Volume Activity Handout **Name____Answer Key_____**

How does math get used in road construction? Consider the roads we all use. What is involved in building a road? A road can't be built on just the "regular" untouched ground for many reasons but primarily because the natural ground is most likely too soft and won't support the traffic over time. Eventually, the road could fail causing a dangerous situation. Thus, contractors will use different types of soils and techniques to condition the soils for optimum performance.

Dilemma: How do you get the ground ready to build on?

This activity will replicate on a small scale what road contractors deal with on a large scale with every project. It is crucial to determine the type of ground you are working with and if the ground can handle the type of traffic required, from small roads in remote areas of Alaska to large airports that must be able to support large jet airplanes.

For this activity there will be 4 groups with specific job functions per person. The goal of this exercise is to excavate (scoop) the material from a gravel pit, load into trucks and transfer the material to the jobsite. At the jobsite you will dump the material. Groups 1 & 3 will not be allowed to compact the material at the jobsite, Groups 2 & 4 will be allowed to compact the material at the job site.

*There are 2 very important rules: Do not spill any material and make sure to document!

Step 1: Assign the following job positions within you team.

1. Project Engineer _____
2. Job Site Foreman _____
3. Excavator Operator (scooper) _____
4. Truck Drivers (1 ea – 4 ea) _____ , _____ , _____ , _____
5. Grade Checker (Groups 1 & 3) or Compactor Operator (Groups 2 & 4) _____

Step 2: Project Engineer and Foreman will get instructions (Project Hand-off Meeting).

Step 3: Project Foreman will debrief team on the scope of work and job assignments for each of their team members.

Step 4: Identify & Calculate

1. What type of material are you working with (circle one)? Flour (overburden) Sugar/M&M's (gravel)
2. Looking from the top down, find the surface area of the earth you need to excavate: Length____13_____ x Width____9_____ = _____117_____ (in square inches – to nearest 1/8")
3. Find the volume of the earth you need to excavate: Length____13____ x Width____9_____ x Depth____3_____ = _____351_____ (in cubic inches)(exact size is 346.5 cubic inches)

Step 5: Begin & Document

1. What was the total # of Scoops: _____379 using 1 Tbsp_____
2. What was the total # of Truck Loads: ____56 loads using 6.25 cu in per load_____
3. What was the total amount of time needed: _____18.93 minutes (based on 3 sec per scoop)_____

Step 6: Review

1. Did your group have enough room at the jobsite to put all the excavation? __Group 1 & 3 yes_____
    a. If so, calculate the volume of material left at your gravel pit: ____varies___ (in cubic inches)(*use Step 4 to help with this calculation)
2. Did your group have additional room at the jobsite for more material? ____Group 2 & 4 yes__
    a. If so, calculate the volume of room left at your job site: _____varies_____ (in cubic inches)(*use Step 4 to help with this calculation)
3. Compute the percentage of "swell or shrink" from Step 4 to Step 6:
    a. Compute: Volume of Step 6 divided by Volume of Step 4 = _____
    b. Multiply you answer by 100 to get % of "swell or shrink" = ___approx. 20 to 30 % targets___
4. Did you group have a "swell or shrink" of material? ___Group 1 & 3 swell, Group 2 & 4 shrink_____

Back in classroom to discuss activity outcomes and key points from the exercise to relate to how contractors must use information like this to do estimates, allocate resources and schedule projects. Also, find out what teams performed more efficiently!

Discuss larger Geometry math problem. Handout packet.