Triangles and Quadrilaterals in Standard Position

Standard Position of any triangle or quadrilateral:

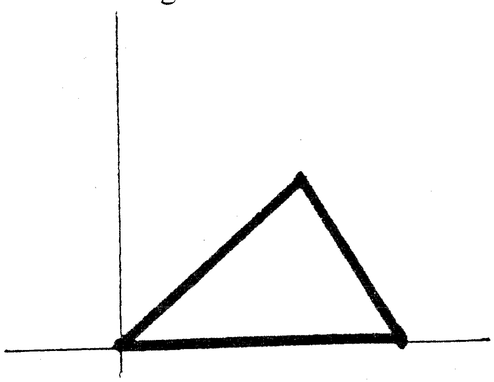
What do you notice about standard position?

⇒ Figure is positioned w/ a vertice at the origin (0,0).

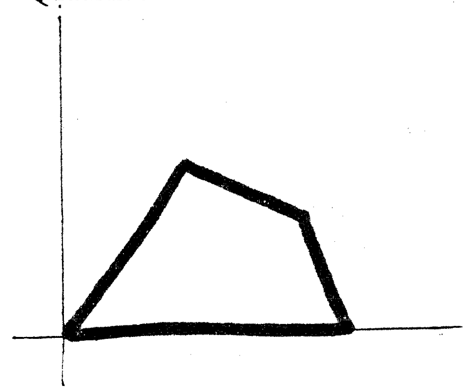
⇒ 1st Quad

⇒ use x- & y-axes as boundaries!

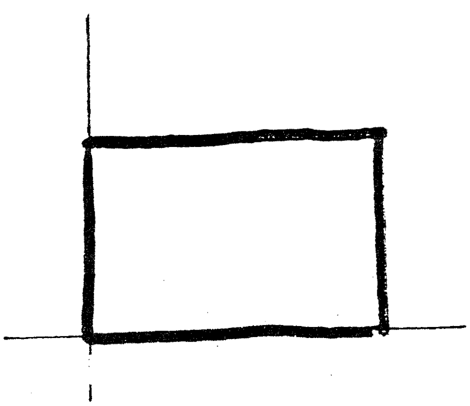
Triangle



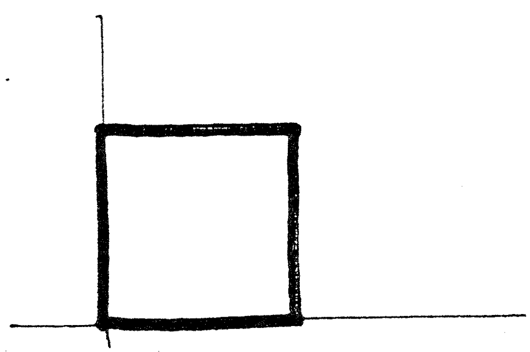
Quadrilateral



Rectangle



Square



Honors Geometry
Notes - Section 4.7 Coordinate Proof

Name KEY
Date ______________________ Period ________

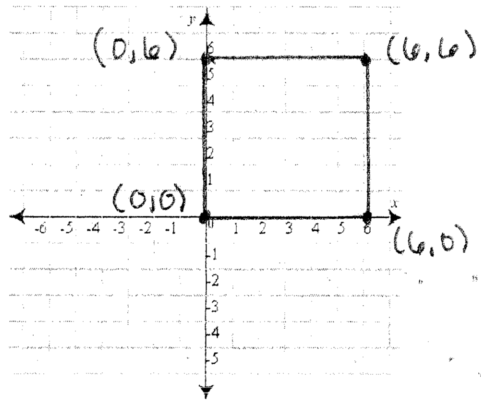
Coordinate Proof
A style of proof that uses coordinate geometry and algebra. The first step is to position the given figure in the plane.

