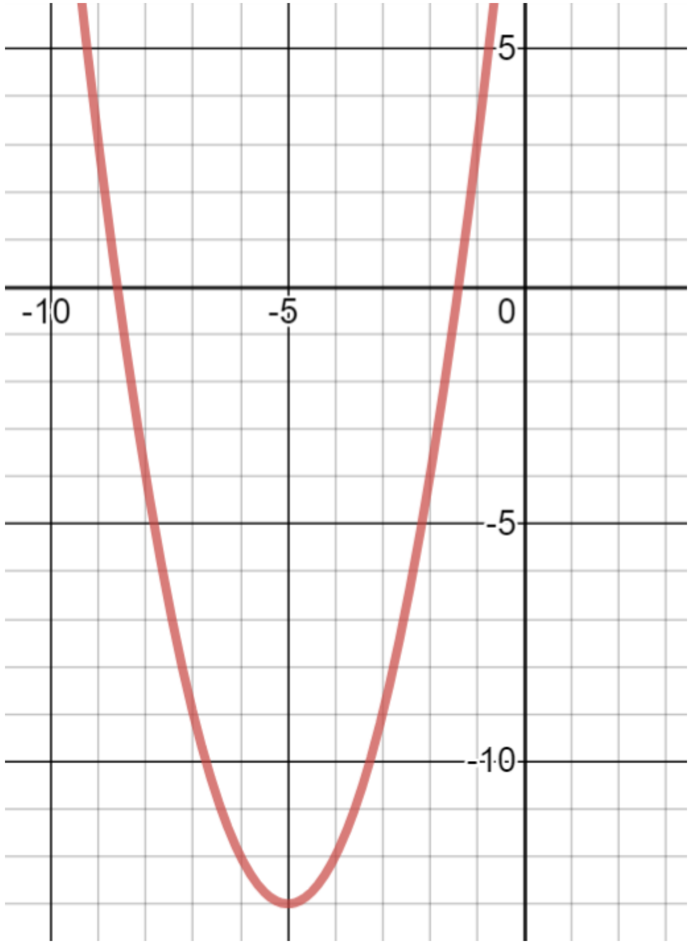
Deon

$$4x^2 - 25 = 0$$
$$4x^2 = 25$$
$$x^2 = \frac{25}{4}$$
$$x = \pm\sqrt{\frac{25}{4}}$$
$$x = \pm\frac{5}{2}$$

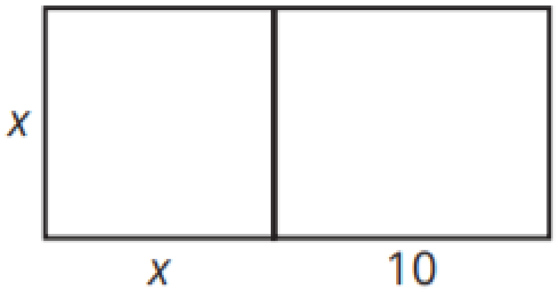
Kayla

$$4x^2 - 25 = 0$$
$$(2x - 5)(2x + 5) = 0$$
$$2x - 5 = 0 \text{ and } 2x + 5 = 0$$
$$2x = 5 \qquad 2x = -5$$
$$x = \frac{5}{2} \text{ and } \qquad x = -\frac{5}{2}$$

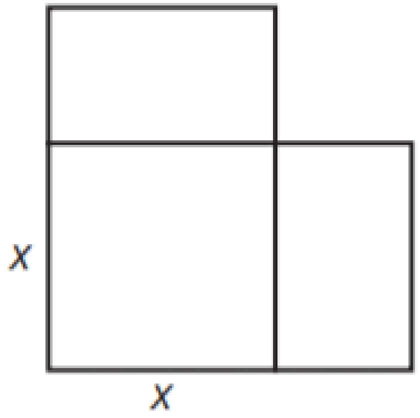
1. **Consider the quadratic equation $y = x^2 + 10x + 12$.**
   Use technology to graph the equation and then sketch it on the coordinate plane. Does this function have zeros? Explain your reasoning.



