10

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Mathematics

Quarter 2 – Module 9: Circles and Other Geometric Figures on the Coordinate Plane

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10

Mathematics

Quarter 2 – Module 9:
Circles and Other Geometric Figures on the Coordinate Plane

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

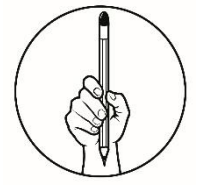
Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you graph and solve problems involving circles and other geometric figures on the coordinate plane. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course but the pacing in which you read and answer this module is dependent on your ability.

After going through this module, you are expected to:

1. graph a circle and other geometric figures on the coordinate plane; and
2. solve problems involving circles and other geometric figures.



What I Know

DIRECTION: Let us determine how much you already know about the graphs and problems involving circles and other geometric figures on the coordinate plane. Read and understand each item, choose the letter of your answer and write it on your answer sheet.

1. Which part of a circle is NOT needed to sketch its graph?
   a) Center b) Radius c) Radius point d) Chord

2. Given an equation of a circle, what is the first step to sketch its graph?
   a) Connect points to draw the circle
   b) Determine the center and radius
   c) Locate the center on the coordinate plane
   d) None of these

3. What is the center of a circle given the equation $(x-4)^2+(y+1)^2=100$?
   a) $(-4,1)$ b) $(4,1)$ c) $(4,-1)$ d) $(1,4)$

4. What is the length of the radius of a circle given the equation $x^2+y^2=8$?
   a) 8 units b) $2\sqrt{2}$ units c) 64 units d) $2\sqrt{8}$ units

5. Which of the following equations represents the smallest circle?
   a) $x^2+y^2=4$ c) $x^2+y^2=1$
   b) $x^2+y^2=9$ d) $x^2+y^2=16$

6. Which point is NOT on the graph of the circle $(x+2)^2+(y-1)^2=9$?
   a) $(-1,2)$ b) $(1,1)$ c) $(-2,4)$ d) $(-5,1)$

7. If the center of a circle is located at $(2,2)$ and it passes through the point $(0,2)$, what is the length of its radius?
   a) 1unit b) 2 units c) 3 units d) 4 units

8. What is the center of a circle if the endpoints of its diameter are at $(1,3)$ and $(1,-3)$?
   a)$(1,0)$ b) $(1,1)$ c) $(0,0)$ d) $(0,1)$

9. Which of the circles has a center located at the second quadrant of the coordinate plane?
   a) $x^2 + (y+4)^2 = 4$ c) $(x+5)^2 + (y+3)^2 = 1$
   b) $(x-3)^2 + (y-1)^2 = 9$ d) $(x+3)^2 + (y-2)^2 = 4$

10. Which of the circles has a center located at the y-axis?
   a) $x^2 + (y+4)^2 = 4$ c) $(x+5)^2 + (y+3)^2 = 1$
   b) $(x-3)^2 + y^2 = 9$ d) $(x+3)^2 + (y-2)^2 = 4$

For items 11 – 12. A radio signal can transmit messages within the boundaries of a circle with the equation $x^2 + y^2 + 2x - 4y - 21 = 0$.

11. If one unit is equal to one kilometer, how far can the signal reach from the center?
   a) 3 km b) 4 km c) 5 km d) 6 km

12. What is the location of the signal's origin?
   a) $(-1,2)$ b) $(-1,-2)$ c) $(-2,-1)$ d) $(-2,1)$

13. A map is drawn on a grid where 1 unit is equivalent to 1km. The land area of San Mateo is in a circular form with its center located at $(4,9)$. If the boundaries are located at 13 km radius, which point is not within the boundaries?
   a) $(-9,9)$ b) $(4,22)$ c) $(-10,13)$ d) $(17,9)$

14. The Mayon Volcano is a tourist attraction in Albay, famous for its near perfect cone shape. When it threatens to erupt, residents within the eight-kilometer radius danger zone are advised to evacuate. Should a resident at 6km East and 7km South of the volcano evacuate? Why or why not?
   a) Yes, because the resident is inside the danger zone.
   b) Yes, because others are evacuating.
   c) No, because the resident is outside the danger zone.
   d) No, because others are not evacuating.

