

Grade 9

Master Teacher

Jacqueline C. Johnson

Time Allotment

Two 90-minute class periods

Overview

This lesson is designed to help students learn the fundamentals of geometry: points, lines, planes and space. Students will also learn that these terms are called the Building Blocks of Geometry. After viewing the video, students will learn how to identify and draw angles. As students complete the second **Culminating Activity** they will use their prior knowledge to identify, draw and measure angles of varying degrees.

Subject Matter

Mathematics

Learning Objectives

Students will be able to:

- ✎ Identify and name lines, points, rays, line segments, and planes;
- ✎ Identify, measure and draw angles of varying degrees.

South Carolina Standards

(These Standards can be found online at http://www.sde.state.sc.us/offices/cso/standards_Page.htm.)

Geometry

I-A. Analyze properties and determine attributes of two- and three-dimensional objects.

Media Components

Video

Standard Deviants: Angles Untangled: Learn Geometry. Teachers may go to

<http://www.standarddeviants.com> to order the video and download extra practice sheets or they can purchase the video from Wal-Mart.

Inspirational Software may be purchased online at Amazon.com or from Books-A-Million.

Teachers may log on to

<http://cfmedia.SCETV.org/searchlite/index.cfm> and click on View Mathematics. Next, click on View Geometry, scroll down until you get to Geometry of Exploration: Eyes Over Mars. (**Note to Teacher:** You will have to click several times at the bottom of the screen to get to the page you want.)

Web Sites

Standard Deviants

(<http://www.standarddeviants.com>). At this Web site, teachers can download activities or assessments. They can also order other videos in this series.

Knowitall.org

(<http://cfmedia.SCETV.org/searchlite/index.cfm>). This site provides a video clip on measuring angles, using real life applications.

Introduction to Angles

(<http://www.quia.com/jg/65822.html>). This site gives students the opportunity to identify angles using concentration, word search matching or flashcards to help them understand angles.

Materials

Per student:

construction paper
paper protractors
notebook paper

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straightedge
markers
poster board
Activity Sheet 2 (Focus Questions
for Discussion)
Activity Sheet 3 (What's My Angle?)
Activity Sheet 4 (Angles in 60 Seconds)

Per Group:

A set of flashcards on basic geometric terms: points, lines, rays, planes, line segments, and angles

Equipment

laptop computer
27-inch television
overhead projector
Averkey
projection screen
VCR

Prep for Teachers

- ✍ Prior to teaching this lesson, bookmark the Web sites used with Portaportal.com, a Web-based bookmarking utility that lets you store links to your favorite Web sites online.
- ✍ Prepare the hands-on element of the lesson by copying Activity Sheets 2, 3 and 4 for each student.
- ✍ Cut and paste Activity Sheet 1 on index cards. There will be 54 cards. Place a set of the 54 index cards into a zip lock storage bag for each group. Each group will consist of 4 or 5 students.
- ✍ Preview Internet sites.
- ✍ Preview the video and then rewind it and have it set to the beginning of Section A.
- ✍ When using media, provide students with a **Focus For Media Interaction**, a specific task to complete and or

information to identify during or after viewing of video segments, Web sites, or other multimedia elements.

Introductory Activity (Day 1)

(**Note to Teacher:** The video is introduced at the beginning of the lesson to provide a foundation for students to master the objectives taught in geometry.)

Step 1: Distribute Activity Sheet 2 to the students. It will help them remember the **Focus for Media Interaction** questions. Then, provide students with their first **Focus for Media Interaction** question by asking them to listen to find out what the geometry taught today is called. (*It is called Euclidean Geometry after Euclid, a prominent mathematician born around 365 B.C.*)

Step 2: Using the Inspiration Software, create a concept map listing students' responses to the following question: "What is Basic Geometry?"

Step 3: Say: "Today we will use Basic Geometry to develop an understanding of angles." Provide students with a **Focus for Media Interaction** by asking them to name the Fundamentals of Geometry. (*The Fundamentals of Geometry are points, lines, planes and space.*)

Insert the **Standard Deviants** tape into the VCR. It is cued to Section A. PLAY the tape until you get to the sentence: Geometry are points, lines, planes and space. Press PAUSE when the narrator says the words "every time." Check students' comprehension for the following question: What is another name for the Fundamentals of Geometry? (*They are known as the Building Blocks of Geometry.*)

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Learning Activity

Step 1: Provide students with the **Focus for Media Interaction** by asking: What is a point? (*A point is represented by a dot; it has no length or width. It is just a placeholder*) What is a line? (*A line has no width, but its length extends infinitely in two directions.*) What are collinear points? (*Collinear points are points, which lie on one line.*) How do you name a point, a line and collinear points? (*A point is named using a capital letter. To name a line, use a lower case letter or name two points on the line and top them with the two-arrowed symbol. The points used on the line are named collinear points.*)

Press PLAY to resume the video. Press PAUSE after the narrator says: ABCD or STU. Ask students to draw five examples of a point, a line and collinear points. Have each student exchange his/her paper with the person sitting on his/her left and that student will write the name for the examples.

