Lines, Point, Ray, Intersections, Right, Acute, and Obtuse Angles:
What's Your Angle?

Brief Overview:

The students will be able to create and identify various types of lines and angles. Students will apply the appropriate name to angles by first comparing the size of angles visually. Students will then proceed to exact measurements of angles by learning to use a protractor and then being able to correlate the actual degrees to the name of the angles.

NCTM Content Standard/National Science Education Standard:

Geometry
Measurement

Grade/Level:

4th Grade

Duration/Length:

3 days (50 minutes each).

Student Outcomes:

Students will be able to:

- Create and identify various types of lines (straight, curved, broken).
- Identify the name of a line, which goes from left to right as a horizontal line.
- Identify the name of a line, which goes up and down as a vertical line.
- Make lines that remain an equal distance apart from each other at all points, never crossing; identifying these types of lines as parallel lines.
- Make a line segment and be able to identify it as line with defined end points and definite length.
- Make a ray and be able to identify it as part of a line that starts at one end point and goes on in the other direction without stopping.
- Determine a point of intersection as the place where two non-parallel lines cross.
- Create perpendicular line, and be able to define them as lines that do intersect to form a right angle.
- Make various size angles by connecting two rays to meet at a single point.
- Identify acute angles as smaller than a right angle.
- Identify obtuse angles as larger than a right angle.
- Associate the size of an angle in degrees to the name of the angle.
- Identify 90° angles as right angles.
- Identify angles, which measures less than 90° as acute angles.

- Identify angles that are larger than 90° and smaller than 180° as obtuse angles.

Materials and Resources:

- Skittles and pretzels (per student)
- Plate and or napkin (per student)
- Geoboard and rubber bands (per student)
- Straight Lines, Parallel Lines, and Perpendicular Lines by Enrico Arno (read a loud)
- SR 1 – Matching Activity
- SR 1a – Answer Key
- SR 2 A & B – Pre-Assessment
- SR 2 C & D – Answer Key
- SR 3 – Street Map
- Angles Are Easy As Pie by Byron Barton (read a loud)
- SR 4 - Pictures and Definitions (per pair of students)
- SR 4a – Answer Key
- SR 5 Geoboard Paper
- SR 6 Large Circle on Sheet
- SR 7 Analog Clock
- SR 8 Measuring Angles Worksheet
- SR 8 Answer Sheet
- SR 9 Clocks, Degrees, and Angles Sheet
- SR 9a Answer Key
- 12 inch ruler
- Protractor (per student)
- SR 10 Measuring Angles With a Protractor
- SR 10a – Answer Key
- SR 11 – Right, Acute, and Obtuse Angle Cards
- SR 12 – Shapes
- SR 13 - Picture Sheet
- Straws and glue
- Construction paper
- SR 14 – Summative Assessment
- SR 14a – Assessment Answer Key

Development/Procedures:

Lesson 1 Line Segments, Lines, and Rays

Pre-assessment – Pre-assessment will be embedded in the launch activities but evaluated and recorded by the teacher. Record and evaluate prior knowledge informally as students build visual representations of geometry terms and symbols, then connect the definition

to their symbol. Assessment will focus on terms of: line, line segment, ray, vertical line, horizontal line, parallel lines, point, intersection, and perpendicular lines.

Alternate pre-assessment is included for those students needing an alternate format or those students absent on the first lesson day (SR1) see SR1a for answer key.

Launch –Group students in pairs or small groups for hands on learning and shared experiences. Give grouping a list of symbols and a list of titled definitions (SR2a & SR2b) see SR2c & d. Distribute pretzels and Skittles to students to use in their creation of geometry symbols. Pretzels will represent lines and line segments. Skittles will be used to represent a point. Broken pretzels can be used to form arrows. Student groups will display a completed individual symbol on a plate with the printed definition attached. When a correct symbol and definition are presented to the teacher, the group will be given permission to eat the symbol.

Teacher Facilitation –Offer limited clues as you move among the groups. Ask inquiry questions concerning student work to help focus discussion within the groups. Refer to concepts developed previously concerning basic shapes and their attributes. Acknowledge there are some symbols and definitions that may be new. Encourage risk taking in work and the use of problem solving strategies. As a closing to the lesson, gather students in a whole group to share findings. Revisit and discuss terms and symbols. Encourage students to elaborate on the strategies they used to identify new terms and symbols. Clarify any wrong concepts and reinforce use of math terms.

Student Application – Ask students to locate similar lines, intersections and points within the classroom furniture and environment Distribute Street maps (SR3) to students. Instruct them to highlight areas that reflect the terms discussed and correctly label those highlighted areas.

Embedded Assessment –Assess students on understanding through teacher observation during construction of symbols and definition correlations during launch activities. Student discussions within small groups and student discussion in large group at closing will aid in ongoing assessment. Student application will also be assessed.

Reteaching/Extension –

- Instruct small groups to physically demonstrate the symbols by using their full body. (A person standing could be a point. Two people lying on floor, feet to feet could represent a line. Arms could be used to construct the arrow look. Repeat definitions for each term in the most basic language and connect to student body representation. A Point is where you are. It is the beginning of a line segment when you move. A point is the spot where you stop on a journey).
- Have students write in their journals about basic shape attributes using the new terms and symbols. (A rectangle has two pairs of parallel line segments.)
- Give each student a different portion of a city map and have them highlight areas that represent each of the symbols in the lesson and label the areas.

Lesson 2 Types of Angles

Pre-Assessment – Students review math terms: point, ray, point of intersection, and line segments, point of intersection, ray, point, horizontal, vertical, parallel and perpendicular lines. Have students in pairs to play the memory game. Students will cut out their picture and definition cards (SR4). They place the cards face down and take turns turning over two cards at a time. If a student turns over two pictures and or two definitions they are to immediately turn the cards face down again in the exact same location. If one of the cards is a picture and the other is a definition, the student should check to see if they match. If they do match, the student keeps the cards. Pairs continue in this manner until all cards (picture and vocabulary terms) have been matched (see SR4a for answer key).
Alternative Pre-Assessment – Students who may not work well with others may be given the option to work alone to match the pictures with the definitions. Observe that students are matching the pictures with definitions correctly.

Launch – Students use a Geoboard to make angles. They will be told to put their finger onto any peg on the Geoboard. They'll be told their peg is like a point, attach a rubber band to their selected starting point. Have students stretch the rubber band vertically to the left or right and pick a peg to attach it to. Then have students take another rubber band and attach it to the same starting point and pick a different peg horizontally to attach it to. (Teacher models this on an overhead Geoboard.) Elicit from the students that this is an angle, and that an angle is created when two rays start at the same point. Instruct students to record what their angle looks like on their Geoboard sheet (SR5). Have students make and record three more angles of various sizes. Ask students if they recall a specific name of the type of angle that they were introduced to last year. Students should recall a right angle. Asks every student to make a right angle on his or her Geoboard.

Teacher Facilitation – Ask students if any of the angles that they made on their Geoboard are bigger or smaller than a right angle? Have students make an angle on their Geoboard that is smaller than a right angle. Have students, a few at a time, come to the front of the room to show their angles that are smaller than a right angle. Once students have shown their angles, inform students that all angles that are smaller than a right angle are called an acute angle. Help students to remember the word acute by saying, "Aah, you're so cute and tiny;" which stands for an acute angle. Lastly, have students make an angle that is larger than a right angle. Once again, have students show their angles, which are larger than a right angle. Inform students that angles, which are larger than a right angle, are called obtuse angles. NOTE: As you introduce each of these math vocabulary terms write each word on the chalkboard, or write each word onto overhead transparency and have students record them in their math journal. Review each of these terms with students and have them describe in their own words the meaning of acute, obtuse angle, and right angle.

Student Application – First, give students a sheet with a large circle on it. Have ¼ of the circle already labeled as a right angle (SR6). Have students cut out their right angle. Then tell students to cut the remainder of the circle into various sizes of slices; make sure

students know to make at least one size larger than their right angle. Instruct students to label their slices acute or obtuse. Second, tell students that they're now going to practice what they know about right, acute, and obtuse angles by using an instrument we use every day to tell time. Ask the students what parts a clock has that relate to angles (point and two rays). Show students with overhead transparency the analog clock. Ask students, "What type of angle can be seen when it's three o'clock? (Right angle) continue to correlate different type of angles using the clock. Have students work in pairs each setting their analog clock to a specific time and asking there to state what type of angle it represents (SR7). The student must be able to state the time and the type of angle being made. NOTE: As you walk around observing and guiding students toward understanding, make note of students who are having problems naming the type of angles, telling time, and those who are grasping the relationship between the time to type of angle. Last, ask students to look around the room to see if they can detect various size angles. Give each student a picture; have them point to a right, acute, and obtuse angle within picture. Inform students that for homework they will need to cutout some type of picture from a magazine or newspaper in which they can see a right, acute, and obtuse angle.