15. A new transmission tower will be put up midway between two existing towers. On a map drawn on a coordinate plane, the coordinates of the first existing tower are $(-5,-3)$ and the coordinates of the second existing tower are $(9,13)$. What are the coordinates of the point where the new tower will be placed?
   a) $(2,10)$ b) $(7,8)$ c) $(2,5)$ d) $(14,16)$

Lesson 1

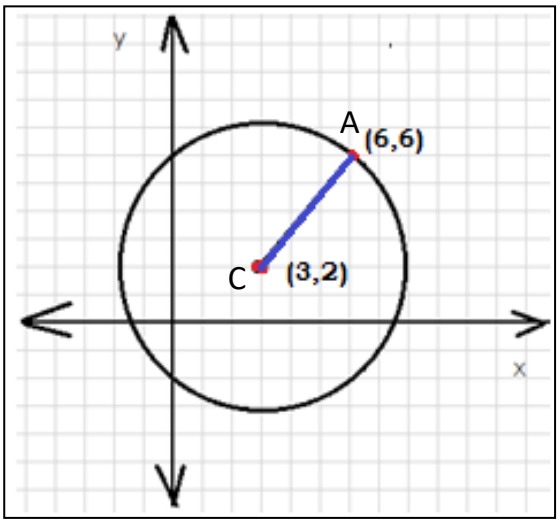
Circles and Other Geometric Figures on the Coordinate Plane

What's In

You have learned from the previous module how to determine the center and radius of a circle given the equation, and how to write the equation of a circle given its center and radius. Consider ⊙C below to determine the equation of a circle. Then, use the guide questions to do the tasks. ***Do not attempt to look at the solution below unless you are done with your work.***

Guide Questions:

1. What is the coordinate of the center?
2. Is it possible to determine the length of the radius using the coordinates of point A and point C?
   If YES, what is the length of the radius?
   If NO, how do we determine its length?
3. What is the equation of the circle in standard form?
4. What is the equation of the circle in general form?



The equation of the circle in

- standard form is $(x-3)^2+(y-2)^2=25$
- general form is $x^2+y^2-6x-4y-12=0$

Center (3,2), Radius = 5 *units*
You may verify the length of the radius using the distance formula.

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

Let $P_1=(3,2)$ and $P_2\,(6,6)$

$d=\sqrt{(6-3)^2+(6-2)^2}$

$d=\sqrt{(3)^2+(4)^2}$

$d=\sqrt{9+16}=\sqrt{25}=\mathbf{5}$

Using $(x-h)^2+(y-k)^2=r^2$
Where $h=3,\ k=2,\ r=5$

$(x-3)^2+(y-2)^2=5^2$
$\mathbf{(x-3)^2+(y-2)^2=25}$

$x^2-6x+9+y^2-4y+4=25$
$x^2+y^2-6x-4y+13=25$
$\boldsymbol{x^2+y^2-6x-4y-12=0}$

What's New

Have you tried playing tops?

A top is an almost spherical device made of plastic or wood attached to a nail. This is used as a toy by spinning using a string. At the start of the game, a wide circle is constructed on the ground by using the top's nail and the string. After deciding on the sequence of players, the tops are placed at the center of the constructed circle. Players then aim to hit the bunch of tops to put them outside using their own slippers.

Based from this situation, what does the string represent in a circle? How about the point where the bunch of tops are placed? How about the ground where the game is played?

To answer the aforementioned questions, match the game terminologies in column A with the terms related to circle in column B.

Column A
String
Point where the bunch of tops are placed
Playing ground

Column B
Coordinate plane
Radius of the circle
Center of the circle

After writing the equation of a circle given its graph, the target now is to learn to graph a circle given its equation. In order to graph a circle, consider the concepts listed below.

Graphing a Circle

1. Know the equation of the circle.
   - standard form with center at the origin: $x^2 + y^2 = r^2$
   - standard form with center at (h, k): $(x - h)^2 + (y - k)^2 = r^2$
   - general form: $x^2 + y^2 + Ax + By + C = 0$
2. Determine the center and the radius of the circle.
3. Plot the center of the circle on the coordinate plane.

What is It

Examples 1 and 2 in this section will illustrate how to graph a circle in a coordinate plane given its equation.

Example 1. Sketch the graph of the circle defined by the equation $x^2 + y^2 = 25$.

Solution:

Step 1. Determine the center and the radius.
Center = $(0, 0)$
Radius = $\sqrt{25} = 5$

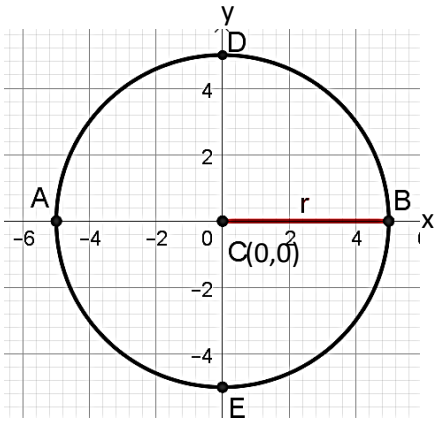
Step 2. Construct a coordinate plane then plot the center which is at the origin $(0, 0)$.Label it as Point C.

