Algebra/Geometry Institute Summer 2004

Lesson Plan Two

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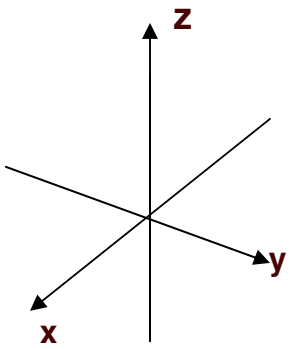
School: Indianola Gentry
City: Indianola, MS
Grade Level: 10th grade Geometry



1 Teaching objective(s)

MS Curriculum Framework Competencies 4 and 5:

4. Explore and demonstrate the connections between Algebra and Geometry.
5. Investigate, classify, compare, and contrast two and three-dimensional geometric figures.

Objectives:

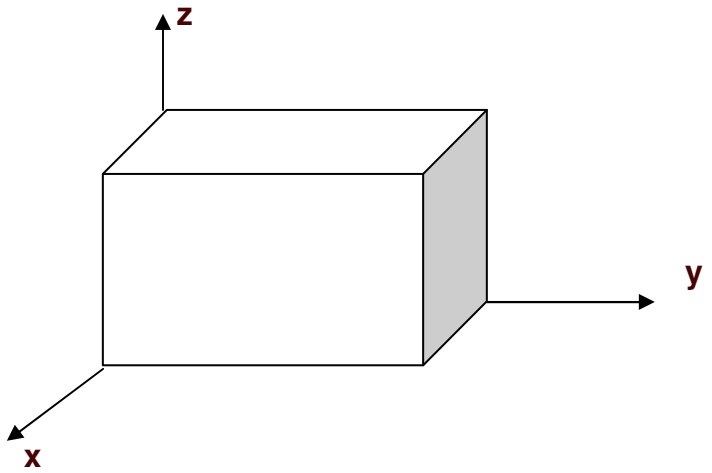
4c. Relate algebraic formulas to geometric properties to solve problems in the coordinate plane.
5d. Use protractors, compasses, rulers, and/or technology to construct geometric figures and drawings.
5g. Use measurement to design and build a three-dimensional object.

2 Instructional Activities

Class will begin with a discussion of two-dimensional and three-dimensional attributes. Each student will receive a handout involving three-dimensional geometry. Differences and similarities about two and three-dimensional figures will be discussed briefly as the questions on the handout are completed. Students will then complete a drawing of a square in a two-dimensional coordinate system. A brief overview (review) of the three-dimensional coordinate system will be discussed and the students will be asked to complete a drawing of a rectangular prism on the isometric graph paper provided. The steps for drawing a rectangular prism that has faces that lie on the XY, XZ, and YZ planes will be given as follows:

1. Plot the origin.
2. Given an ordered triple such as (4,5,3), plot the given point.
3. Plot the projection into the XY plane by setting the z-coordinate to 0. (4,5,0)
4. Plot the projection into the XZ plane by setting the y-coordinate to 0. (4,0,3)
5. Plot the projection into the YZ plane by setting the x-coordinate to 0. (0,5,3)
6. Plot the points that lie on the x, y, and z axes by setting the other two coordinates to 0.
   (e.g. (4,0,0) , (0,5,0) & (0,0,3)
7. Connect the points that form rectangles directly on the XY, XZ, and YZ planes.
8. Connect the points that form parallel planes with the rectangles from step 7.

- After the rectangular prisms are drawn, the participants will be divided into four groups to complete the following layout:



- Each group will plot two points using the point where the corner of the floor meets the
  bottom corner of the wall as the origin.
- The groups will use measuring tape to plot given points in units of feet.
- The distances in the chart will be calculated using the distance formula :

  (d = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$)

- A comparison of calculated and measured values will be made and discussed.

The ordered triples will be assigned as follows:

Group I—A(0,0,0) and G(8,8,4) also segment DF
Group II---D(8,0,0) and C(8,8,0) also segment EC
Group III---E(0,0,4) and H(8,0,4) also segment AB
Group IV---F(0,8,4) and B(0,8,0) also segment AD

(**All groups must be aware of all coordinates to calculate the length of their assigned segment**)
(See attached activity sheet)

3 Materials and Resources

- **Paper**
- **Pencils**
- **Masking tape, string, scissors, tape measure**
- **Handout**
- **Isometric graph paper**
- **Internet: www.cord.org, www.tacoma.ctc.edu**
- **Houghton Mifflin, *Algebra and Trigonometry Structure and Method* 1986**
- **Addison-Wesley, *Geometry* 1990**

4 Assessment

- **Observation of Students**
- **Graded activity Sheets**

Activity Sheet

1. **When a three-dimensional system is described, the third dimension is (depth or height).**

2. **Geometry in three-dimensions is known as (Solid Geometry).**

3. **What is similar about the area and volume formulas of the following shapes: (height)**

   a. Square vs. Cube A= l x w ; v = l x w x h
   b. Circle vs. Cylinder $A = \pi r^2$; $V = \pi r^2 h$

4. **Using the last three digits of your telephone number, complete the following instructions to create a rectangular prism on the provided isometric graph paper. Remember the ordered triple (4,5,3) is just an example that should be replaced with the last three digits of your phone number.**

   1. **Plot the origin.**
   2. **Given an ordered triple such as (4,5,3), plot the given point.**
   3. **Plot the projection into the XY plane by setting the z-coordinate to 0.(4,5,0)**
   4. **Plot the projection into the XZ plane by setting the y-coordinate to 0.(4,0,3)**
   5. **Plot the projection into the YZ plane by setting the x-coordinate to 0.(0,5,3)**
   6. **Plot the points that lie on the x, y, and z axes by setting the other two coordinates to 0.**
      (e.g. (4,0,0) , (0,5,0) & (0,0,3)
   7. **Connect the points that form rectangles directly on the XY, XZ, and YZ**
      planes.
   8. **Connect the points that form parallel planes with the rectangles from step 7.**