Embedded Assessment – (Pre-Assessment) Matching pictures and definitions and (Student-Application) Have students to label their slices of the circle as acute or obtuse.

Reteaching/Extension – For students who had problems naming the type of angles give them a review sheet which redefines the three types of angles they have learned and have them label the various types of angles (SR8) see SR8a for answer key. For those students who have had problems telling time, set a time to work with that group of students in order to review time telling. For the students who are grasping connecting time with type of angle give them a worksheet for homework in which they'll record the time on an analog clock in conjunction to the type of angle (SR9) see SR9a for answer key. Last, there are various websites that are great to use for reteaching and extended the concepts of angles.
http://www.mathleague.com/help/geometry/angles.htm
http://www.staff.vu.edu.au/mcaoline/units/geometry/angles.html
http://www.kidsnewsroom.com/elmer/infocentral/geometry/LinesQuiz.html

Lesson 3 Measuring Degrees of Angles With a Protractor

Pre-Assessment – Give students a sheet with various angles on it (SR10) see SR10a for answer key. Ask, "Based upon the size of the angle, what can you tell me about it?" Students should be able to tell state whether it's an acute, right, or obtuse angle. Also, ask students if the degrees of angle are given, will you able to tell me the name of the angle? Student response should be yes (learned in previous lesson). Inform students that you, the teacher, are going to call out various degrees of angles; they're to use their right, acute, and obtuse angle response cards to respond (SR11) see SR11a for answer key.

Examples – What's the name of a 90° angle? (Right angle) What's the name of a 110 ° angle? (Obtuse angle) What's the name of a 77 ° angle? (Acute angle)

Launch – Give students a regular 12-inch ruler to measure the length of various types of lines. Give students a protractor and explain that this is the type of ruler we use to measure angles exactly in degrees. Model how to use the protractor on the overhead. Allow students to practice using the protractor to measure angles. Observe and assist, reviewing with students how to line-up the protractor. For the first attempt, give students a right angle (they will realize that it measures directly in the center at the top of the protractor - 90°). Give students other angles to practice measuring. As students are learning to use their protractor, provide them with this hint: tell them that if they go pass the center at the top of their protractor then the angle is larger than 90° (obtuse) and if they don't reach the center at the top of their protractor - it's an angle that's smaller than 90° (acute).

Teacher Facilitation – Put various shapes on the overhead and model for students how to determine the number of degrees in each angle of a particular shape (square, rectangle, and various triangles) (SR12) answers may vary depending upon which angle is selected. Students will be asked to take out their homework from yesterday. Put on the overhead and trace the angles on the picture. Ask students to do the same on their pictures (to trace all the angles they see within their picture). Model using the protractor to measure angles again. Record the number of degrees for each angle. Move around the room to help students find the measurement of other angles within their picture; and to assist and provide feedback on how they're measuring their angles.

Student Application – Give students a sheet with various shapes and pictures on it (SR13) answers may vary. Ask students to find at least one angle within every picture or shape, measure it with the protractor and record it in degrees.

Embedded Assessment – (Pre-Assessment) Say a specific angle in degrees and students state the name of the angle based upon its degrees. (Student-Application) Accurately measure various angles of shapes and those found within pictures.

Reteaching/Extension – For those students who may finish early have them trace their hand and label the angles found between their fingers. Students can use "a" for an acute angle, "o" for an obtuse angle, and "r" for a right angle. For students who may be visually impaired have them make angles with straws. Have these students glue their right, acute, and obtuse angle to a sheet of construction paper, then label. As an extension activity have students fold a sheet of paper in order to make a paper airplane. Then have them unfold the airplane and identify all the types of angles created by the fold lines. As a nice closing kinesthetic activity to end today's lesson, have all students stand. Instruct students to use their arms to make the capital letter "L". Ask them to all say in unity the type of angle they have made with their arms? (Right angle) Then have students make a "v" using their arms. Ask what type of an angle have they made? (Acute angle.) Lastly, have students make an angle, which is as wide as a capital "W". Ask what type of angle this is? (Obtuse angle.) Then have students take turns playing "Simon

Angles". Students will use the game of Simon Says to practice making angles with their arms. For example, Simon says, make an obtuse angle. Simon says make a 90º angle (emphasize to students when they say an angle in degrees that we can only use estimation as to what we think that size angle actually is. Student modeling may vary a little and that's okay. After modeling how to play, walk around giving students the opportunity to be Simon, while observing, taking notes, and providing feedback.

Summative Assessment:

Students will be given an assessment (SR14 a & b), which includes eight multiple-choice questions (each worth one point) and one brief constructed response (worth 2 points maximum) covering the content of the three lessons of this unit on angles (see SR14c & d for answer key.

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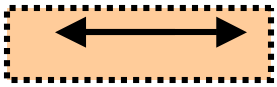
Write letter of matching definition under symbol



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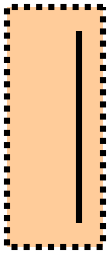

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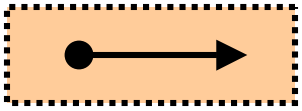

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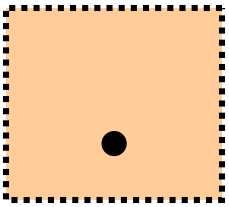

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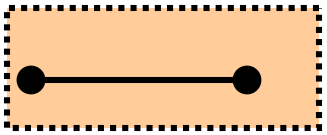

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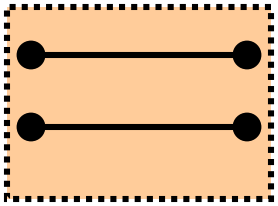

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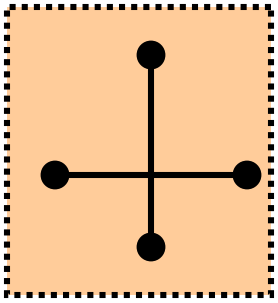

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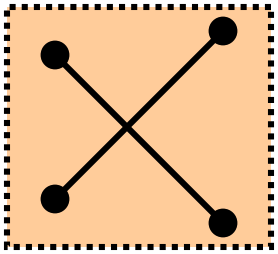

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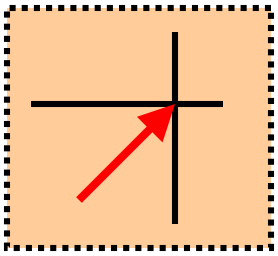

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Intersecting line segments that form square corners **A**

A ray is another straight figure; it has one endpoint and goes on forever in just one direction **B**

A straight line that goes straight up and down **C**

Line segments that stay the same distance apart from each other **D**

A straight line that goes straight across form left to right **E**

A straight figure with two end points **F**

A place where two non-parallel lines cross **G**

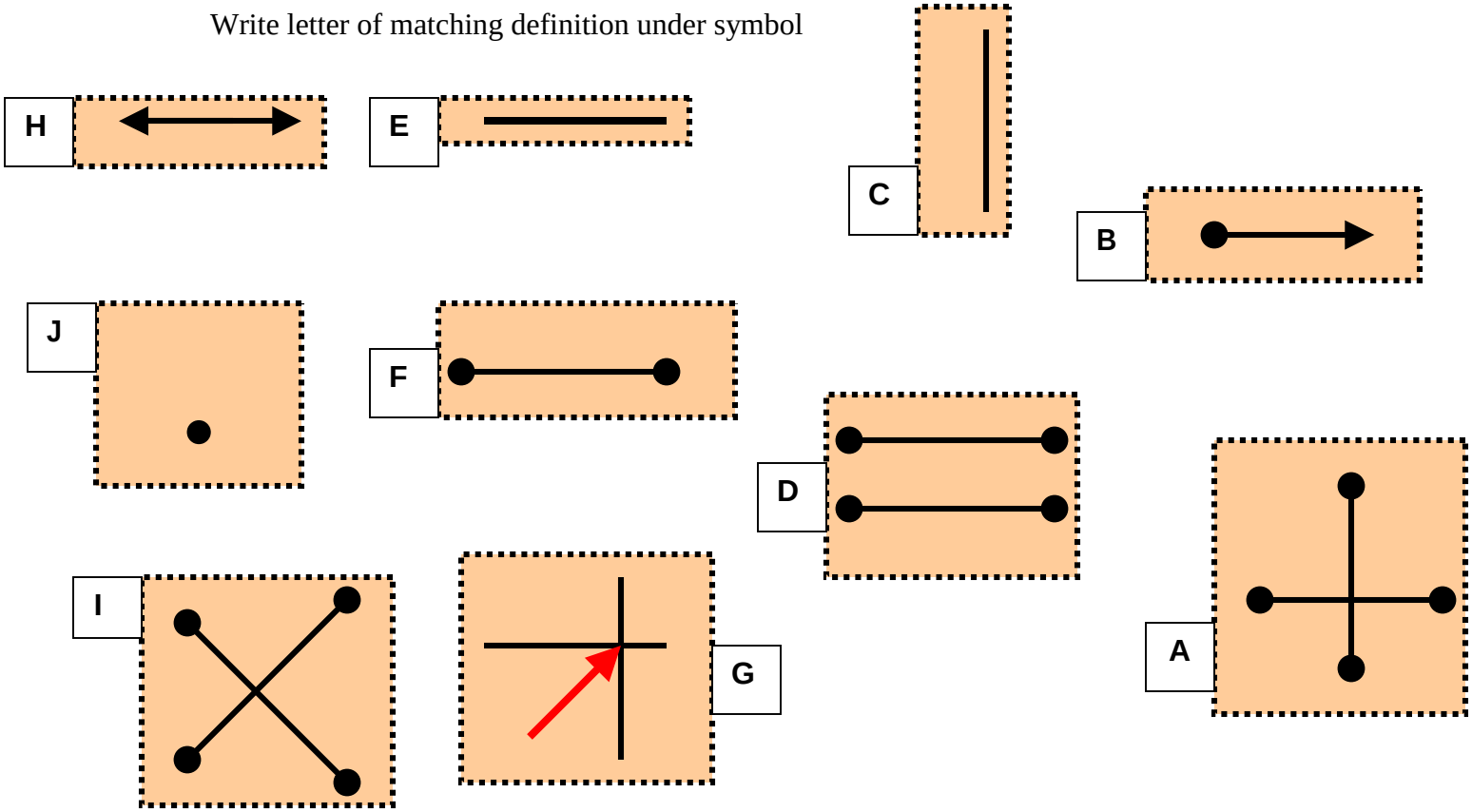
A straight-line figure that goes on forever in both directions **H**

