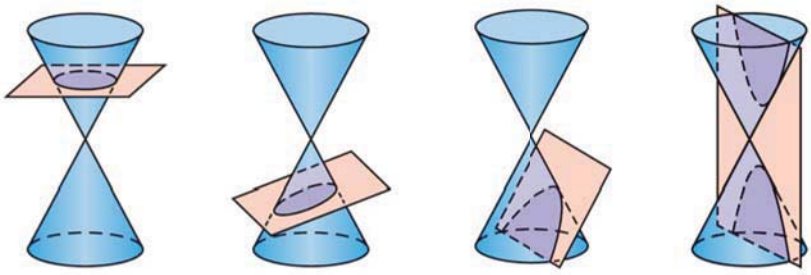
9.6 Exploring Intersections of Planes and Cones

TEKS 2A.5.A

MATERIALS • flashlight • graph paper

QUESTION How do a plane and a double-napped cone intersect to form different conic sections?

The reason that parabolas, circles, ellipses, and hyperbolas are called *conics* or *conic sections* is that each can be formed by the intersection of a plane and a double-napped cone, as shown below.



Circle Ellipse Parabola Hyperbola

EXPLORE Find an equation of a conic

STEP 1 Draw axes

Work in a group. On a piece of graph paper, draw x- and y-axes to make a coordinate plane. Then tape the paper to a wall.

STEP 2 Model a circle

Aim a flashlight perpendicular to the paper so that the light forms a circle centered on the origin of the coordinate plane. Trace the circle on the graph paper. Find the circle's radius, and use it to write the standard form of the circle's equation.

STEP 3 Model an ellipse

Tilt the flashlight, and aim it at the paper to form an ellipse with a vertical major axis and center at the origin. Trace the ellipse and write the standard form of its equation.

DRAW CONCLUSIONS Use your observations to complete these exercises

1. *Compare* the equations for your circle and for your ellipse with the equations of other groups. Are your equations all the same? Why or why not?
2. Refer to the diagram of a hyperbola to explain how you can orient the flashlight beam to form a branch of a hyperbola on the wall.