Tooele County Lesson Plan Template

Class: **Secondary Math 2**

Standard: G.GPE.1 - Derive the equation of a circle of given center and radius using the Pythagorean Theorem

What do I want my students to learn and be able to do? Learning Objective in Student Friendly Language (Post in class for students to see.)

Discover the equation of the circle through the Pythagorean Theorem

Tier 1 Instruction - Step by Step Procedure

10 minutes	Performance Quizette - Factoring #2 2016
5 minutes	Homework Q&A
5 minutes	Review right triangle relationships - Pythagorean Theorem
2 minutes	Send out calculator document and understand objective
5 minutes	Page 1.2 in TI Nspire doc: Use calculate feature to calculate the hypotenuse of the right triangle using pythagorean theorem. Move triangle and experiment with various side lengths.
5 minutes	Discuss the choice of variables used in the calculator. Why?
5 minutes	Page 1.3 in TI Nspire doc: Reciprocal teaching: Predict! What shape will it make now that we have 4 triangles? What if the whole screen were filled with multiple triangles that adhered to this pattern?
5 minutes	Page 1.5 in TI Nspire doc: Geometry trace feature to trace path of point p. Discuss: why is a circle created? What is the center and radius?
10 minutes	Page 1.6 Definition of a circle. Discuss: meaning of locus. Radius and hypotenuse relationship. Using x, y to determine if point is on circle.
5 minutes	Equation of a circle
10 minutes	Page 1.7 in TI Nspire doc: explore changes to radius and center and impact on equati
5 minutes	Reciprocal Teaching: Summarize findings!
10 minutes	Practice writing equations of circles and homework

Key Vocabulary: Circle- the locus of points equidistant from a given point in a plane.
Pythagorean Theorem- locus - a set or collection of points
Hypotenuse - the side oppposite the right angle
Center, Radius of a circle Radius of a circle

Considerations for Special Populations:

*Technology

*Manipulatives

What will I do if they don't learn it? (Tier 2 & 3 interventions)

* Small group instruction

*Reciprocal Teaching

What explicit teaching strategies need to be emphasized?

* Partner sharing (think, pair, share)

*exploration through technology

* reciprocal teaching strategies

What will I do if they already know it? (What additional challenges will I assign?)

*Predict transformations of circles and the impact on the equation of a circle. Experiment with calculators to verify predictions.

How will you know that they learned the material?

TI Nspire Concept Quiz

8.1 Homework

Resources/Materials Needed:

TI Nspire Calculators with Navitagor software, TI Nspire Circles document with student handout.

Reflect on how the lesson was received by the students:

Exploring the Equation of a Circle

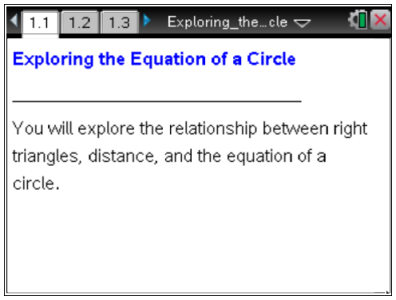
Student Activity

Name _____

Class _____

Open the TI-Nspire document
Exploring_the_Equation_of_a_Circle.tns.

In this lesson, you will be able to visualize the definition of a circle and the relationship between the radius and the hypotenuse of a right triangle. By manipulating the size and location of different circles, you will see how the equation of a circle is derived.



Move to page 1.2.

1. Move your cursor to cover point *p* and hold down the "select" button until the hand appears to grab the point. Now, drag the point to make any right triangle you want and click again to drop the point.
   a. As you drag point *P*, a triangle moves along with the point. What changes about the triangle? What stays the same? What are the lengths of the legs of the right triangle you've selected?

   b. Use the Pythagorean Theorem to find the length of the hypotenuse. What do you notice about this number?

   c. Select (grab), drag and drop the point *P* to a different spot. What are the lengths of the legs? What is the length of the hypotenuse? How do you know?

   d. As you drag the point *P* around, what do all those points have in common?

Move to page 1.3.

2. You have 4 right triangles on your page now. What could we prove about these triangles?

3. Select (grab) and drag the point *P*. What happens? What relationship do all these triangles share?

4. As you drag point *P*, can you see what shape is formed? Let's take a closer look!

Move to page 1.4.