Line segments that meet or cross each other **I**

This dot is like a period at the end of a sentence, helps to tell where a line segment or ray ends **J**

ANSWER KEY

Write letter of matching definition under symbol



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Student Resource: Mixed List of Symbols, and Definitions with Term Name

DIRECTIONS: Cut the following terms into strips and keep ready to attach to the pretzel models you build for the different symbols and figures

1. Point-symbol to define a point of beginning, ending, or crossing

2. Intersection-a place where 2 non-parallel lines cross

3. Line-a straight line that goes forever in both directions

4. Line segment- A line with a defined end points and a defined length

5. Vertical line- is a line that goes up and down

6. Ray-a line that starts at a defined end point and continues along the line forever

7. Right angle- two lines that intersect with a 90° angle

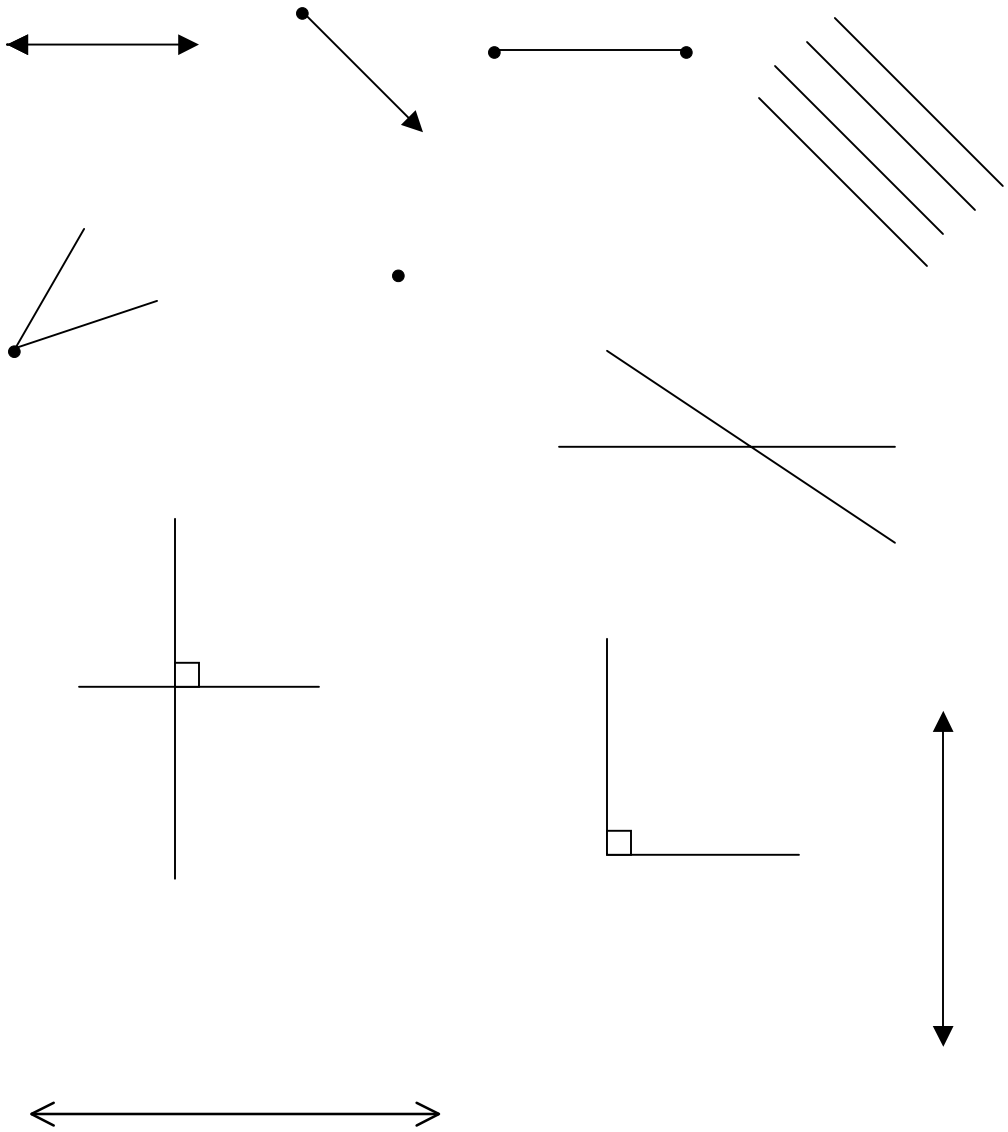
8. Horizontal line- a line that goes from left to right

9. Parallel lines- 2 or more lines that remain an equal distance apart from each other, never crossing

10. Angle-created when two line segments or rays intersect

***11. Perpendicular line*-line segments that form square corners when intersecting**

Use the following as guides to help you build the different symbols and figures. After you have constructed the symbol with the given materials, attach the corresponding definition and name. Show your instructor.



