Factoring Special Cases

Name ______________________

Class ______________________

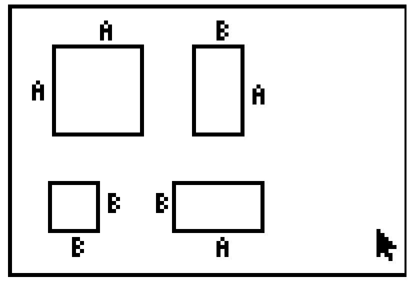
Problem 1 – Factoring a perfect-square trinomial

Any trinomial of the form $a^2 + 2ab + b^2$ is a perfect-square trinomial. If you recognize a perfect-square trinomial, you can factor it immediately as $(a + b)^2$.

To see why $a^2 + 2ab + b^2 = (a + b)^2$, start the **CabriJr** app and open the file **FACTOR1**.

This file shows two squares and two rectangles, with their dimensions labeled with A or B.

- What is the area of each shape? On the screenshot at right, label each shape with its area.



Arrange the shapes to form a square.

- The area of this square is equal to the sum of the areas of the shapes that make it up. What is the area of the square? Have you seen this trinomial before?

- How long is one side of the square?

- Using the formula $A = s^2$ for the area of a square with side length s what is the area of this square?

You have shown that the area of this square is equal to $a^2 + 2ab + b^2$ and also equal to $(a + b)^2$. Therefore $a^2 + 2ab + b^2 = (a + b)^2$.

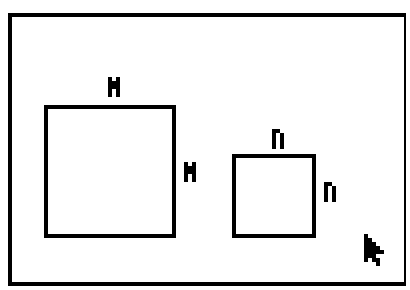
You have proved the rule for factoring a perfect-square trinomial!

Problem 2 - Factoring a difference of squares

Any trinomial of the form $m^2 – n^2$ is a difference of squares. If you recognize a difference of squares, you can factor it immediately as $(m + n)(m – n)$.

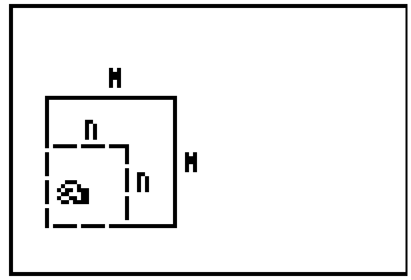
To see why $m^2 – n^2 = (m + n)(m – n)$, open the file **FACTOR2**. This file shows 2 squares with their dimensions labeled.

- What is the area of each square? On the screenshot at right, label each square with its area.



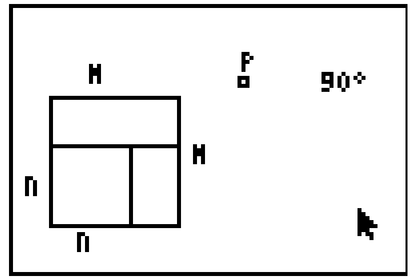
How can you represent the area $m^2 - n^2$ with these squares? Move the n^2 square on top of the m^2 rectangle so that their corners align.

- On the screenshot at the right, shade the area that is equal to $m^2 - n^2$.

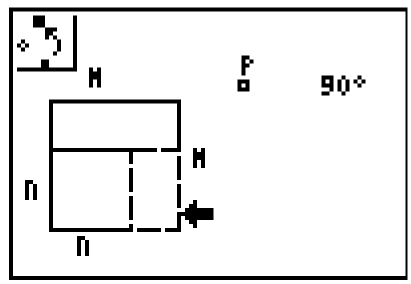


We know that the area of the L-shape is $m^2 - n^2$, but there is also another way to find its area: by taking it apart and rearranging the pieces into a single long rectangle.

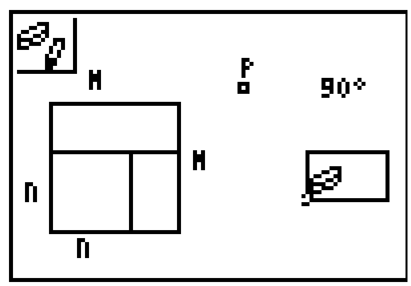
Open the file **FACTOR3**, which shows the same shapes, but with the L-shaped area ($m^2 - n^2$) divided into two rectangles.



Rotate the smaller rectangle about point P (at the top of the screen) clockwise 90° using the **Rotation** tool.



Hide the original small rectangle and the vertices of the rotated image using the **Hide/Show > Objects** tool.



Move the larger rectangle alongside the rotated image to form one long rectangle. Now there are two rectangles whose combined area is equal to the area of the original L-shape.

- What are the dimensions of the long rectangle?
- Using the formula $A = lw$ for the area of a rectangle and these dimensions, what is the area of this rectangle?

You have shown that the L-shaped area is equal to $m^2 - n^2$ and also equal to $(m + n)(m - n)$. Therefore $m^2 - n^2 = (m + n)(m - n)$.

You have proved the rule for factoring a difference of squares!