Learning Package No. 18

CIRCLE – ANGLE RELATIONSHIP

developed by **:** Roderick V**.** Baluca

COMPETENCIES

1. Name properties of angles formed by radii, chords, secants, and tangents.
2. Name segments formed by chords, secants, and tangents.

GENERAL OBJECTIVE

The students will investigate and use the properties of angles formed by radii, chords, secants, and tangents to solve problems involving circles. Also, the properties of triangles can be used to relate existing segment lengths formed by chords, secants, and tangents.

SPECIFIC OBJECTIVES

The students are expected to **:**

1. point out the relationship between the central angle and the intercepted arc.
2. familiarize the relationships involving angles formed by radii, chords, secants, and tangents; and the relationships involving lengths of chords, secants, and tangents.
3. apply the properties of angles formed by radii, chords, secants, and tangents.
4. calculate the lengths formed by chords, secants, and tangents.
5. solve problems involving angles formed by radii, chords, secants, and tangents; and involving lengths of chords, secants, and tangents.
6. value accuracy and precision in calculating and solving problems involving circles.

CONTENT

Having learned about angles, triangles, and parallelograms in the earlier lessons, recall that a circle is the set of all points on a plane at a given distance from a fixed point called the center. Throughout this learning package, the discussion will be about circles in relation to their angles, intercepted arcs, chords, radii, segments, secants and tangents. Several other types of angles and segments are associated with circles and are measured in terms of their arcs that they intercept, angles that they form, and lengths of segments.

PRIOR KNOWLEDGE

Before the lesson, the students may be thinking that **:**

1.) The central angle is smaller than the intercepted arc in terms of their measurement.
2.) The measurement of the inscribed angle is equal to its intercepted arc.
3.) The measurement of the angle formed inside of a circle by two intersecting chords is equal to the difference of the two intercepted arcs.
4.) The measurement of the angle formed outside of a circle by the intersection of any of these three situations (two tangents or two secants or a tangent and a secant) is equal to the difference of the two intercepted arcs.
5.) If two chords intersect inside a circle, then the sum of the lengths of the segments of one chord is equal to the sum of the lengths of the segments of the other chord.
6.) If two secants intersect in the exterior of a circle, then the product of the lengths of interior segment and its external segment of one secant is equal to the product of the lengths of the other interior segment and its external segment of the other secant.
7.) If a secant and a tangent intersect in the exterior of a circle, then the product of the lengths of the interior segment and its external segment of a secant is equal to the square of the length of the tangent segment.

NEW KNOWLEDGE

After doing the various activities, the students realized that **:**

1.) The measurement of the central angle is equal to intercepted arc.
2.) The measurement of the inscribed angle is equal to half of the intercepted arc.
3.) The measurement of the angle formed inside of a circle by two intersecting chords is equal to half of the sum of the intercepted arcs.
4.) The measurement of the angle formed outside of a circle by the intersection of any of these three situations (two tangents or two secants or a tangent and a secant) is equal to half of the difference of the two intercepted arcs.
5.) If two chords intersect inside a circle, then the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.
6.) If two secants intersect in the exterior of a circle, then the product of the lengths of one secant segment and its external segment is equal to the product of the lengths of the other secant segment and its external segment.
7.) If a secant and a tangent intersect in the exterior of a circle, then the product of the lengths of the secant segment and its external segment is equal to the square of the length of the tangent segment.

RESOURCES

References:

Kalin, Robert; Corbitt, Mary Kay (1995). *Prentice Hall Geometry.* Pasig City, Philippines : Anvil Publishing, Inc.

Coronel, Antonio C.; Coronel, Sr. Iluminada C., F.M.M. (2002). *Geometry Based on the 2002 BEC.* Makati City, Phillippines : Bookmark, Inc.

Nivera, Gladys C., Buzon, Olivia N., and Lapinid, Minie Rose C. (2007). *GEOMETRY Patterns and Practicalities*, Makati City, Antonio Arnaiz cor. Chino Roses Avenues, Philippines : Salesiana Publishers, Inc.

Materials:

Drawing Activity Sheet #1 (Draw It To Me Baby)
Investigation Activity Sheet #2 (The Math Circle)
Activity Sheet #3 (Star Circle Quest)
Drawing Activity Sheet #4 (Draw Me Something)
Investigation Activity Sheet #5 (Full Circle)
Activity Sheet #6 (The Circle Of Love)
Activity Sheet #7 (Synthesis Journal)
Activity Sheet #8 (Concept Map)
Compact Disc(CD), Protractor, Ruler/Straightedge, Bond Paper, Pencil/Ball pen, and Geometers Sketchpad Software.

Websites:

http://www.balucamath.tripod.com/learningpackage.html
This site is useful for inscribed angles group activity.

http://regentsprep.org/regents/mathb/5A1/CircleAngles.htm
This site is for angles formed by radii, chords, tangents, and seconds. There are formulas found on this site when working with angles in circles.

http://books.google.com/books?id=njewSk-IcCwC&pg=PA42&lpg=PA42&dq=secants-tangents+activities&source=web&ots=3Pfdn0cuD_&sig=gEg3N--V7RIf9MaaQ-YSZoyEU7w#PPA42,M1
This is a very nice site for Cooperative Learning activities for Geometry Classes. For circles, choose #21 of page 42 of this site, which is entitled “The Lines of Circles.”

http://www.regentsprep.org/Regents/math/geometry/GP14/CircleChords.htm
This site is about circles and chords where perpendicularity of a circle is being proved.

http://www.pinkmonkey.com/studyguides/subjects/geometry/chap7/g0707701.asp
This site is a lesson type and a proof of segments of chords, secants, and tangents.

www.jmap.org/JMAP/JMAPLessonPlans/CONICS/JMAP_LESSON_PLANS_Chords_Secants_and_Tangents.doc
This site is an MS Word file which discusses about the angles and segments in relation to chords, secants and tangents.

