Greetings Math II Students! We hope you are safe and well with your families!
This assignment is for the week, use your time wisely. **You do not have to complete this in one sitting**. Here is the lesson plan for this week:

| Goals for this week |
|---|
| **Learning Objectives:**
Students will be able to:
1. Reason with geometric figures including lines, rays, segments, angles, circles, and triangles

(Standard G-C) |
| **Literacy Objectives:**
Students will be able to:
　1. to create, interpret and explain a table, chart or graph
　2. to compute, interpret and explain numbers
　3. to read, break down, and solve a word problem
　　　(https://www.bpsma.org/schools/brockton-high-school/about-us/mission-literacy-charts) |

Carnegie Learning (use with Carnegie Resources provided below)

CL Carnegie Learning (Log-in through Clever)

Instructional Video Links: Please watch at least one of these videos to help guide you.	**Printable Resources:**
● Video 1: Properties of circles 　https://www.youtube.com/watch?v=5quiJo49YFY ● Video 2: Properties of angles 　https://www.youtube.com/watch?v=gACYLwjPyMw ● Video 3: Special Right Triangles 　https://www.khanacademy.org/math/geometry/hs-geo-trig/hs-geo-special-right-triangles/v/45-45-90-triangles https://www.khanacademy.org/math/geometry/hs-geo-trig/hs-geo-special-right-triangles/v/intro-to-30-60-90-triangles	● Skills Practice: Module 1 Topic 1 Lesson 1- Running circles around Geometry See Below
Practice Activities: On-Line: All students now have access to an on-line program called Mathia! ● Mathia- If you are already in Mathia, please continue to work in the program. ● If you are new to Mathia: Please see the log-in information below.	**Key Terms:** ● **Angle:** an angle is a figure that is formed by two rays that extend from a common point called the vertex ● **Central angle:** an angle formed in the center of the circle. Both sides are radii. ● **Major arc:** An arc whose measure is greater than 180 degrees ● **Minor arc:** An arc whose measure is less than 180 degrees

	● **Secant/Tangent of a circle:** A secant line passes through a circle in two points where a tangent line passes through the circle at one point ● **Transversal:** A line that intersects two or more lines ● **Hypotenuse:** The side of a right triangle that is opposite the right angle.

Extension Activities:

Stretch

Consider the circle with a center at point *P*. Construct the perpendicular bisectors of chord *MN* and chord *ST*. Then make a conjecture about the perpendicular bisectors of chords in a circle.
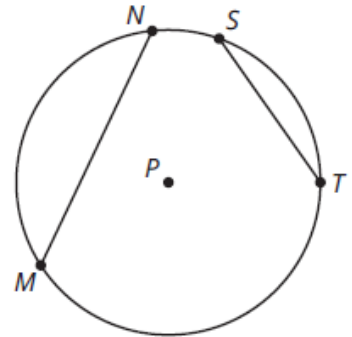
Log-in Information

1. Log-in to Clever
2. Under Math, click on MATHia
3. Username: 6-digit BHS school ID # @bpsma.org
   Password: Date of birth bps 1920
   Example: Student (Michael) with ID #:123456
       Date of birth: January 1st, 2000
       Username: 123456@bpsma.org
       Password: 01012000bps1920

Additional Support

<u>Email:</u>
* Please email your math teacher with specific questions.

<u>Office Hours:</u>
* Here is a list of math teachers' office hours. Your teacher is available to help you during their scheduled office hours.
  https://brocktonpublicschools-my.sharepoint.com/:x:/g/personal/danielcorbett_bpsma_org/EWk_ij9UwjpPtRAHBUkEpS4B3vue-_IG8VYz0AwG9ovJjQ?e=4%3arkcL1r&at=9&CT=1588698277992&OR=OWA-NT&CID=8d0078f2-9a27-460f-e632-64578875ee60

Carnegie Learning Resource

Running Circles Around Geometry

Using Circles to Make Conjectures

Warm Up

Write a description of each geometric object and provide an example.

1. point

2. line

3. line segment

4. circle

Learning Goals

- Construct circles, parallel lines, and perpendicular bisectors.
- Identify line segments, lines, and angles associated with the interior and exterior of circles.
- Make conjectures about vertical angles, alternate interior angles, corresponding angles, and points on the perpendicular bisector of a line segment in order to write theorems.
- Make conjectures about inscribed angles on a diameter and the angles formed where tangent lines intersect radii of a circle.

Key Terms

- major arc
- minor arc
- secant
- conjecture
- inscribed angle
- intercepted arc
- tangent
- circumscribed angle
- theorem
- postulate

You know a lot about geometry and can reason with geometric objects. How can you use what you know about circles to make conjectures about line and angle relationships?

Freehand Circle Drawing Championship

Teacher Alexander Overwijk, as a little joke, told his math classes for over a decade that he was a "World Freehand Circle Drawing Champion" because he could draw perfect circles on the board.