Step 3. Plot the radius points. The radius points are located using the length of the radius from the center. Extend the length of the radius in four directions: left, right, up, and down. Since the radius is 5 units and the center has coordinates (0,0), 5 radius points could be obtained by

- Counting 5 units to the left from (0,0), or subtracting 5 from the x-coordinate and carry the y-coordinate of the center. We let this radius point as A. The coordinates of A is (-5,0).
- Counting 5 units to the right from (0,0), or adding 5 from the x-coordinate and carry the y-coordinate of the center. We let this radius point as B. The coordinates of B is (5,0).
- Counting 5 units upward from (0,0), or adding 5 from the y-coordinate of the center and carry the x-coordinate of the center. We let this radius point as D. The coordinates of D is (0,5).
- Counting 5 units downward from (0,0), or subtracting 5 from the y-coordinate of the center and carry the x-coordinate of the center. We let this radius point as E. The coordinates of E is (0,-5).

Step 4. Connect the radius points to sketch the graph of the circle.

The figure that follows illustrate Steps 1 – 4.



Example 2. Show the graph of the circle whose equation is given by $(x + 3)^2 + (y + 5)^2 = 25$. Then identify two other points (ordered pairs) that lie on the circle.

Solution:

Step 1. Determine the center and the radius.

Center = $(h, k) = (-3, -5)$

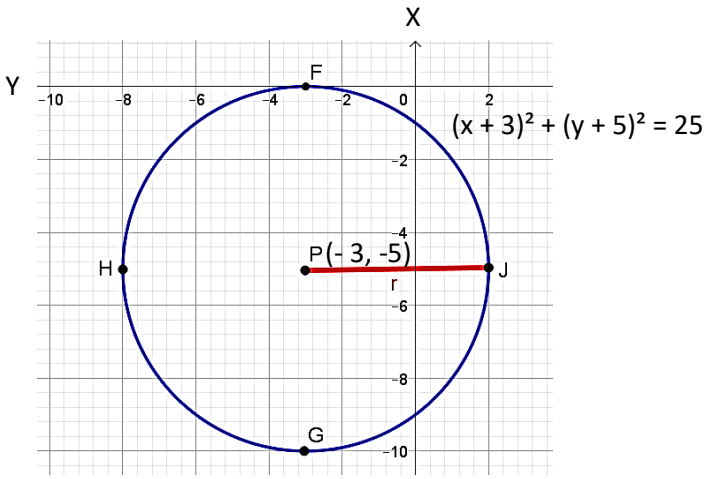
Radius = $\sqrt{25} = 5$

Step 2. Construct a coordinate plane then plot the center which is at $(-3, -5)$.

Step 3. Plot the radius points. The radius points are located using the length of the radius from the center. Extend the length of the radius in four directions: left, right, up, and down. Since the radius is 5 units and the center has coordinates (-3,-5), 5 radius points could be obtained by

- Counting 5 units to the left from (-3,-5), or subtracting 5 from the x-coordinate and carry the y-coordinate of the center. We let this radius point as H. The coordinates of H is (-8,-5).
- Counting 5 units to the right from (-3,-5), or adding 5 from the x-coordinate and carry the y-coordinate of the center. We let this radius point as J. The coordinates of J is (2,-5).
- Counting 5 units upward from (-3,-5), or adding 5 from the y-coordinate of the center and carry the x-coordinate of the center. We let this radius point as F. The coordinates of F is (-3,0).
- Counting 5 units downwards from (-3,-5), or subtracting 5 from the y-coordinate of the center and carry the x-coordinate of the center. We let this radius point as G. The coordinates of G is (-3,-10).

Step 4. Connect the radius points to sketch the graph of the circle.



Step 5. Based from the graph, identify two exact points (ordered pairs) on the circle. From the illustration in Step 4, possible answers are$(0,-9)$ and $(-6,-1)$. To verify if these points are on the circle, check if each point satisfy the equation. Let us check (0,-9).

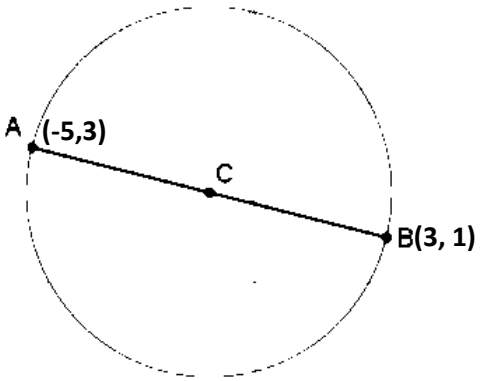
$(x + 3)^2 + (y + 5)^2 = 25$	Substitute the coordinates in the equation of the circle.
$(0 + 3)^2 + (-9 + 5)^2 = 25$	Simplify
$(3)^2 + (-4)^2 = 25$	
$25 = 25$	Since $(0,-9)$ satisfies the equation, hence the point is on the circle.

(-6,-1) also satisfies the equation, thus it also a point on the circle. Can you show it?

Examples 3 and 4 are problems how to find the equation of a circle given certain conditions.