http://education.ti.com/educationportal/activityexchange/activity_detail.do?cid=us&activityid=4066
This is a PDF file with an exploration activity to investigate properties of segments formed when two chords, secants and tangents intersect. To open the file: Click on CabriJr_Interactive_Act28.pdf under Activity Downloads. This is for teachers' reference.

http://summit.k12.co.us/schools/shs/StaffWebPages/YankowsK/geometry/geoCh12.htm
This site has exercises on angles and sides formed by chords, secants and tangents.

http://www.nos.org/Secmathcour/eng/ch-20.pdf
This site is a PDF file with exercises about secants, tangents and properties.

http://www.mathwarehouse.com/geometry/circle/
This is an interactive and exploratory site where students will explore and discover the relationship between circles, chords, arcs and tangents.

http://www.algebralab.org/lessons/lesson.aspx?file=Geometry_CircleSecantTangent.xml
This site is an algebralab or an interactive page about secants and tangents.

http://ced.ncsu.edu/techcomps/portfolio/artifacts/unit.PDF
This site is a PDF file with an activity about circles, segments and congruency.

PROCESS

Lesson 1

Angles formed by radii, chords, secants, and tangents

I. Introduction

1.) To elicit the prior knowledge of the students regarding this topic, ask them the following questions **:**
   a.) Given a circle, how are angles formed ? What kind of angles are formed ?
   b.) Do all angles formed outside the circle have the same measurement ? Why or why not ? What about angles that are formed on the circle and in the circle itself ?
   c.) How do you relate these angles that formed outside the circle, on the circle, and in the circle to its corresponding arc length ?

2.) Then the teacher will write the answers of the students on the board for reference. Note that answers may vary depending on how they understood it.

3.) After that the teacher will give his/her thoughts or comments regarding the answers of the students. Then the teacher tells the students that in the next part they will find out what the correct answers are to the questions just asked by doing the next activities.

II. Interaction

1.) For initial perception of the topic, instruct the students to get their materials for drawing, such as ruler/straightedge, Compact Disc with size 4.10 inches, and protractor. Distribute a clean short bond paper to each student. Let the students do the Drawing Activity Sheet #1 (Draw It To Me Baby) individually by drawing each instruction step by step as instructed by the teacher orally.

2.) After drawing everything, the teacher will write the five angles (a – e) to be measured using protractor, on the board. Then, let the students answer it.

3.) After that, the teacher will post the sample table below for better analysis of the results.

	Measurement of the angle by each student				
Angle	Student 1	Student 2	Student 3	Student 4	Student 5
a.) ∠AOG					
b.) ∠ABG					
c.) ∠BFE					
d.) ∠ACD					
e.)∠EFG					

(Note that some of the drawings of the students may be wrong so they could not give the precise measures.)

4.) Then, let the students analyze their individual work. And let them answer this question **:**
How are the measures of the angles related to each other and to the arcs ?

5.) With the guidance of the teacher, let the students observe their results and relate them to the measurement of the corresponding arcs given by the teacher in the step by step instruction. Also, let the students compare their individual answers and discuss it among themselves.

6.) Then, let the students answer the following questions **:**
a.) What can you say about the central angle and the intercepted arc ?
What about the inscribed angle and the intercepted arc ?
b.) How do you compare the measurement of the angle formed inside of the circle and the two intercepted arcs ?
c.) What relationship can you think of between the angle formed outside of the circle and the two intercepted arcs ?

7.) To make them re-think and verify their answers made in the introduction part, let the students perform the Investigation Activity Sheet #2(The Math Circle), by pair.

8.) After doing this activity, what have you noticed about the central angle and the inscribed angle? Are there any relationship can you give between the central angle and the intercepted arc? What about the inscribed angle and the intercepted arc?

9.) Now, to deepen their understanding about inscribed angle, let the students visit this site and, let them do the Inscribed Angles Group Activity found on this website **:**
http://www.balucamath.tripod.com/learningpackage.html
Instructions on how to go about this activity and some questions to answer are already included and stated on this site.

10.) After doing the Investigation Activity Sheet #2, let the students compare their work/answer with the other pair groups.

11.) Call on two or three pairs of group to give their findings and let them answer this process question **:**
How are central and inscribed angles related to the measure of their intercepted arcs?

12.) Considering the answers given by the students, the teacher will now guide or lead them to the following relationship of angles (as the teacher writes the following figures on the board) Also, the teacher will let the students answer the following process questions **:**

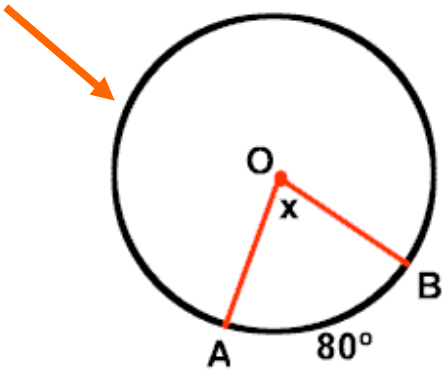
Process Questions : (based on the two figures given below**)**

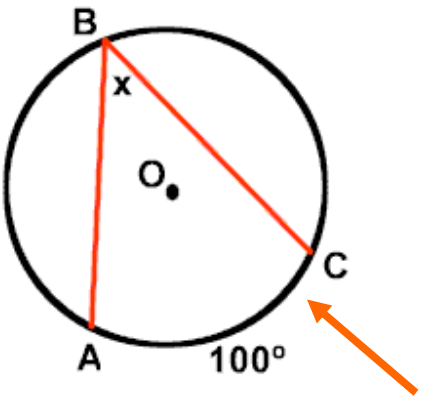
a.) How is the central angle O or angle x related to the minor or intercepted arc AB which measures 80 degrees ?

b.) What is the relationship between minor or intercepted arc AC with an arc length of 100 degrees and angle x or inscribed angle ABC ?

