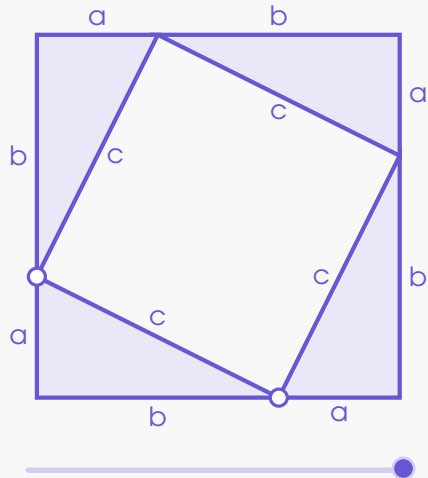


Objective: To create an applet that proves the Pythagorean Theorem by applying the Area of a Square Formula.



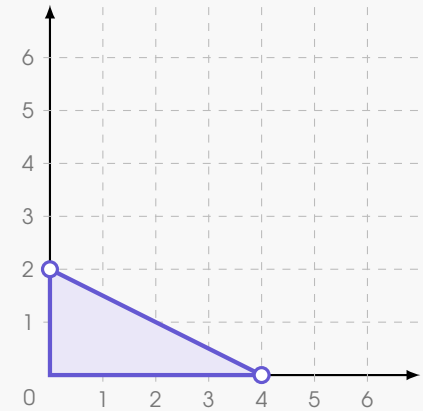
$$(a + b)^2 - c^2 = 4\left(\frac{1}{2}ab\right)$$

$$a^2 + 2ab + b^2 - c^2 = 2ab$$

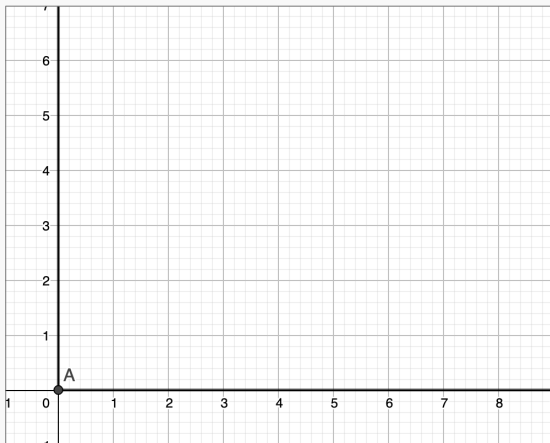
$$a^2 + b^2 - c^2 = 0$$

$$a^2 + b^2 = c^2$$

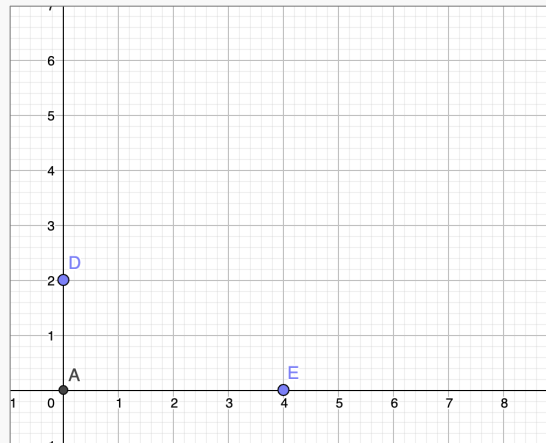
Mini-Objective 1: To create a right triangle with one leg on the positive x-axis and the other on the positive y-axis.