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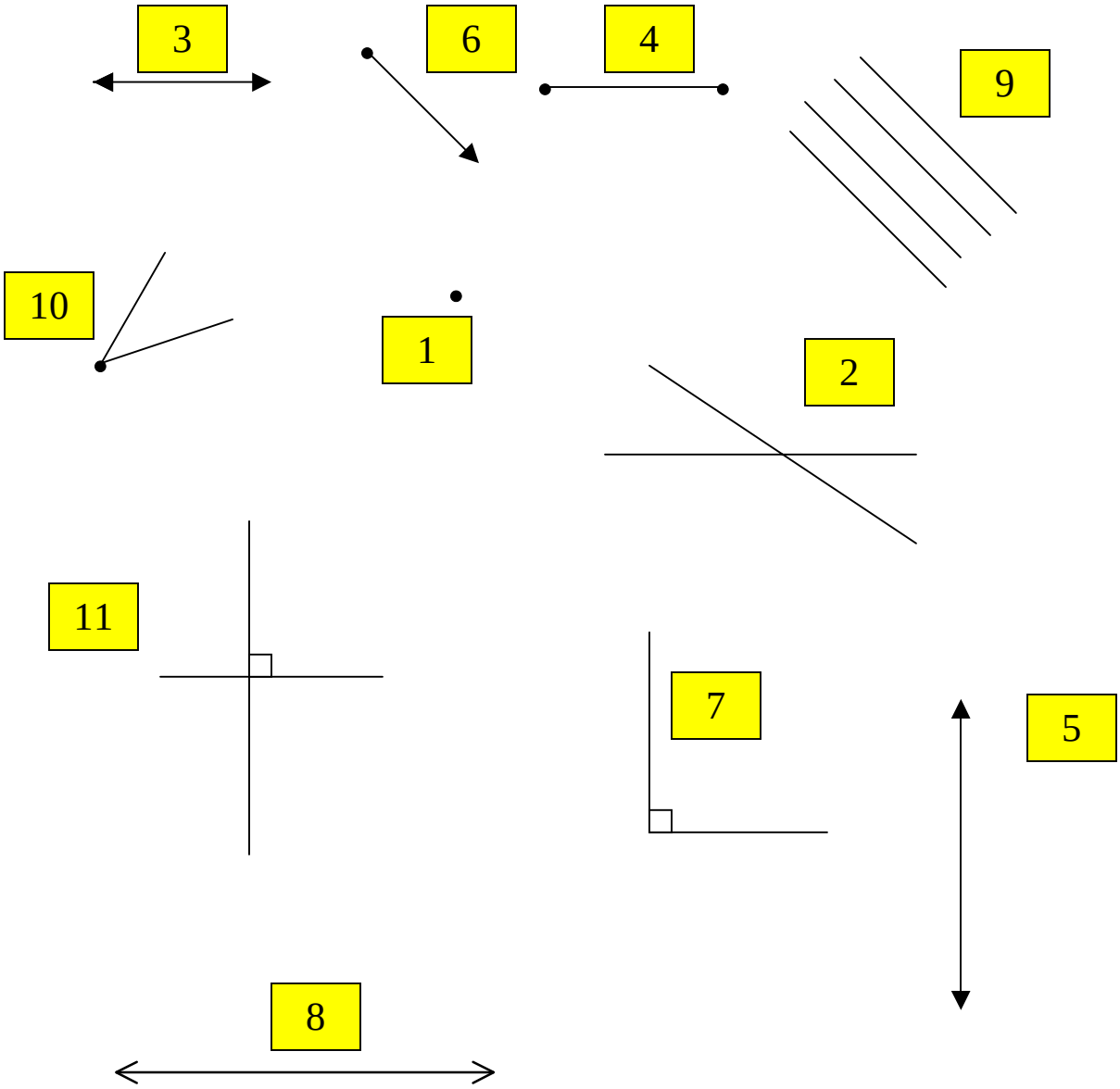
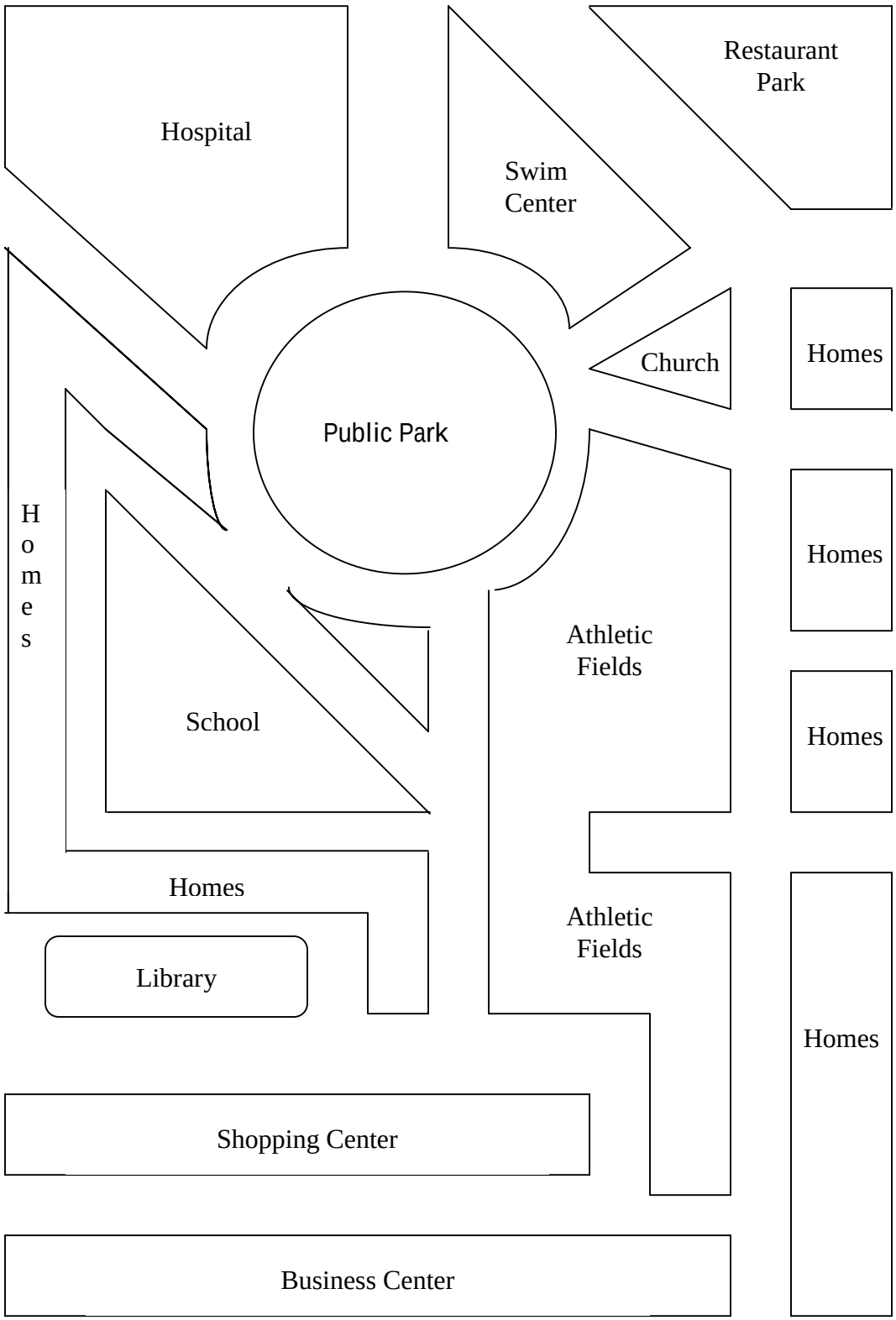
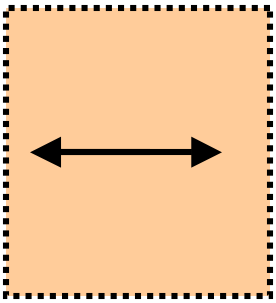
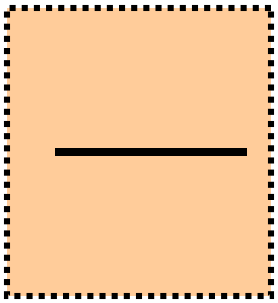
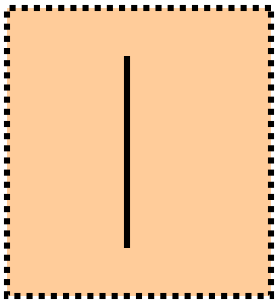


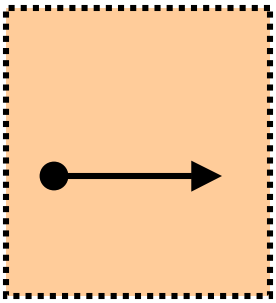
1. Color one pair of parallel streets purple.
2. Color one set of intersecting lines red.
3. Color 1 right triangle green.
4. Color one pair of perpendicular streets yellow.

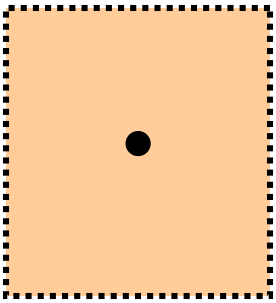


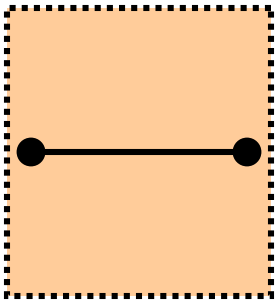


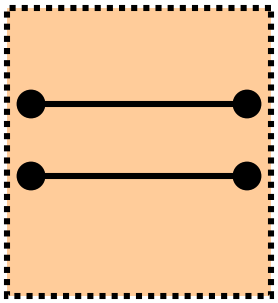


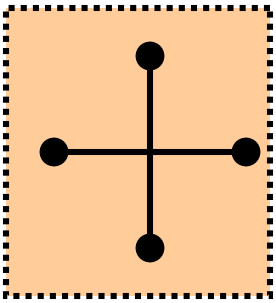


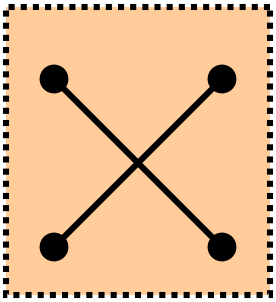


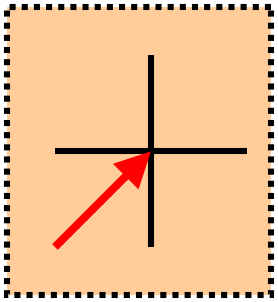












A place where two non-parallel lines cross

Line segments that meet or cross each other

Intersecting line segments that form square corners

Line segments that stay the same distance apart from each other

A straight figure with two end points

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A ray is another straight figure; it has one endpoint and goes on forever in just one direction

A straight line that goes straight up and down

A straight line that goes straight across from left to right

A straight-line figure that goes on forever in both directions

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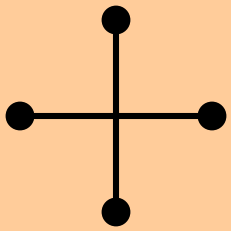