But the championship didn't really exist, until a video of Overwijk's circle-drawing ability went viral, launching the first World Freehand Circle Drawing Championship in 2007.

Can you draw a perfect circle freehand?

1. **Try to draw a perfect circle, like the one shown, without tracing or using tools.**
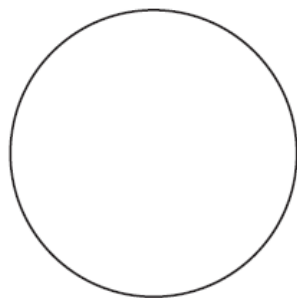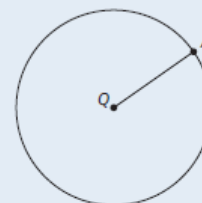
2. **Explain how you could decide whether one circle is closer to "perfect" than another. Use your criteria to judge your and your classmates' best circles.**

3. **What is the measure of an angle that forms a perfect circle? What is the arc measure of that angle?**

<table>
<tr><td>ACTIVITY</td><td rowspan="2">Circle Parts and Bisectors</td></tr>
<tr><td>1.1</td></tr>
</table>

Let's investigate what you know about circles and their parts.

1. **Use a compass to construct a circle in the space provided. Label the center point, *O*.**
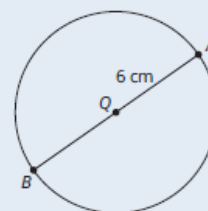
2. **Use the definitions to complete the construction and answer each question.**

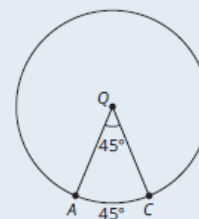   a. **Construct a diameter of the circle. Label the endpoints *D* and *M*. Point *O* is the midpoint of the diameter.**

   b. **How many central angles and arcs are produced by drawing a diameter and what are their measures? Explain how you know.**

   c. **What name is given to each half of the circle created by the diameter?**

3. **Construct a perpendicular bisector of the circle's diameter. Label the points of intersection of the perpendicular bisector and the circle as points *P* and *B*.**

A radius is a line segment from the center of a circle to a point on the circle.

A diameter of a circle is a line segment passing through the center of the circle with endpoints on the circle.

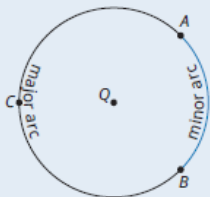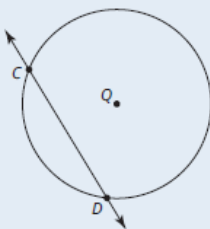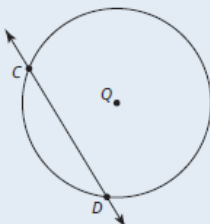A central angle is an angle with its vertex at the center of a circle, like $\angle AQC$. An arc is a part of a circle, like $\overset{\frown}{AC}$. The measure of $\overset{\frown}{AC}$ is the measure of the central angle formed by the endpoints.

Two points on a circle determine a major arc and a minor arc. The arc with the greater measure, $\overgroup{ACB}$, is the **major arc**. The other arc, $\overgroup{AB}$, is the **minor arc**.

4. Use the definitions to identify the circle parts and answer each question.

   a. Identify all the drawn radii of the circle created by the diameter and its perpendicular bisector.

   b. What central angles and arcs are produced by the diameter and its perpendicular bisector and what are their measures? Explain how you know.

A **secant** of a circle is a line that intersects the circle at two points. In this circle, $\overleftrightarrow{CD}$ is a secant.

5. Draw a line through two of your labeled points on the circle to form a secant and a chord that is not a diameter.

   a. Use a protractor to measure the angles of the triangle and a ruler to measure the side lengths.

A chord is a segment whose endpoints are points on a circle. In this circle, $\overline{CD}$ is a chord.

   b. Classify the triangle you have created.

6. Compare your circle diagrams with your classmates' diagrams.

   a. Did everyone create the same triangle? The same type of triangle?

   b. Are all circles similar? Congruent?

7. What conjecture can you make about this type of triangle?

When you **conjecture**, you use what you know through experience and reasoning to presume that something is true. Later, you will use formal reasoning to prove whether these things are actually true.