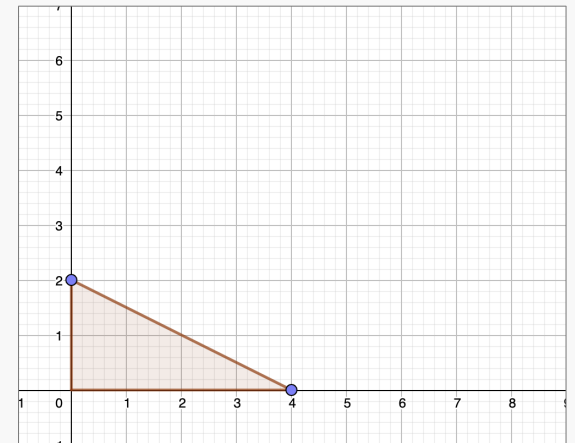
Step 1: Draw a ray that extends the positive y-axis and a ray that extends the positive x-axis. Hide points B and C.



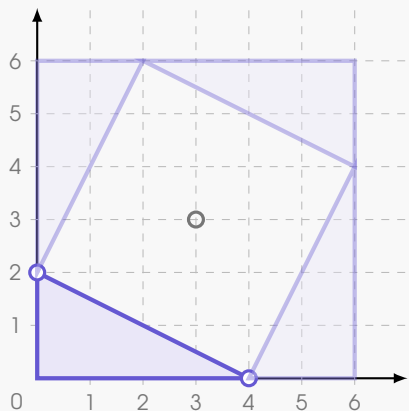
Step 2: Select the Point on Object tool and place a point on each ray. Hide the rays.



Step 3: Select the Polygon tool and then select points A → D → E → A to create a triangle. Hide point A and hide the labels of point D and E.



Mini-Objective 2: To assemble a square by rotating $\triangle ADE$ around its predicted center point.



Note: $\triangle ADE$ is a movable object and therefore the center point must be defined dependent to this object.

$$\text{Center Point} = \left(\frac{\text{Leg 1} + \text{Leg 2}}{2}, \frac{\text{Leg 1} + \text{Leg 2}}{2} \right)$$

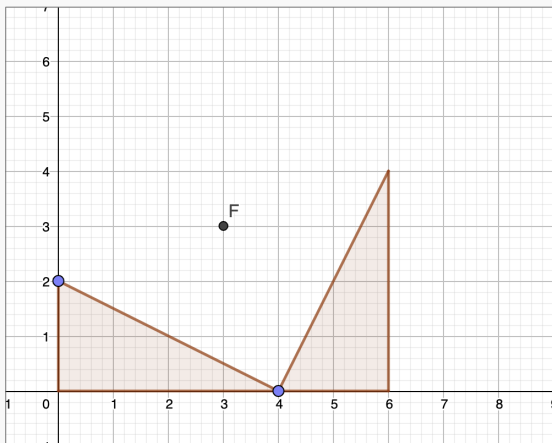
This definition will allow for a dynamic display that is responsive to the movement of points D and E.

Step 4: Inside the algebra window, define the center point as:

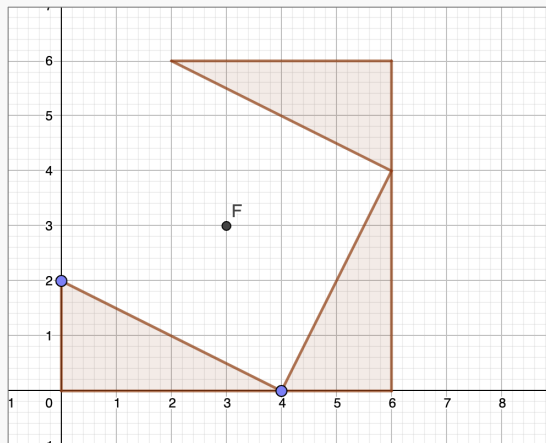
+	$F = \left(\frac{(d+e)}{2}, \frac{(d+e)}{2} \right)$ $\rightarrow = (3,3)$	⋮
---	-----------------------------------------------------------------------------	---

Tip: Right-click on an object to learn its name.

Step 5: Select the Rotate around Point tool to create a copy of $\triangle ADE$ that is rotated 90° counter-clockwise around point F. Hide the copied points.



Step 6: Select the Rotate around Point tool to create a copy of $\triangle ADE$ that is rotated 180° counter-clockwise around point F. Hide the copied points.