Carefully read these directions:

1. Select Menu > Trace > Geometry Trace
2. Select point *P*
3. Then select (grab) and drag point *P* to observe the path it traces.

Move to page 1.5.

4. Drag point *P*. What shape is created?

5. Why is this shape created?

6. Where is the center and what is the radius?

7. Using the relationship we found for the triangles on page 1.3, what relationship do all these points *P* share?

Move to page 1.6.

Read the definition of a circle given on this page. Discuss in your group what the word locus might mean? What parts of a circle have to be defined to draw it?

Read page 1.7, then move on to page 1.8.

8. The equation of the circle and the coordinates of point *P* are given.

a. What is the relationship between the hypotenuse of the right triangle and the radius of the circle?

b. What is the relationship between the legs of the right triangle and point *P*?

c. When given any right triangle and the lengths of its legs, what formula is used to find the length of its hypotenuse? Why is that helpful in this situation?

d. Since point *P* lies on the circle, what must be true about its coordinates? Pick a point and verify.

9. Change the radius of circle *O* by dragging point *Q* along the *x*-axis.

a. When the radius of the circle changes, what changes in the equation? What stays the same?

b. Why does the constant in the equation change?

10. Move the center of the circle away from the origin by dragging point *O*.

a. How are the coordinates of the center of the circle related to the equation?

b. Where have we seen this happen in equations before?

c. What formula is used to find the length of radius $\overline{OP}$?

d. Why is this formula similar to the equation of the circle?

11. Suppose a circle has the equation $(x - 12)^2 + (y + 4)^2 = 25$.

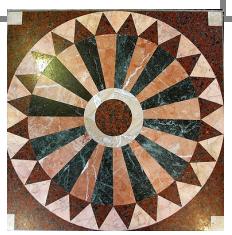
a. What is the radius of the circle?

b. What are the coordinates of the center of the circle?

c. How can you determine whether the point (12, –9) lies on the circle?

You're now ready for your Concept Quiz!!

Name: Circles and Other Conics | 8.1



Ready, Set, Go!

Ready

Topic: Special products and factors

Factor the following as the difference of 2 squares or as a perfect square trinomial. Do not factor if they are neither.

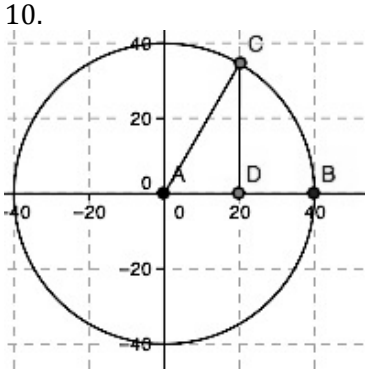
1. $25b^2 - 49y^2$
2. $100b^2 - 20b + 1$
3. $36b^2 + 30b + 25$

Set

Topic: Writing the equations of circles.

Write the equation of each circle centered at the origin.

10.



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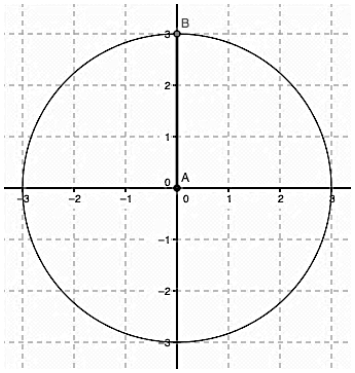

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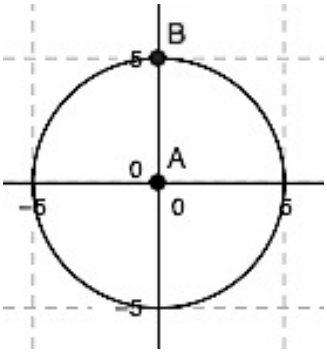