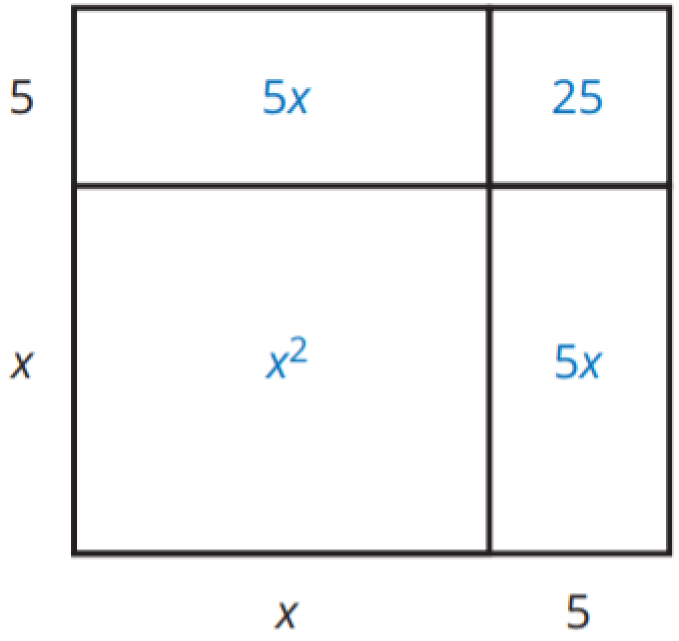
2. The expression $x^2 + 10x$ can be represented geometrically as shown. Write the area of each rectangle within the diagram.



a. Complete the side length labels for the split rectangle and write the area of each piece within the diagram.



c. Complete the figure to form a square. Label the area of the piece you added.



d. Add the term representing the additional area to the original expression. What is the new expression?

$x^2 + 10x + 25$

e. Factor the new expression.

$(x + 5)^2$

The process you just worked through is a method known as *completing the square*. **Completing the square** is a process for writing a quadratic expression in vertex form which then allows you to solve for the zeros.

4. Draw a model to complete the square for each expression. Then factor the resulting trinomial.

a. $x^2 + 8x$

b. $x^2 + 5x$

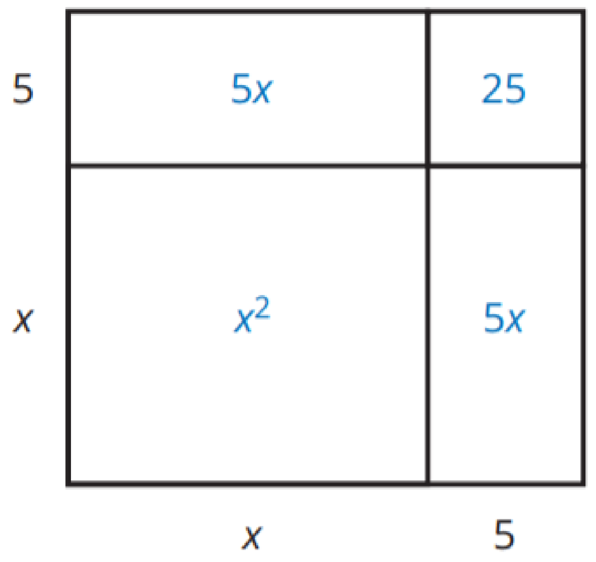
6. Use the descriptions you provided in Question 5 to determine the unknown second or third term to make each expression a perfect square trinomial. Then write the expression as a binomial squared.

a. $x^2 - 8x +$ ________ = ________

b. $x^2 + 5x +$ ________ = ________

c. $x^2 -$ ________ $+ 100 =$ ________

d. $x^2 +$ ________ $+ 144 =$ ________



Determine the roots of the equation $x^2 + 10x + 12 = 0$.

Isolate $x^2 - 4x$. You can complete the square and rewrite this as a perfect square trinomial.

$$x^2 + 10x + 12 - 12 = 0 - 12$$
$$x^2 + 10x = -12$$

Determine the constant term that would complete the square.
Add this term to both sides of the equation.

$$x^2 + 10x + \_\_\_\_ = -12 + \_\_\_\_$$
$$x^2 + 10x + 25 = -12 + 25$$
$$x^2 + 10x + 25 = 13$$

Factor the left side of the equation.

$$(x + 5)^2 = 13$$

Determine the square root of each side of the equation.

$$\sqrt{(x+5)^2} = \pm\sqrt{13}$$
$$x + 5 = \pm\sqrt{13}$$

Set the factor of the perfect square trinomial equal to each square root of the constant.
Solve for x.

$$x + 5 = \sqrt{13} \quad \text{and} \quad x + 5 = -\sqrt{13}$$
$$x = -5 + \sqrt{13} \quad \text{and} \quad x = -5 - \sqrt{13}$$
$$x \approx -1.39 \quad \text{and} \quad x \approx -8.61$$

The roots are approximately 3.41 and 0.59.

1. Consider the equation $y = x^2 + 8x + 10$.

a. Use this method to determine the roots of the equation. Show your work.