

**8.1, 8.2 & 8.3 Parabolas, Ellipses & Hyperbolas**

Target 4A/4C/4E: Investigate the geometric properties of parabolas/ellipses/hyperbolas

**Conic Sections Sort**

<p style="text-align: center;">A</p> $\frac{x^2}{49} + \frac{y^2}{16} = 1$	<p style="text-align: center;">B</p> $\frac{x^2}{49} - \frac{y^2}{16} = 1$	<p style="text-align: center;">C</p> $x^2 = 16y$	<p style="text-align: center;">D</p> $x^2 + (y + 3)^2 = 49$
<p style="text-align: center;">E</p> $\frac{x^2}{16} + \frac{(y + 3)^2}{49} = 1$	<p style="text-align: center;">F</p> $\frac{x^2}{16} - \frac{(y + 3)^2}{49} = 1$	<p style="text-align: center;">G</p> $(y + 3)^2 = -16(x - 2)$	<p style="text-align: center;">H</p> $16x^2 + 16y^2 = 16$
<p style="text-align: center;">I</p> $\frac{(y - 3)^2}{16} + \frac{(x + 2)^2}{49} = 1$	<p style="text-align: center;">J</p> $\frac{(y - 3)^2}{16} - \frac{(x + 2)^2}{49} = 1$	<p style="text-align: center;">K</p> $16(y - 2) = (x + 3)^2$	<p style="text-align: center;">L</p> $4y^2 = -64x$
<p style="text-align: center;">M</p> $16x^2 + 4y^2 = 64$	<p style="text-align: center;">N</p> <p style="text-align: center;">Vertices:  <math>(-2, -4)</math> &amp; <math>(-2, 10)</math>            Minor axis: 8</p>	<p style="text-align: center;">O</p> <p style="text-align: center;">Focus: <math>(0, -4)</math>            Directrix: <math>y = 4</math></p>	<p style="text-align: center;">P</p> <p style="text-align: center;">Vertices: <math>(\pm 4, 0)</math>  <math>y = \pm \frac{7}{4}x</math></p>

### Suggested Sorts

1. Sort by type of conic section.
2. Sort by orientation.
3. Sort by centers.
4. Sort by “a” value.
5. Sort by eccentricity.

Teacher Directions: Cut out cards. Students work in groups of 3. Give students 5 minutes per sort.

## Sort Outcomes

- Sort by type of conic section.

Circles: D & H  
 Parabolas: C, G, K, O, & L  
 Ellipses: A, E, I, M, & N  
 Hyperbolas: B, F, J, & P

- Sort by orientation.

Parabola  
 Opens up: C & K  
 Opens down: O  
 Opens right: N/A  
 Opens left: G & L

Ellipse  
 Major axis  $\parallel$  to  $x$ -axis: A & I  
 Major axis  $\parallel$  to  $y$ -axis: E, M, & N

Hyperbola  
 East-West: B, F, & P  
 North-South: J

- Sort by centers.

Center  $(0, 0)$ : A, B, H, M, & P  
 Center  $(0, -3)$ : D, E, & F  
 Center  $(-2, 3)$ : I, J, & N

*Note:*

Vertex  $(0, 0)$ : C, L, & O  
 Vertex  $(2, -3)$ : G  
 Vertex  $(-3, 2)$ : K

- Sort by “a” value.

$a = 7$ : A, B, E, I, & N  
 $a = 4$ : F, J, M, & P

- Sort by eccentricity.

$e = 0$ : D & H  
 $e = 1$ : C, G, K, O, & L  
 $0 < e < 1$ : A, E, I, M, & N  
 $e > 1$ : B, F, J, & P