Step 7: Select the slider tool to create a variable angle, α . Right-click on the slider and unselect the Pin to Screen option.

Slider

Name

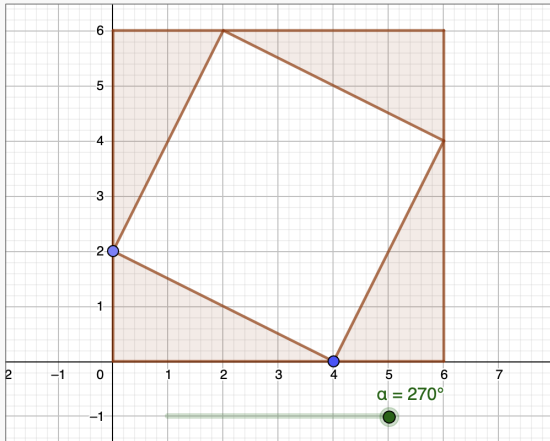
$\alpha = 0^\circ$

Number
 Angle
 Integer

Interval

Min	Max	Increment
0°	270°	1°

Step 8: Select the Rotate around Point tool to create a copy of $\triangle ADE$ that is rotated α counter-clockwise around point F. Hide the copied points and hide point F.



Step 9: For each triangle and its edges, go to object settings, navigate to the advanced tab, and provide the following condition to show object: $\alpha > \text{angle of rotation}$.

Condition to Show Object

$\alpha > 0^\circ$

Condition to Show Object

$\alpha > 90^\circ$

Condition to Show Object

$\alpha > 180^\circ$

→

Tip: To enter the degree symbol type *deg*.

To enter α , type: option + a (Mac), alt + a (Windows).

→

→

Mini-Objective 3: To provide an algebraic derivation to compliment the visual.

$$(a + b)^2 - c^2 = 4\left(\frac{1}{2}ab\right)$$

$$a^2 + 2ab + b^2 - c^2 = 2ab$$

$$a^2 + b^2 - c^2 = 0$$

$$a^2 + b^2 = c^2$$

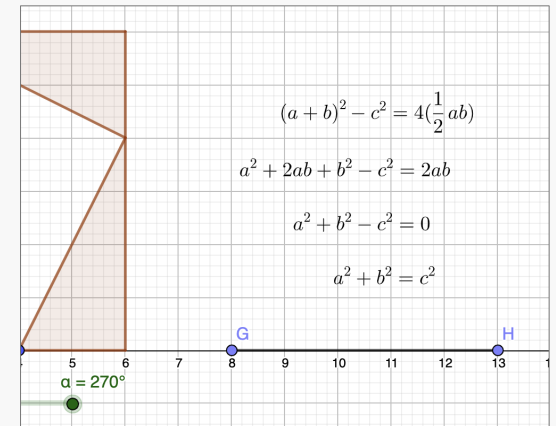
●
Pull Down to Reveal

Step 10: Select the text tool, indicate text as a LaTeX Formula, and copy and paste the following LaTeX code:

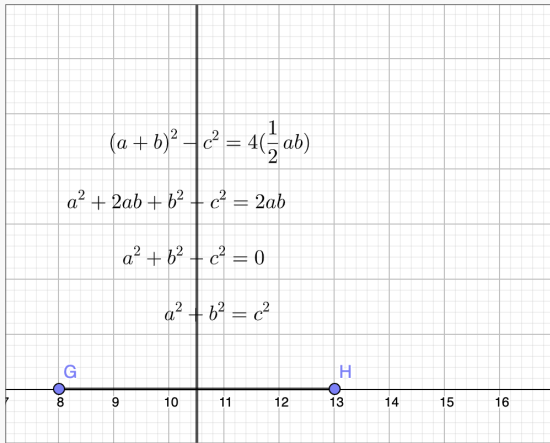
```

\hspace{.525in} (a + b)^2 - c^2 = 4
(\frac{1}{2}ab) \\ \\ \\ a^2 + 2ab
+ b^2 - c^2 = 2ab \\ \\ \\ \\
\hspace{.7in} a^2 + b^2 - c^2 = 0 \\ \\
\\ \\ \hspace{1.225in} a^2 + b^2 = c^2
    
```

