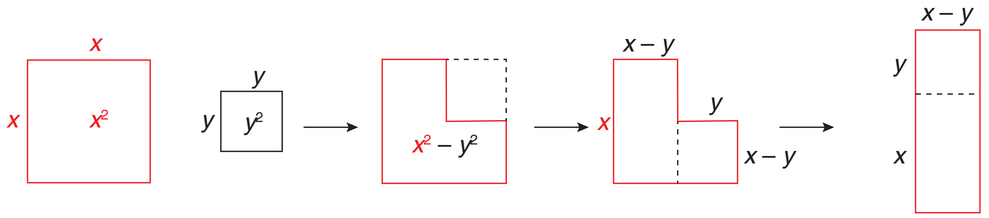
Lesson 5.4: Other Factoring Strategies

Practice – VI

1. This diagram was used in *Lesson 5.4* to help explain factoring a difference of squares.



a. Explain the diagram.

Explanations will vary. A sample is shown.

- The first step shows that a square with side length x has an area of x^2 and that a square with a side length y has an area of y^2.
- The second step shows that $x^2 - y^2$ can be represented by removing a square of length y from a square of length x.
- The third section step shows that the remaining area can be split into two rectangles. One has length x and width $x - y$ and the other has length y and width $x - y$.
- The fourth step shows that the two rectangles can be placed side-by-side to form a larger rectangle because both rectangles have a width of $x - y$.

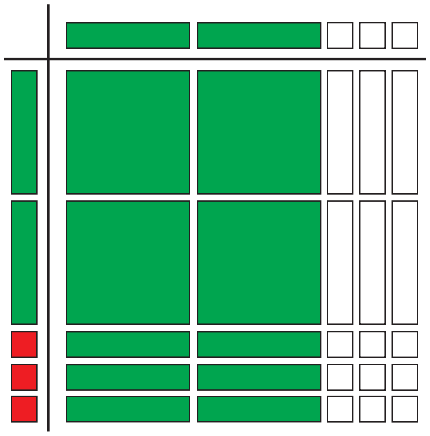
b. How does this diagram show that $x^2 - y^2 = (x + y)(x - y)$?

The area of the shape in the second step can be represented by $x^2 - y^2$. This same area is represented in the final diagram as a rectangle with length $x + y$ and width $x - y$. Because the two areas are equal, $x^2 - y^2$ must equal $(x + y)(x - y)$.

2. Show that $4p^2 - 9$ can be factored using each of the following methods.

   a. algebra tiles

   Six pairs of *x* and –*x* tiles must be introduced to form a rectangle.



   $4p^2 - 9 = (2p - 3)(2p + 3)$

   b. decomposition

   $ac = -36$ and $b = 0$

   The integers –6 and 6 have a product of –36 and a sum of 0.

$$\begin{aligned} 4p^2 - 9 &= 4p^2 - 6p + 6p - 9 \\ &= (4p^2 - 6p) + (6p - 9) \\ &= 2p(2p - 3) + 3(2p - 3) \\ &= (2p - 3)(2p + 3) \end{aligned}$$

   c. a difference of squares

   $\sqrt{4p^2} = 2p$ and $\sqrt{9} = 3$

   $4p^2 - 9 = (2p + 3)(2p - 3)$

3. Factor each of the following expressions.

   a. $121 - p^2$

   $\sqrt{121} = 11$ and $\sqrt{p^2} = p$

   $121 - p^2 = (11 + p)(11 - p)$

b. $a^2 - b^2$

$\sqrt{a^2} = a$ and $\sqrt{b^2} = b$

$a^2 - b^2 = (a+b)(a-b)$

4. Factor each of the following expressions.

a. $n^2 - 4n + 4$

$$\begin{aligned} n^2 - 4n + 4 &= n^2 + 2(n)(-2) + (-2)^2 \\ &= (n-2)^2 \end{aligned}$$

The trinomial $n^2 - 4n + 4$ can also be factored to $(2-n)^2$.

b. $4t^2 + 8t + 4$

$$\begin{aligned} 4t^2 + 8t + 4 &= 4(t^2 + 2t + 1) \\ &= 4(t^2 + 2(t)(1) + 1^2) \\ &= 4(t+1)^2 \end{aligned}$$

5. Arnold said he can multiply some large numbers easily by factoring a difference of squares. He showed the following example.

$$\begin{aligned} (54)(46) &= (50+4)(50-4) \\ &= 50^2 - 4^2 \\ &= 2500 - 16 \\ &= 2484 \end{aligned}$$

Comment on Arnold's procedure.

Responses will vary. A sample is shown.

Arnold's strategy is reasonable, but he never actually factored a difference of squares. A better description may be that he used the difference of squares relationship to multiply large numbers.

Please complete *Lesson 5.4 Explore Your Understanding Assignment*, located in *Workbook 5.4*.