Example 3. The ends of the diameter of ʘC are points $A(-5,3)$ and $B(3,1)$. What is the equation of this circle in general form?

Solution:



Step 1. Find the length of the diameter, d using the distance formula.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Let A be $P_1(-5,3)$ and B be $P_2(3,1)$

$d = \sqrt{[3-(-5)]^2 + (1-3)^2}$

$d = \sqrt{(8)^2 + (-2)^2}$

$d = \sqrt{64+4}$

$d = \sqrt{68}$

$d = 2\sqrt{17}$

Step 2. Find the length of the radius, r.

$$r = \frac{diameter}{2}$$
$$= \frac{2\sqrt{17}}{2}$$
$$= \sqrt{17}$$

Step 3. The center of a circle is the midpoint of a diameter. Thus to find the coordinates of the center given the endpoints of a diameter, use the midpoint formula.

$$Midpoint = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$P_1(-5,3)$ and $P_2(3,1)$

$$Center = \left(\frac{-5+3}{2}, \frac{3+1}{2}\right)$$
$$Center = \left(\frac{-2}{2}, \frac{4}{2}\right)$$
$$Center = (-1, 2)$$

Step 4. Write the equation of the circle.

h= -1, k = 2, r = $\sqrt{17}$

$$(x-h)^2 + (y-k)^2 = r^2$$
$$[x-(-1)]^2 + (y-2)^2 = \left(\sqrt{17}\right)^2$$
$$(x+1)^2 + (y-2)^2 = 17$$
$$x^2 + 2x + 1 + y^2 - 4y + 4 = 17$$
$$x^2 + y^2 + 2x - 4y + 5 = 17$$
$$x^2 + y^2 + 2x - 4y - 12 = 0$$

Therefore, the equation of the circle in general form is $\boldsymbol{x^2 + y^2 + 2x - 4y - 12 = 0}$.

Example 4

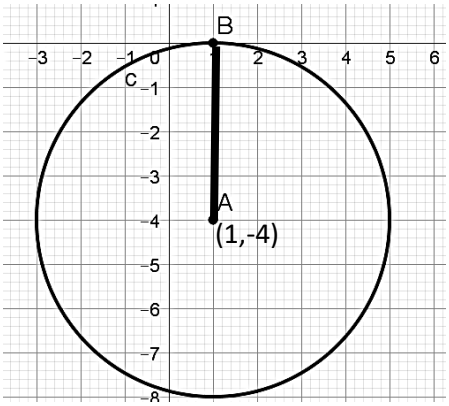
Write in standard form the equation of the circle that has its center at (1,-4) and tangent to the x-axis.

Solution:

Step 1: Illustrate the given.

A circle tangent to the x-axis is the same with a circle tangent to a line. It means that if a circle is tangent to the x-axis, then the circle touches the x-axis at

exactly one point. In the illustration, let the center of the circle as A and the point of intersection of the circle with the x-axis as B.



Step 2: Find the radius.

The radius with one endpoint at B is parallel to the y-axis since it is perpendicular to the tangent line which is the x-axis. With this, the length of the radius is the vertical distance from the center to the x-axis. The radius is equivalent to 4.

Step 3: Substitute the coordinates of the center and the length of the radius in the equation of the circle in standard form.

$(x-1)^2 + (y+4)^2 = 16$

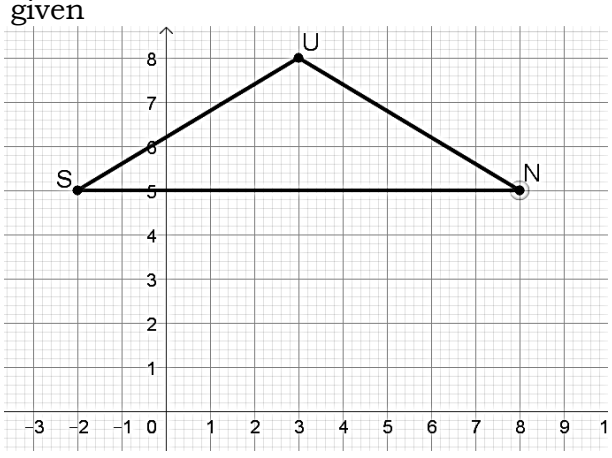
Example 5 is a problem on a geometric figure in a coordinate system.

Example 5

A triangle has vertices S(-2, 5), U(3, 8), and N(8, 5). Find the area of the triangle.

