PROJECT

THE LUXOR

LESSON PLAN

This activity is designed for review and enrichment. It is assumed that the students have already been instructed on calculating the various dimensions of a pyramid, slant height in particular, in order to calculate the surface area and volume. The Luxor hotel has world-record attributes that help the student distinguish the various components of the pyramid. The lesson is self-directed, however, each question has a particular point of emphasis that the teacher should assess.

1. The student should place the given height in the interior of the pyramid, perpendicular to the base, rather than along the surface of the pyramid.
2. Again, the student is to identify and label these dimensions. Each of these three requires the student to visualize a right triangle within the pyramid. Encourage the students to sketch these triangles.
3. The area of the base is needed for calculating both surface area and volume. Focusing on the size of the casino, helps the students distinguish between area of the base (B) and a base edge (b).
4. The students here are to use the given height, and not the calculated slant height which is often erroneously done on calculating volume. The idea of the atrium focuses student attention on the interior of the pyramid.
5. The amount of glass used on the hotel is intended to draw the students' attention to the lateral surface of the pyramid, so they may visualize the lateral area as four distinct triangles.
6. This question makes connections to previous material, specifically, trigonometry and corresponding angles.
7. The novelty of the inclinators helps distinguish the difference between the slant height and the lateral edge. The fact that their angles to the horizontal are different makes for a good discussion on which length should be longer: a smaller angle should yield a longer length and a longer horizontal distance.

Concepts
Pyramids: slant height, lateral edge, surface area and volume; right triangle trigonometry.

Time: 1 hour

Materials
Student handout.

Preparation
Students need sound understanding of pyramids and their components.

SOLUTIONS

*In order to protect the integrity of these lessons in the classrooms, the solutions have been removed from this version of the project. For a copy of the entire project, including all of the solutions, order **MPJ's Ultimate Math Lessons** at http://www.mathprojects.com or call 1-800-247-6553 to order over the phone.*
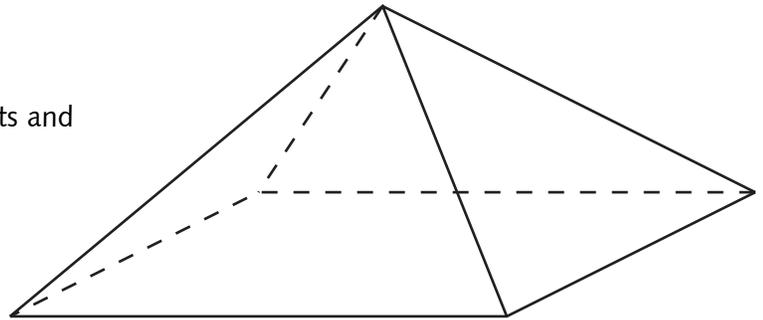
THE LUXOR

The Luxor Hotel in Las Vegas is modeled after the Great Pyramids of Egypt and boasts many world-record attributes. This activity investigates some of these awesome measurements. To begin, the building is 646 feet wide at the base and 350 feet high.

1. Place the dimensions in the diagram to the right.

2. Calculate the length of the following measurements and designate the answers on the diagram.

   Slant Height = _____

   Lateral Edge = _____

   Diagonal of the Base = _____

3. The casino at the Luxor is 120,000 square feet. What percentage of the pyramid's base is dedicated to the casino?

4. The Luxor boasts the largest atrium (a vaulted open space within a building) in the world, with a measurement of 29 million cubic feet. What is the volume of the entire pyramid? Your answer should differ significantly from the volume of the atrium. How do you account for this discrepancy?

5. The Luxor claims that its outer walls are covered by 13 acres of glass. There are 43,560 square feet in an acre. How many square feet of glass cover the Luxor? Calculate the lateral area of the pyramid. Your answers should be close, but not exact. How do you account for the discrepancy?

6. The rooms have an outer wall made entirely of glass. As you might assume, these glass walls are slanted. What angle do the glass walls form with the floor? What geometric principle guarantees that this will be true for all rooms along the same side of the pyramid?

7) Rather than elevators, the Luxor has inclinators (elevators that rise at an oblique angle) along the lateral edges of the pyramid. At what angle to the ground do the inclinators travel?