

Kim Long
Geometer's Sketchpad Unit
Grade 8 Lesson plans

These lessons are to be used after the students have gained familiarity with how Geometer's Sketchpad works.

Lesson 1-Use of geometric symbols and definitions related to triangles

Lesson 2-Classification and drawing of different kinds of angles

Lesson 3-Using the Pythagorean theorem to solve right triangles

Lesson 4-Identification of opposite, adjacent, complimentary and supplementary angles, and bisection of angles

Lesson 5-Finding the area of triangles, trapezoids and circles

Lesson 1

Use of geometric symbols and definitions related to triangles

Introduction:

In order to make sure students use correct language, review the following vocabulary that relates to geometric figures: points, segments, intersections, congruence, acute, obtuse, endpoints, angles parallel and perpendicular.

WV IGO's:

- 8.39-construct segments, angles, perpendicular bisectors and angle bisectors
- 8.42-identify parallel and perpendicular lines
- 8.46-use appropriate software to practice and master eighth grade instructional objectives in mathematics

Materials:

- Geometer's sketchpad on computer
- Computer diskette

Procedures:

- 1-Students, using Geometer's sketchpad, are asked to create a sketch giving an example of each of the following: a point, a segment, an intersection of two lines, congruence, an acute angle, an obtuse angle, endpoints, parallel angles and perpendicular lines. Students should save each sketch separately on their diskette.
- 2-Students, working in pairs, should have one student create one of the objects on one computer and the other student duplicate the object on another computer. Students should use correct vocabulary while creating a copy. The student creating the copy should not see the object they are to copy. They should only be told the name of the object and the size it should be. Students are expected to use measuring tools so that a congruent shape can be produced.
- 3-Students should repeat step 2 until all of the objects have been successfully duplicated. The duplicates do not need to be saved on the diskette.

Conclusion:

Students are to discuss their attempts to recreate the objects using the correct vocabulary. Students are asked which terms they used more frequently and why. For students who did not create exact duplicates, have them explain why.

Lesson 2

Classification and drawing of different kinds of angles

Introduction:

Review the classification of different kinds of angles using the following terms: ray, line, line segment, angle, straight angle, obtuse angle, acute angle, and the use of the protractor. Students are asked if they prefer to draw angles with a protractor or Geometer's sketchpad.

WV IGO's:

8.39-construct segments, angles, perpendicular bisectors and angle bisectors
8.46-use appropriate software to practice and master eighth grade instructional objectives in mathematics

Materials:

Geometer's sketchpad on computer
Diskette

Procedures:

- 1-Student, using Geometer's sketchpad, should create one of the following: ray, line, line segment, angle, straight angle, obtuse angle, or acute angle. Rays, lines, segments and angles should be labeled.
- 2-Using a text box, the student should label the object that they just created, list any measurements and write the definition of the object. Save this to diskette.
- 3-Repeat steps 1 and 2 until all of the objects have been created.

Conclusion:

Students should save each object with descriptions on their diskette to hand in.

Lesson 3

Using the Pythagorean theorem to solve right triangles

Introduction:

Students are shown a triangle and the names for the sides are discussed. The name for the longest side is the hypotenuse. Students are shown the relationship between the length of the hypotenuse and the length of the other two sides. Students are told that there is a formula that shows this relationship and that it is called the Pythagorean theorem.

WV IGO's:

8.36-solve right triangle problems using the Pythagorean theorem, indirect measurement, and definitions

8.46-use appropriate software to practice and master eighth grade instructional objectives in mathematics.

Materials:

Geometer's sketchpad

Diskette

Procedures:

1-Students, using Geometer's sketchpad, should draw a right triangle and form a square off of each side.

2-The teacher should have an example to show students. There are a couple of different ways to draw this object and any method is okay. The students could either draw a triangle first then add squares off each side or they could draw three squares and bring them together to form a right triangle.

3-Students are asked to take measurements of each of the squares of their triangle.

4-Students are asked to compare the areas of the squares they drew. Students will be able to see the relationship between the area of the square on the hypotenuse and the squares on the other two sides of the triangle.

Conclusions:

-Students will be shown an example that has been labeled with the areas of the squares. Students will be shown the formula $a^2 + b^2 = c^2$. The teacher will plug in areas of the example triangle into the formula to demonstrate how the formula works.