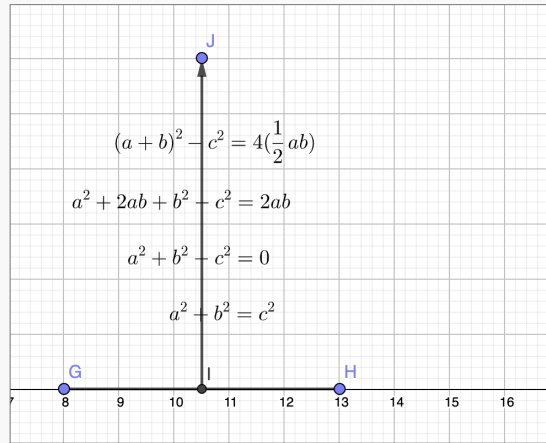
Step 11: Select the Segment tool and create a segment with endpoints outside of the text.



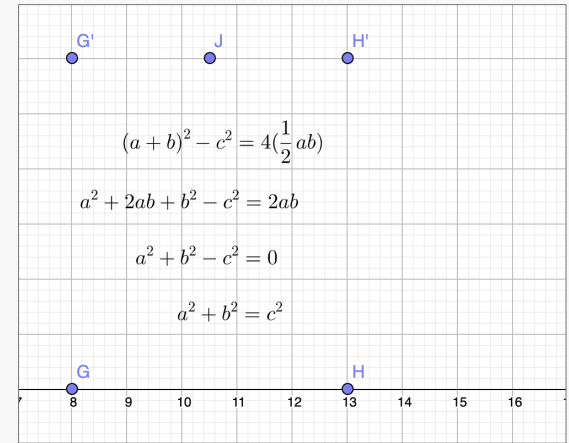
Step 12: Select the Perpendicular Bisector tool and then select the segment.



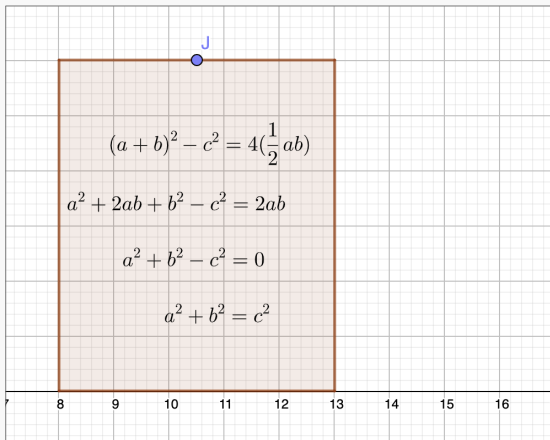
Step 13: Select the Vector tool. Select the point of intersection and then a point on the line. Hide the line.



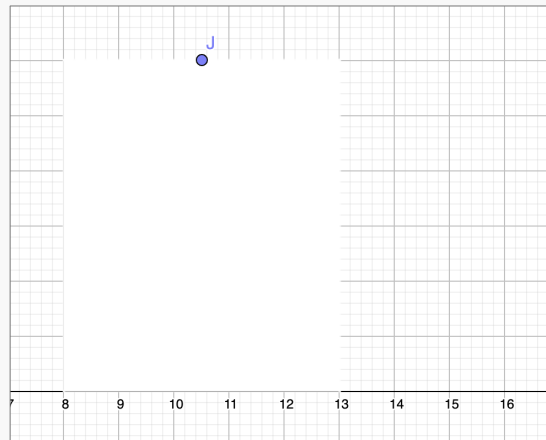
Step 15: Select the Translate by Vector tool. Select the segment and then the vector. Hide the vector, segments and point I.



