

PROBLEM OF THE DAY

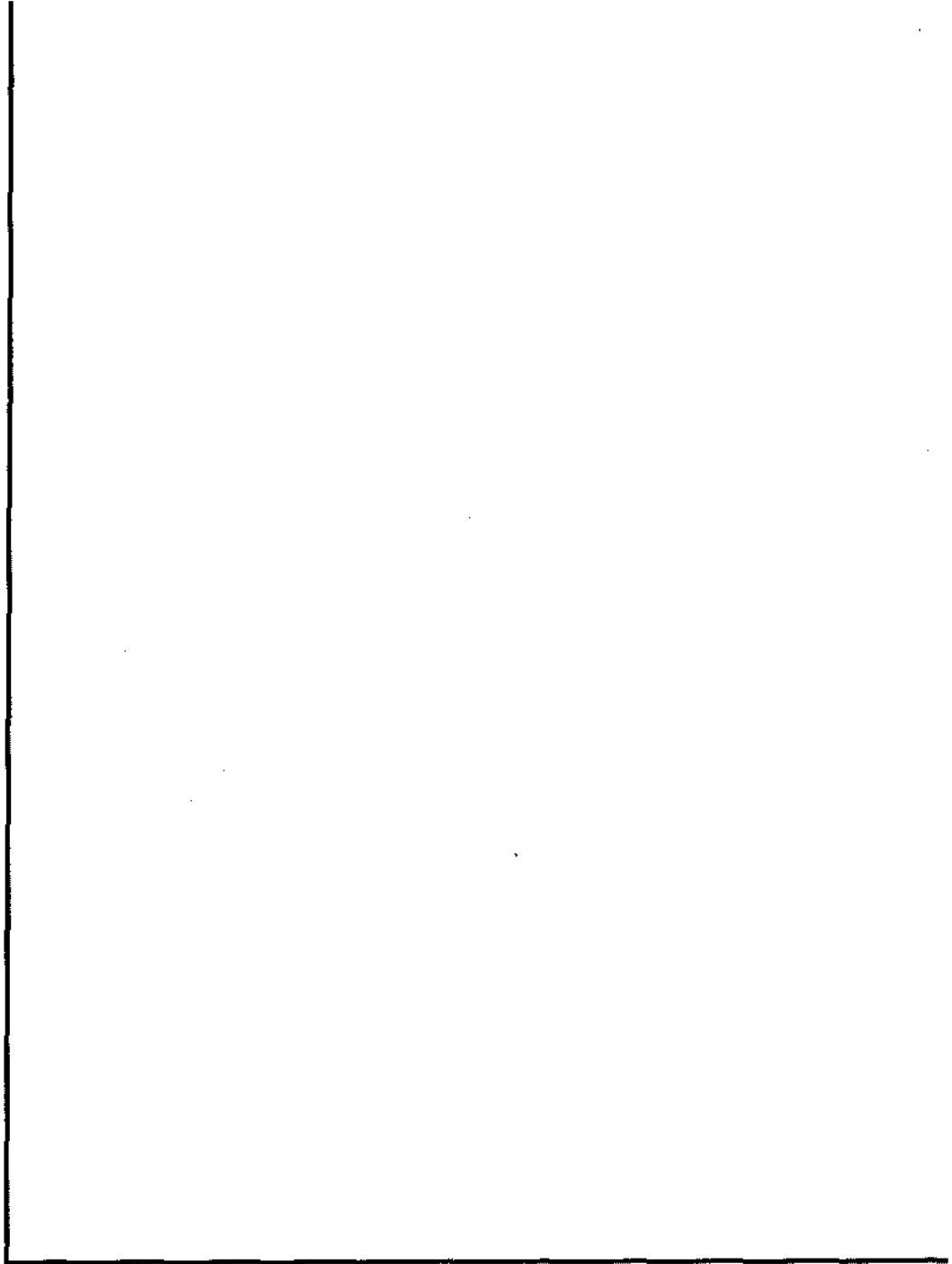
- **4 X 4 SQUARE ARRAYS**
- **How many squares are in a 4x4 square array like the one shown below?**

_____ squares

PROBLEM OF THE DAY

- Here is another counting problem for the 4x4 square array. How many different RECTANGLES of all sizes can you find? Count carefully and systematically and look for patterns. Be sure and include all of the squares that you counted?