Angle and Arc Relationships

Let's use your geometric knowledge to make a few more conjectures.
Consider the circle and triangle Josh constructed.
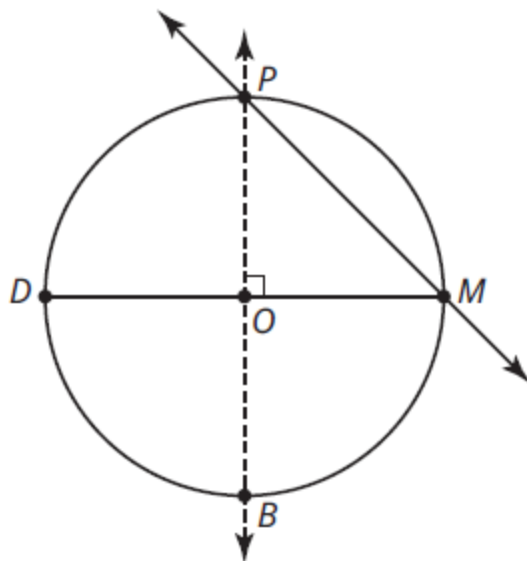
Angles *POM* and *DOB* are vertical angles. Angles *BOM* and *POD* are
vertical angles.

1. **Faith and Tre each made a conjecture about the measures of
   vertical angles. Consider their conjectures and determine who's
   correct. Explain why the other conjecture is incorrect.**

   ## Faith
   All vertical angles
   are congruent
   and measure 90°.
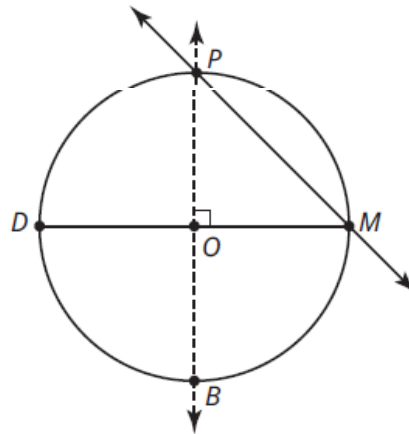
   ## Tre
   All vertical angles are
   congruent.

2. Consider the central angles ∠MOP and ∠POD and their arcs $\overarc{MP}$ and $\overarc{PD}$.

   a. What do you know about the sum m∠MOP + m∠POD?

   b. What can you conjecture about the sum m$\overarc{MP}$ + m$\overarc{PD}$?

3. Construct $\overleftrightarrow{EL}$ through the center of the circle parallel to $\overrightarrow{PM}$, so that ∠EOP and ∠LOM are both acute angles. Then make conjectures about each angle pair.

   a. ∠PMO and ∠EOD

   b. ∠MPO and ∠POE

   c. Make a conjecture about another angle pair that you know something about.
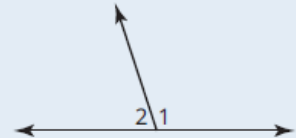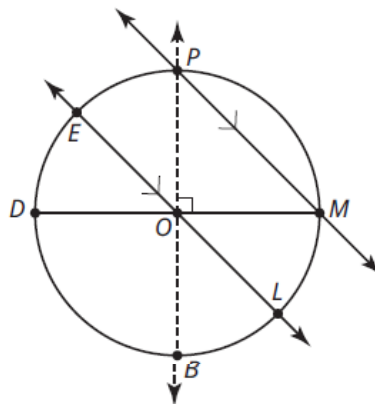
Let's investigate some relationships among inscribed angles and arc measures to make some more conjectures.

An **inscribed angle** is an angle whose vertex is on a circle and whose sides contain chords of the circle.
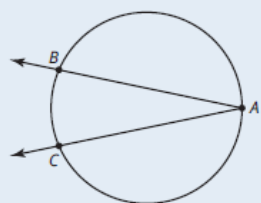
1. **Consider Dawn's completed diagram. Identify two inscribed angles in the diagram.**

The vertex of ∠*PMD* is on the circle. The two rays of the angle intersect the circle at points *P* and *D*. This makes $\overset{\frown}{PD}$ an *intercepted arc* of ∠*PMD*. An **intercepted arc** is a part of a circle that lies in the interior of an angle with endpoints that are the intersection of the sides of the angle and the circle.

2. **Central angle *POD* also intercepts $\overset{\frown}{PD}$. Compare the measures of ∠*POD* and ∠*PMD*. What do you notice?**

3. Vicki conjectured that the measure of an inscribed angle is equal to the measure of a central angle when both angles intercept the same arc.

   Do you agree or disagree with Vicki's conjecture? Draw examples to justify your answer.

4. Consider the measures of inscribed angles that intercept the same arc. What conjecture can you make about this relationship? Use examples to explain your reasoning.

