Sweet Scale!

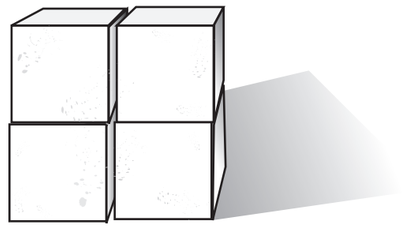
Try this activity to compare how length, area and volume all change as you scale up the size of a sugar cube.

Procedure

- Make a chart on the paper to record length (cube lengths), surface area (sugar cube faces) and volume (number of sugar cubes) of your sugar cube structures.
- Start with one sugar cube. Record in the chart the length of the cube (one, in this case), the surface area (6) and the volume (1 cube).
- Now make another cube that is double the size of the first (two cubes long). Record in the chart the length, surface area and volume.
- Continue by building the next largest cube and recording the results.
- Make as many cubes as your sugar cubes allow.
- Notice the relationship between length, surface area and volume.
- Can you figure out a pattern? Can you predict what the surface area and volume would be for a cube that is 10 sugar cubes long? How about 20? Do you notice anything about the way that the surface area and volume increase for cubes this large?

Materials
(per student or team)

- 64 sugar cubes per team of 2-4 students (approximately 126 come in a box)
- paper and pencil for recording results
- rulers



Self Similarity

Many things around us exhibit a trait called self-similarity.

Mathematicians describe this as a phenomenon whereby a part of something looks like the whole. A tree displays a good example of self-similarity. If you look at an entire tree (deciduous is best), you will notice that its largest branches look like the whole tree, only on a smaller scale. If you look at smaller branches on those larger branches, you will notice the same thing. Objects that display self-similarity are called fractals. Fractal objects are described as items that have repeating patterns that decrease in scale.

Try to find examples of fractals around you. Look at some broccoli, cauliflower, clouds, lilacs or bracken fern. How are these objects self-similar? Can you find others?

Resources

Here are some of the titles you might wish to add to your classroom library or your own professional library.

Exploration Magazine, Vol. 19, No. 3, Fall 1995

Family Math Sampler, EZUALS Program, Lawrence Hall of Science

Family Math, by Jean Kerr Stenmark, Virginia Thompson and Ruth Cossey, 1989

Fractals, The Patterns of Chaos, by John Briggs, 1992

Science On Wheels website: www.pacificsciencecenter.org/education/sow

Exploration Science Snacks Website: www.exploratorium.org

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SCIENCE On WHEELS

Mathfinder

Dear Teacher,

Thank you for having the *Mathfinder Van* visit your school. We hope you enjoyed investigating mathematics with your students during Pacific Science Center's Science On Wheels experience. This flier is intended to help continue the enthusiasm generated by our visit and extend your students' learning.

The following activities have been selected because they encourage problem solving skills, which are important components in math. Please feel free to adapt them to suit your needs. The insert is written for your students, with activities you may choose to do as a class or copy for home use.

Thank you for having the *Mathfinder* van visit your classroom, and remember, have fun!

~Science On Wheels Teachers

En–tire Weight

How heavy is a car? Measure the amount of surface each tire presses into the ground and the pressure inside each tire and you can calculate the approximate weight of a car.

Procedure

- Have an adult drive the car into place and set the parking brake. Shove pieces of cardboard tightly around the base of each tire so that the paper surrounds all sides of each tire.
- Clear the area of students and have an adult drive or push the car away. There should be four rectangular shapes left where the tires used to be. (See diagram)
- Calculate the area of each rectangle (l x w) and record.
- Find the amount of pressure in each tire using the gauge and record.
- To find the amount of weight each tire holds, multiply the area of the rectangle by the psi in the tire. (When you multiply square inches by psi, the square inches cancel and and you're left with pounds.)

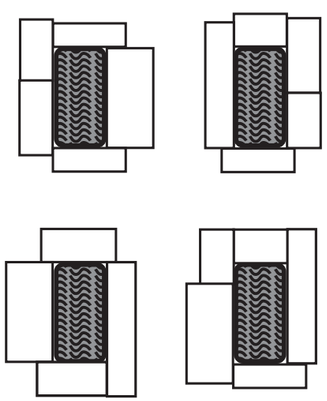
  Example: 28 $in.^2$ x 30 lbs = 840 lb

  Do this for all four tires.

- Add the weight together for all four tires – that's the approximate weight of the car!
- To see how close you came to the real weight, check the owner's manual or look at the specification plate on the inside of the driver's door.

Materials
(per team)

- 1 or more cars
- 1 or more tire gauges in psi (pounds per square inch)
- 1 or more rulers
- a clean, flat, dry piece of ground
- thin cardboard or manila folders
- paper and pencils



Big Budget

What would your students buy from the classifieds if they had $1,000,000? How long would it take them to spend the money? How many things could they get for a million dollars?