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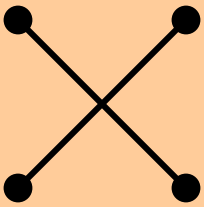
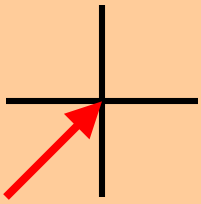


10



10 A place where two non-parallel lines cross

9 Line segments that meet or cross each other

8 Intersecting line segments that form square corners

7 Line segments that stay the same distance apart from each other

6 A straight figure with two end points

5 This dot is like a period at the end of a sentence, helps to tell where a line segment or ray ends

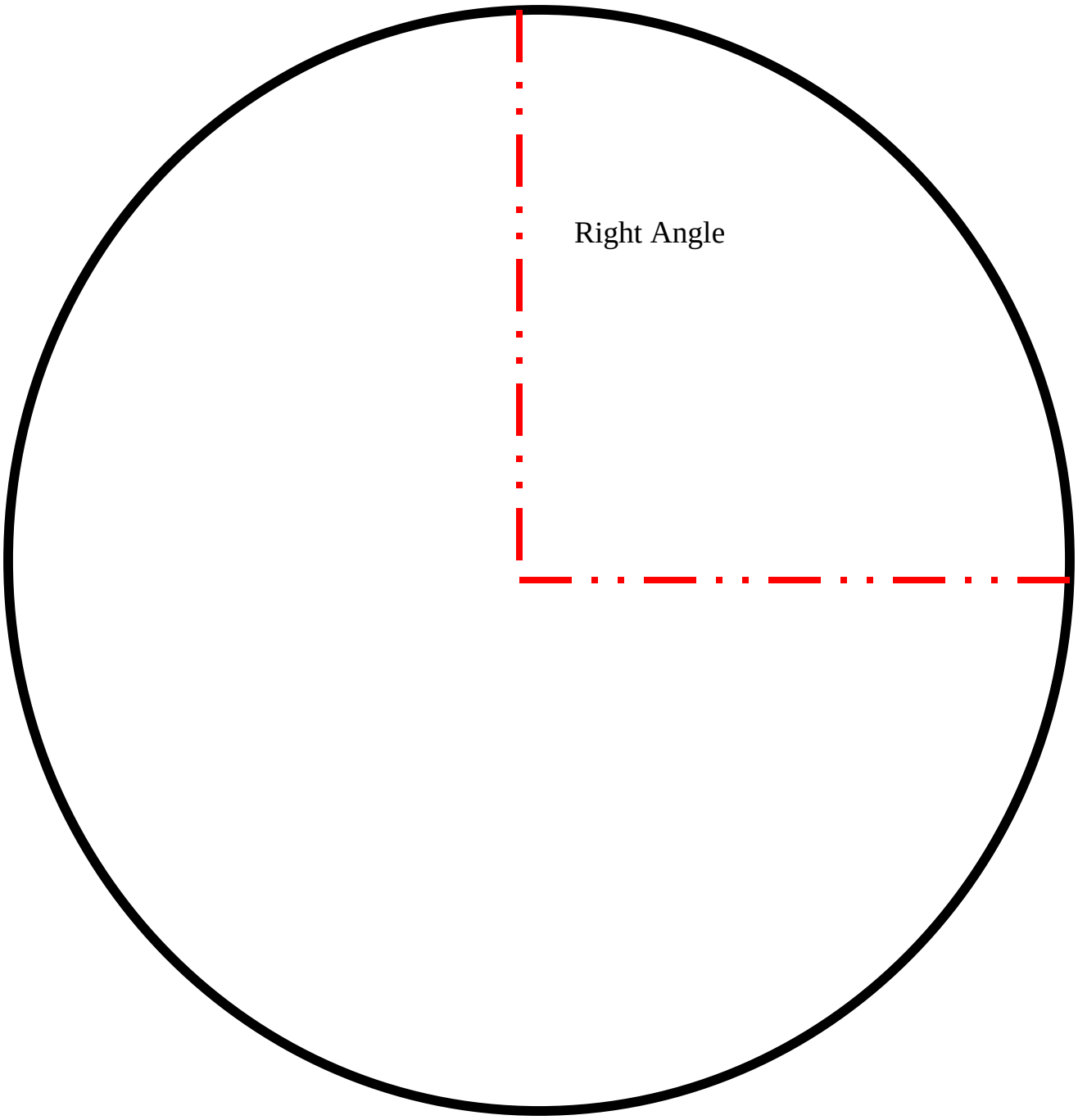
4 A ray is another straight figure; it has one endpoint and goes on forever in just one direction

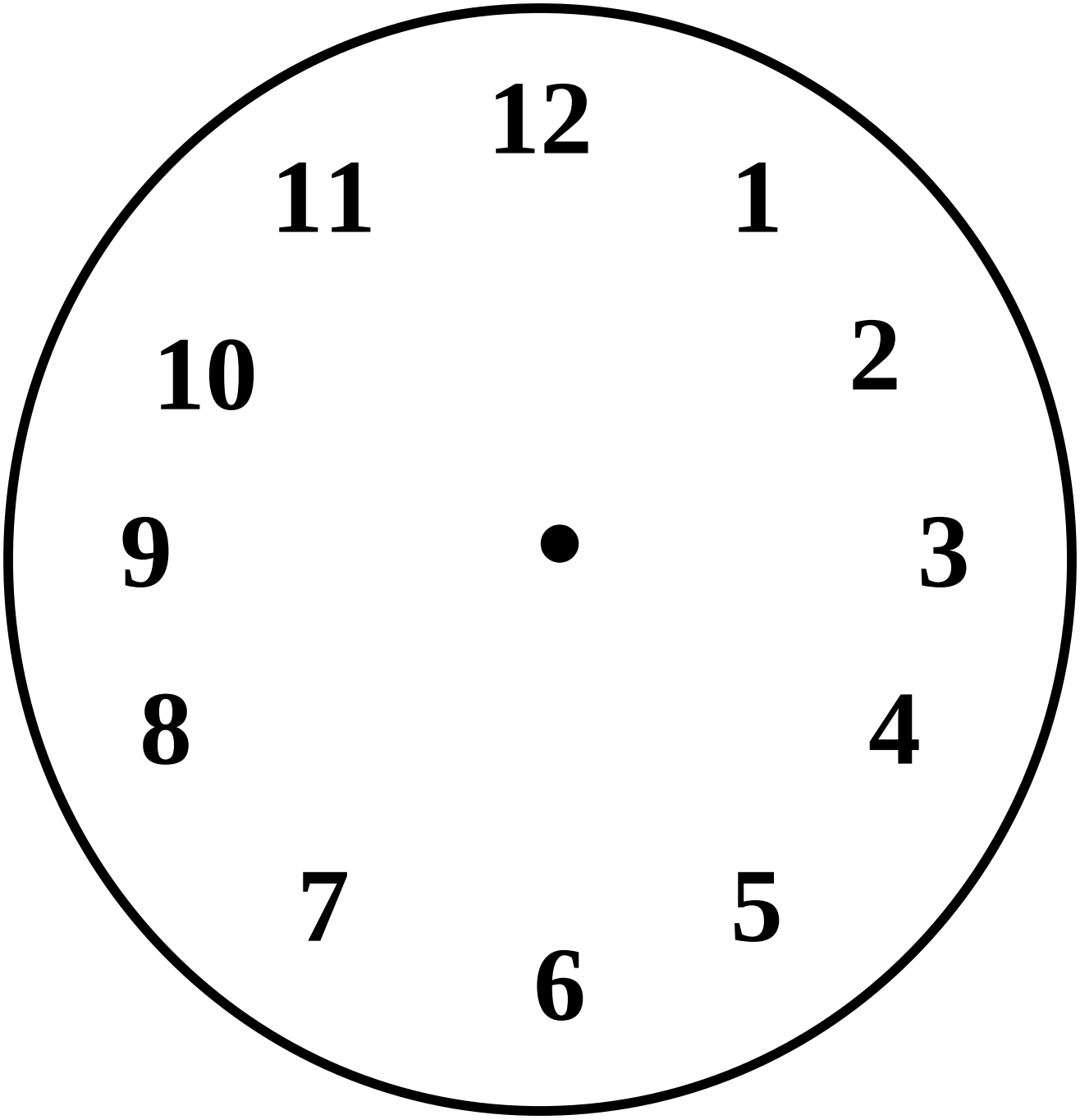
3 A straight line that goes straight up and down

2 A straight line that goes straight across from left to right

1 A straight-line figure that goes on forever in both directions

Name _____ Date _____


Right Angle


12
1
2
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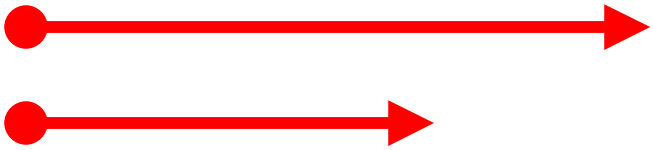
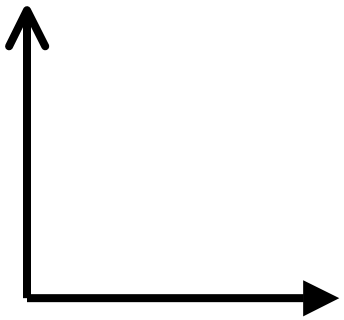
10
11