-Students and teacher will work through the following problem:

A carpenter needs to build a brace for a wall. He wants the brace to reach the top of the wall and he wants it to be 1 meter out from the base of the wall. How long must his brace be if the wall is 2 meters high? (square root of 5)

-Students should save the right triangle they created with its measurements on their diskette to hand in

Lesson 4

Identification of opposite, adjacent, complimentary and supplementary angles, and bisection of angles

Introduction:

Students are asked to review definitions of the following angles: acute, obtuse, right and straight. Students are shown an example of the intersection of two lines and are asked how many angles are formed (4)? They are then shown three lines intersecting at one point and are asked how many angles are formed (6)? Discuss congruency and demonstrate with examples.

WV IGO's:

8.39-construct segments, angles, perpendicular bisectors, and angle bisectors

8.46-use appropriate software to practice and master eighth grade instructional objectives in mathematics

Materials:

Geometer's sketchpad on computer

Diskette

Procedures:

1-Students are shown a sketch with two intersecting lines. The angles are then measured to show congruence.

2-The teacher discusses the following:

--when two lines intersect, two pairs of opposite angles are formed

--two angles that share a common side and vertex but do not overlap are called adjacent angles

--when the sum of the sizes of two angles is 90 degrees, the angles are complementary

--when the sum of the sizes of two angles is 180 degrees, the angles are supplementary

3-Students are asked to create a sketch that describes each of the following: opposite angles, adjacent angles, complementary angles, supplementary angles, and an angle being bisected. Use a text box to explain each sketch. Save each sketch on their diskette.

4-The teacher then demonstrates how to bisect an angle. Students are asked what is the result of a bisected angle (two adjacent, congruent angles). The students are then asked to create a sketch showing the bisection of an angle. They are to use a text box to explain what they did and save this sketch to their diskette.

Conclusion:

Students are asked the meaning of complementary, supplementary, opposite, and adjacent angles. Students are then asked to explain what happens when any angle is bisected. Students are to save their sketches on their diskette to hand in.

Lesson 5

Finding the areas of triangles, trapezoids, and circles

Introduction:

Students are asked to recall the shape of a triangle, circle, and trapezoid. They are asked to recall the process for measuring the area of a rectangle using Geometer's sketchpad (base times height and filling the rectangle then measuring the area). Students are informed that there are two ways in which to calculate the areas of a triangle, circle and trapezoid. Students will need to create these objects and find the areas using both methods.

WV IGO's

8.31-calculate area and circumference of circles using radius and diameter

8.34-find angle measures; estimate and solve application problems involving perimeter, area, surface area, and volume of plane and solid geometric figures

8.37-discover and verify the value of pi using measurement of physical models

8.46 use appropriate software to practice and master eighth grade instructional objectives in mathematics

8.52-use a calculator to find area and circumference of a circle

Procedures:

1-The teacher, using Geometer's sketchpad, will create a circle. The circle is measured and students are shown the calculation for area by using the formula $\pi \cdot r^2$.

2-Students are then to create their own circle and to measure the area two different ways, by calculation and by fill. Students are to save this object with its measurements to their diskette.

3-Students are then asked to compare the results and to note that the two calculated areas remain equal in value even if the circle is altered.

4-Students are reminded of the formula for calculating the area of a triangle is $\frac{1}{2}$ base times height.

5-Students are asked to create a triangle and to measure the area two different ways, by calculation and fill. Students are to save this object with its measurements to their diskette.

6-Students are reminded of the formula for calculating the area of a trapezoid is $\frac{1}{2}(\text{base 1} + \text{base 2}) \times \text{height}$.

7-Students are asked to create a trapezoid and to measure the area two different ways, by calculation and fill. Students are to save this object with its measurements to their diskette.

Conclusion:

Students should be reminded that there are instances in real life where they will need to calculate the area of a figure and will not have Geometer's sketchpad handy. Since these concepts are confirmed both in calculation and using the tools of Geometer's sketchpad, students can see that there are multiple ways of arriving at the same result.

Sample unit test:

1. Create a triangle with the angles 100, 30 and 50 degrees.
2. Create a triangle with two congruent angles and two congruent sides
3. Create two parallel lines that are intersected by another line.
Measure and label all opposite angles, adjacent angles, complementary and supplementary angles.
4. Create an angle and bisect it. What is the result of any bisected angle?
5. Create a triangle and measure its area by two methods.
6. Create a trapezoid and measure its area by two methods.
7. Create a circle and measure its area by two methods.