9. **Label your axes on your isometric graph paper using the following configuration:**

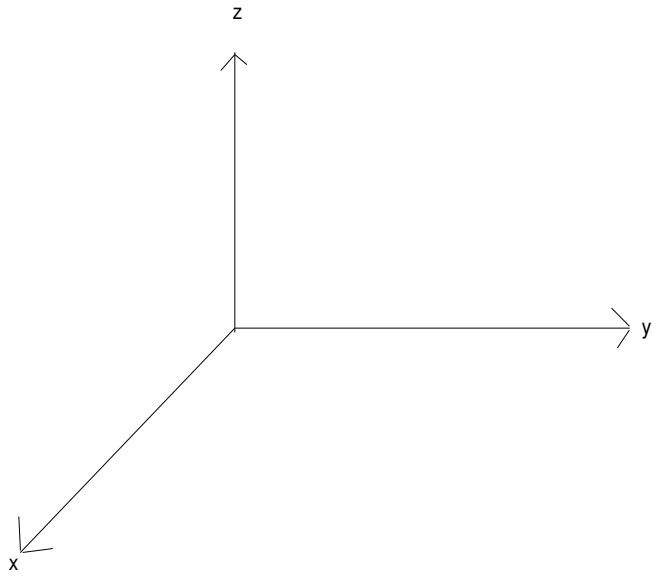


Figure 1.

5. **Using the coordinates of your assigned segment endpoints, find the length of your assigned segment using the distance formula. Record your result in the calculated length column of the chart on number 8.**

D = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$

6. **Complete charts 7 (Coordinates) and 8 (Lengths) after plotting your points using the figure 2. and the following instructions.**
(Use the information from the other groups to fill in the charts).

   A. **Label your assigned points on a piece of masking tape.**
   B. **Measure the distances to your points using the measuring tape.**
   C. **Place your label directly on your measured point.**
   D. **Measure your assigned segment.**

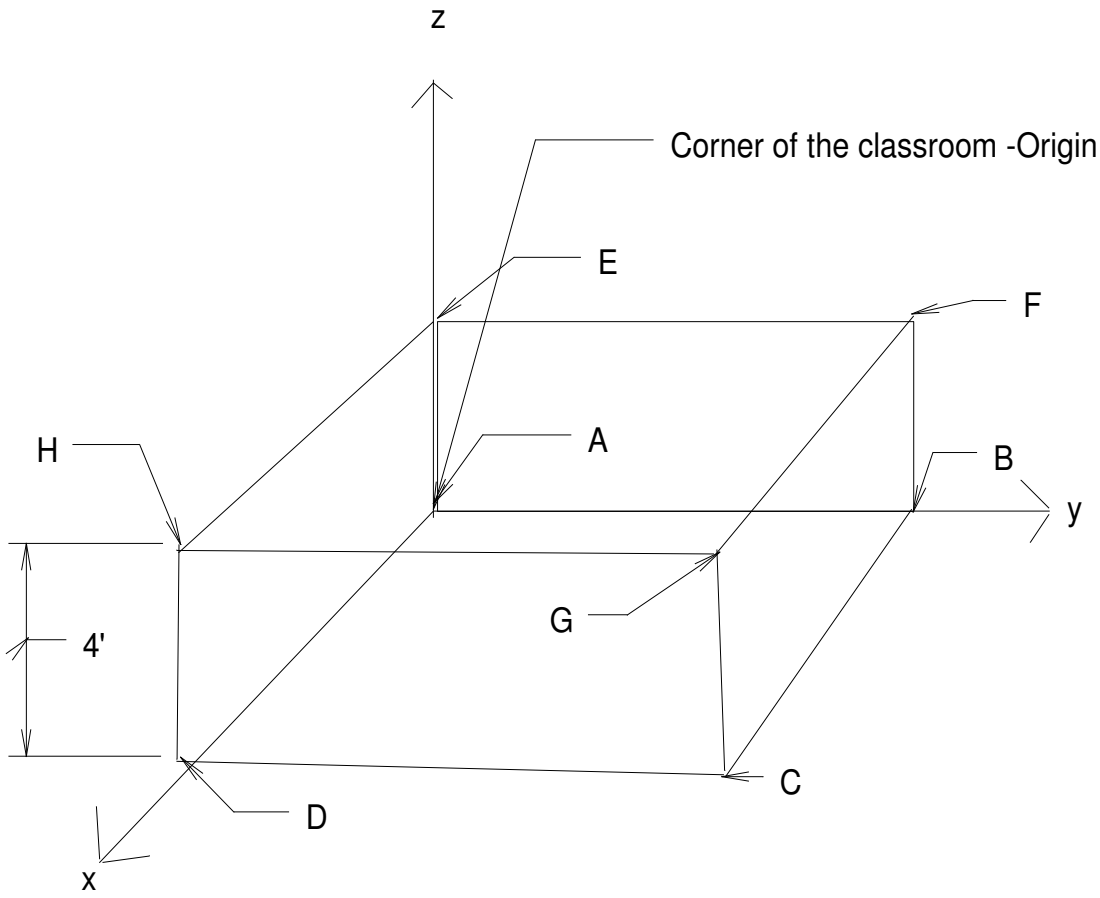


Figure 2.

7. Coordinates

Points	A	B	C	D	E	F	G	H
Coordinates								

8. Lengths

Segment	Measured Length	Calculated Length	Difference
DF			
EC			
AB			
AD			
GC			