

CHAPTER 9 PROJECT

Trigonometric Applications



Built by King Khufu from 2589–2566 BC to serve as his tomb, the Great Pyramid of Giza covers 13 acres and weighs more than 6.5 million tons. The Great Pyramid is the oldest and the only remaining wonder of the 7 Wonders of the Ancient World. Even using modern technology, engineers in the 21st century would have difficulties recreating this impressive structure. Today, we can only put forth theories as to how this amazing structure was created.

When first built, the Egyptians called the Great Pyramid Ikhet (which means Glorious Light) because the sides of the pyramid were covered in highly polished limestone that would have shone brightly under the hot Egyptian Sun.

1. When built, the length of each side of the base was 754 ft and the distance from each corner of the base to the peak was 718 ft. What was the surface area of the four sides?

The Egyptians quarried most of the stone locally, but they also floated huge granite blocks down the Nile River from Aswan.

2. Your barge with the latest shipment of granite for King Khufu is quickly approaching Giza. The river is flowing at 195 yards per minute. You command your oarsmen to start rowing towards shore at a 65° angle from the direction of the current. They can row 260 yards per minute.
 - a. What is the resultant true velocity of the barge?
 - b. The Nile River is 840 yards wide near Giza. If the boat is in the center of the river and the dock is 750 yards ahead, will they hit the bank before or after it? By how much will they miss it? (**Hint:** (velocity)(time) = distance.)
3. Once the boat reaches the shore, the granite stones need to be moved into place.
 - a. If a granite block weighs 8300 pounds and 12 of your men are each pulling on it (in the same direction) with a force of 115 pounds, what is the total force being applied?
 - b. In order to get the stone to the necessary spot, the stone must be pulled up a ramp that has been built around the pyramid. If the ramp has a 9° grade, what force is necessary to keep the block from sliding?
 - c. If the top of the pyramid is currently 320 feet above the desert, how long does the ramp have to be?
 - d. How much work is it for the 12 men to drag the stone to the top of the pyramid? (Remember, in this case work is done in both the horizontal and vertical directions.)