(These are some of the possible responses/answers of the students.)

a. The measure of ∠x = 80, which is the central angle, is just the same as the measure of the intercepted arc AB.





b.) The measure of ∠x = 50, which is the inscribed angle, is equal to half of the intercepted arc AC.

13.) To fully comprehend the relationship of angles and arcs in a circle, let the students perform the Activity Sheet #3(Star Circle Quest). Distribute the activity sheet #3 to the students individually and let them group by five(5) or six(6) to work on it.

14.) After working on the Activity Sheet #3, call one representative for two (2) or three(3) groups to answer the following process questions **:**

a.) Are there any relationships that help us to determine angles formed by intersecting secants, chords, and tangents? Explain.

b.) When two chords intersect inside the circle, how many angles are formed?

c.) What is the measure of the angle formed by a secant and a tangent intersecting on a circle? Explain.

15.) Again, the teacher will now guide or lead them to the following relationship of angles (as the teacher writes the following figures on the board) Hence, the teacher will let the students answer the following process questions **:**

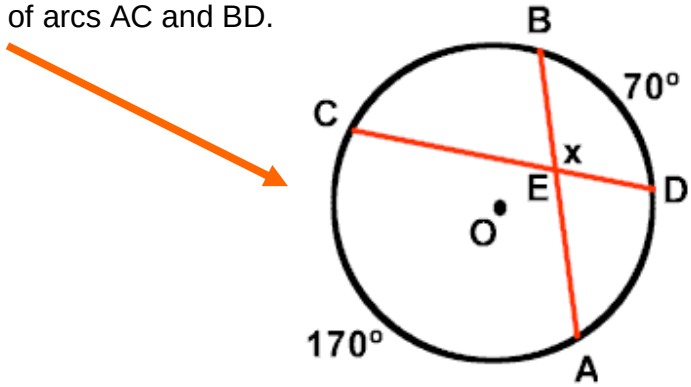
Process Questions : (based on the two figures given below and on the next page**)**

a.) How do you find the measure of angle x, which is the interior angle, if the measure of arcs BD and AC are 70° and 170°, respectively ?

b.) How do you find the measure of the exterior angle x, formed by two intersecting secants, if the measure arcs BD and AE are 20° and 80°, respectively ?

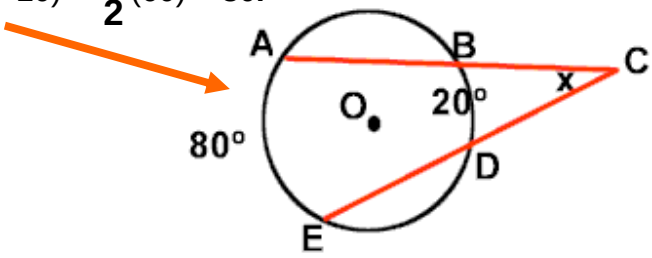
(These are some of the possible responses/answers of the students.)

a.) The measure of ∠x = 120, which is the interior angle formed by two intersecting chords, is equal to half the sum of arcs AC and BD.



b.) The measure of $\angle x = 30°$, which is the exterior angle formed by two intersecting secants, is based on the equation.

The $m\angle x = \frac{1}{2}(m\overset{\frown}{AE} - m\overset{\frown}{BD}) = \frac{1}{2}(80 - 20) = \frac{1}{2}(60) = \mathbf{30.}$



16.) After doing all the activities, let the students open this site below **:**
http://regentsprep.org/regents/mathb/5A1/CircleAngles.htm
This site will tell them the proper way to solve circles when working with angles. No instructions needed for this site because these are formulas on how to solve circles in relation to angles.

17.) After viewing the site above, what have you noticed about the things you said in the introduction part ? Were you clarified of some relationships of angles ? Which ideas became clearer?

18.) Now, let us see how circles are related to segments formed by chords, secants, and tangents. Note that the integration part of this lesson will be tackled after discussing Lesson 2.

Lesson 2

Segments formed by chords, secants, and tangents

I. Introduction

1.) Before doing the Drawing Activity Sheet #4, allow the students to answer this preliminary problem question **:**
What is the relationship between circles and lengths of segments formed by radii, chords, secants, and tangents ?

2.) The teacher will solicit answers from the students based on the problem question given above and let them explain their answers by drawing.

3.) Now, let us see the relationship of segments formed by chords, secants, and tangents by performing the next activity.

4.) Instruct the students to get their materials for drawing such as ruler/straightedge, and Compact Disc with size 4.10 inches. Distribute a clean short bond paper to each student. Let the students do the Drawing Activity Sheet #4 (Draw Me Something) individually by drawing each instruction step by step as instructed by the teacher orally.

5.) After drawing everything, the teacher will write the nine segments(a – i) to be measured on the board using ruler, in centimeter(cm) as a unit of measurement. Then, let the students answer it.

6.) After that, the teacher will post the sample table below for better analysis of the results.

	Measurement of the segment of each student				
Segment	Student 1	Student 2	Student 3	Student 4	Student 5
a.) $\overline{HM}$					
b.) $\overline{MN}$					
c.) $\overline{LM}$					
d.) $\overline{MI}$					
e.) $\overline{HJ}$					
f.) $\overline{NJ}$					
g.) $\overline{LJ}$					
h.) $\overline{KJ}$					
i.) $\overline{IJ}$					

7.) With the teacher as their facilitator, the students will now observe the results of the nine(a-j) segments written on the board and relate each of them. They should also compare each others answer and see who among them answered correctly.

