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“Shooting” for Coordinates & the Equation of a Circle



For this activity, you will be gaining more practice with plotting coordinates. You will also be determining the equation of a circle using 2 points and converting a general form for the equation of a circle to the standard form.

Goals:

* Students will be able to plot points on a coordinate plane using prior knowledge.
* Students will be able to discover the equation of a circle given points using prior knowledge.
* Students will be able to take the general form of an equation of circle and convert to the standard form for an equation of a circle.

Objectives:

* Given a Nerf gun, students will plot points on a coordinate plane. Students will then find the equation of a circle in standard form using 2 points.
* Given a the general form for the equation of circle, students will convert the equation to standard form and will then name the center point and will plot/”shoot” the point.

Materials:

* Nerf Gun
* Nerf Gun Bullets (preferably w/ suction cups at end)
* Coordinate Plane (projected/drawn on board)
* Student Worksheet
* Pencil

Procedure:

* Decide whether you will be working individually or in pairs.
* “Shoot”/Plot 2 points on the coordinate plane and keep record of them.
* Follow steps listed below in the space provided in order to find the equation of a circle.
* Given the general form for the equation of a circle, find the standard form.
* Determine the center and “shoot”/plot your coordinate (center).

Definitions & Formulas

* Circle: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Completing the Square: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Equations of a Circle:
	+ Standard Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ General Form: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Distance Formula: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Find the Equation of a Circle Given a Center Point and Point Passing Through the Circle.***

**“Shooting” Points**

Using the Nerf gun, plot (“shoot”) two points on the coordinate plane provided. Record your coordinates below.

Coordinate #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Coordinate # 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 1:** Determine which of your two coordinates will be the center and which will be the other.

Center Point: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Point Passing Through: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 2:** Find the radius. What formula will you need to use?

Radius = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 3:** Using the information above, give the standard form for the equation of a circle by plugging in.

Equation of a circle: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Convert the Following Equation of a Circle from General Form to Standard Form***

$$2x^{2}+2y^{2}+6x-8y+12=0$$

**Step 1:** Group the terms!

**Step 2:** Divide each term by the coefficient of the $x^{2}and y^{2}.$

**Step 3:** Think about how you are going to convert the equation to standard form. What are you going to use?

**Step 4:** Find/Record the center point and then plot (“shoot) it on the coordinate plane.

Center Point: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Conclusions***

1. Why do we use the distance formula when given the center point and point that passes through the circle?
2. Is there a rule that we can say in regards to (h, k) when the equation is in standard form?
3. What do we use to convert the equation of a circle from general form to standard form?

Additional Questions: Complete on separate sheet of paper.

1. Find the equation of a circle given the point (9,-5) and the center point (-4,-6).
2. Convert the equation of circle from general form to standard form and name the center. $x^{2}-2y+y^{2}+6x=2$
3. Convert to standard form and name the center. $3x^{2}+4x+3y^{2}-6y-4=0$
4. Given (1, 4) as the center point and (3, 7) as a point that passes through the circle find the equation of the circle.

☺ Bonus ☺

* What would happen to your equations for #1 and #4 if you reflected the center points over the y-axis? The x-axis? The line y=x? Find your new equations for each and describe what happens.

Sources:

* <http://www.algebra.com/algebra/homework/Circles.faq.question.61514.html>
* <http://surfingtosuccess.blogspot.com/2012/09/using-nerf-gun-to-teach-coordinate-grid.html>
* [http://www.mathsisfun.com/algebra/circle-equations.html](http://http/www.regentsprep.org/Regents/math/algtrig/ATC1/circlelesson.htmwww.mathsisfun.com/algebra/circle-equations.html)
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