Solution:

Step 1: Illustrate the given

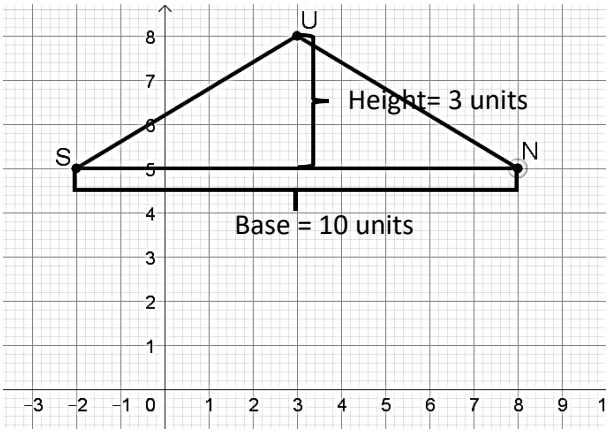


Step 2: Solve for the Area

To solve for the area of a triangle, we can use the formula

Area= $\frac{1}{2}(base)(height)$

Base and height of the triangle can be identified by counting the number of units as shown in the illustration.



$$\text{Area} = \frac{1}{2}(10)(3)$$
$$= 15 \text{ units}^2$$

The area of the triangles is 15 square units.

Examples 6 and 7 are word problems about situations around us. We will use the concepts in the previous examples.

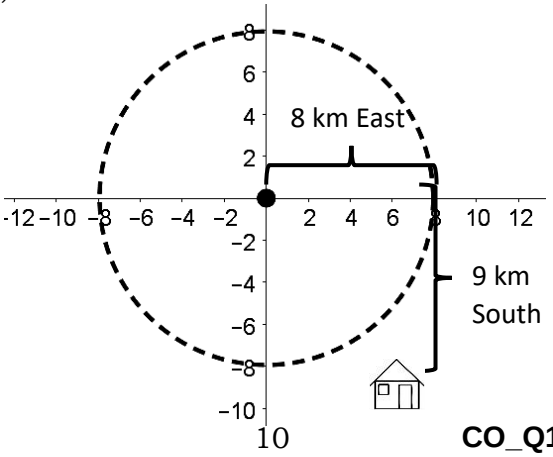
Example 6

The Mayon Volcano is a tourist attraction in Albay, famous for its near perfect cone shape. When it threatens to erupt, residents within the eight-kilometer radius danger zone are advised to evacuate. Should a resident at 8km East and 9km South of the volcano evacuate? Why or why not?

Solution:

Let the Mayon Volcano be located at the point of origin and let 1 km distance be 1 unit. Draw a circle with center at the point of origin and 8 units radius to show the eight- kilometer radius danger zone, as illustrated in the figure that follows. This means that any resident inside and on the circle is within the danger zone.

To answer the problem, plot 8 km East and 8 km South in the Cartesian Plane. Follow the direction of East and South on a map, 8 km East is equivalent to 8 units to the right and 9 km South is equivalent to 9 units downward as shown in the figure that follows. In the illustration, the location of the resident is represented by the house and it is outside the circle. This indicates that the resident is not within the 8 km. danger zone. Thus, the resident is not advised to evacuate.



We can also solve the problem algebraically as follows:

Step 1: The danger zone is within the eight-kilometer radius and let Mayon Volcano be at the point of origin. This means that the 8 km. danger zone is represented by the following inequality.

$$x^2 + y^2 \leq 8^2$$

Step 2: 8 km East is equivalent to 8 units right from the origin and 9km South is equivalent to 9 units downward from the origin thus it is located at point equivalent to (8, -9). Substitute the point (8,-9) to identify if it will satisfy the inequality in Step 1.

$$x^2 + y^2 \leq 8^2$$
$$8^2 + (-9)^2 \leq 64$$
$$64 + 81 \leq 64$$
$$145 \leq 64$$

The derived inequality is incorrect, thus a resident located 8 km East and 9 km South from the Mayon Volcano is not located within the danger zone. He/she does not need to evacuate.

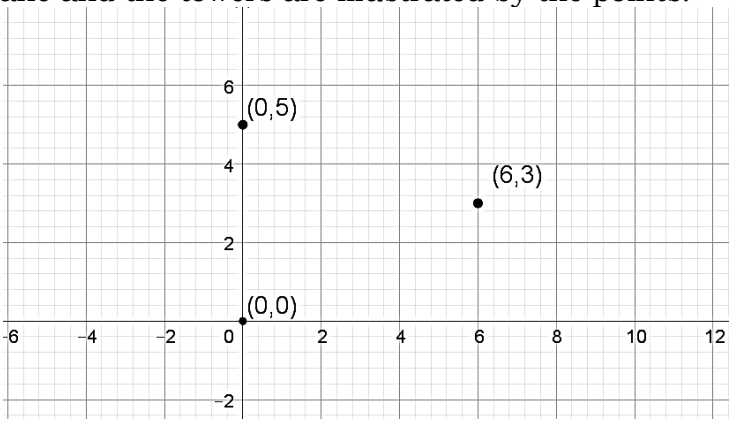
Example 7:

Telecommunication towers can be used to transmit cellular phone calls. A graph with units measured in kilometers shows towers at points (0,0), (0,5), and (6,3). These towers have a range of about 3 kilometers.

