

**2009 Middle School Math Festival  
Engineering Project (Algebra and Geometry)**

SCHOOL \_\_\_\_\_

Team Number \_\_\_\_\_

Student Names: \_\_\_\_\_

**GOAL:** Construct a right square pyramid, which has a square base and four congruent triangular faces. The goal to obtain the largest sum of total surface area and volume.

**MATERIALS PROVIDED:** 1 – 8 ½ by 11 inch card stock

**MATERIALS TO CONSTRUCT (brought by the team):**

Scissors, ruler (with centimeters), and tape

**RESTRICTIONS:** Failure to follow these restrictions will disqualify the team.  
No other materials may be used.  
Measurements must be to the ***nearest*** centimeter (no decimals).  
**ALL VALUES SHOULD BE WHOLE NUMBERS!!**  
Incorrect calculations will disqualify the team.

**EQUATIONS:**  $b$  = length of one side of the square base  
 $B$  = area of the base:  $B = b^2$   
 $L$  = Slant height of one of the triangular faces  
 $h$  = height of the pyramid (perpendicular from center of base to top)

$$h = \sqrt{L^2 - \frac{b^2}{4}}$$

$$\text{Volume} = V = \frac{1}{3} Bh$$

$$\text{Total Surface Area} = SA = B + 2bL$$

**Team Values:**  $b$  = Length of one side of the square base = \_\_\_\_\_ cm

$L$  = Slant height the triangular faces = \_\_\_\_\_ cm

**Proctor's Initials** \_\_\_\_\_ **(verifying measurements)**

Volume = \_\_\_\_\_ cm<sup>3</sup>

Total Surface Area = \_\_\_\_\_ cm<sup>2</sup>

Sum = Volume + Total Surface Area = \_\_\_\_\_

**JUDGING:** Proctors will verify the measurements. An Excel program will calculate the volume, total surface area, and sum compared to student calculations. Projects will be rank ordered from the largest sum to the smallest sum for each Team category.