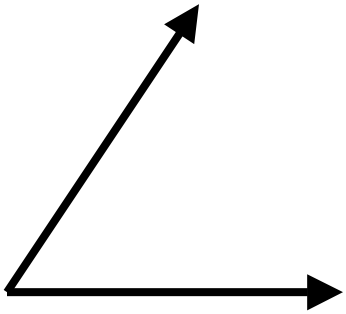
NAME_____ DATE_____

Angles

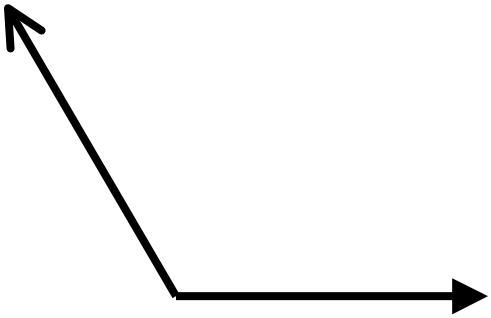
Two rays that meet at a single point, which is called a vertex, form an angle. The rays are called the sides of the angle.



Right Angle formed by perpendicular lines and forms a square

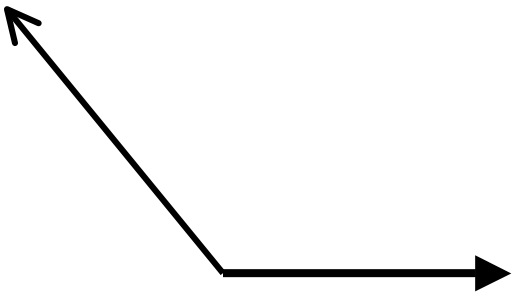


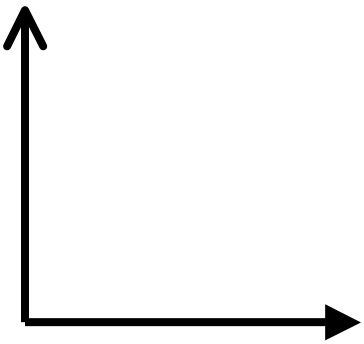
Acute Angle is smaller than a right angle

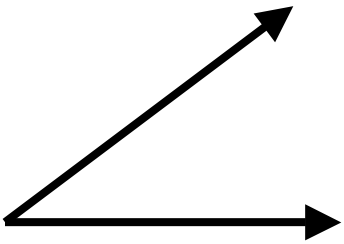


Obtuse Angle is larger than a right angle

Directions: Name the type of angle.







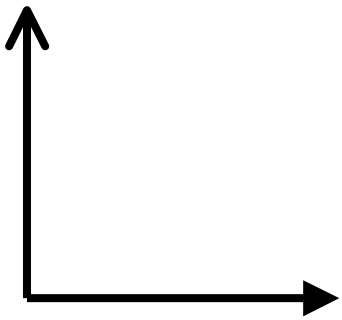
_____ _____ _____

ANSWER KEY

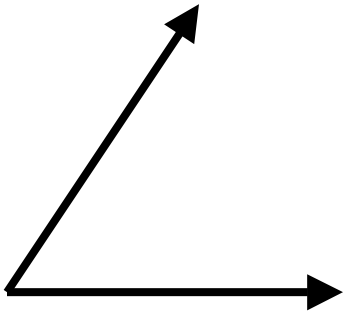
NAME_____ DATE_____

Angles

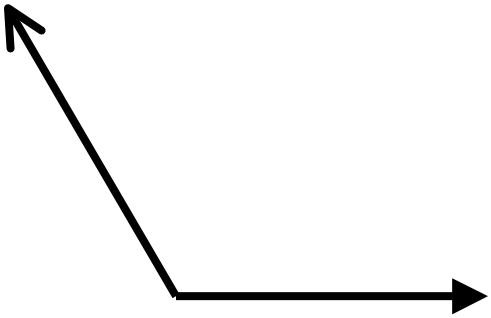
Two rays that meet at a single point, which is called a vertex, form an angle. The rays are called the sides of the angle.



Right Angle formed by perpendicular lines and forms a square

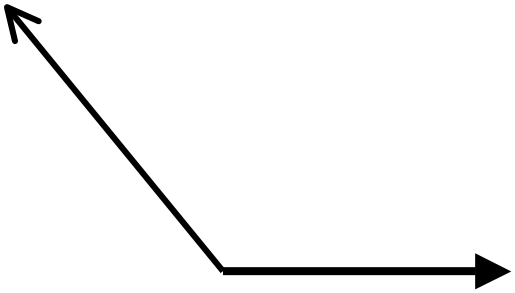


Acute Angle is smaller than a right angle

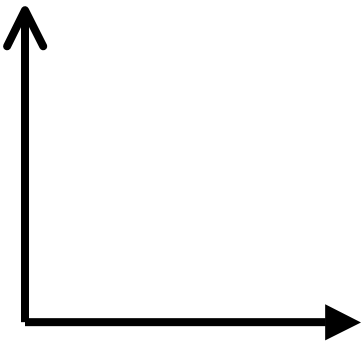


Obtuse Angle is larger than a right angle

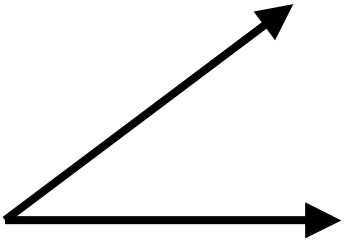
Directions: Name the type of angle.



Obtuse Angle



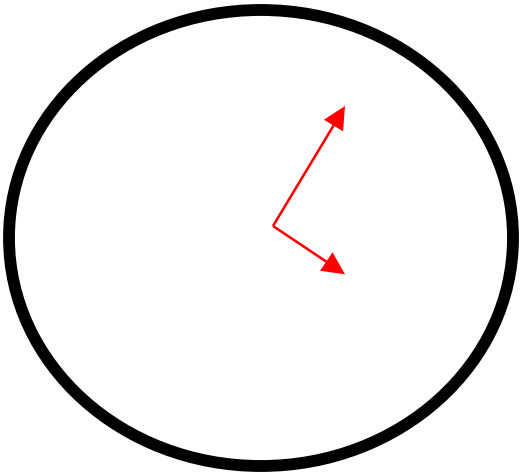
Right Angle



Acute Angle

NAME_____ DATE_____

DIRECTIONS: Determine and record the time, measure degrees of angle by using protractor, and write the name of the angle.