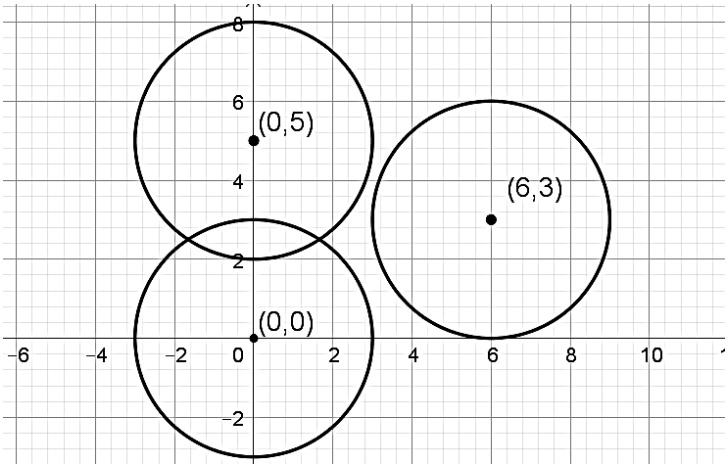
a. Sketch a graph and locate the towers.
b. Are there any locations that may receive calls from more than one tower? Explain your reasoning.

Solution:

a. Sketch the graph and locate the towers. Let 1 km equivalent to 1 unit in the coordinate plane and the towers are illustrated by the points.



b. Are there any locations that may receive calls from more than one tower? Explain your reasoning.



From the given, each telecommunication tower has a range of about 3 km. In the graph, draw a circle of radius 3 units in each center to show the coverage of each tower. We can see that there are two circles with overlapping regions. This means that those located within the overlapping regions can transmit calls using the signals from 2 towers.

What's More

Activity 1: Round and Round You Go!

In a graphing paper, perform each task.

A. Sketch the graph of the circle defined by the equation$x^2 + y^2 + 2x + 6y + 9 = 0$. To be guided in your sketch, answer first the following questions.
   1) Write the equation in the standard form.

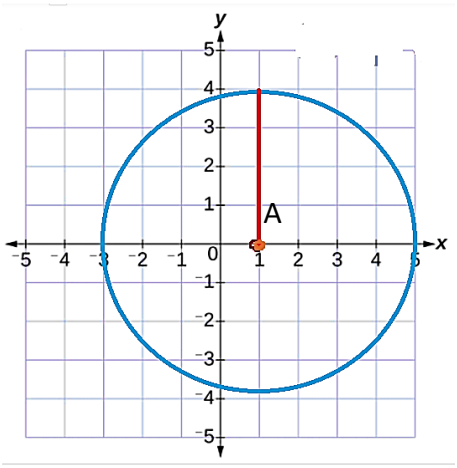
   2) What are the coordinates of the center?

   3) What is the length of the radius?

   4) Identify four radius points using what you obtained in items 2 and 3. What are the coordinates of the four radius points?

   5) At what quadrant does the graph lies on the coordinate plane?

B. Given the graph of circle A that follows, answer the questions that follow.



1) What are the coordinates of the center of the circle?

2) What is the length of the radius?

3) Identify the coordinates of the four radius points.

4) After knowing the center and the radius of the circle, write the equation of the circle in the standard from.

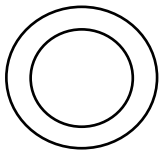
5) Write the equation of the circle in general form.

Activity 2: Problem Solving

Solve each problem. Show the solutions and necessary illustration.

1) Write in general form the equation of the circle that has its center at $(-1,4)$ and tangent to the y-axis.

2) Find the equation of the circle in standard form which is concentric to the circle with equation $x^2 + y^2 - 6x + 2y - 6 = 0$, and passes through the point $(-3,4)$.



*Concentric circles are circles having a common center.

What I Have Learned

Fill Me In!

Fill in the blanks with the correct words.

A (1)_____ is the set of all points with the same distance from a fixed point called (2)_____. The (3)_____ is the distance from the fixed point to any point on the circle.

The (4)_____ of a circle can be written in two forms: (5)_____ and (6)_____. A circle whose center on the (7)_____ is written in the form $x^2 + y^2 = r^2$. On the other hand, a circle whose center is at (h, k), it is written in the form (8)_____.

An ordered pair of numbers is a (9)_____ to the equation of a circle when it passes through the(10)_____ of the circle.

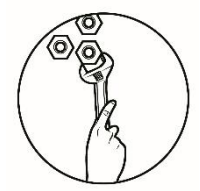
Sequence Me!

Arrange chronologically the steps in graphing a circle by writing the number on the blank. Use numbers 1 to 5.

_____ Measure the radius from the center to another point on the circle.
_____ Locate the center of the circle.
_____ Construct a coordinate plane.
_____ Identify the center and radius of the circle.
_____ Draw the circle with the use of a compass.

