Geometry Project

For this project, you will turn in four parts:

1. a closed three dimensional paper figure that you’ve cut, folded, and fixed together
2. your research essay
3. a copy of the net with your measurements (angles and lengths) labeled on it
4. the completed measurements & calculations worksheet

See the attached rubric for grading criteria.

You’ll need the following materials for your project:

* Cardstock (thick, sturdy paper)
* Scissors
* Glue stick (or double sided tape)
* Ruler or measuring tape
* Protractor
* Online computer and printer

**STEP 1:** Read Sections 10.3-10.5 in the textbook.

**STEP 2:** Choose a pattern or “net” of the 3D space figure that you would like to fold from one of the following websites.

<http://www.korthalsaltes.com/index.html>

<http://etc.usf.edu/clipart/galleries/math/solid_form_patterns.php>

<http://www.senteacher.org/Worksheet/12/Nets.xhtml>

**STEP 3:** Print 2 identical copies of your pattern as large as you can on your home printer. One will be used for tracing; the other will be turned in with your project.

**STEP 4:** With a heavy hand, trace the pattern onto the back of the cardstock. Cut on the designated edges and fix the pattern together with your glue stick

**STEP 5:** Research your chosen 3D figure and write an essay using the following guidelines.

 Introduction: What is the name of your chosen three dimensional figure. What (if any) other names does it go by? Who discovered it and when? What is its history?

Body paragraph: Elaborate on physical characteristics: How many faces should it have? What shapes are the faces? Is every face the same shape? How many of each type of face are there? Are the faces “regular”? How many edges does it have? How many vertices does it have? Is it a polyhedron? Why or why not?

Conclusion: Where can you find your 3D figure in the real world? Why is it important? What makes it special?

**STEP 6:** MEASUREMENTS

Measure the edges and angles on the net of your 3D figure using American measurements (inches) and degrees. (I have protractors you may use, upon request.) Round your measurements to the nearest quarter of an inch. Label these measurements on the net that you submit with your project. \*Make sure that all measurements required for your formulas are labeled on your net!

**STEP 7:** CALCLULATIONS

Answer the following questions, including formulas, calculations, and units.

1. Find the **area** of one of the **faces** of your figure.
	1. What is the name of the shape of the face?
	2. Find the perimeter of the face. Show your calculations.
	3. Write the formula for the area of the face, and state which part of the face each variable represents.
	4. Use the formula above and your measurements to find its surface area. Show your calculations and include units in your answer.
2. If you have more than one type of face, repeat question #1 for each type.
3. Now, based on the area of each face, and number of times each face appears in your 3D figure, approximate the total surface area of your figure. Show your calculations below.
4. Find a formula for the **surface area** of your 3D figure.
	1. Write the formula, and state which part of your figure each variable represents. \*Make sure that all measurements required for your formulas are labeled on your net!
	2. Use the formula above and your measurements to find the surface area of your 3D figure. Show your calculations and include units in your answer.
	3. Your answers to #3 and #4b should be very close. What is the difference?
5. a. What was the area of the original cardstock you printed your net on? Show your formula and calculations.

b. Find the area of your leftover cardstock (after cutting out the net) using some of your answers from previous questions. Show your calculations.

1. Find a formula for the **volum**e of your 3D figure.
	1. Write the formula, and state which part of your figure each variable represents. \*Make sure that all measurements required for your formulas are labeled on your net!
	2. Use the formula above and your measurements to find the volume? Show your calculations and include units in your answer.

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| **Score** |   | **5** | **4** | **3** | **2** | **1** |
|   | **Difficulty of 3D figure** | More than 10 sides and 2 types of faces | 8-10 sides and 2 types of faces | 7-10 sides and 1 type of face | triangular or rectangular pyramid | rectangular prism |
|   | **Quality of 3D figure** | clean edges, hold its shape | mostly clean edges or flimsy | messy edges or flimsy | messy edges and flimsy | does not resemble a known figure |
|   | **Labeled Net** | Angles and length measurements labeled on net | Missing 1 label on net | Missing 2 labels on net | Missing many labels on net | net, no labels |
|   | **Use of American Measurements** | Used fractions of an inch correctly | Misused fractions of an inch | did not use American measurement |
|   | **Research Write-up (**names, discovered by who, when, real world, faces, edges, & vertices) | Includes answers to all prompted questions and more | Includes answers to all prompted questions | Missing 1-2 answers to prompted questions | Missing many answers to prompted questions | no research write-up |
|   | **Understanding of key terms** (regular, polyhedron, edge, face, vertex, angle) | Used key terms accurately | Made some mistakes with key terms | Did not use key terms correctly |
|   | **Included Formulas and variable descriptions in Calculations** | Includes formulas and clearly defines variables | Included some formulas and variable definitions | Did not include formulas or variable definitions |
|   | **Showed calculations** | Showed all work neatly and organized | Showed all work but messy | Showed most work | Showed some work | Did not include any work |
|   | **Included Units in answers to calculations** | Included appropriate units on all answers | Included units on some answers or incorrect units on some | did not include units on any answers |
|   | **Accuracy of Calculations** | No mistakes, formulas calculated correctly | 1-2 mistakes | some mistakes | many mistakes | all calculations were incorrect or missing |