Step 2: Provide students with a **Focus for Media Interaction** by asking: How is a ray like a line? (*A ray is like a line because it begins at one point, and extends infinitely in one direction from that point.*) What is a segment? (*A segment is part of a line or ray that is between two points.*) Where did the segment begin and end? (*The segment began at point T and ended at point E.*)

Press PLAY on the VCR to resume the video. Press PAUSE after the narrator says POINT E.

Step 3: Provide students with a **Focus for Media Interaction** by asking: How many endpoints does a ray have compared to a segment or a line? (*A ray has one endpoint, a segment has two, and a line does not have any.*)

Press PLAY to resume the video. Press PAUSE after narrator says true love.

Step 4: Provide students with a **Focus for Media Interaction** by asking: What is an angle? (*An angle is 2 rays that share the same endpoint.*) What is always listed in the middle when naming angles? (*The vertex*)

FAST FORWARD to **Section D: Angles** and press PLAY. Press PAUSE after the narrator says notations.

Step 5: Provide students with a **Focus for Media Interaction** by asking them to define an acute angle, a right angle, a straight angle and an obtuse angle. START the video and play until you hear straight line. Press STOP.

Culminating Activity

Step 1: The students will review the vocabulary presented in the video. Give each group a zip lock bag of index cards. Instruct students to spread the cards on their desks and try to match each definition with a term or picture.

Step 2: Students will log on to <http://www.quia.com/ig/65822.html>. This site gives the students the opportunity to identify angles using word search matching or flashcards.

Learning Activity (Day 2)

Step 1: Generate a class discussion on the concepts learned in the previous lesson. Review the definitions for acute, right, obtuse and straight angles.

Step 2: Instruct the supply managers to distribute the paper protractors. Model how to use the protractors to measure angles.

Step 3: Tell students to practice measuring angles of various degrees.

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Step 4: START the *Standard Deviants* video at Complementary Angles: 0:17:38. STOP when the narrator says: are supplementary. Generate a class discussion on complementary and supplementary angles. Allow the students to form several examples of complementary and supplementary angles. Students will use the Substitution Method to explore this concept. $M\angle 1 + M\angle 2 = 180$ degrees or $\angle A + \angle B = 90$ degrees.

Step 5: Students will logon to <http://cfmedia.SCETV.org/searchlite/index.cfm>. This site reinforces the use of the protractor to measure angles using real world applications. Display this Web site on the television using the AverKey.

Culminating Activity

Step 1: Have each group to construct and identify five angles.

Step 2: Each student is responsible for writing the steps they used to construct their angles in their journals.

Step 3: Using the clock and geometric shapes as models, students will identify various angles. (See Activity Sheet 3.)

Step 4: Using the substitution method, students will form equations to find the missing angle. (See Activity Sheet 4.)

Assessment

Students will be assessed on their construction of the angles.

Students will also be assessed on their project: Design a poster to promote Complementary and Supplementary Angles using the Substitution Property.

(**Note to Teacher:** See Activity Sheet 5 for instructions on doing this activity with students.)


Cross-Curricular Extensions

Language Arts: Students will write the Focus Questions in their journals.

Students will also write instructions for naming geometric figures and measuring angles.

Art: Students will visit the Web site of Jonathan Greene to view angles in art.

Community Connections

 Students will use the digital camera to take pictures of angles in the real world.

Student Materials

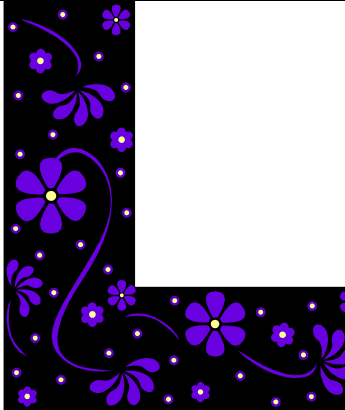

construction paper
paper protractors
notebook paper
straightedge
markers
poster board

Activity Sheet 1

Concentration Cards

This activity can also be created using the Inspiration software and the students can use the AverKey and television to play it.

Euclidean Geometry	What is geometry today called?	What are the Fundamentals of Geometry?	Points, Lines, Planes, and Space	What is another name for the Fundamentals of Geometry?
They are known as the Building Blocks of Geometry.	What is a point?	A point is represented by a dot; it has no length, or width. It is just a placeholder.	What is a line?	A line has no width, but its length extends infinitely in two directions.
What are collinear points?	Collinear points are points, which lie on one line.	How do you name a point?	A point is named using a capital letter.	How do you name a line?
To name a line, use a lower case letter or name two points on the line. Top them with the two- arrowed symbol.	How do you name collinear points?	The points used on the line name collinear points.	How is a ray like a line?	A ray is like a line because it begins at one point and extends infinitely in one direction from that point.
What is a segment?	A segment is part of a line or ray that is between two points.	How many endpoints does a ray have?	A ray has one endpoint.	How many endpoints does a line have?
A line has no endpoints.	How many endpoints does a segment have?	A segment has two endpoints.	What is an angle?	2 rays that share the same endpoint form an angle.
What is always listed in the middle when naming angles?	The vertex.	What is an acute angle?	An acute angle measures less than 90 degrees.	What is an obtuse angle?