Multiplication Rectangle



Factor the following problems using Algebra Tiles and your multiplication rectangle.

1) $X^2 + 5X + 6$

2) $X^2 + 5X + 4$

3) $X^2 + 6X + 9$

Now – start with factors and find the equivalent polynomial

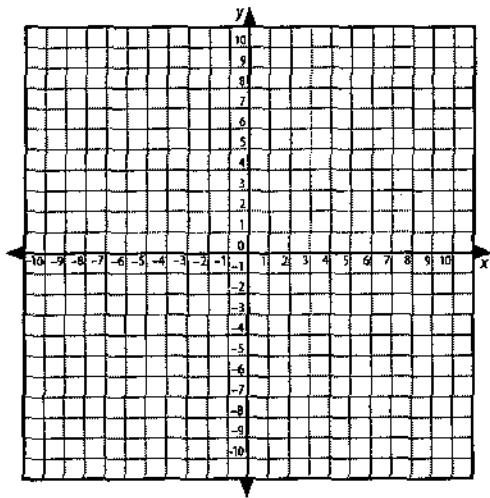
4) $(X + 5)(X + 1)$

5) $(X + 2)(X + 4)$

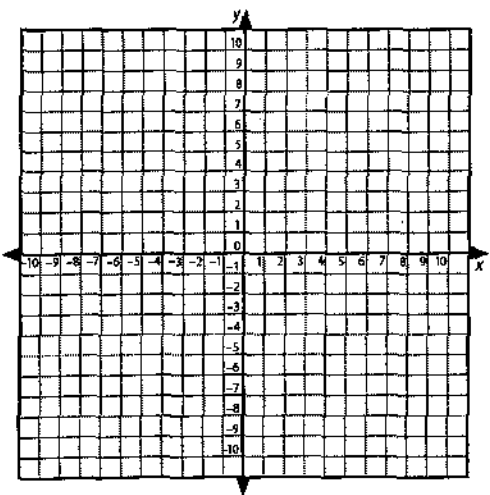
UNIT 6 • MODELING GEOMETRY**Station Activities Set 1: Conics****Station 1**

Work with your group to answer the questions about each circle.

1. What is the equation of a circle with center $(4, 3)$ that is tangent to the x -axis?
2. Graph the circle in problem 1.



3. Circle C has the equation $(x + 1)^2 + (y + 2)^2 = 4$.
 - a. Graph the circle.



- b. What is the circle's vertical axis of symmetry?

continued

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UNIT 6 • MODELING GEOMETRY

Station Activities Set 1: Conics

4. On the graph in problem 3, use a different color to draw circle D , which has the same radius as C , is tangent to C 's vertical axis, and has a center at $(1, -2)$.

5. What is the equation of circle D ?

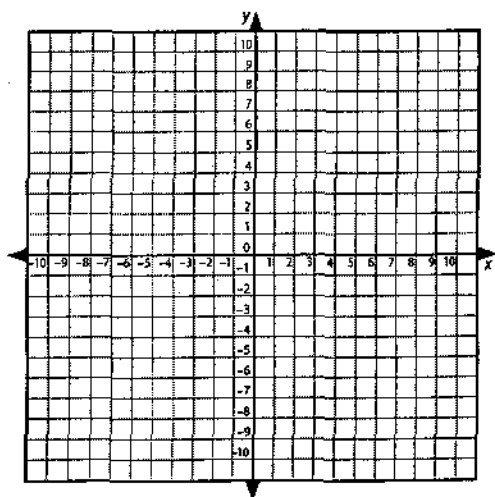
6. A circle has the equation $x^2 + y^2 - 8y + 16 = 25$.
 - a. What is its radius?

 - b. What is its vertical axis of symmetry?

 - c. What is its horizontal axis of symmetry?

 - d. What is a horizontal line tangent to it?