Reflection

1. I am doing well in _____
   _____
2. I still need help in _____
   _____
3. I am really confused in _____
   _____
4. I am proud of myself for _____
   _____



What I Can Do

Task 1. Danger Zone

During a typhoon, the NDRRMC declared that a certain mountain top is at high risk of landslide. In order to prevent casualties, the NDRRMC declared the force evacuation of all residents living within a 6 km radius of the mountain top. Suppose the mountain top is located at the origin on the cartesian plane and that 1 unit is equal to 1 km. Is there a need for a family to evacuate if their house is located at a coordinate of (6,5)?

Applying what you have learned in this module, do you consider the location of the family as part of the danger zone? What will you advice to the family? Show necessary solution to back up your advice to the family.

Task 2. Be an Artist

Elmo, an artist wants to sketch Mount Mayon on a Cartesian Plane. Mt. Mayon is known for its almost perfect conical shape. He wants to make sure that the base of the drawing is a perfect circle at the center of the Cartesian plane. He decides that the diameter of the circle is 12 units and its altitude from the center is 10 units.

1. Show the sketch of the drawing of Elmo in the Cartesian plane and label the parts appropriately.
2. Elmo wants to put a rectangular tower exactly 2 units away from the Mt. Mayon's base. If the tower has a dimension of exactly 3 by 6 units, show also the sketch of the tower in your drawing.

Rubrics:

Score	Descriptors
20	Details from the given are accurately and neatly graphed. Also, details are properly labelled.
15	Details from the given are accurately and neatly graphed. However, some details are not properly labelled.
10	Details from the given are not accurately graphed.
5	Incorrect graph.

Assessment

Read and understand each item, then choose the letter of your answer and write it on your answer sheet.

1. What is the center of a circle if the endpoints of its diameter are at $(1,3)$ and $(3,-3)$?
   a) $(2,0)$ b) $(2,2)$ c) $(0,0)$ d) $(0,2)$

2. Which of the circles has a center located at the y-axis?
   a) $x^2 + (y+2)^2 = 4$ c) $(x+3)^2 + (y+4)^2 = 1$
   b) $(x-4)^2 + y^2 = 9$ d) $(x+6)^2 + (y-1)^2 = 4$

3. Which point is on the graph of the circle $(x+2)^2 + (y-1)^2 = 2$?
   a) $(-1,2)$ b) $(1,1)$ c) $(-2,4)$ d) $(-5,1)$

4. What is the center of a circle given the equation $(x+4)^2 + (y+1)^2 = 100$?
   a) $(-4,1)$ b) $(4,1)$ c) $(-4,-1)$ d) $(1,4)$

5. Given an equation of a circle, what is the first step to sketch its graph?
   a) Connect points to draw the circle c) Locate the center on the coordinate plane
   b) Determine the center and radius d) None of these

6. What is the length of the radius of a circle given the equation $x^2 + y^2 = 12$?
   a) 12 b) $2\sqrt{3}$ c) 144 d) $2\sqrt{12}$

7. Which part of a circle is not needed to sketch its graph?
   a) Center b) Radius c) Radius point d) Chord

8. Which of the circles has a center located in the third quadrant of the coordinate plane?
   a) $x^2 + (y+4)^2 = 4$ c) $(x+5)^2 + (y+3)^2 = 1$
   b) $(x-3)^2 + (y-1)^2 = 9$ d) $(x+3)^2 + (y-2)^2 = 4$

9. Which of the following equations represents the biggest circle?
   a) $x^2 + y^2 = 4$ c) $x^2 + y^2 = 1$
   b) $x^2 + y^2 = 9$ d) $x^2 + y^2 = 16$

10. A new transmission tower will be put up midway between two existing towers. In a map drawn on a coordinate plane, the coordinates of the first existing tower are $(-5,-3)$ and the coordinates of the second existing tower are (9,13). What are the coordinates of the point where the new tower will be placed?
    a) $(2,10)$ b) $(7,8)$ c) $(2,5)$ d) $(14,16)$

11. If the center of a circle is located at $(3,2)$ and it passes through the point $(0,2)$, what is the length of its radius?
    a) 1 unit b) 3 units c) 6 units d) 9 units

12. A map is drawn on a grid where 1 unit is equivalent to 1km. The land area of San Mateo is in a circular form with its center located at $(4,9)$. If the boundaries are located at 14 km radius, which point is within the boundaries?
    a) $(-9,9)$ b) $(11,22)$ c) $(-10,13)$ d) $(17,19)$

For items 13 – 14. A radio signal can transmit messages given by the equation $x^2 + y^2 - 6x - 4y - 12 = 0$.

13. If one unit is equal to one kilometer, how far can the signal reach from the center?

a) 4 km. b) 5 km. c) 6 km. d) 7 km.