Procedure

- Introduce students to the classifieds section of the paper.
- Tell the students that they have a budget of $1,000,000 to "buy" anything they want from the classifieds.
- Locate items in the classifieds that they would like to purchase. They may only buy one of each thing, or one set of each item. (For instance, they can only buy one of the beagle puppies, but they can buy both speakers!) Highlight these items and record them on a piece of paper along with their dollar amount. It will probably be easier if they keep a running total on the calculator as they purchase rather than adding it all up at the end, but it is important to write it down in case they lose their place.
- They must spend exactly one million dollars. Discuss their experience of trying to spend a million dollars. Did they have to buy more things than they expected? How many of the items on their list would they actually want?

Materials
(per student or team)
- 1 highlighter pen
- 1 Sunday newspaper "to sell" classifieds section
- 1 seven decimal place calculator
- pencils and paper

The Bank 1122

Date: 9/25/07

Pay to the order of: You $ 1000000.00

One Million Dollar

Your Neighbor Bank
1234 Main Street
Springfield, WA 98100

For: Classifieds

2:8783428790945270::4354.:'1122

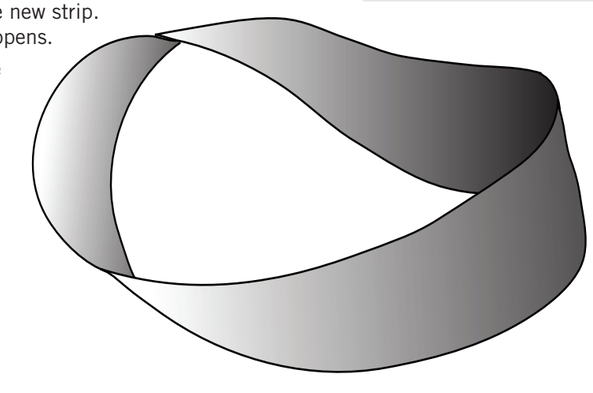
Möbius Strips

Make one of these mathematical wonders and experiment with cutting it in different ways to see what happens.

Procedure

- Cut strips of gift wrap that are 24 inches by 2 inches. Twist the strip once and tape or glue the ends together.
- Draw a line down the center of the strip. Cut along this line until you return to your starting point. What happened?
- Draw another line down the center of the new strip. Cut along this line and find out what happens.
- Make another Möbius strip and this time cut along a strip that's only a third of the way in from the edge of the strip. What happens when you finish cutting?
- What happens if you twist the strip two or three times and then cut down the center?

Materials
(per student or team)
- pen
- scissors
- gift wrap (or any paper that has two sides that are different colors)



Mock DNA Profile

DNA (deoxyribonucleic acid) is a large molecule that humans and other organisms have in their cells. This material is sometimes described as the blueprint for living organisms as it organizes us into what we are. Many traits that you posses are genetic traits that you inherited from your parents' DNA. Traits like eye and hair color are examples of genetic or DNA-inherited traits. DNA can serve as a way to identify people in much the same way that fingerprints are used to identify people. Our DNA can be just as unique as our fingerprints. Law enforcement agencies can use some crime scene evidence as a source of DNA. If DNA can be collected and processed, it can be formed into patterns and these patterns, sometimes called profiles, are generally unique from person to person. However, if the strands of recovered DNA are too short, the chances of another person sharing the same patterns are substantial. If a long strand of DNA is recovered the chances of the resulting pattern matching that of another person are extremely low. Try the model below to illustrate this concept.

Procedure

- Discuss the above paragraph with your students.
- Have them fill in the appropriate rectangles in the Mock DNA Profile #1. This represents a short strand of DNA.
- Let them compare the resulting pattern with other classmates. Those with matching patterns should stand together. There will probably be lots of matches. Discuss outcome with students.
- Have them fill in Mock DNA Profile #2. This represents a long strand of DNA. Let them compare patterns again and discuss.
- Just for your classroom, have the students calculate the probability of a match in both cases and the implications this might have in criminal cases involving the use of DNA evidence.

Materials
(per student or team)
- pencils
- photocopies of Mock DNA Profile below

Mock DNA Profile Template

Name:

	1		2
☐	Female	☐	Female
☐	Male	☐	Male
☐	Right-handed	☐	Right-handed
☐	Left-handed	☐	Left-handed
		☐	Brown hair
		☐	Black hair
		☐	Blonde hair
		☐	Red hair
		☐	Curly/wavy hair
		☐	Straight hair
		☐	Brown eyes
		☐	Blue eyes
		☐	Green eyes
		☐	Hazel eyes
		☐	_____ eyes
		☐	Can "roll" tongue
		☐	Cannot "roll" tongue

Number of students in classroom:

Matching profiles for #1

Matching profiles for #2