7. Graph the circle in problem 6.

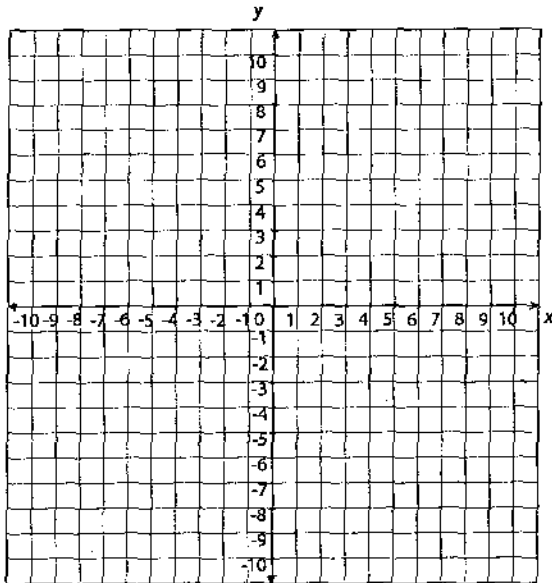


UNIT 6 • MODELING GEOMETRY**Station Activities Set 1: Conics****Station 2**

Work with your group to answer each question about circles and lines. Use the coordinate plane provided to graph your answers.

Given: A circle has the equation $(x - 1)^2 + (y + 1)^2 = 16$.

1. Graph the circle.



2. a. Write the equation of a line that does not intersect the circle.
b. Graph the equation.
c. If the equation of the line and the equation of the circle were solved as a system, would the system have any real solutions? If so, how many?
3. a. Write the equation of a line that is tangent to the circle.
b. Graph the equation.
c. If the equation of the line and the equation of the circle were solved as a system, would the system have any real solutions? If so, how many?
4. a. Write the equation of a line that intersects the circle at two points.
b. Graph the equation.
c. If the equation of the line and the equation of the circle were solved as a system, would the system have any real solutions? If so, how many?

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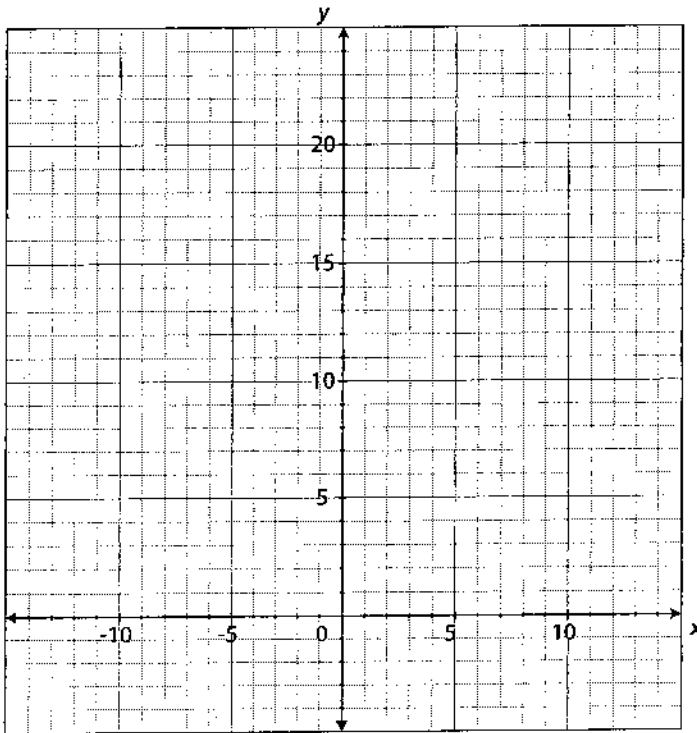
Station Activities Set 1: Conics

Station 3

Work with your group. For problems 1 and 2, complete the following for each given equation:

- Write the equation in standard form.
- Graph the equation.
- Identify the type of graph each equation represents.

