Engineering Try-It

This Engineering Try-It was designed and developed by Troop 123 of Girls Scouts of New Mexico Trails (formerly Sangre de Cristo Council). Contact bevaikin@earthlink.net for more information. The requirements have been slightly modified to align with Magic Mountain GSGLA Day.

Engineers use science, math, and technology to solve problems. They turn ideas into reality.

Do the first activity and at least three others to earn this Try-It. Starred activities (*) may be completed during Magic Mountain GSGLA Day.

1. What Are Engineers Made Of?

Engineers are women and men who have worked hard to learn how to think critically. They use science and math to solve problems for the benefit of society. Engineers are involved in everything from designing amusement park rides or life-saving equipment to making the materials that all things are built from. Engineers turn ideas into reality.

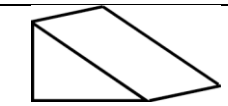
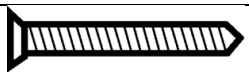
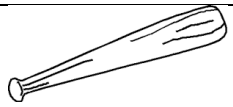
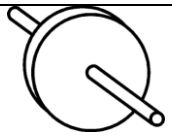
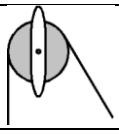
Engineers like to:	**Do you?**
Ask why or why not?	
Be a leader	
Build things, models and kits	
Communicate	
Cook and bake	
Create and imagine	
Decide between trade-offs (limited time, $, etc.)	
Do science experiments	
Help people or society	
Invent things	
Make decisions	
Make money	
Make things better or easier	
Plan and carry out projects	
Solve problems	
Think critically and logically (step by step)	
Use computers	
Use math	
Use technology	
Use tools	
Work in teams	
Work with many different people	

2. Visit an Engineer

Visit or talk to an engineer in your community. Find out what field they are in and what they like to do. Share what you learned with your troop, group, or family.

3. Simple Machines

A machine is a device that applies force to move things and do work. Machines make working easier. Engineers design and build complex machines by combining simple machines. There are six simple machines: inclined plane, wedge, screw, lever, wheel and axle, and pulley.

	An **inclined plane** is a flat surface (plane) that is slanted (inclined). An example is a wheelchair ramp.
	A **wedge** is the edge of an inclined plane. You use a wedge when you cut your food with a knife.
	A **screw** is an inclined plane wrapped around a cylinder. We use screws to hold pieces of wood or other materials together.
	A **lever** is an arm that pivots (turns or rotates) around a fulcrum (point). Teeter-totters, wheelbarrows, and baseball bats are examples of levers.
	The **wheel and axle** is a type of lever that moves objects across distances. As the wheel rotates, the axle moves. A water wheel is an example of a wheel and axle used to do work. Gears are wheels with teeth
	A **pulley** is a variation of the wheel and axle. The wheel is used to rotate a rope that may used to do work like raise and lower a flag.

Find one example of each of the six types of simple machines and use at least one simple machine to solve a problem. Find a complex machine (like a wagon or blender) and see how many simple machines it is made out of.

4. Abacus Math Tool

Engineers use math to solve problems. An abacus is a tool that can be used to help do addition and subtraction. Build an abacus out of popsicle sticks (glued into a square), string, and beads. Use your abacus to solve the following math problems.

4 + 3 = _____ 7 + 5 = _____
13 + 16 = _____ 56 + 21 = _____
38 – 12 = _____ 75 – 22 = _____
54 + 29 = _____ 25 + 37 = _____
76 – 19 = _____ 56 – 19 = _____

5. *It's Hands-On!

Put your engineering skills to the test by participating in one of the Girl Scout "Olympi-gineering" activities during Magic Mountain GSGLA Day. The schedule of available challenges will be available at the Girl Scout table at Six Flags Magic Mountain during GSGLA Day.

6. Communication

Effective communication is important for engineers and those they work with. Follow written directions to build something from a kit (blocks, stick & connectors, wood & nails, magnets, etc.).

7. *Materials Make a Difference

Different materials can be used to make things that serve the same purpose. For example, a cup can be made out of ceramic, glass, aluminum, pewter, paper, polystyrene foam, or thick polyethylene. Aluminum and pewter are metals. Polystyrene and polyethylene are polymers, often called plastics.

The tracks of roller coasters can be made out of steel or wood. Find an example of each type at Six Flags Magic Mountain or other amusement park. Do you see any differences between the two types of roller coasters? Are there some things one type can do that the other can't? Why do you think both types of materials are used to make roller coasters?

8. Center of Gravity

The center of gravity of an object is the center of the object's mass or its balance point. Engineers need to know where the center of gravity is to correctly balance an object on its supports. The center of gravity of a circle is at its center. The center of gravity of a round donut is in the middle of its hole.

Collect five different objects and balance each of them on your fingertip to find their centers of gravity.

Where is your center of gravity? Sit on a chair with your feet on the floor and your arms folded across your chest. See if you can stand up, but you may NOT lean forward. You can't stand up because your center of gravity is too far back to allow you to stand. Now try to stand up by leaning forward first. Leaning forward allows you to adjust your center of gravity and move it over your feet.

Make a can that will roll up hill and amaze your family or friends. Get a clean, empty can like a small coffee can. Fix a chunk of clay or another heavy object inside the can. Place the can near the bottom of a book or board that has been propped up on one end. Make sure the clay is near the top on the uphill side of the board. Let go and see what happens. Why does the can roll up hill? The can rolls up the hill because the center of gravity (the lump of clay) moves downward.

9. *The Force is with You

Visit a ride of your choice at Six Flags Magic Mountain or other amusement park. Stand outside the ride at a place where you can watch it. Watch a rider and try to determine what forces the rider feels on his/her body at various points during the ride. Would the seat be pushing on the rider's bottom? Would the shoulder harness be holding the rider in the seat? Would the side of the car be pushing on the rider? Would the back of the seat be pushing the rider forward? Would the shoulder harness prevent the rider from flying forward?

Now ride the ride or interview someone who did. Try to remember the forces you felt at some of the points listed above. Work with a group. Assign each person a specific point at which to collect data. Do your observations agree with your predictions made above? Discuss.