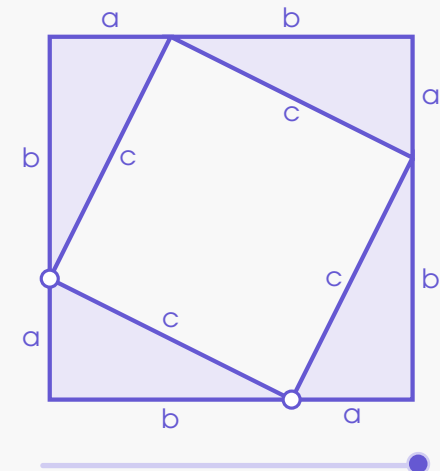
Step 16: Select the Polygon tool and then select points $G \rightarrow H \rightarrow H' \rightarrow G' \rightarrow G$. Hide points $G, G', H,$ and H' .



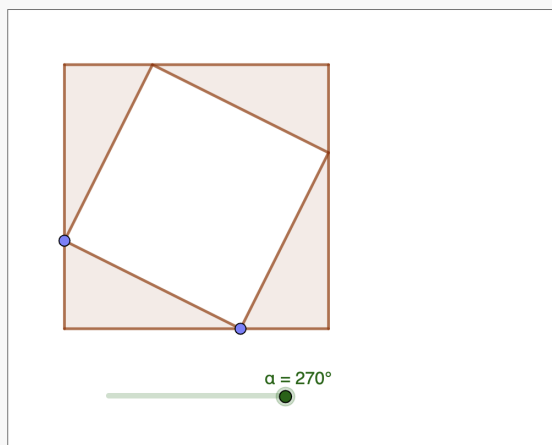
Step 17: In object settings, navigate to the Advanced tab and indicate the polygon and point J as Layer 1 objects. Navigate to the Color tab and change the color to white with full opacity.



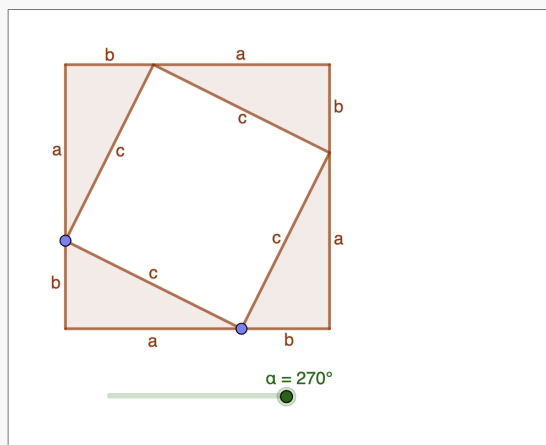
Mini-Objective 4: To add some final touches.



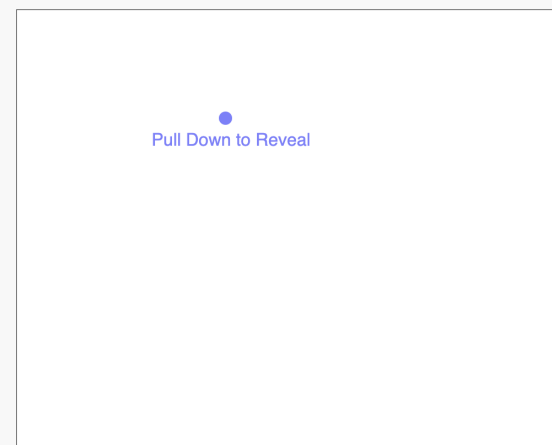
Step 18: In graphics settings, hide the grid and hide the axes.



Step 19: In object settings, show label as caption for each segment. Provide the following captions.



Step 20: In object settings, show label as caption for point I. Provide the following caption.



Tip: To access graphics settings, right-click on the graphics window and then select, Graphics.

Step 21: Customize the appearance to your liking.