1. $3x^2 - 6x - y + 5 = 0$



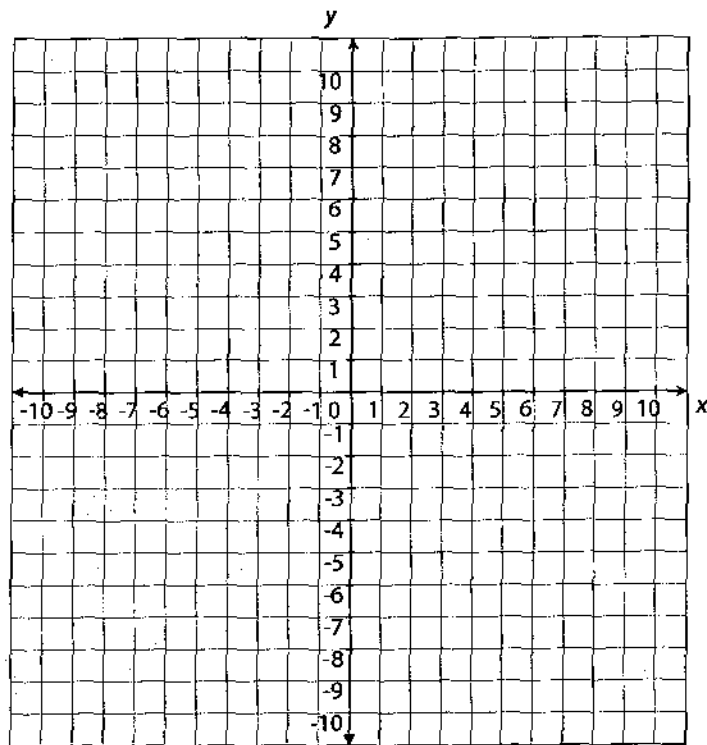
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Station Activities Set 1: Conics

2. $x^2 + y^2 + 4x - 6y + 4 = 0$



3. How can you identify the shape of a graph based on an equation in general form?

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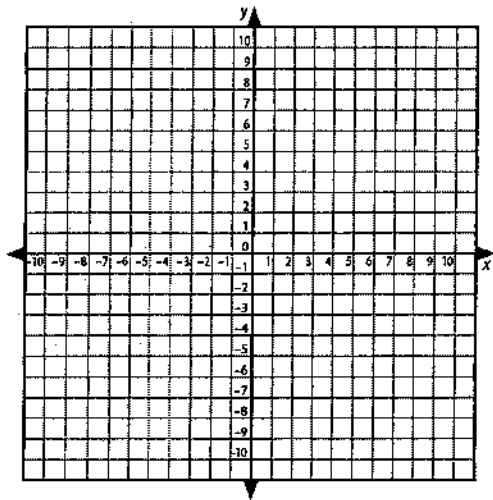
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Station Activities Set 1: Conics

Station 4

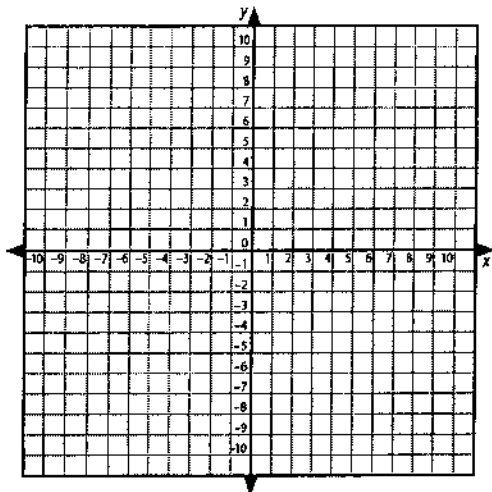
Work with your group to answer the questions about each parabola.

