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## PARENT LETTER FOR BUILD IT AND BREAK IT

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### SCIENCE

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The Techno-Build summer camp is a favorite of any child that likes to build things. Teachers for this class are encouraged to let your children not just listen to engineering concepts, but actively construct a different concept each day. They will be given their **Techno-Build Workbooks** at the beginning of each class. The workbooks are divided into days. Each day they will learn about a different engineering concept and then be instructed to build a structure that uses the day's concept. They will have directions for their structures, that they must read and interpret; however, teachers will encourage them to build the structure in a way that they feel will best put to use their learned engineering concept. Below is a breakdown of each engineering concept:

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#### DAY 1 AND 2 PRINCIPLE- STRUCTURES AND TRUSSES

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- By the end of your child's first day of camp they should walk out with a new understanding of concepts people in ancient Rome used! They will go from challenge to challenge as they progressively construct a sturdy paper bridge. Though it may seem simple, this paper bridge will start your child's understanding of stable structures.
- They will be building there very on trusses.. Through these trusses they will understand just how strong the 'triangle shape' is. This shape is used in a lot of major bridges.
- Next they will enter into a Team Building Marshmallow Challenge. How can they use the skills they have learned to build the tallest structure that can hold a marshmallow? This may seem simple but they will find that the marshmallow weighs a lot more than they think!
- **Discovery Questions**
  - *What makes the structure more stable?*
  - *What shapes are most stable?*
    - *What is the "weakest link" of a structure?*
  - Your children will be introduced to Geodesic Domes! We promise- it is as cool as it sounds! They will each take home a dome!
  - They will also build a HUGE newspaper dome that they can climb in!
  - **Discovery Questions**
    - What is a geodesic dome?
    - Why are arches and domes so stable?

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### DAY 3 PRINCIPLE- LEVERS AND MACHINES

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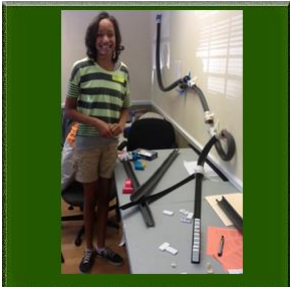


- Your children will learn about the three types of levers and test examples of each!
- Your children will then travel back to the medieval times and divide into groups to make TREBUCHETS! These trebuchets will launch “targets”. Given directions and materials like milk jugs and wooden dowels your children will be encouraged to discover different “engineering tricks” that will enable their trebuchets to shoot farther and straighter!
- **Discovery Questions**
  - Name some types of levers?
  - What is a trebuchet?

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### DAY 4 PIN BALL MACHINE

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- Next it is on to Newton’s Laws as the students work with ball contraptions to learn action, reaction, acceleration and impact.
- Your children will put all of the above concepts to use into making their very own Pin Ball Machines! They have total creative control – and we love seeing what they come up with!
- **Discovery Questions**
  - How did the weight of the balls affect its speed and impact?
  - How did you make you pin ball machine?
  - Why do you love this camp so much? (Just kidding!)



Pinball Machine

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### DAY 5 BUILD AND TEST A MAG LEV RACER

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Here our students get to create and race their own mag lev racer. They will learn about magnetism, friction, angles, and acceleration as they test this magnetic levitation device.

We will also do an amazing balancing act with nails and have a Spaghetti building challenge as time permits.

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## TECHNOLOGY

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In our “Build It and Break It” camp we are offering lots of builds for your student to enjoy and learn from. We give you descriptions of many of these builds, but your student may not be able to get to all of them. Because they are fun and good learning tools we will attempt to build as many as camp time permits. We will do a combination of motorized and pneumatic machines.

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### MOTORIZED MACHINES

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**The Power Car:** This exciting exercise is one of the most popular motorized builds. With the use of gear concepts your student will create a car that can race to the finish line, pull a load up a hill and maybe jump through the air off the end of a ramp. Ask your student what they changed on the original building of the power car to make it go faster during the second race of the day!

In learning to use the motors your students will build a Gear Racer and a Tower Crane.



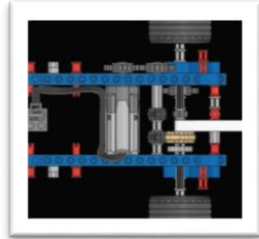
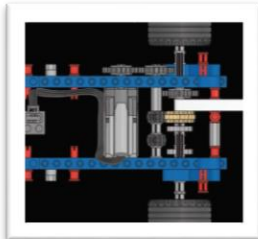
The **Tower Crane** will lift different weights to stimulate your students mind. This activity uses Architectural Engineering concepts to build the standing base of the Crane. You can see how the legs of the structure have cross beams for stability. What is the ratio of the base length to the length of the Crane arm or “Jib”, and why would that be important? Behind the “slewing unit” (the gear and motor that allow the arm to rotate) on the tower arm is the counter weight. How much weight it could lift and whether it would fall over is decided by the counter weight among other things. Your student will come away with their own conclusions by the end of the exercise.



**The Gear Racer:** This activity is a great way for students to understand how a car changes gears and how this can speed up and slow down a car when needed.

They will also get a clear view of a gear box or “housing”. What is the housing? Exactly what it says it is. A box that is normally enclosed on 4 sides with the gearing on the inside.

The white beam will change positions as the students gears their racer “up” or “down”. Ask your student to explain the differences they observed.

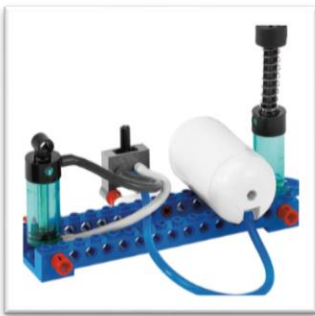




**The Hammer:** What is a cam and how can it be used with a hammer? A cam is an egg-shaped gear that helps the hammer arm to lift and fall, allowing the arm to go up and then to fall on the axle. Does your student know that each of the gears used in Lego sets has a different grip? Well, once your student builds this hammer they will, by experimenting with different sized gears and axles, how many hits it takes to move an axle through them!

## PNEUMATICS

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With the first building activity of Pneumatics students will discuss what a Pneumatic powered machine is, how it uses pumps and compressed air molecules to move machines. The students will build basic models demonstrating the principles behind pneumatics. In discussing the principle models, they will be learning about air flow, valves, air pressure, manometers and more.



**The Excavator:** This activity uses 2 pneumatic pumps. One to pump air into the lines and another to lift the excavator bed to dump a load. The Pump sends air to the valve switch. If the switch is in the upright position it traps the air in the lines for use when the switch is turned. One way for sending the dump platform down the other way to lift the dump platform to its horizontal position. Each of these pneumatic activities has a steering system.

Your student will build an **Ackerman** steering with the excavator and all the other pneumatic activities that are being offered in this camp. The Ackerman steering uses a bar that connects at pivot points on linkages. In steering, the goal is to turn the wheels to enable them to go around corners or wherever the tires are pointed. This means that the rods need to be able to move back and forth at different angles to complete the wheels direction. The steering bar remains static.



Students will also build a Bulldozer, a Forklift and a Crane. Each of these activities is being offered to reinforce the ideas and principles of pneumatics in the same way.