14. What is the location of the signal's center?
a) $(-2,-3)$ b) $(-3,-2)$ c) $(3,2)$ d) $(2,3)$

15. As a photographer, Mr. P wants to take the best picture of the Mayon Volcano in Albay for its near perfect cone shape. Since there is no imminent magmatic eruption, he intends take his shot 6 kilometers from the volcano. His basis for the distance is the advisory of DOST-PHILVOCS that the Permanent Danger Zone is 6 kilometer radius. Is Mr P. safe to shot his pictures? Why or why not?
a) Yes, because Mr. P is not inside the Permanent Danger Zone
b) Yes, because there is no imminent magmatic eruption
c) No, because 6 kilometers from the volcano is still within the Permanent Danger Zone.
d) No, because all areas in Albay no matter how far from the Mayon Volcano is in danger.

Additional Activity

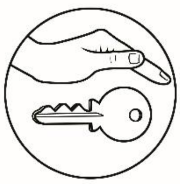
Future Architect, Help Me!

Carlos is a Grade 10 student who dreams to be an architect someday. After watching the movie entitled "Hobbits" he was inspired to design a house similar to that of the lodgings found in the movie. Hobbits are fictional characters who are small in nature and whose houses are circular. Carlos then designed a house whose doors and windows are made of circles. Help Carlos by plotting the graph of the given equations. Plot and connect also the given coordinates to complete his design.

Door: $(x+7)^2+(y+3)^2=9$

Windows: $(x-2)^2+(y-4)^2=4$
$(x-8)^2+(y-4)^2=4$

Other points to be connected: (-12,-7), (-12, 9) (0,12), (12,9), (12,-7)



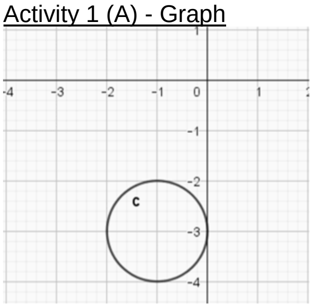
Answer Key

What I Know

1) d	4) b	7) b	10) a	13) c
2) b	5) c	8) a	11) b	14) a
3) c	6) a	9) d	12) a	15) c

What's More

Activity 1 (A) - Graph



Activity 1(A)

1) $(x+1)^2+(y+3)^2=1$
2) $(-1,-3)$
3) 1 unit
4) $(0,-3); (-1,-2);$ $(-2,-3);$ $(-1,-4)$
5) Quadrant III

Activity 1 (B)

1) $(1,0)$
2) 4 units
3) $(5,0); (1,4);$ $(-3,0); (1,-4)$
4) $(x-1)^2+y^2=16$
5) $x^2+y^2-2x-15=0$

Activity 2

(1) $x^2+y^2+2x-8y+16=0$ (2) $(x-3)^2+(y+1)^2=61$

What I Have Learned

Fill Me In

1) circle
2) center
3) radius
4) equation
5) standard / general
6) standard / general
7) origin or (0, 0)
8) $(x-h)^2+(y-k)^2=r^2$
9) solution
10) graph

Sequence Me!

4
3
2
1
5

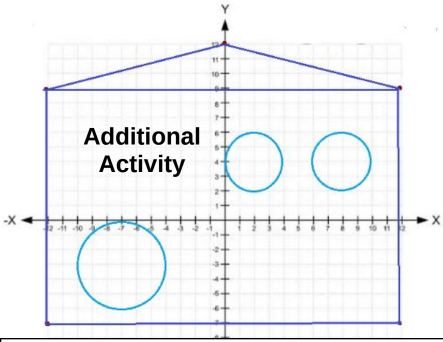
What I Can Do

Task 1 – ***see figure 1 below***

Based from the 6 km radius danger zone, the location at (6, 5) is not included for force evacuation. However, it is still advisable that the family may join the evacuation because their location is near the danger zone.

Assessment

1) a	4) c	7) d	10) c	13) b
2) a	5) b	8) c	11) b	14) c
3) a	6) b	9) d	12) a	15) c



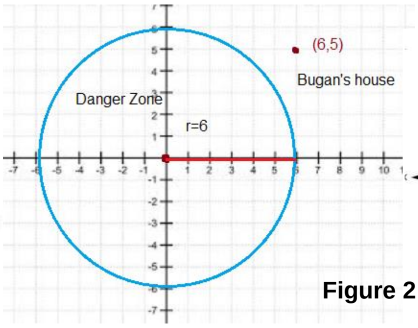


Figure 2

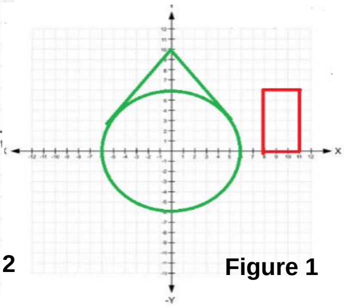


Figure 1

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