

# FUN CHALLENGE TO KEEP YOUR BRAIN FIT THIS SUMMER!

Grades 3-12



# Let's Build a Bridge

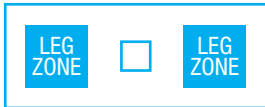
## THE CHALLENGE:

We cross bridges every day but what keeps a bridge up and how does it hold all of that traffic? Do some research and try to design and build a bridge that holds the greatest amount of weight.

Grades 4-10

## Supplies Needed:

- 200 popsicle sticks/ one bottle of craft glue OR 50 gumdrops and 100 flat toothpicks (per group)
- Wax paper
- Rulers
- Cardboard (with two 5cm square leg zones 15 cm apart and a 4cm hole cut in the middle of the cardboard)



- Small container to hold weights
- Weights (rocks)
- String

## Where to Begin:

- No materials may be used as a part of the bridge other than those stated above.
- The bridge may not touch the ground in any area outside the "leg zone" squares.
- The bridge must be at least 3 cm wide.
- The bridge must be at least 5 cm off the ground
- Think about the span of your bridge and the weight it must support.
- Design and build your bridge.

## The Results:

- Display your bridges.
- Conduct strength tests by tying a string to the bridge and suspending weights from the string through the hole in the center of the cardboard.
- Which bridges held the most weight?
- Why do you think one held more weight than another?



## If you need help or more information connect with a tutor at Tutor.com:

- What Geometric shape will produce the greatest strength? (Geometry)
- How does Geometry help engineers build bridges? (Geometry)
- What forces act on a bridge? (Physics)
- How can bridges be built to deal with weather and other wear? (Earth Science)
- Where are the 3 longest bridges in the world and how long are they? (Social Studies)
- Are there different kinds of bridges? What are they? (Social Studies)

# Spacing Out

## THE CHALLENGE:

Ever dreamed of being an Astronaut? Did you know there are three people living and working on the International Space Station? Imagine that you and your friends have to spend a year together on your own space station orbiting Earth and working on scientific experiments. What would you need to live and be comfortable in space? Use the ideas you come up with to design your own space station.

Grades 6-10

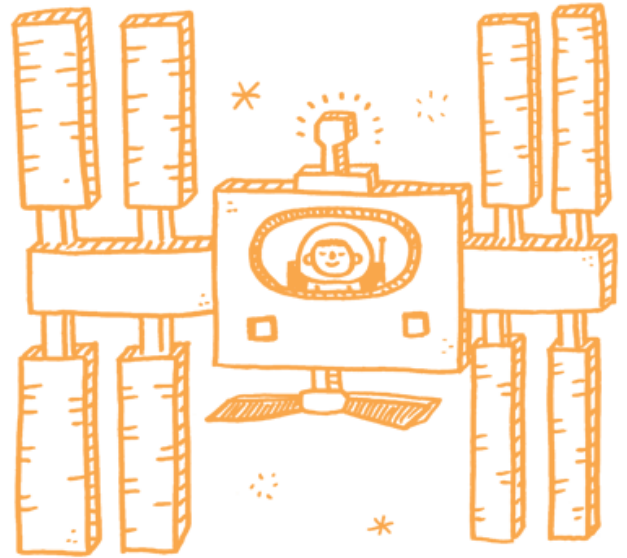
## Supplies Needed:

- Plenty of recycled cardboard boxes
- 1 roll of duct tape and a yardstick or tape measure
- 2 Plastic cups, 4 straws, and 5 pipecleaners
- Scissors or box cutters
- Tempera paint and brushes (optional)
- Digital camera for uploading images to Tutor.com (optional)

## Where to Begin?

Keep these things in mind when designing a space station:

- You must live comfortably together for an extended period of time.
- It must withstand the stress and strain of space, including the harsh conditions of high radiation.
- It must have a recycling unit for clean air.
- What kind of spaces will you need? Bedroom? Work space? Storage space? Utilities (how will you get power and water)?
- How large should the spaces be and what shapes? Are circles or triangles stronger?
- What will you eat? Do you need space for growing food?
- How will the lack of gravity affect your design?



## The Results:

- Once you have designed your space station, discuss the results and share your designs. Explain why you chose your design, what were you trying to accomplish?
- What features did you include and why?
- What challenges and scientific problems did you encounter and how did you resolve them?

