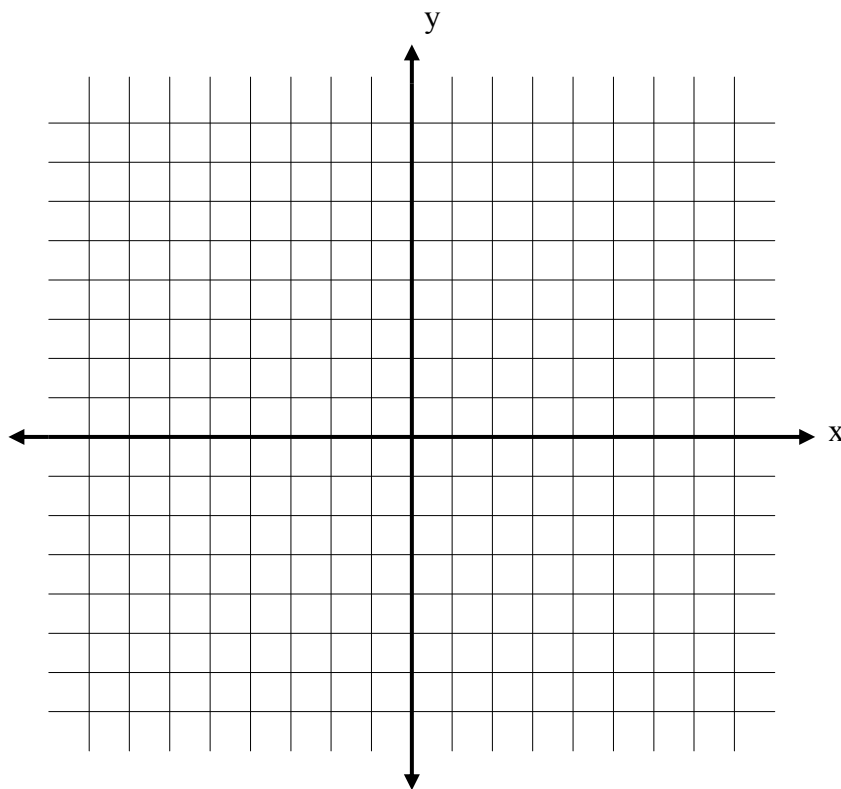**Algebra 2: Section 7-4, Ellipse**

Equations of Ellipses: An **ellipse** is the set of all points in a plane such that the *sum* of the distances from two given points in the plane, called the foci, is constant. An ellipse has two axes of symmetry which contain the **major** and **minor axes**. In the table, the lengths *a*, *b*, and *c* are related by the formula $c^2 = a^2 - b^2$

*** *Please note that a, b, and c are related to the Pythagorean theorem, but not the same parts!* ***

Standard Form of Equation	$\dfrac{(x-h)^2}{a^2} + \dfrac{(y-k)^2}{b^2} = 1$ where $c^2 = a^2 - b^2$	$\dfrac{(x-h)^2}{b^2} + \dfrac{(y-k)^2}{a^2} = 1$ where $c^2 = a^2 - b^2$
Center	**(h, k)**	**(h, k)**
Direction of Major Axis	**Horizontal**	**Vertical**
Foci	**(h – c, k) & (h + c, k)**	**(h, k + c) & (h, k – c)**
Length of Major Axis	**2a units**	**2a units**
Length of Minor Axis	**2b units**	**2b units**

Every ellipse has two axes of symmetry. The points at which the ellipse intersects the axes define two segments with endpoints on the ellipse. The longer segment is called the <u>major axis</u>; the shorter the <u>minor axis</u>. The foci always lie on the major axis. The intersection of the two axes creates the <u>center</u>.

The sum of the distances from the foci to any point on the ellipse is 2a. The distance from the center to a focus in c. The total length of the major axis is 2a. The total length of the minor axis is 2b. Notice that a > b. It follows that $a^2 > b^2$. Thus, if a^2 (the bigger number) is the denominator of the $(x - h)^2$ term, the major axis is horizontal. If a^2 (the bigger number) is the denominator of the $(y - k)^2$ term, the major axis is vertical.