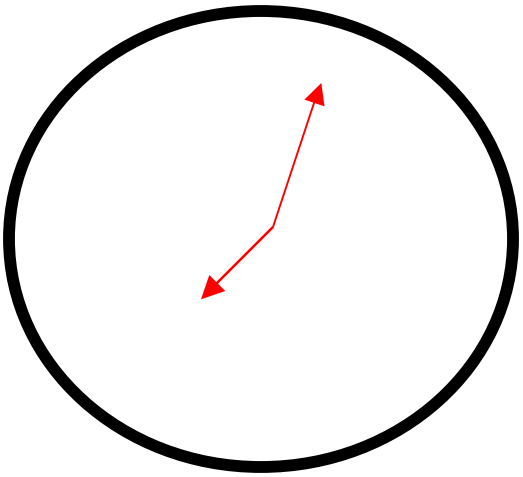


Time _____

Degrees _____

Name of Angle

_____

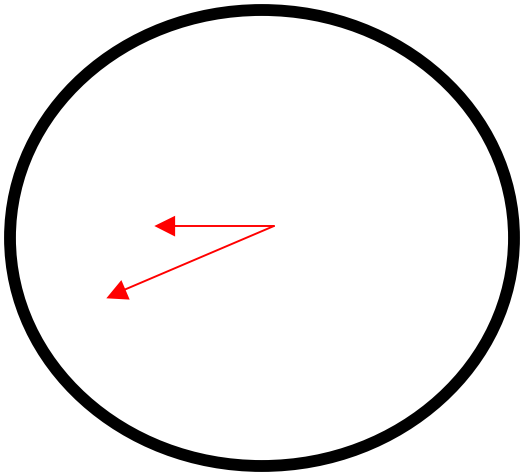


Time _____

Degrees _____

Name of Angle

_____

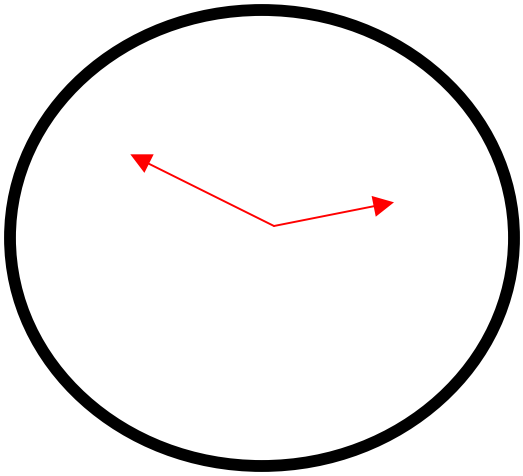


Time _____

Degrees _____

Name of Angle

_____



Time _____

Degrees _____

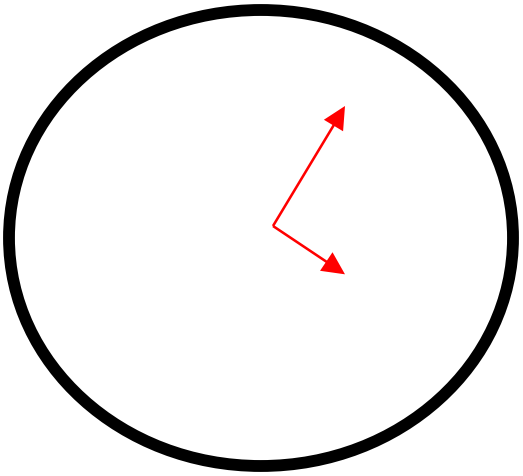
Name of Angle

_____

NAME_____ DATE_____

DIRECTIONS: Determine and record the time, measure degrees of angle by using protractor, and write the name of the angle.

ANSWER KEY

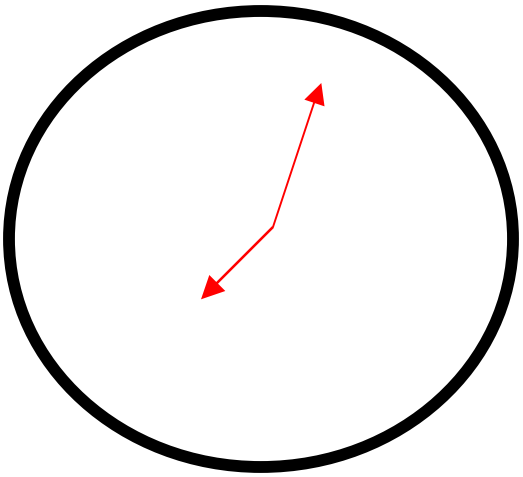


Time **4:05**

Degrees **90°**

Name of Angle

Right Angle

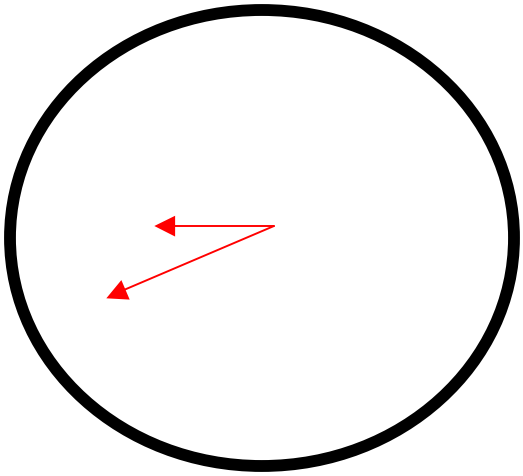


Time **7:03**

Degrees **178°**

Name of Angle

Obtuse Angle

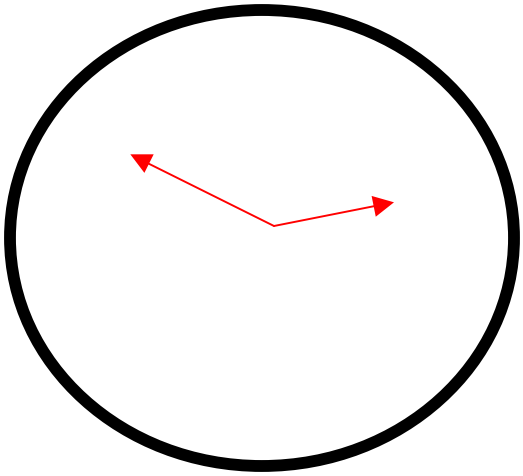


Time **8:40**

Degrees **30°**

Name of Angle

Acute Angle



Time **2:50**

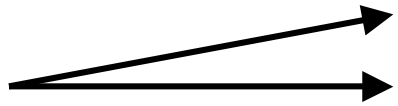
Degrees **135°**

Name of Angle

Obtuse Angle

NAME_____ **DATE**_____

1.

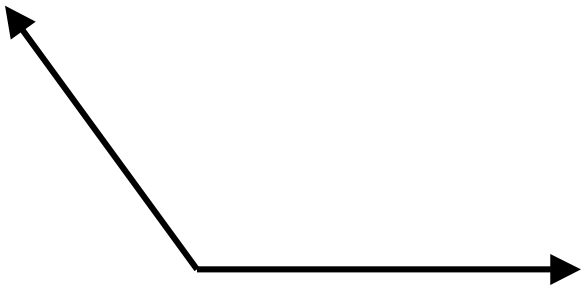


Degrees _____

Name of Angle

_____

2.

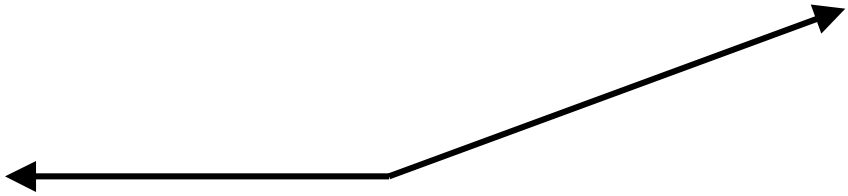


Degrees _____

Name of Angle

_____

3.

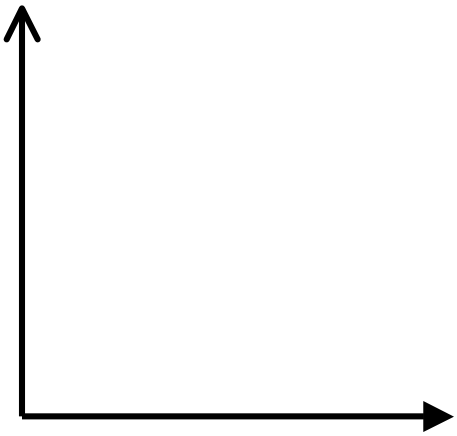


Degrees _____

Name of Angle

_____

4.



Degrees _____

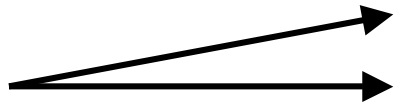
Name of Angle

_____

ANSWER KEY

NAME_____ **DATE**_____

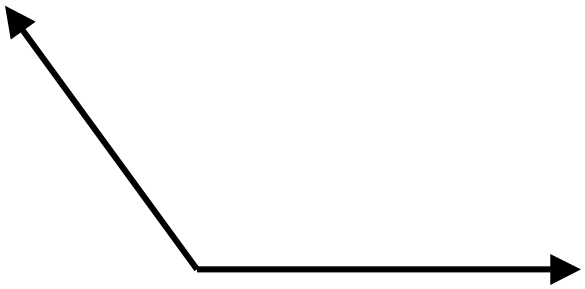
1.



Degrees 13°

Name of Angle Acute Angle

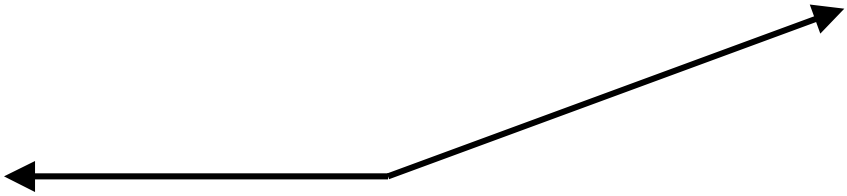
2.



Degrees 125°

Name of Angle Obtuse Angle

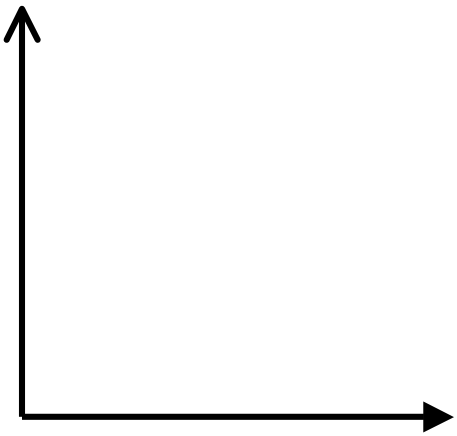
3.



Degrees 160°

Name of Angle Obtuse Angle

4.