## For Help or More Information Tutor.com Tutors are there to help:

- What shapes are the strongest for building in space? (Geometry) What materials are best? (Physics)
- What life support systems are needed for space travel? How are air and water recycled? (Biology)
- What could you grow on a space station if you had to grow your own food? (Biology)
- What kinds of changes would your body experience in zero gravity? (Biology)
- How large of a space does each human need on a space station? (Biology)
- How long can a human stay in space at one time? Do you need to sleep more or less in space? (Biology)
- How long does it take to get to the International Space Station? (Earth Science)
- How do scientists calculate the exact take off and approach locations for getting to the International Space Station? Remember, the Earth is spinning. (Physics)

# Let's Eat

## THE CHALLENGE:

It's important to eat well so that our bodies and minds function at their best. What does it mean to "eat well" and can we do that without spending a fortune? Develop a low-cost, highly nutritious meal plan to feed four adults for breakfast, lunch, and dinner for seven days with a budget of \$300. The plan must include daily recommended servings of fruits, vegetables, protein, and grains and provide each person 1500 - 2000 calories per day. Think about variety as you plan your meals, no one wants to eat the same food every day.

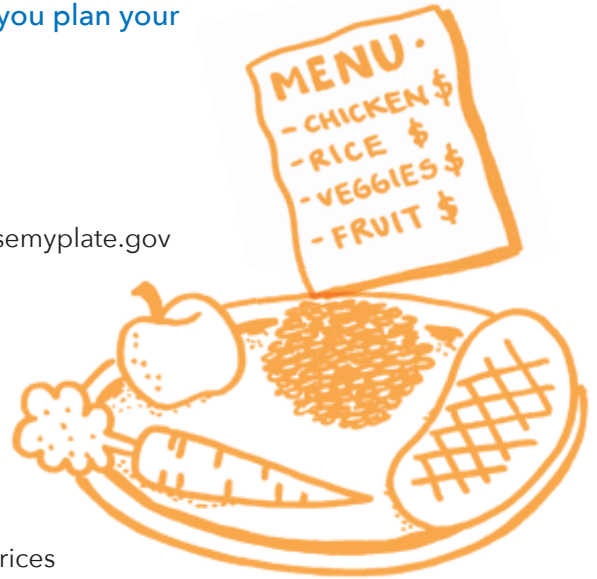
Grades 7-10

## Supplies Needed:

- Paper and pencils
- A calculator
- Access to food and nutrition information online at sites like [www.choosemyplate.gov](http://www.choosemyplate.gov)

## Where to Begin:

- Check out online sources of information on what food groups and foods constitute a balanced nutritious meal.
- You may want to have a few different choices for your breakfasts, lunches and dinners.
- Think about portions. How much of each food group will each person eat?
- Now it's time to do your grocery shopping. You can find out grocery prices at a nearby store or from an online grocery store such as [Safeway.com](http://Safeway.com).
- Pull it all together into a plan with costs. How are you doing in relation to your \$300 budget? Do you need to swap out some items for something nutritious but a bit less expensive? Do you need to cut down on your portions?



## The Results:

- Share your meal plans with each other.
- Were you able to stay within your budget?
- Would you eat those meals? Why? Why not?
- What did you find most surprising?
- Do you think you can eat healthy on a budget? Why? Why not?

## If you need help or more information connect with a biology tutor at [Tutor.com](http://Tutor.com):

- Understanding what components make up nutritious meals.
- How do you read a nutrition label? What are you looking for?
- Are all calories equal? Do 100 calories of junk food have the same impact on your body as 100 calories of vegetables?
- What happens to your body when you don't eat enough calories per day, or when you eat too many?
- What is the difference between good fats and bad fats?
- Are low-fat foods good for you?
- How does your body utilize sugar? Are there good and bad sugars?
- What other factors must be considered for a healthy lifestyle?

# Feel the Burn

Grades 6-10

## THE CHALLENGE:

When you think about exercise you might think about playing sports, riding your bike or even playing an interactive video game. But did you know exercise is really all about science and math? To understand how exercise really works, find out what activities are required to pass the fitness test for each branch of the military. Then, use one of these [fitness calculators](#) to calculate how many calories a 150 lb. person would burn for each fitness test. Finally, design a workout plan that enables that same 150 lb. person to burn 2100 calories per week. You may even want to design your own fitness plan!

## Supplies Needed:

- Paper and pencils
- A calculator
- Access to fitness information and exercise calculators online

## Where to Begin:

Research what it takes to pass a fitness test for any of the military branches at <http://www.military.com/military-fitness/> then figure out how many calories are burned for each type of activity. Design a workout routine that burns the same amount of calories for a 150lb. person as your chosen fitness test, contains at least 3 different activities, requires the person to exercise at least 3 days per week, and is interesting enough to keep the person motivated.