8.) Then, let the students answer the following questions **:**

a.) What can you say about the lengths of two chords intersect inside a circle and the lengths of the segments of the other chord ?

b.) How do you compare the measurement of the two secants intersect outside a circle and the lengths of the other interior segment and its external segment of the other secant ?

c.) What relationship can you think of between the lengths of the secant and the tangent intersect in the exterior of a circle and the length of the tangent secant ?

9.) And then afterwards, since many of the students have different answers, tell them that the next activity will let them know the right answer.

II. Interaction

1.) To facilitate the process of finding the correct answer as discussed in the introduction part of lesson 2, let the students answer this process question **:**

What observation can you make regarding the circles in relation to the lengths of segments formed by secants and tangents ?

2.) Call three (3) to five (5) students to answer the process question above and write their responses/answers on the board.

3.) Next, to deepen their understanding about tangent and secant segments, let the students perform the Investigation Activity Sheet #5(Full circle), individually.

4.) Allow the students to summarize their findings and observations.

5.) Afterwards, using the strategy "Think – Pair – Share". Let the students think of their answers first by double checking it, then pair with their nearest seatmate and compare each others answer, then lastly, share their results to the bigger group or to the whole class.

6.) Then, the teacher will comment their report by giving immediate feedback regarding their answers.

7.) As a final thought of the investigation activity, the teacher will let the students answer this process question **:**

What can you say about the measurement of the different secant lines drawn in circle O?

8.) Next, to deepen their understanding about the lesson, let the students perform the Cooperative Learning Activity found on this website **:**
http://books.google.com/books?id=njewSk-IcCwC&pg=PA42&lpg=PA42&dq=secants-tangents+activities&source=web&ots=3Pfdn0cuD_&sig=gEg3N--V7RIf9MaaQ-YSZoyEU7w#PPA42,M1
The instruction on how to conduct this activity is found on this website itself.

9.) After doing the activity on the website above, ask the students to answer this question **:**

What are the relationships of segments formed by a secant and a tangent; two secants; and intersecting chords?

10.) Considering the answers given by the students, the teacher will now guide or lead them to the following relationship of segments (as the teacher writes the following figures on the board)**.** Allow the students to answer the following process questions **:**

Process Questions : (based on the three figures given below**)**

a.) How are the two chords related with each other in terms of their lengths of segments?

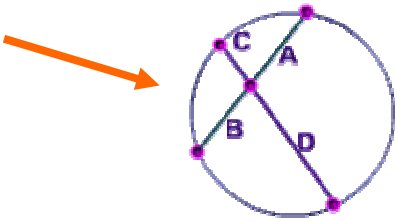
b.) What is the relationship between the lengths of the two secants that intersect outside of the circle and its external segments ?

c.) How do you find the length of the tangent segment in relation to the lengths of the secant and its external segments ?

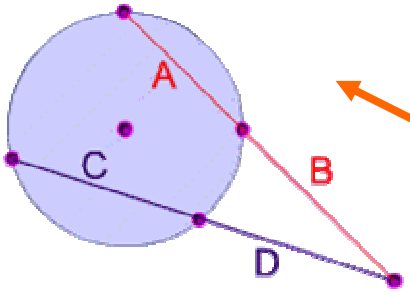
(These are some of the possible responses/answers of the students.)

a. If two chords intersect, then the product of the lengths of the segments of one chord is equal to the product of the lengths of the other.

$A \cdot B = C \cdot D$



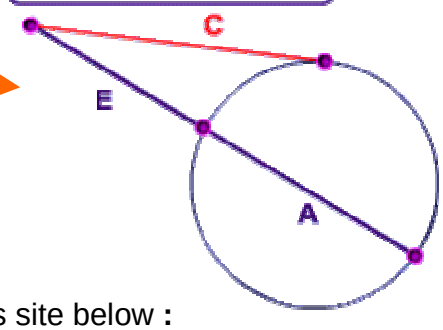
$(A+B) \cdot B = (C + D) \cdot D$



b. If two secants intersect outside of the circle, then the product of the lengths of one secant segment and its external segment is equal to the product of the other secant and its external segments.

c. If a secant and a tangent intersect in the exterior of a circle, then the product of the lengths of the secant and its external segments is equal to the square of the length of the tangent segment.

$C^2 = E \cdot (A + E)$



11.) After doing all the activities, let the students open this site below **:**
http://www.pinkmonkey.com/studyguides/subjects/geometry/chap7/g0707701.asp
This site will tell them the proper way to solve circles when working with segments. No instructions needed for this site because these are proofs and samples on how to solve circles in relation to lengths of segments.

12.) Now that we are done discussing lessons 1 and 2, let us see how circles in relation to segments and angles formed by radii, chords, secants, and tangents by integrating it to real-life situations.

III. Integration

1.) Given the concept map (Activity Sheet #8), ask the students to supply the missing terms/words/statements and let them explain their answers thoroughly. Let the students know the importance of the concept map and its usefulness in understanding the lesson. Note that the students are given the opportunity to modify or add some information to unlock the difficulty of the lesson.

2.) Now, the teacher will facilitate the discussion by going back to the things or statements they said in the introduction part of both lessons and relate it to the results of their concept mapping activity.

3.) Allow the students to compare their answers in their previous activities particularly in their initial understanding about the concept and let them decide which of those answers are correct.

4.) Call some students to share their initial ideas and what they found out after the lesson.

5.) To assess their understanding of the lesson, let the students answer the on-line interactive sample problems found on this site **:**
http://www.algebralab.org/lessons/lesson.aspx?file=Geometry_CircleSecantTangent.xml
Instructions on how to go about this assessment is stated on this site itself. There will be two problems where students will input their answers on the box provided for each item. Then, an immediate feedback/answer will come out together with the solutions.

6.) To check their understanding of the lesson and readiness in applying to real-life situation, let them solve the Activity Sheet #6(The Circle of Life), independently.

7.) Call some students to share and discuss their answers on the board and allow other students to give feedback on their answers.