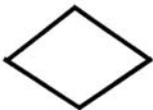
<p>An obtuse angle measures more than 90 degrees but less than 180.</p>	<p>What is a right angle?</p>	<p>A right angle measures exactly 90 degrees.</p>	<p>What is a straight angle?</p>	<p>A straight angle measures exactly 180 degrees. It looks like a straight line.</p>
<p>What are complementary angles?</p>	<p>Complementary angles are two angles whose measures add up to 90 degrees.</p>	<p>What are supplementary angles?</p>	<p>Supplementary angles are two angles whose measures add up to 180 degrees.</p>	<p>What is the substitution property?</p>
<p>The substitution property states the measure of angle one plus the measure of angle two = 180 or 90 degrees.</p>		<p>A right angle.</p>		<p>Four right angles.</p>

Focus for Discussion Questions “Angles Untangled”

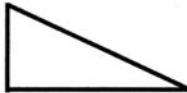
1. What is geometry today called?
2. What are the Fundamentals of Geometry?
3. What is another name for the Fundamentals of Geometry?
4. What is a point?
5. What is a line?
6. What are collinear points?
7. How do you name a point?
8. How do you name a line?
9. How do you name collinear points?
10. How is a ray like a line?
11. What is a segment?
12. How many endpoints does a ray have?
13. How many endpoints does a line have?
14. How many endpoints does a segment have?
15. What is an angle?
16. What is always listed in the middle when naming angles?
17. What is an acute angle?
18. What is an obtuse angle?
19. What is a right angle?
20. What is a straight angle?
21. What are complementary angles?
22. What are supplementary angles?
23. What is the substitution method?

What's My Angle?

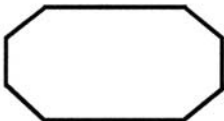
Directions: Name the angle or angles shown in each picture.

















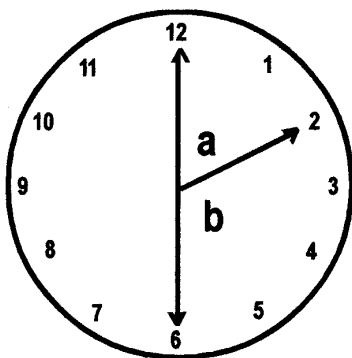








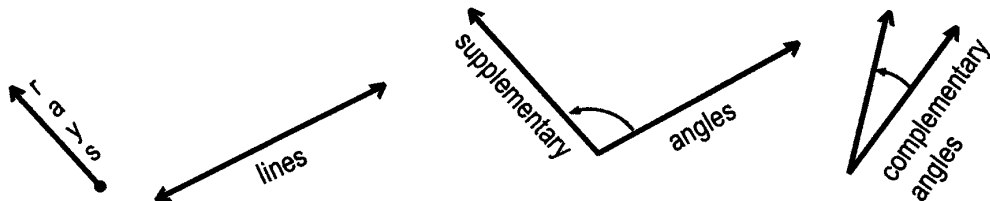
ANGLES IN GO SECONDS



If $m \angle a$ is 16.8° and $\angle a$ and $\angle b$ are supplementary, find the measurement of angle b .

$$\begin{array}{r}
 m \angle a + m \angle b = 180^\circ \\
 16.8^\circ + m \angle b = 180^\circ \\
 \underline{-16.8^\circ} \qquad \qquad = -16.8 \\
 m \angle b = \underline{173.2^\circ}
 \end{array}$$

Heat It Up with Angles



Activity Sheet 5

“101 Strategies to Teach Any Subject” Jacqueline C. Johnson

Objective: The student will create a print advertisement to promote his/her understanding of complementary and supplementary angles using algebraic equations.

Standards: Geometry IB

Vocabulary: ray, line, angle, vertex, supplementary angle, complementary angle, algebraic equation.

Procedure:

1. Divide students into tribes of 4 members.
2. Each tribe will create a print advertisement that promotes the group’s understanding of supplementary and complementary angles using algebraic equations.
3. The advertisement must contain the vocabulary words, a slogan and visuals.
4. The tribe must present its idea.
5. The tribe must explain what the advertisement is about.
6. The tribe must discuss how it solved the equation.

Activity Sheet 5 (cont.)

Explanation of Advertisement for “101 Strategies to Teach Any Subject”

1. Explain what the advertisement is about.

The advertisement assumes that the student has prior knowledge of angles. It shows that it is possible to solve a problem about angles in 60 seconds if one uses an algebraic equation.

2. Explain how the group solved the problem.

To solve the equation we followed these steps:

1. First we wrote an equation from the information given because we know if the angles are supplementary then they equal 180 degrees.
2. Next, we took the inverse of addition, which is subtraction. We subtracted 16.8 from both sides of the equation to get angle b by itself.
3. The measure of angle b is 173.8 degrees.
4. We also practiced subtracting decimals in this equation.