## The Results:

- Discuss the results.
- Do you think you could do what the service members have to do to pass each of the military fitness tests?
- Share your recommended routines. Which do you think is the routine that will work best and why?
- Do you think you would follow that routine?
- What activity will burn the most calories for a 150 lb person? Would a person be able to do that for every workout?
- What happens over time to your muscles when you do the same workout over and over again?
- Given your answer to #7, how would you change your workout to fight the problems associated with working out using the same routine?
- Why do your muscles feel sore after working out?
- Is it a good thing for your muscles to keep working out when they are sore?

## If you need help or want more information Tutor.com tutors can help you!

- To research the requirements to pass the fitness tests for each branch of the military. (English)
- To check your calculations for calories burned. (Math)
- To help you to understand why certain exercises burn more calories than others and the differences in losing weight by dieting versus through exercise. (Biology)

# Spin It in a Minute

## THE CHALLENGE:

To test your imagination and your writing skills, create an “anthology” (which means a collection of selected writings). Your anthology will be published at the end of camp or shared in a public reading. You will be writing “micro-fiction” or “micro-non-fiction” which is another way of saying “very, very short pieces of writing”. Remember that fiction comes from your imagination and non-fiction is written work that offers opinions about facts or reality. The works that you write should be 6, 25, 50 and 100 WORDS long. That means your first piece will be shorter than this sentence!

## Where to Begin:

*Research, read, discuss:*

You could start by reading and discussing examples of micro-fiction/ non-fiction of different lengths and on different topics and discussing common features of this type of writing.

What do you think makes some examples more interesting than others?  
How does this type of writing differ from longer works?

*Brainstorm:*

What might be some good topics to write about? You will want to pick one “story” or work of non-fiction for each topic you select. Let’s say that you decided that you want your themes to be earth, water, air and fire. You would write one story about each of those themes. One story would be 6 words long and each of the next stories would be 25, 50 and then 100 words.

*Write your stories:*

Get started together or separately creating your works and your anthology. Share your writing as you proceed. All good writers get feedback.

## The Results:

- Print your results and don’t forget to include the name of the author!
- Read your stories to the group.
- Discuss why you chose your topics.
- What did you like about micro-writing?
- What did you find most challenging?
- Do you prefer writing short pieces or longer ones?
- What advice would you give to other micro-writers?

Grades 3-12



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- Brainstorm ideas.
- Edit your work down to size.
- Review your work and provide feedback.
- Recognize what a great job you are doing!



# Fruit Power!

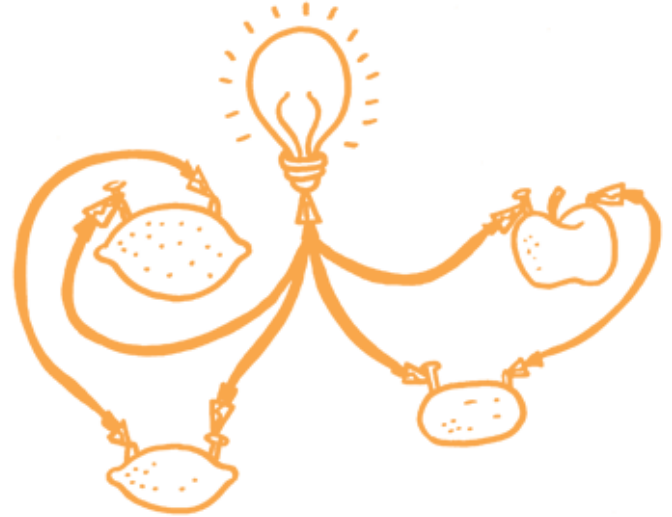
## THE CHALLENGE:

Do you ever stop to wonder how those batteries in your remote control really work? See if you can build a battery that conducts electricity. It may not be strong enough to power your remote, but you can test the voltage with a multi-meter and do your best to light an LED light bulb.

Grades 7-10

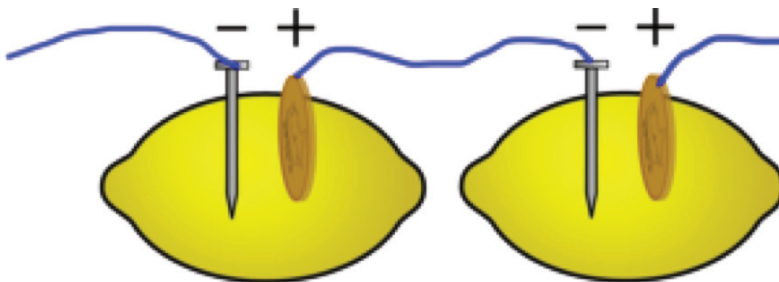
## Supplies Needed:

- Four lemons, two apples, and two potatoes per group
- Approximately three feet of copper wire per group
- One pair of wire cutters per group
- One knife and cutting board per group
- Galvanized nails (at least 12 per group)
- Copper pennies (at least 12 per group)
- Alligator clips
- A small LED bulb
- A multimeter (one per group if possible, but otherwise at least one that can be circulated among groups as they test their batteries)
- Notepaper
- A digital camera for uploading photos to Tutor.com and/or a small digital clock (optional)



## Where to Begin:

- Set each piece of fruit on a table and gently roll it around to soften it up. You want the juice to be flowing inside the fruit without breaking its skin. Alternatively, you can squeeze the fruit with your hands.
- Make small inserts in the fruit with the knife.
- Attach copper wire to the nail and to a copper penny using the alligator clips.
- Insert the galvanized (zinc) nail and copper penny into each piece of fruit you use and connect them to the LED light bulb.
- The penny and the nails should be about 2" or 5 cm apart. You don't want them to be touching each other. Avoid puncturing through the end of the fruit.
- If your light bulb doesn't light, attach the wire ends to the multimeter to see if you are generating electricity. Remember, you might have the wrong ends attached to the two wires on the light bulb and you will have to switch them. One side of the light bulb is the positive side and one side is the negative side. If the multimeter is showing that you are generating electricity, then you need to troubleshoot the connection to the light bulb and/or the amount/type of fruit used.



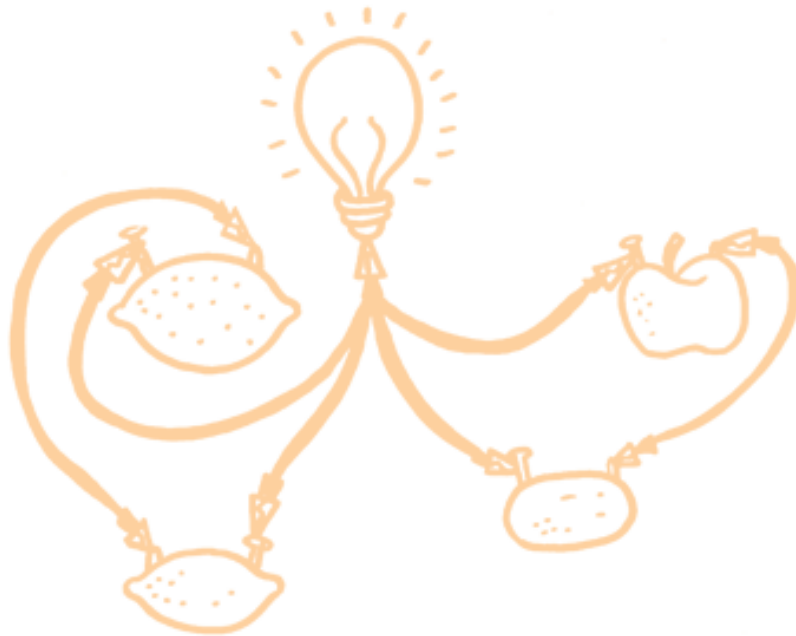
- Try this with as many fruits and vegetables and as many combinations of fruits and vegetables as you'd like.
- Hint: to generate more electricity, you can connect a wire from the penny on one piece of fruit to the nail on another piece of fruit. You can form a chain of fruit by doing this.
- Scientists document their work. Be sure to take notes on each combination and the results you found.

*continued*

# Fruit Power!

## The Results:

- When time is up (30 to 40 minutes, typically), discuss your strategies and results.
- Did the light bulb light? How much electricity did each group generate?
- What combinations did you try and which ones generated the most electricity?
- Why do you think some combinations worked better than others?
- How do you organize the fruit battery to generate the most current?
- What do you think happens if the zinc and copper touch each other?
- What happens if you connect the penny on one piece of fruit to the penny on the next piece of fruit?
- Does the penny represent the positive or negative charge?
- Does the nail represent the positive or negative charge?
- How does electricity flow? From positive to negative charge or from negative to positive charge?
- Could you use plastic nails? Why or why not?
- Could you use a nickel instead of a penny?
- What is the most important component of battery design? Why can't we design batteries that hold their charge forever?



**If you need help or more information connect with a physics tutor at [Tutor.com](https://www.tutor.com):**

- Review how batteries work.
- Get ideas for making batteries.
- Strategize ways to generate more electricity than other groups.
- Figure out why your battery does not seem to be working.
- Understand the answers to the questions listed above.