5. **Ameet measured each of the inscribed angles that intercept a semicircle. He conjectured that the measure of any inscribed angle that intercepts a semicircle arc is equal to 90°.**

   **Do you agree or disagree with Ameet's conjecture? Draw examples to justify your answer.**

A **tangent** to a circle is a line that intersects a circle in exactly one point, called the point of tangency.
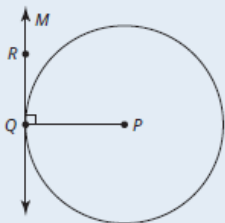
Tad drew two *tangent* lines to the circle, one through point L and one through point G to form a *circumscribed angle, ∠GQL.*
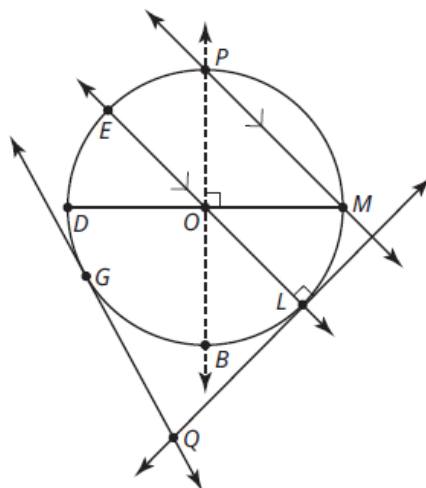
A **circumscribed angle** has its two sides tangent to the circle.
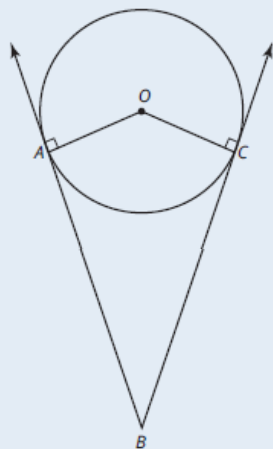
6. **What conjecture can you make about the measures of angles formed by tangent lines and the radii of a circle? Draw examples to explain your reasoning.**

TALK the TALK

Draw Whatcha Know

You have explored and measured different relationships to make and analyze several conjectures throughout this lesson. In mathematics, you often have to prove a solution is correct. In geometry, *theorems* are used to verify statements. A **theorem** is a statement that can be proven true using definitions, *postulates*, or other theorems. A **postulate** is a mathematical statement that is not proven but is considered true.

The table shows the conjectures that were made in this lesson. You will prove these as theorems in upcoming lessons.

1. **Based on your explorations in this lesson, draw an example of each conjecture.**

a. All circles are similar.	
b. Vertical angles are congruent.	

c. When the measures of two angles x and y are added, the sum is the measure of another angle, z.	
d. When the measures of two arcs x and y are added, the sum is the measure of another arc, z.	
e. When two parallel lines are crossed by a transversal, alternate interior angles are congruent.	

f. When two parallel lines are crossed by a transversal, corresponding angles are congruent.	
g. When an inscribed angle intercepts the same arc as a central angle, the inscribed angle has half the measure of the central angle.	
h. Two inscribed angles that intercept the same arc have the same measure.	

i. When an inscribed angle intercepts a semicircle arc, the inscribed angle measures 90°.	
j. The angle formed by a tangent line and a radius of a circle is 90°.	

Assignment

Write

Match each term with the best description.

1. secant   a. a presumption that something is true or false
2. major arc   b. a line that intersects a circle at exactly one point
3. minor arc   c. an angle that has two sides tangent to a circle
4. conjecture   d. an angle with a vertex that is on a circle and sides that contain chords
5. inscribed angle   of the circle
6. intercepted arc   e. the arc with the greater measure
7. tangent   f. a mathematical statement that cannot be proven but is considered true
8. circumscribed angle   g. a statement that can be proven
9. theorem   h. a line that passes through two points on a circle
10. postulate   i. the arc of a circle with endpoints that are intersected by two rays of an angle
                                     j. the arc with the lesser measure

Remember

Circles can be helpful in constructing geometric figures in order to make conjectures about line and angle relationships.

When you conjecture, you use what you know through experience and reasoning to presume that something is true. The proven statement of a conjecture is called a theorem.

Practice

1. Write a conjecture about each geometric object described. Draw examples to test your conjecture.

   a. Vertical angles
   b. Points on the perpendicular bisector of a line segment
   c. Inscribed angles that intercept the same arc of a circle
   d. Tangent

2. Draw examples of inscribed angles that intercept the diameter of the circle. What conjecture can you make about the measure of the inscribed angle?

Review

1. Determine whether the pair of triangles in each diagram are congruent. If so, write a statement of triangle congruence.

a.

b.
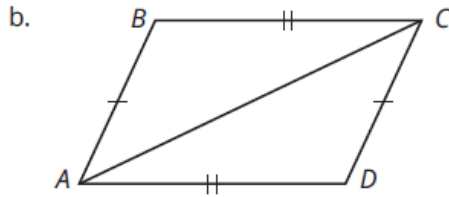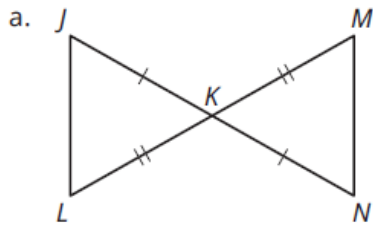
2. Determine each unknown measure in the figure. Explain your reasoning.