8.) Now that they are done answering activity sheet #6, let the students answer this process question **:**

What generalizations/findings can you make regarding angles, arcs, and segments of lengths in relation to circles formed by radii, chords, secants and tangents ?

9.) Students should answer the process question above by writing it on a one half sheet of paper individually to check if they really understood the lesson well.

10.) After going through all the activities, let the students answer these questions below **:**

a.) What is the importance of these two lessons to your life as a student or as a junior ?

b.) Will these lessons help you improve your skills in solving mathematical problems ? Explain ?

c.) What values have you learned in doing all the activities and experiences you encountered ?

Lastly, emphasize to the students the importance of accuracy in solving mathematical problems and the value of practice in aid of understanding the lesson easily by telling it to the class orally.

Synthesis Journal :

To assess their thoughts and feelings regarding the lesson, let the students fill up the Activity Sheet #7 (Synthesis Journal), where they could summarize all the activities, what they have learned and discovered, and also how they could use and apply it.

Then the teacher will process the answers of the students by asking them some follow-up questions based on what they wrote on their synthesis journal.

Closure :

Our environments may have circular figures. In constructing such circular spaces, problems arise regarding its measurement and other aspects such as intersection of another line forming arcs or chords. To solve such problems, it is helpful to remember that the measure of the central angle is equal to its intercepted arc, and the inscribed angle is equal to half of its intercepted arc. Similarly, if a secant and a tangent meet at a point outside a circle, the product of the exterior part of the secant with its entire length is equal to the square of the tangent segment, and if two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the segments of the other.

Drawing Activity Sheet #1
DRAW IT TO ME BABY

Direction : Draw the following independently as instructed by the teacher.

1.) Draw/Trace circle O with a slant diameter ($\overline{AE}$) of 4.10 inches or the size of the Compact Disc(CD) in a one whole short bond paper.

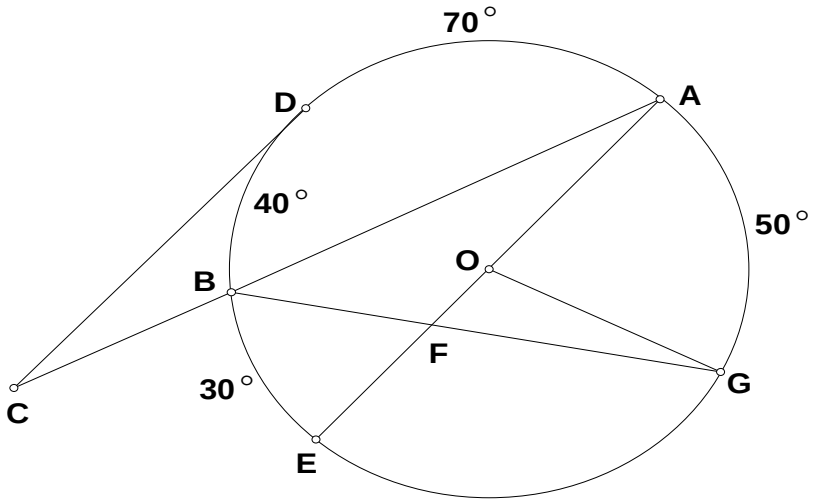
2.) Draw radius ($\overline{GO}$) forming ∠AOG with a minor arc length ($\overset{\frown}{AG}$) equal to 50°.

3.) Draw chord ($\overline{GB}$) intersecting radius ($\overline{EO}$) and name the intersection as point F.

4.) From point A, draw a secant ($\overline{AC}$) passing through point B which will form an inscribed ∠EAC, with a minor arc length ($\overset{\frown}{BE}$) equal to 30°.

5.) From point C, draw a tangent line ($\overline{CD}$) on the surface of arc $\overset{\frown}{AB}$, which will form an arc length ($\overset{\frown}{AD}$) equal to 70°, and another arc length ($\overset{\frown}{BD}$) equal to 40°.

The diagram/figure will look like this below **:**



Investigation Activity Sheet #2
THE MATH CIRCLE

Instruction : Copy this chart below. Complete the chart as you answer Questions 1 – 8.

m∠ACB	$m\overset{\frown}{AB}$	m∠D	m∠E	m∠F
(a) ?	(b) ?	(c) ?	(d) ?	(e) ?

In circle C, ∠ACB is a central angle, and ∠EHF is neither a central angle nor an inscribed angle.

1.) Use a protractor to measure ∠ACB.

2.) What is $m\overset{\frown}{AB}$?

3.) How are ∠D, ∠E and ∠F alike ?

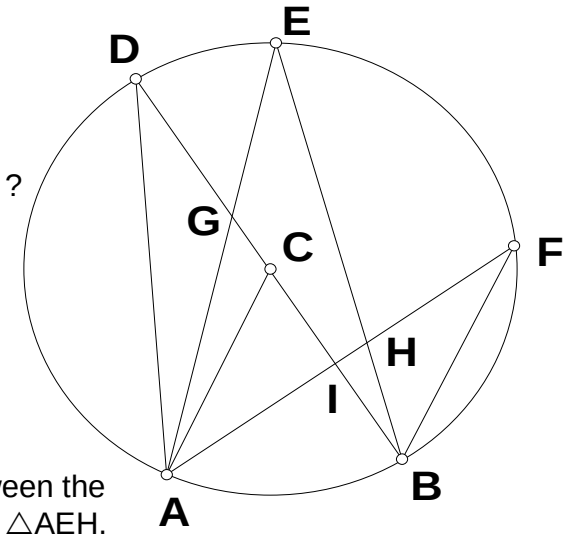
4.) What do these angles have in common with ∠ACB ?

5.) Use a protractor to measure ∠D, ∠E and ∠F.
What appears to be true ?