Strategies for Positioning Figures in the Coordinate Plane

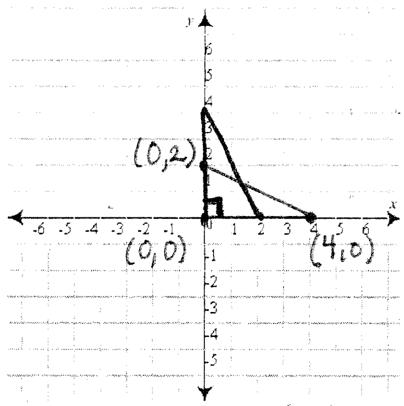
- ★ Use the origin as a vertex, keeping the figure in Quadrant I.
- Center the figure at the origin.
- Center a side of the figure at the origin.
- Use one or both axes as sides of the figure.

use standard position if you can!!

Example 1: Position a square with side length of 6 units in the coordinate plane. (standard form)



Example 2: Position a right triangle with leg lengths of 2 and 4 units in the coordinate plane.
(standard form)



NOTE: You can use slope, the coordinates of the vertices, the Distance Formula, or the Midpoint Formula to prove statements about the figure.

Slope Formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Midpoint Formula:

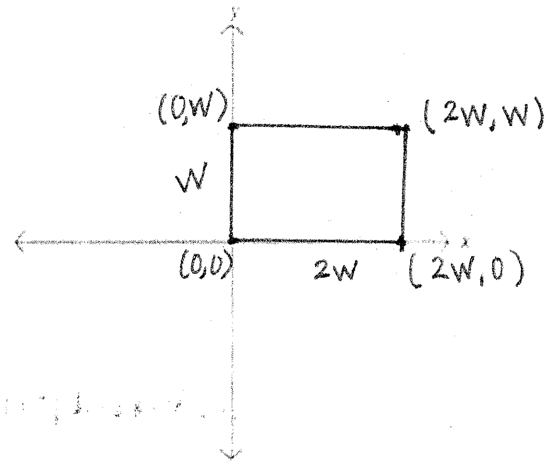
$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Distance Formula:

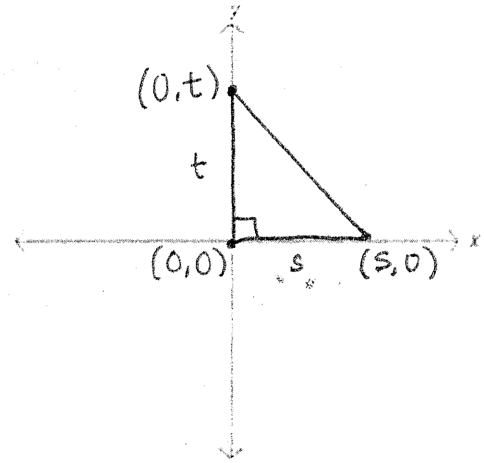
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Example 3: Position each figure in the coordinate plane and give the coordinates of each vertex.

A. rectangle with width ~~w~~ W and length twice the width 2W



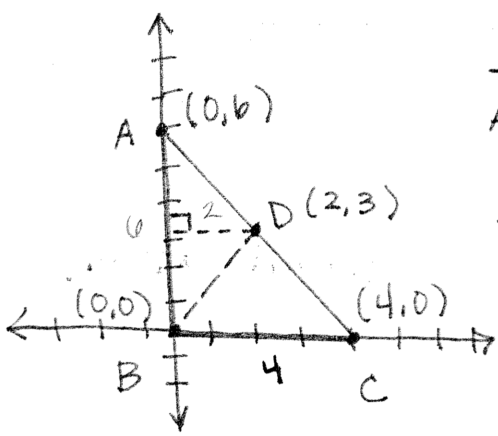
B. right triangle with legs of length s and t.



Example 4:

Given: Right $\triangle ABC$ has vertices A(0,6), B(0,0), and C(4, 0). D is the midpoint of AC.

Prove: Area of $\triangle ADB$ is one half the area of $\triangle ABC$.