Degrees 90°

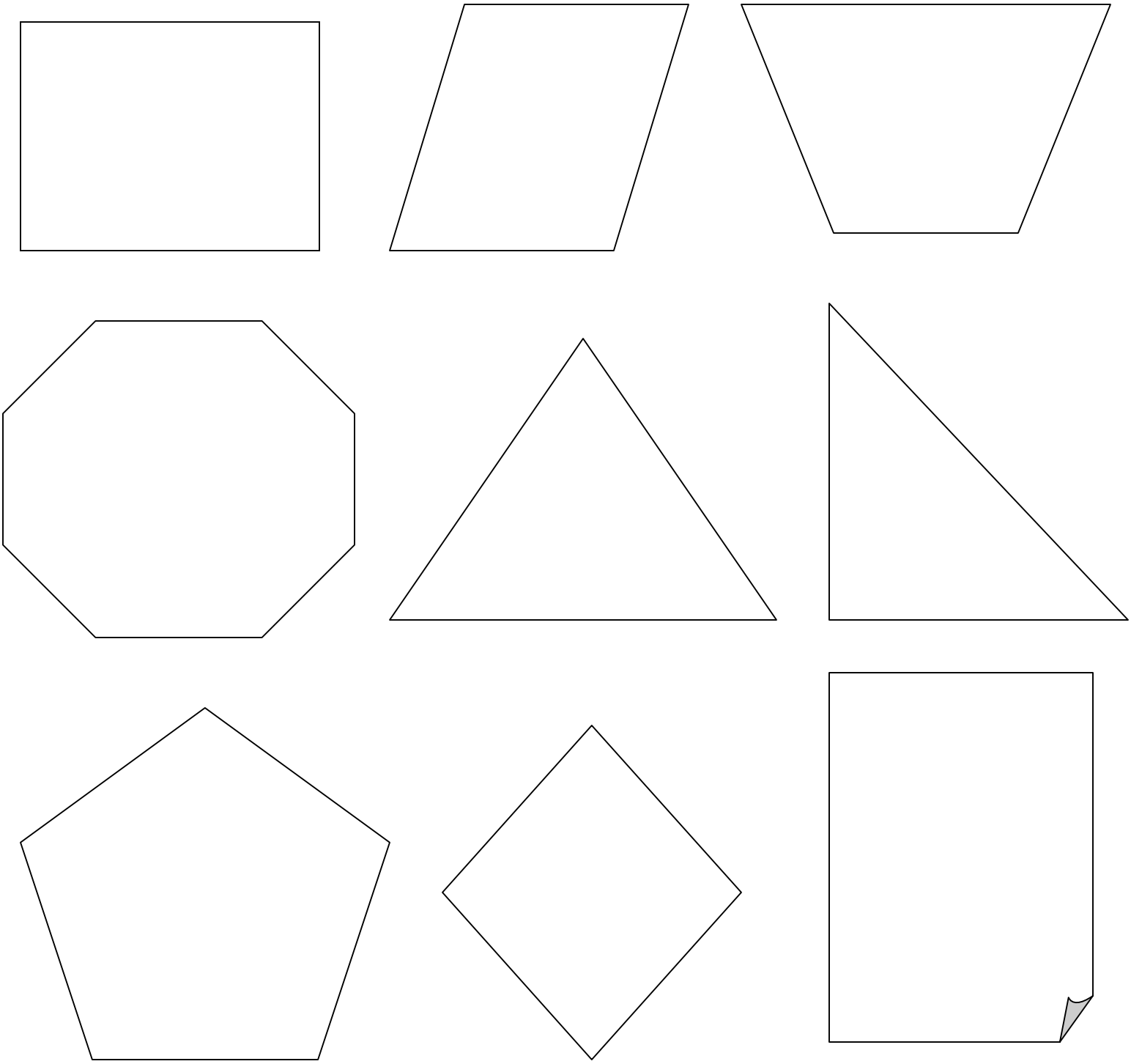
Name of Angle Right Angle

Right Angle

Acute Angle

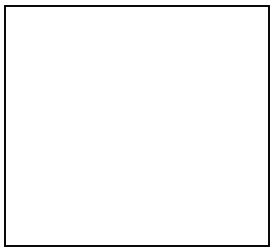
Obtuse Angle

Shapes



NAME_____ DATE_____

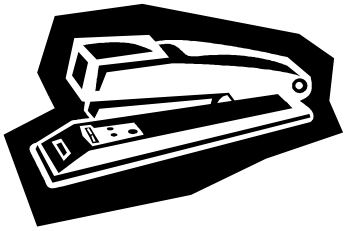
<u>Directions</u>: Find an angle on each of these pictures and shapes. Trace the angle on the pictures and shapes you have decided to measure. Record the degree of the angles and the angle's name.

1. 

Degrees _____

Name of Angle

_____

2. 

Degrees _____

Name of Angle

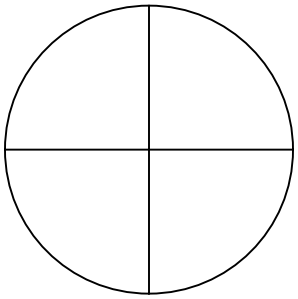
_____

3.

Degrees _____

Name of Angle

_____

4. 

Degrees _____

Name of Angle

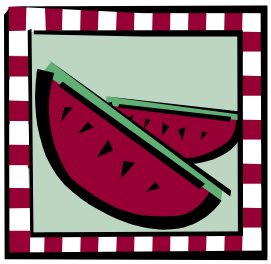
_____

5.

Degrees _____

Name of Angle

_____

6. 

Degrees _____

Name of Angle

_____

NAME_____ DATE_____

Summative Assessment

1. A straight line that goes on forever in only one direction is called a/an_____.

   Ⓐ ray Ⓒangle
   Ⓑcurved line Ⓓline segment

2. Line segments that stay the same distance a part are called_____.

   Ⓐ rays Ⓒ parallel
   Ⓑ intersection Ⓓ angle

3. Where 2 lines cross is called_____.

   Ⓐan intersection Ⓒan angle
   Ⓑa vertical Ⓓa parallel

4. A line that has 2 set end points is called_____

   Ⓐ ray Ⓒvertical
   Ⓑ line segment Ⓓ horizontal

5. An angle that has a square corner is called_____.

   Ⓐ an acute angle Ⓒ an obtuse angle
   Ⓑ a right angle Ⓓ a parallel angle

6.The name of a tool used to measure angles is called_____

   Ⓐa ruler Ⓒa protractor
   Ⓑ a geoboard Ⓓa meter stick

7.One property of an angle is_____.

Ⓐ must have vertical sides
Ⓑ rays meet at a point called parallel
Ⓒ 2 rays meet at a vertex
Ⓓ the sides are parallel

8. Lines, line segments and rays are_____.

Ⓐ straight
Ⓑ straight or curved
Ⓒ bent or straight
Ⓓ straight and curve

Brief-Constructed Response (BCR)

You and three friends go to Angelo's Pizza Station. You buy one pizza to share equally. Each person gets one slice. What will be the angle on your slice?

Will the angles on each slice be the same?

What is the sum of all angles?

Use what you know about angles to explain why your answers are correct. Use words and numbers to explain your thinking.

NAME_____ DATE_____

Summative Assessment

1. A straight line that goes on forever in only one direction is called a/an__A __.

   Ⓐ ray Ⓒangle

   Ⓑcurved line Ⓓline segment

2. Line segments that stay the same distance a part are called___C_____.

   Ⓐ rays Ⓒ parallel

   Ⓑ intersection Ⓓ angle

3. Where 2 lines cross is called_____A_____.

   Ⓐan intersection Ⓒan angle

   Ⓑa vertical Ⓓa parallel

4. A line that has 2 set end points is called____B____

   Ⓐ ray Ⓒvertical

   Ⓑ line segment Ⓓ horizontal

5. An angle that has a square corner is called_____B_____.

   Ⓐ an acute angle Ⓒ an obtuse angle

   Ⓑ a right angle Ⓓ a parallel angle

6.The name of a tool used to measure angles is called____C___

   Ⓐa ruler Ⓒa protractor

   Ⓑ a geoboard Ⓓa meter stick

7.One property of an angle is_____C_____.

Ⓐ must have vertical sides
Ⓑ rays meet at a point called parallel
Ⓒ 2 rays meet at a vertex
Ⓓ the sides are parallel

8. Lines, line segments and rays are_____A_____.

Ⓐ straight
Ⓑ straight or curved
Ⓒ bent or straight
Ⓓ straight and curve

Brief-Constructed Response (BCR)

You and 3 friends go to Angelo's Pizza Station. You buy one pizza to share equally. Each person gets one slice. What will be the angle on your slice?

90 degrees

Will the angles on each slice be the same? Yes

What is the sum of all angles? 360 degrees

Use what you know about angles to explain why your answers are correct. Use words and numbers to explain you thinking.

90 degrees in a right angle X four equals 360 degrees