6.) Relate ∠EHF to the inscribed angles of △AEH.
Write an equation to show this relationship.

7.) Rewrite the equation by using the relationship between the arc measures and the inscribed angle measures of △AEH.

8.) Relate the inscribed angles to △BFH.

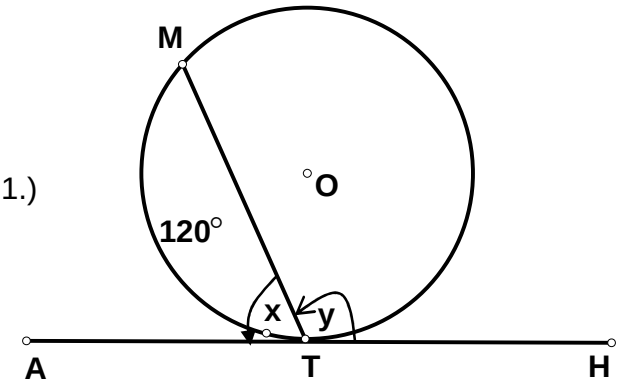


Activity Sheet #3

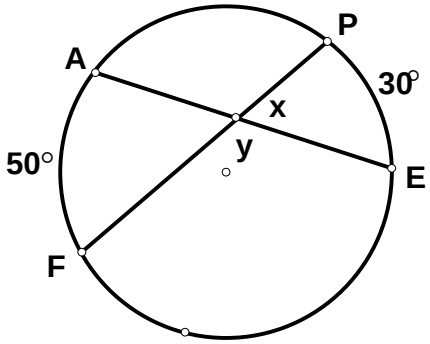
STAR CIRCLE QUEST

Direction : Find the unknown marked angles or arcs (x and/or y) in each figure.

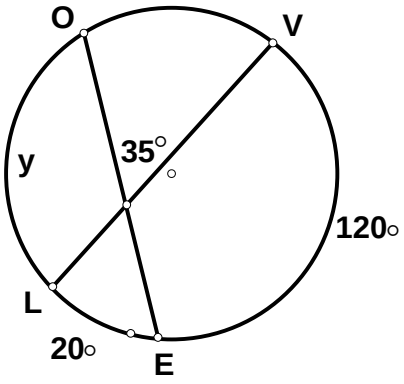
1.)



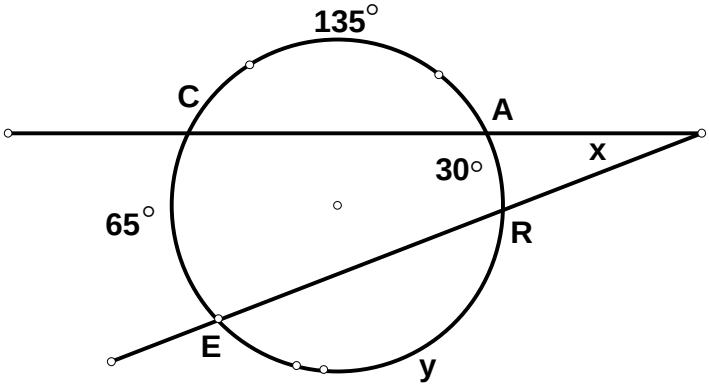
2.)



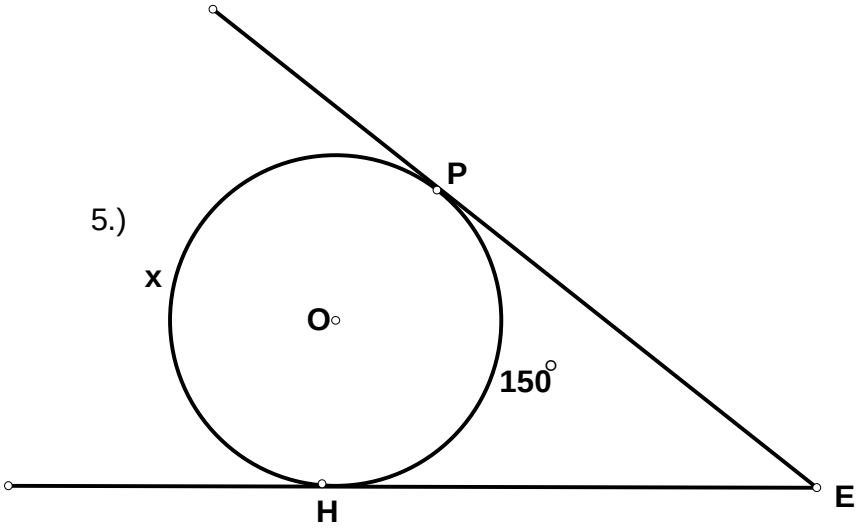
3.)



4.)



5.)



Drawing Activity Sheet #4
DRAW ME SOMETHING

Direction : Draw the following independently as instructed by the teacher.

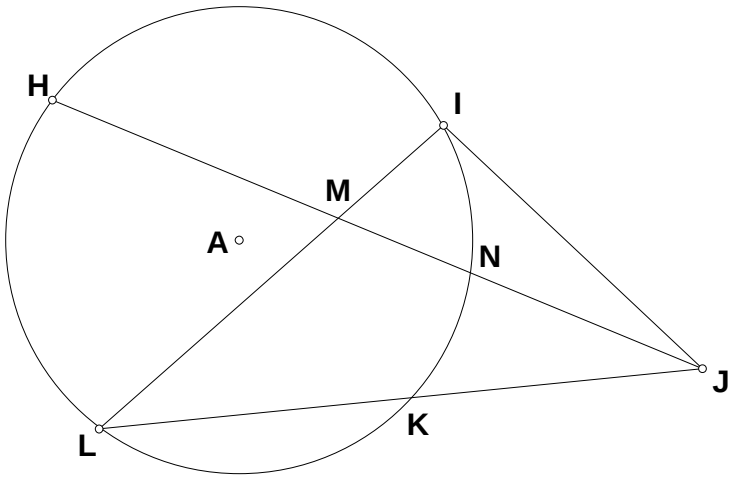
1.) Draw circle A with a diameter of 4.10 inches or the size of the Compact Disc(CD) in a one whole short bond paper.