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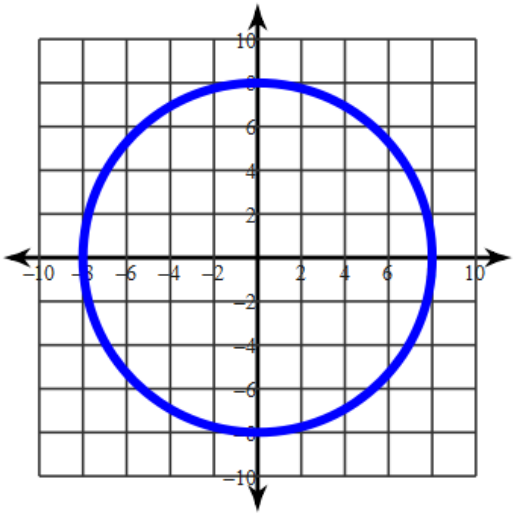

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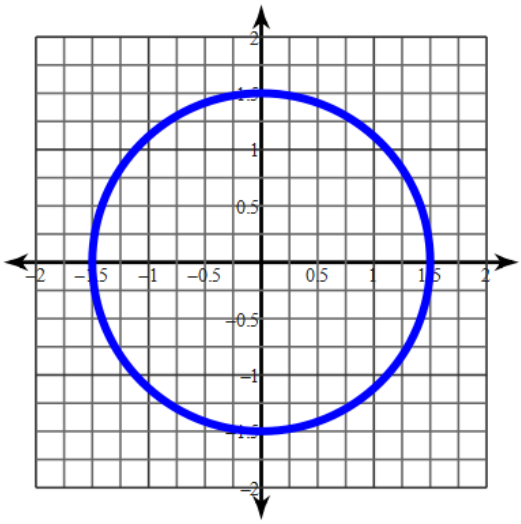

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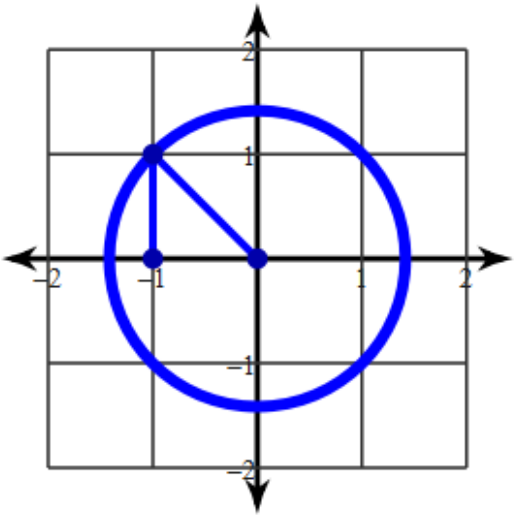


Ready, Set, Go!

Ready

Topic: Making perfect square trinomials.

Fill in the number that completes the square. Then write the trinomial in factored form.

1. $x^2 + 6x + \_\_\_\_\_$

2. $x^2 - 14x + \_\_\_\_\_$

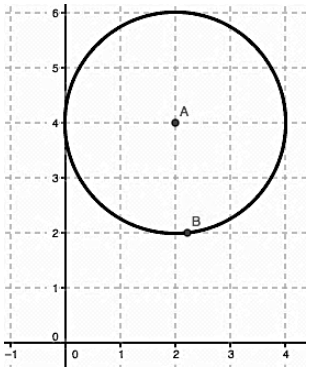
3. $x^2 - 50x + \_\_\_\_\_$

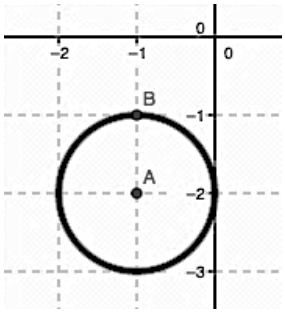
4. $x^2 - 28x + \_\_\_\_\_$

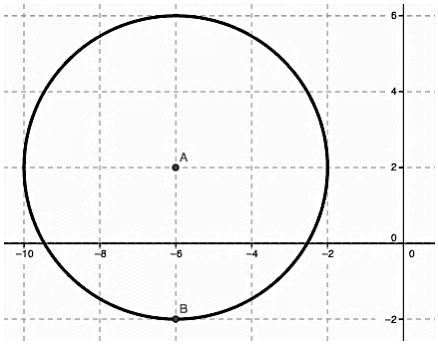
Set

Topic: Writing equations of circles with center (h, k) and radius *r*.

