TECHNO-WHIZ!
GUIDES

PROGRAM COMMITTEE

INTRODUCTION

Techno-Whiz is designed to allow the girls to 'play' with engineering and science activities. The activities are meant to be fun for the girls and the Guiders!

The Association of Professional Engineers, Geologists and Geophysicists of Alberta provided much appreciated information on fun engineering activities. Thanks also to the Guiders who contributed to the development of the challenge. The Mining activity is a simplified version of Theme #9 in *Theme Meetings for Pathfinders*. Have fun!

Select at least 2 of the following areas of interest and do an applicable activity - either the one listed here or another equivalent challenge.

Structures: Explore how to build a tower that is stable and will support itself.
Materials for each team of 4 girls: newspaper, roll of tape, and 25 toothpicks.

Step 1) Place a sheet of newspaper on the floor.
Step 2) Place a toothpick at one corner and roll the paper tightly around the toothpick, forming a dowel. Tape it to hold it together.
Step 3) Repeat Steps 1 and 2 to make a supply of dowels.
Step 4) Build a tower with the dowels. The goal is to build the highest tower possible, without it falling over.

Tips: Build a strong base before trying to build it high. Cross bracing (i.e. angled dowels) will provide reinforcement. They can fold the dowels in half to increase strength. The trick is to wrap the newspaper very tightly. Debate what is more important - the strength of the materials or the design.

Magnetism: Magnetize a paperclip to make a compass. It's not magic – its science!
Materials: magnets, paperclips, corks or small pieces of Styrofoam, 1-2 buckets.

Step 1) Indent a line across the top of the cork.
Step 2) Open the paperclip so that it is straight.
Step 3) Rub the magnet down the length of the paperclip 30 times in the same direction.
Step 4) Lay the paperclip in the line on the top of the cork and float the cork in the bucket of water. The cork should spin until the paper clip points north.

Tips: Consider gluing the paperclips to the pieces of cork ahead of time. Have a 'real' compass out to locate North. Keep the cork away from the edge of the bucket.

Why: The paperclip is composed of metallic fibres that are scattered in all directions. The magnet aligns the metallic fibres in a North-South orientation. When the magnetized paperclip is floated on the water, it will align itself relative to the magnetic north and south poles of the earth.

Pulleys: Explore how to amplify the effect of strength through the use of pulleys.
Materials: 2 broom handles, approximately 2m of rope (nylon work the best).

Step 1) Ask two girls to each hold a broom handle horizontally at waist height. They should stand about 30cm apart.

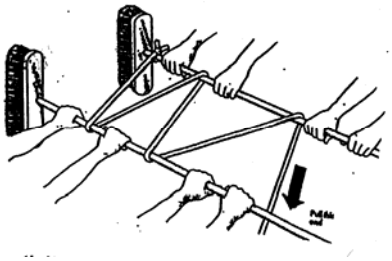
Step 2) Have the third girl attach the rope to one handle, and then thread it as shown.

Step 3) The two girls should try to keep the handles 30cm apart while the third girl pulls on the end of the rope. What happens?

Step 4) Try again with four girls holding on to the two brooms. Can the girl pulling on the rope still win?

Tips: Pay attention to how the pulleys are threaded. If not using nylon rope, lightly dust the broom handles with talcum powder.

Why: Each pulley (or loop on the broom handle) doubles the effect of the pulling force on the end of the rope.



Mining: The goal of this fun activity is to mine (i.e. remove) as much ore (i.e. chocolate chips) from the rock (i.e. cookie) as possible using the tools provided.
Materials for the group: chocolate chip cookies, toothpicks, and paperclips.

Step 1) Each girl should receive a piece of rock (cookie) and two tools (toothpick and paperclip).

Step 2) Give them 5 minutes to remove as much ore (chocolate chips) as possible using only the tools provided, no fingers. They should try not to break the chips because this reduces their value. They should also try not to leave too much rock attached to the ore as this increases the shipping costs.

Step 3) Discuss what problems they had with the tools. Can they suggest other tools that would be useful? Did they manage to remove all of the ore from the cookie in the available time? Eat the snack when the discussion is complete.

Why: Mining is very important to our way of life. Most of the components in a house, a car, or a school come from a mine, such as clay, gravel, cement, copper, iron. Many engineers work together to remove useful products from the earth at the lowest cost possible. This is accomplished by trying to reduce the amount of waste products that are transported and having effective tools to use.

Challenge Created By:
Alberta Program Committee 2000
Edited 2005