Name Date

Enrichment and Extension

9.5

Measuring Up with Sand

Children at the beach often spend a lot of time pouring sand and water from one bucket to another bucket.

1. You have a bucket that is a cube with a side length of 4 inches that you fill with sand. You pour its contents into a bucket that is a square pyramid with a base length of 4 inches and a height of 10 inches. Will the sand spill over? If so, how much sand will spill out? If not, how high will the sand be in the pyramid bucket?

2. Your friend has a bucket that is a square pyramid with a base length of   
6 inches and a height of 9 inches that is full of sand. Your friend pours the sand into a cylindrical bucket with a diameter of 6 inches and a height of   
9 inches. Will the sand spill over? If so, how much sand will spill out? If not, how high will the sand be in the cylindrical bucket?

3. Another friend has two buckets, one that is a triangular pyramid and one that is a triangular prism. The bases of both buckets are triangles with a base of 3 inches and a height of 4 inches. The pyramid is 6 inches tall. When you fill the pyramid with sand and pour it into the prism, it fills the prism exactly. What is the height of the prism?

4. You borrow a cylindrical bucket. You fill the cube bucket from Exercise 1 with water and pour the entire contents into this cylindrical bucket. The water is 7 inches high. Does this cylindrical bucket have a larger or   
smaller diameter than the cylindrical bucket from Exercise 2? Explain   
your reasoning.

5. You enter a sand castle building contest. You are given a bucket that is a square prism with base length of 6 inches and height of 10 inches that is full of red sand. According to the rules for the competition, you can use only this sand and nothing more, but you do not have to use all the sand. How would you design your sand castle? Draw a picture and give the names, dimensions, and volumes of the shapes you would use in your castle. Assume that you can form whatever shapes and sizes you choose.