2.) Draw tangent $\overline{JI}$, where I is the point of tangency.

3.) From point J, draw two secants $\overline{JL}$ and $\overline{JH}$ intersecting circle A with points K and N which contain secants $\overline{JL}$ and $\overline{JH}$, respectively.

4.) From point L, draw chord $\overline{LI}$ intersecting secant $\overline{JH}$ at point M in the interior of the circle.

The diagram/figure will look like this below :



Investigation Activity Sheet #5
FULL CIRCLE

Instruction : Copy the figure below and answer Questions 1 – 5, independently.

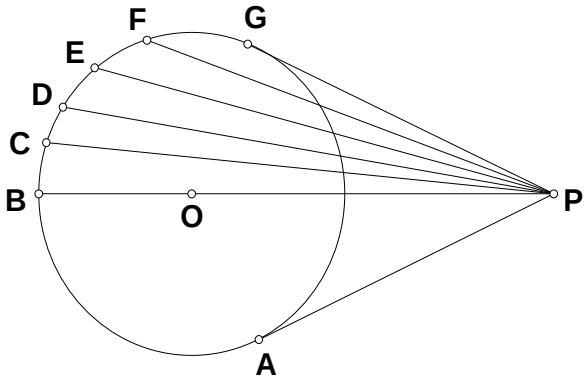
1.) Measure $\overline{PA}$, $\overline{PB}$, $\overline{PC}$, $\overline{PD}$, $\overline{PE}$, $\overline{PF}$, and $\overline{PG}$.

2.) Are any of these segments congruent ?
What kinds of segments are they ?

3.) Which secant is longest ? Why ?

4.) Which secant is shortest ? Why ?

5.) Are there any segments shorter than
the shortest secant ? Why ?



Activity Sheet #6

THE CIRCLE OF LIFE

Direction : Answer the following real-life problems completely. Show your complete solutions.

1.) Photography: Using a zoom lens, a photographer focuses his camera on a fountain. His camera is at the vertex of the angle formed by tangents to the fountain. He estimates this angle is 40°. What is the me asure of the arc of the circular basin of the fountain that will be in his photograph? (See figure 1.)

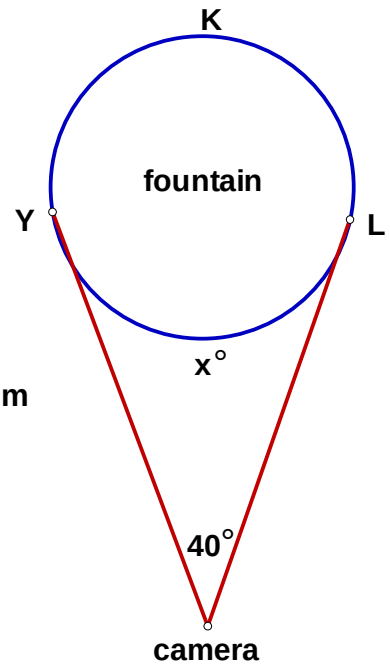


figure 1

2.) ΔHML is circumscribed about circle D. Find the perimeter of ΔHML. (See figure 2.)

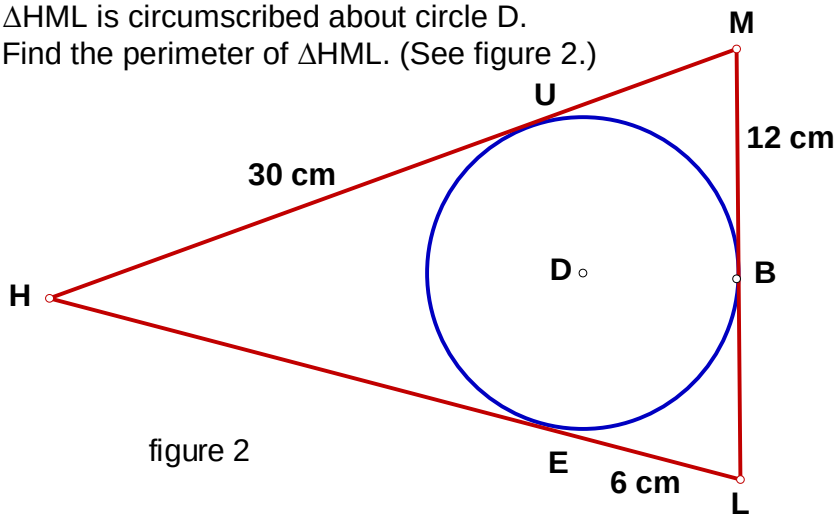
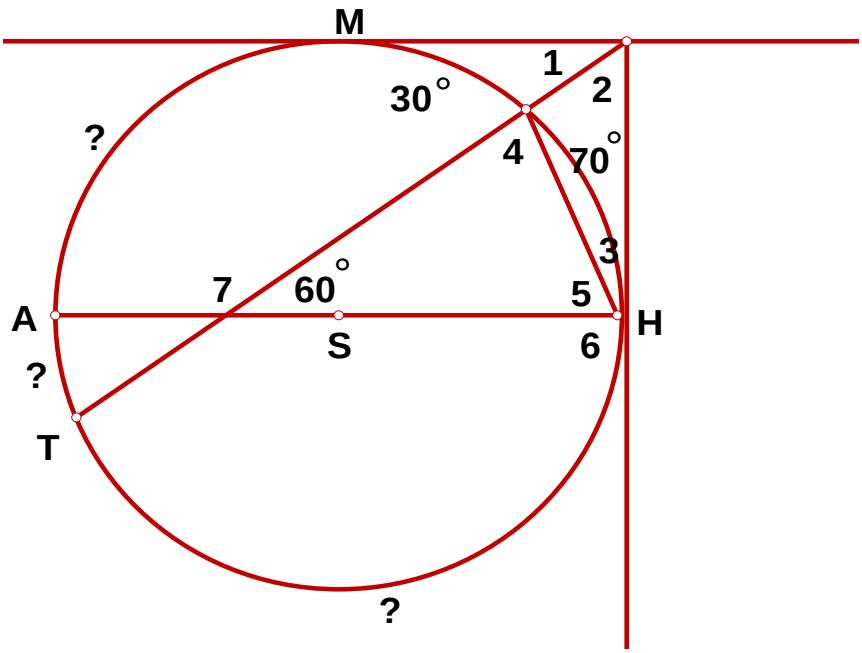