Area $\triangle ABC$

$A = \frac{1}{2}(4)(6) = \frac{1}{2}(24) = \boxed{12 un^2}$

Midpoint D

$M = \left(\frac{0+4}{2}, \frac{6+0}{2}\right) = (2, 3)$

Area $\triangle ADB$

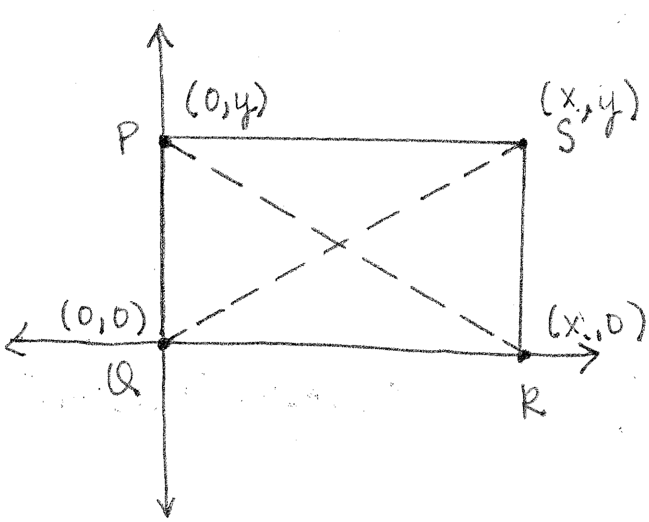
$A = \frac{1}{2}(2)(6) = \frac{1}{2}(12) = \boxed{6 un^2}$

$\therefore$ Area of $\triangle ADB$ is $\frac{1}{2}(\triangle ABC)$.

Example 5:

Given: Rectangle PQRS

Prove: Diagonals are congruent.



$SQ = \sqrt{(x-0)^2 + (y-0)^2} = \boxed{\sqrt{x^2+y^2}}$

$PR = \sqrt{(0-x)^2 + (y-0)^2} = \boxed{\sqrt{x^2+y^2}}$

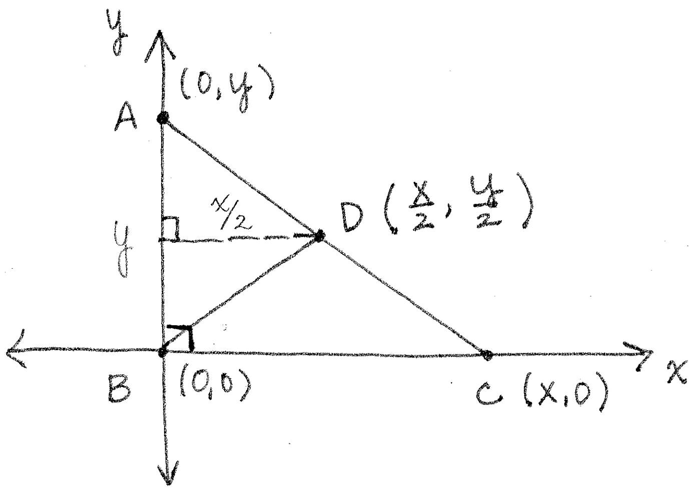
$SQ = PR$

$\therefore \overline{SQ} \cong \overline{PR}$

Example 6:

Given: $\angle B$ is a right angle in $\triangle ABC$. D is the midpoint of $\overline{AC}$.

Prove: The area of $\triangle ADB$ is one half the area of $\triangle ABC$.



Area $\triangle$ ABC

$$A=\frac{1}{2}(x)(y) = \boxed{\frac{xy}{2}}$$

Midpoint D

$$M = \left(\frac{0+x}{2}, \frac{y+0}{2}\right) = \left(\frac{x}{2}, \frac{y}{2}\right)$$

Area $\triangle$ ADB

$$A = \frac{1}{2}(y)\left(\frac{x}{2}\right)$$

$$A = \frac{1}{2}\left(\frac{xy}{2}\right) = \boxed{\frac{xy}{4}}$$

$\therefore$ Area of $\triangle$ ADB is $\frac{1}{2}$ $\triangle$ ABC.