

Designing A Fort

Summary

In this project, students will further explore their knowledge of right triangles, concentrating on the 30-60-90 special right triangle. In cooperative learning groups, students will design and create a scaled down model of a life sized tourist attraction similar to Fort Jefferson in the Florida Keys. Students will expand and solidify their knowledge of right triangles in creating and constructing this real life model.

Main Core Tie

Mathematics Grade 8

[Strand: GEOMETRY \(8.G\) Standard 8.G.7](#)

Time Frame

2 class periods of 90 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning, Communication

Materials

Students should meet in their groups and sketch a blueprint of their structure before they actually start their constructions.

Finished projects should be able to fit easily on a student desktop.

Materials which will be needed are:

- posterboard

- colored pencils or markers

- tape

- centimeter rulers

- scissors

- any other items which the group would like to use to decorate their attraction.

I found that it is important to make the list of materials short, and inexpensive. If each student is required to bring one piece of posterboard, this whole project can be constructed using the above list of supplies. I would suggest that you not allow students to use clay, paints, living materials, or food items. These can add to the expense of the project, and make the project too heavy to be portable.

Background for Teachers

Teachers will want to use this lesson after their students are familiar with the qualities of right triangles. Students should know how to use, and measure triangle sides using the Pythagorean Theorem. Students will also need to know properties of the 30-60-90 right triangle.

In this lesson, teachers will be putting students in cooperative learning groups. This is not recommended to be the first activity of this type. Teachers may want to use cooperative learning activities in their classroom before using this activity.

Student Prior Knowledge

Students will need to know how to use the Pythagorean Theorem, find perimeter and be familiar with

the regular hexagon and how to find the interior angles of this shape. Students will also need to have practiced problems using the 30-60-90 special right triangle.

Intended Learning Outcomes

Students will explore the properties of right triangles, and expand and solidify their knowledge in creating and constructing a real life model.

In small learning groups, students will conceive a structure, create a small scale model of their attraction, assess themselves and other groups, and present their models and findings to the class.

Instructional Procedures

After learning and practicing special right triangle problems involving the 30-60-90 triangle, students are ready to use their knowledge in this hands on activity. Students will be clustered in cooperative learning groups of 2-3 students in each group.

The following steps should be used to develop the assignment concept:

Have students look up Fort Jefferson on the Internet under the address: <http://www.nps.gov/drto>

Students will find an aerial photo and background information on this popular Florida tourist attraction. Have students browse this website, and require them to read the section "History and Culture". There is also a great history section if students look at the on-line brochure provided.

Students will now get into their groups and brainstorm a tourist attraction which they would like to create. This structure must be in a regular hexagonal shape and have a common theme (i.e., a historical museum, a living aquarium, a park, or other structure for the public to visit). Groups must sketch a blueprint of their structure, including a scale, and measurements calculated using 30-60-90 trigonometry principles. I have included a sample blueprint in the attachment below.

The measurements have been omitted so teachers may let slower students use this worksheet as their blueprint.

Students will design a small scale model of their attraction. Students must construct a model of what the structure will look like on the outside, providing measurements that are accurate to their scale, and found in real world structures.

Students must have a center point in the middle of the structure, and 6 hallways, or walkways to each side of the hexagon. These walkways must be perpendicular bisectors to the opposite side of the hexagon. The length of the walkways and the sides of the hexagon must be calculated using their knowledge of right triangles, and the 30-60-90 right triangle.

Students will submit measurements for each side of the hexagons, and each walkway in their structure. Their calculations are also a required submission. The group must decide on a "real life" scale for their structure, and submit their final measurements in scale and real life measurements.

The students will write up a short paper (1 page approximately) explaining their attraction and its use in the tourist industry. In this paper, students should include: the scale and measurements of the entire structure and its walkways, and the purpose and size of the center point in the hexagon. Additional credit will be given for a 3-dimensional structure in the center of the hexagon which is also constructed using right triangles. Perimeter, angle and side measurements are required for full credit.

If there is time, have students share their completed structure with the class, or with another group. Allow the other students the opportunity to assess each other's forts, and check the calculations for accuracy.

Strategies for Diverse Learners

This lesson can be easily adapted to any level of student. A student who may be struggling can be helped by other members of their cooperative learning group. An ELL student can be included by

using aspects of their culture to create an attraction which has significance to their particular culture. Gifted students can be more challenged by adding additional right triangle structures, and finding their perimeters, side lengths and angle measurements.

Extensions

By use of a summary paper, students will use their writing skills from their English curriculum. While presenting their findings, students can also practice their public speaking skills.

Assessment Plan

Attached is a sample Assessment Rubric. You may use this method of assessment, or choose one of your own.

Bibliography

<http://www.nps.gov/drto>

Authors

[Kayloa Anderson](#)