figure 2

3.) Find the measures of the indicated arcs(?) and numbered angles(1 – 7) below.



Activity Sheet #7

SYNTHESIS JOURNAL

Direction : Complete the table based on your own assessment of the lesson.

What I Did	What I Learned	How I Can Use It

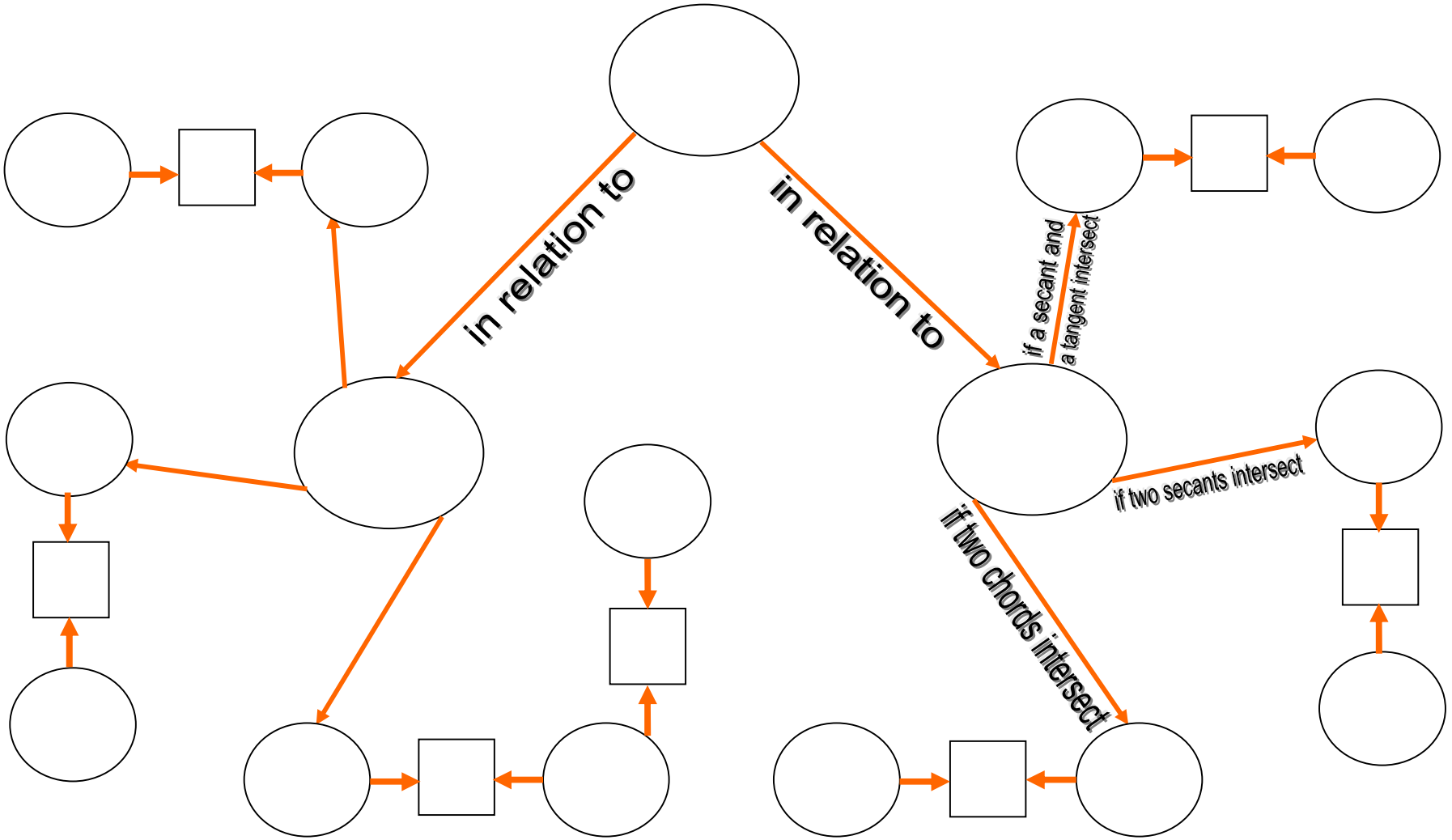
LEGEND FOR THE CONCEPT MAP: (ANSWER KEY)

1.) exterior angle
2.) half of the difference of the two arcs
3.) interior angle
4.) half of the sum of the intercepted arcs
5.) twice of the inscribed angle
6.) the product of the lengths of the segments of the other chord
7.) the product of the lengths of the segments of one chord
8.) the product of the lengths of the other secant segment and its external segment
9.) the product of the lengths of one secant segment and its external segment
10.) the product of the lengths of the secant and its external segments
11.) the square of the tangent segment

Activity Sheet #8

CONCEPT MAP

Direction **:** Supply the missing terms/words/statements to complete the concept map.



CONCEPT MAP
ANSWER KEY