CHRISTIAN EDUCATION DEPARTMENT

The Size of the Promise Science Activity

Theme: God's family is large and growing.

Bible Verse: I will indeed bless you, and I will make your offspring as numerous as the stars of heaven and as the sand that is on the seashore... Genesis 22:17

Materials needed:
- Small amount of sand (or salt or sugar)
- Magnifying glasses (optional)
- Small ruler

In Genesis 28:10-19a, God reveals Godself to Jacob at Bethel and makes a promise to him that sounds a lot like the promise God made to Jacob's grandfather, Abraham. **This activity helps us think about how HUGE the promise was and is.**

Today, four thousand years later, all believers can be called the "children of Abraham." True to Scripture, no one knows the total number of those believers of religions coming from Abraham (Christianity, Judaism, and Islam) worldwide and throughout the ages, surely numbering in the billions. God's kingdom is still growing, even in this troubled world, as people acknowledge their Creator and call upon God's name.

Sand Experiment

Sand grains provide a good example of an extremely large number. The challenge is to count some individual sand grains and estimate the total grains on all the seashores of the world. *There is some math involved.*

Take your ruler and a pinch of sand (or salt or sugar). The particles can be sprinkled on a dark smooth surface that shows them clearly. The goal is to count the number of grains along a 1-inch* (1 centimeter) length of ruler. With the ruler edge, push some of the grains into a line and begin counting. The exact number is not necessary and depends on the particle size. A magnifier may be helpful. Your 1-inch lineup may total nearly 100 sand grains.

Now we need to estimate the number of sand grains in a cubic inch, or handful of sand. Take the lineup number and multiply it times itself twice, cubing it. If the initial number was 100, then 100^3 is 1,000,000 or 10^6. Going further, a fair estimate for the sand on all the seashores of the world is 10^{16} cubic inches, or 10 thousand trillion cubic inches. Multiplying these two numbers gives the worldwide total of sand grains: $10^6 \times 10^{16} = 10^{22}$

Your final number should be close to this result. This number estimates all the sand grains on the earth's shorelines. Amazingly, it is also approximately the total number of *known* stars in the universe. In words, this number equals 10 billion trillion stars or sand grains. Such a vast number is beyond our comprehension. The meaning of Genesis 22:17 is not that Abraham will have exactly 10^{22} offspring. Instead, the promise is that God's family is beyond counting, and it's still growing!

Explanation

Let's estimate the number of cubic inches of sand on all the earth's seashores (10^{16}), as used in the science activity. As a rough guess, assume there is a total of a million miles of sandy seashores. This number equals 42 trips around the earth and includes the many irregular shorelines. Further, assume the average beach is 100 feet wide and filled to a depth of 10 feet with sand. These would seem to be a conservative estimate. Now convert all three numbers to inches—length, width, and depth—and multiply them to get the total sand volume in cubic inches. There are 63,360 inches in one mile. The final answer is close to 10^{16} cubic inches. As earlier, multiply this number by 1 million to obtain the total sand grains, 10^{22}.

This is also approximately the total number of photographed stars within all the galaxies of the known universe. This is more than a trillion stars for every person on earth. Whether one considers sand grains or stars, both show God's great glory.

*This experiment is done using the English (Imperial) measuring system but can also be done using the metric system.

adapted from *77 Science Activities for Illustrating Bible Lessons* by Donald B. DeYoung