Write the equation of the circle.

11. 

12. 

13. 

Write the equation of the circle with the given center and radius. Then write it in expanded form.

14. Center: (5, 2) , Radius: 13

15. Center: (46, 410) , Radius: 9

16. Center: (0, 8) , Radius: 15

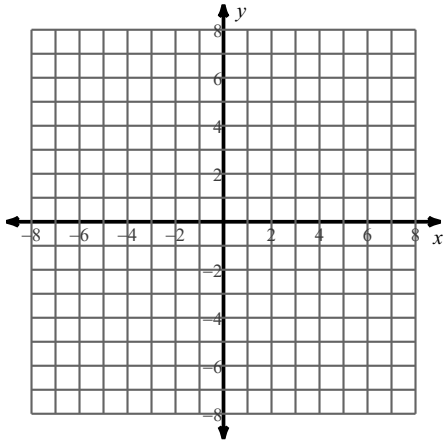
17. Center: (19, -13) , Radius: 1

18. Center: (-1, 2) , Radius: 10

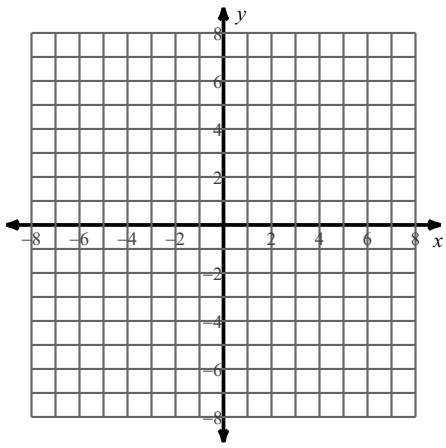
19. Center: (-3, -4) , Radius: 8

Identify the center and radius of each. Then sketch the graph.

1) $(x-3)^2+(y+1)^2=4$

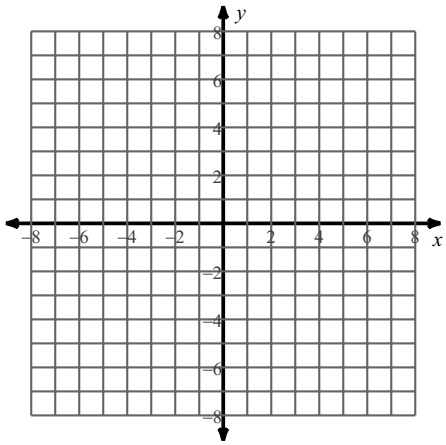


2) $x^2+(y+3)^2=9$



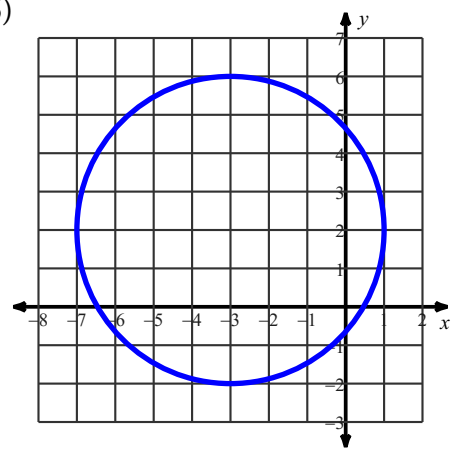
Identify the center and radius of each. Then sketch the graph.

3) $(x-4)^2+(y-3)^2=5$



Use the information provided to write the equation of each circle.

6)



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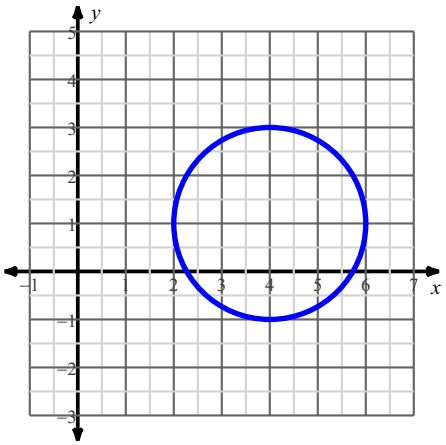

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