1. Graph $8x = y^2$.



2. In problem 1, what is the parabola's directrix?

3. Graph $2y = (x - 3)^2$.



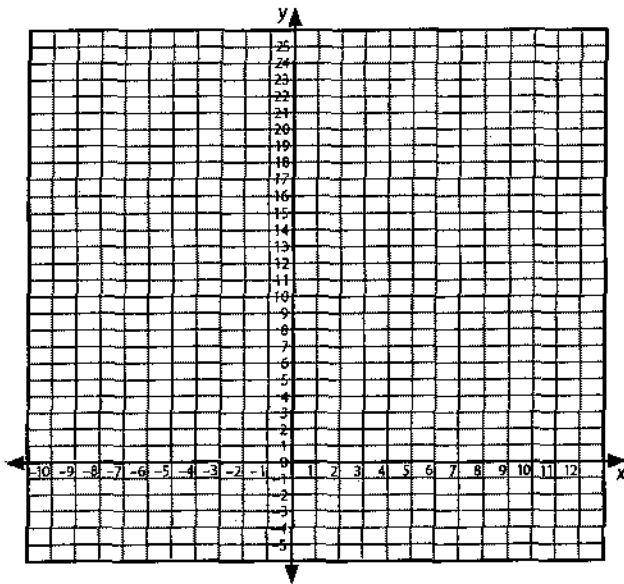
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UNIT 6 • MODELING GEOMETRY

Station Activities Set 1: Conics

- In problem 3, what is the parabola's directrix?
- In problem 3, what are the coordinates of the parabola's vertex?
- In problem 3, where is the parabola's focus?
- Graph $y = \frac{x^2}{4} - x + 1$.



Georgia Department of Education
 Common Core Georgia Performance Standards Framework Teacher Edition
CCGPS Analytic Geometry • Unit 6

Task Name	Task Type Grouping Strategy	Content Addressed
Equations of Circles	Performance Task <i>Large Group/Partner Task</i>	Generalizing the formula for the equation of a circle.
Converting Standard to General Form	Learning Task <i>Individual/Partner Task</i>	Algebraic manipulations necessary to change an equation from standard form to general form.
Completing the Square in a Circle?	Learning Task <i>Individual/Partner Task</i>	Completing the square to find the center and radius of a given circle.
Graphing Circles on a Graphing Calculator	Extension Task <i>Partner/Small Group Task</i>	Using technology to graph a circle.
Radio Station Listening Areas	Performance Task <i>Individual/Partner Task</i>	Real-world applications of writing the equation of a circle.
Deriving the General Equation of a Parabola	Performance Task <i>Large Group/Partner Task</i>	Generalizing the formula for the equation of a parabola.
Parabolas in Other Directions	Learning Task <i>Individual/Partner Task</i>	Derive the equation of a parabola given the focus and directrix.
Writing the Equation of a Parabola	Learning Task <i>Individual/Partner Task</i>	Write the equation of a parabola given the focus and directrix.
The Intersection of a Line and Quadratic	Performance Task <i>Individual/Partner Task</i>	Solving systems of a linear and quadratic equation in two variables.
Algebraic Proof	Learning Task <i>Individual/Partner Task</i>	Using coordinates to prove simple geometric theorems algebraically.
Culminating Task: Dr. Cone's New House	Performance Task <i>Individual/Partner Task</i>	Write the equations of circles and parabolas and use coordinates to prove simple geometric theorems algebraically.

CULMINATING TASK: DR CONE'S NEW HOUSE

Standard Addressed

MCC9-12.G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

MCC9-12.G.GPE.2 Derive the equation of a parabola given a focus and directrix.

MCC9-12.G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.*

A local mathematician, Dr. Cone, has hired your architecture firm to design his new house. Because your boss knows you are in Analytic Geometry, he has put you in charge of the design for the entrance of the house. The mathematician has given some very unconventional requests for the design of the entrance:

- He wants two doors, both shaped like parabolas.
- He wants at least two windows, both shaped like circles.

You also know the following information:

- The dimensions of the front entrance way are 18 feet long and 10 feet tall.
- A local window and door manufacturer can produce any shape window or door, given an equation for the shape.

State and Local guidelines also state:

- All entryways to residential property must be greater than or equal to 7 feet in height.

Using a piece of graph paper, draw a design for the entry way of the house. Be sure to label all important points for the builder. Include a "Specifications Sheet" that includes equations of the figures for the window and door manufacturer.

Dr. Cone has come to you after seeing your design and expresses a concern. He has just ordered a new transmogrifer and he is worried that it will not fit in the front door. The transmogrifer ships in a box that is 3'x3'x9'. According to your design, will the box fit in one of your doors?