This activity is a fun way to discover “the right tool for the right job.” In this activity, the students will pretend they are designing a tool that will pick up different kinds of “treasure.”

**Design**

Working in groups of 3-5 students, let each student in each group choose a tool (clothespin, toothpick, spoon, scissors, clay). Every type of tool should be available for each group, and students should use the same tool throughout the activity. Show them each type of treasure they will be trying to collect and let them hypothesize about which type of treasure will be the easiest for them to pick up with their tool.

**Test**

- Place about 10 marbles on the floor for each group. Allow students to collect as much treasure as they can only using their tool. Set a time limit if appropriate. As they collect the treasure, they can put it back into their cups. When the students have finished, graph their results on a chart, tool type vs. amount of treasure collected.
- Do the same with the raisins and the macaroni. Challenge the students by placing the styro foam “popcorn” in a large container which is filled halfway with water. A chart can be constructed to record the results for each type of treasure.
- Discuss the charts and their observations.

**Materials**

<table>
<thead>
<tr>
<th>(per group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>spring-type clothespin</td>
</tr>
<tr>
<td>clay or play-doh®</td>
</tr>
<tr>
<td>toothpick</td>
</tr>
<tr>
<td>spoon</td>
</tr>
<tr>
<td>safety scissors</td>
</tr>
<tr>
<td>large plastic container such as a dish pan or shallow storage tub</td>
</tr>
<tr>
<td>plastic or paper cups</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(per class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 60 marbles</td>
</tr>
<tr>
<td>about 60 pieces of uncooked macaroni</td>
</tr>
<tr>
<td>about 60 raisins</td>
</tr>
<tr>
<td>about 60 pieces of styrofoam “popcorn” packing material</td>
</tr>
<tr>
<td>water</td>
</tr>
</tbody>
</table>

Mechanical engineers consider different shapes and sizes when designing tools or machines. Discuss the types of tools the students use every day. Choose one and discuss its limitations and how it could be useful to perform other tasks. What is a tool they would like to design?

**Resources**

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

- **Underground**, by David Macaulay, 1983
- **Bridges**, by Elsa Kaner and Pat Cupples, 1995
- **Inventionering: Nurturing Intellectual Talent in the Classroom**, by Bob Stanish and Carol Singletary, 1987
- **Science for All Cultures**, compiled by Shirley J. Carby, 1993

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**Dear Teacher,**

Thank you for having the Engineering van visit your school. We hope you enjoyed investigating engineering with your students during this Science On Wheels experience. This flyer 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 creativity and problem-solving skills, both important components in engineering. Please feel free to adapt them to suit your needs. The one page insert is written for students, with activities you may choose to do as a class, or copy for home use.

Thank you again for having the Engineering van visit your classroom and remember, have fun!

~Science On Wheels Teachers

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**Blow My House Down**

Small Pig Brothers Construction Company vs. B.B. Wolf Demolition Inc.

**Design:** As pigs, the students can:

- Construct three houses.
- Design a “For Sale” sign that tells prospective buyers about the attributes of their house.

**Test:** As wolves, the students can:

- Design and carry out tests to knock down the homes using wind power.
- Prepare a fact sheet to give advice to prospective house wreckers.

**Re-Design**

As a class, discuss which buildings best withstood the wolf’s demolition. How would students build their home if they were to build it again?

**Materials**

<table>
<thead>
<tr>
<th>(per student or team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>straw</td>
</tr>
<tr>
<td>tape</td>
</tr>
<tr>
<td>scissors</td>
</tr>
<tr>
<td>twigs</td>
</tr>
<tr>
<td>wood glue</td>
</tr>
<tr>
<td>modeling clay</td>
</tr>
<tr>
<td>sculpting tools</td>
</tr>
<tr>
<td>hair dryer</td>
</tr>
</tbody>
</table>

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**Toothpick Towers**

**Design**

Work in pairs to design and build the tallest free-standing structure possible. Experiment with various shapes.

**Test**

Which tower is stronger – one made of triangles or one made of rectangles?

**Re-Design**

Once the students have found the strongest part of their building, let them change their building so that the entire structure is stronger.

**Materials**

<table>
<thead>
<tr>
<th>(per student or team)</th>
</tr>
</thead>
<tbody>
<tr>
<td>toothpicks</td>
</tr>
<tr>
<td>gumdrops or small marshmallows</td>
</tr>
</tbody>
</table>
Some things to remember about robots:
• A robot is a computer that moves.

There are three main parts of a robot/computer:
• The input is what the programmer tells the robot to do.
• The output is what the robot does with the programmer’s commands.
• The brain, like yours, stores and processes information. This is sometimes called the Central Processing Unit or the CPU.

Design
• Define the task your robot is designed to accomplish.
• Describe the kinds of environments in which the robot will need to function.
• Describe the types of inputs, outputs, and other characteristics that especially suit your robot to its task and environment.
• Pick a name for your robot.
• Draw your robot.

For example
Perhaps you’d like a robot to wash your dishes. What features would it need to get its job done: arms, sponges, suction cups? How would it know when the dish is clean? Will water harm it? What name will fit your robot?

All structures are composed of different geometrical shapes. Send your students on a scavenger hunt which will give them practice in recognizing and naming those shapes.

Design
Look through some old magazines that are likely to have photographs of buildings, bridges, towers, etc...travel magazines often have pictures like this, or explore the Internet.) Build a collection of these pictures large enough to accommodate your students.

Review with your students the fact that structures are composed of geometrical shapes. You may need to review all of the shapes they know. Provide the entire class with a large picture of a structure and work together to find some shapes within the structure. Use a marking pen to outline the shapes you find.

Next, hand out the pictures you have collected and let the students work with a partner to find and mark the shapes they find. Let your students make labels naming the shapes and put their results up for a display.

Extension
Go on a field trip around your own school to find the many shapes the school is made of. If it is possible, label the shapes as you find them.