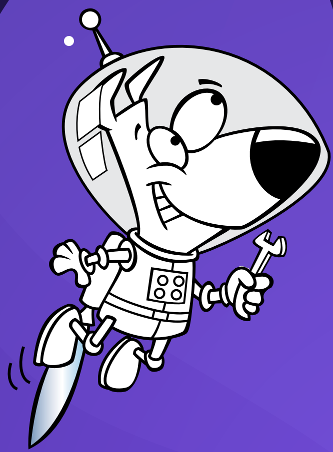


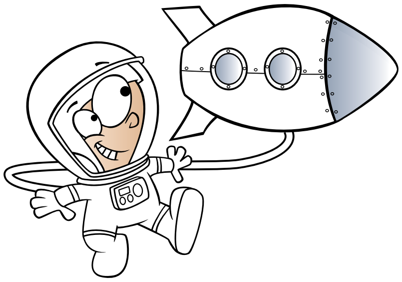
WagiSpace

Your Mission Book to Great Ideas!

Kathy Schubert and Chic Thompson
with Bethany Bogacki, Jennifer Li and Lexi Hutchins

Your Mission Book

Look Down... Look Up!



Your Missions:

1. Gravity
Let's Build a Contraption

2. Lift Off
Let's Build a Bottle Rocket

Let's Create Rocket Fuel

3. Life in Space
Let's Create a "Space Diaper"

4. Return Home
Let's Land an Egg

5. Everyday Challenges
Let's Play the "**Smash-Up**" Game!

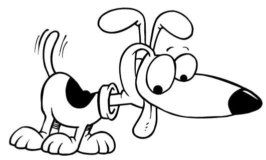
Resources

WagiLabs is a nonprofit 501 (c)(3) organization.

ISBN: • woof@WagiLabs.org • +1 434-296-6138

"In the beginning, God created
the heavens and the earth."

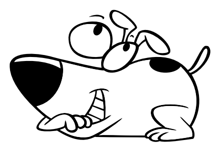
Look Down...



What do you see?

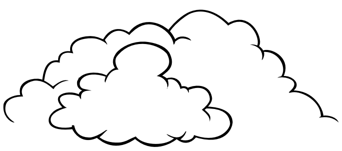
Your hands, your phone, your shoes, the earth. What you see are things within your reach and within your control.

Now, Look Up!



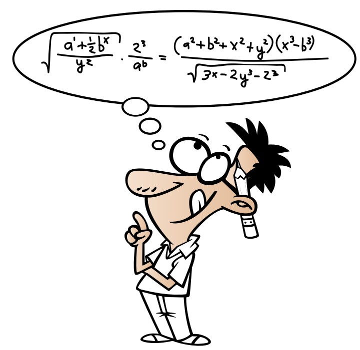
What do you see?

The ceiling! **That's not exciting!**



If you are lucky to be outside, you see the clouds, the stars, and the heavens.

Looking up helps you see what you could have and drives you to seek new things.



Looking up is a source of inspiring creativity and encourages engineers to explore space and travel to far away places like the Moon and Mars.

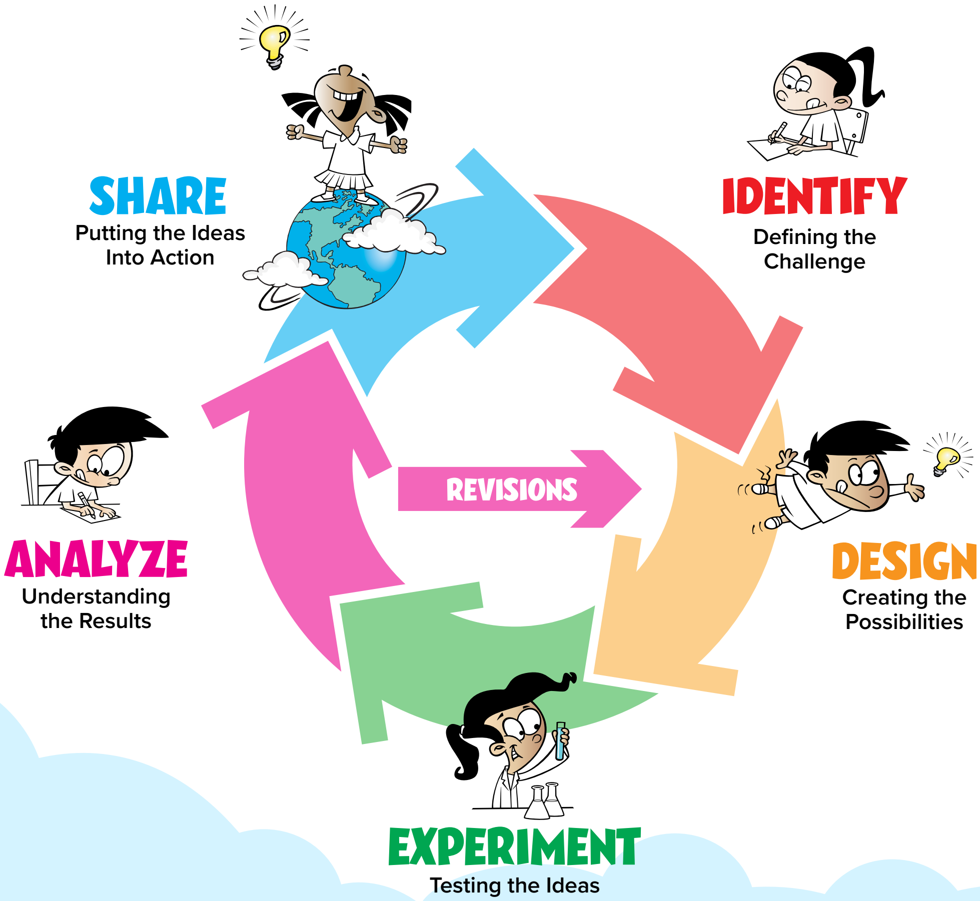
To launch into space, you have to use **science**, **technology**, **engineering**, and **mathematics**. This is what we now call **STEM** and **STEM** education has three goals:

1. Preparing students for college and graduate study in the fields of science, technology, engineering, and mathematics.
2. Fostering inquiring minds, logical reasoning, and collaboration skills.
3. Providing hands-on lessons making math and science both fun and interesting.

To understand **STEM**, you need to understand the scientific way of thinking. In science, it's questioning and experimenting; in technology, it's using cool tools and making stuff work; in engineering, it's designing and building; and in mathmatics, it's calculating and seeing numerical patterns.

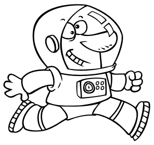
SCIENCE	TECHNOLOGY	ENGINEERING	MATHMATICS
Questioning	Inventing	Designing	Patterning
Observing	Using Tools	Creating	Sequencing
Experimenting	Identifying Issues	Building	Numbering
Predicting	Making Stuff Work	Solving	Shaping

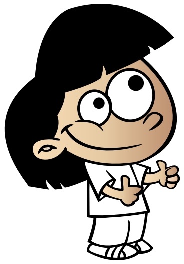
STEM thinking can be described in five key steps. We'll use these steps on our first mission: learning about **gravity**.



1. Gravity

We have been on a kidpreneurship journey of **looking down** and identifying community challenges and then brainstorm solutions to present at the GuppyTank.





Now we are going to **look up** to space and see how our astronauts get there safely, how they live once in space, and how they return home.

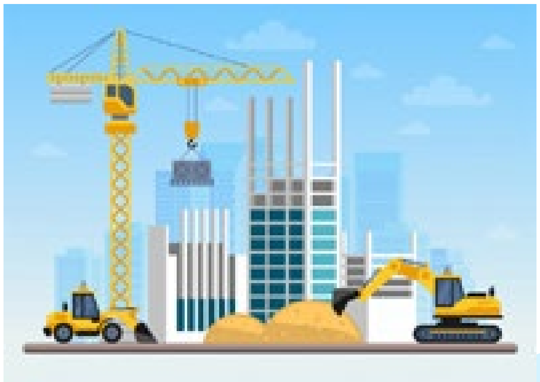
We'll start off our missions with first learning about gravity.

Here on earth, gravity is such a part of our lives that we rarely think about it. **Gravity affects everything we do**, and you see gravity in action any time you drop something and watch it fall to the ground.

Gravity makes it easy for you to keep your feet on the planet. It also keeps objects on the ground, and a lot of those objects are very heavy.

Think about a construction site and how we can lift beams and glass and metal to make buildings that soar far into the sky.

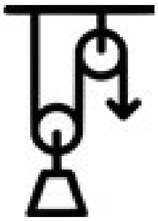
How are we able to build skyscrapers despite the effects of gravity? Well, we've developed **simple machines** to use as tools. Simple machines are devices with no, or very few, moving parts that make work easier.



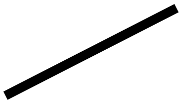
What are Simple Machines?

Describe these six simple machines and give an example:

1. What is a **pulley**, and how does it help us?

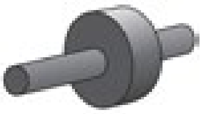


2. What is an **inclined plane**, and how does it help us?



3. What is a **lever**, and how does it help us?

4. What is a **wheel and axle**, and how does it help us?

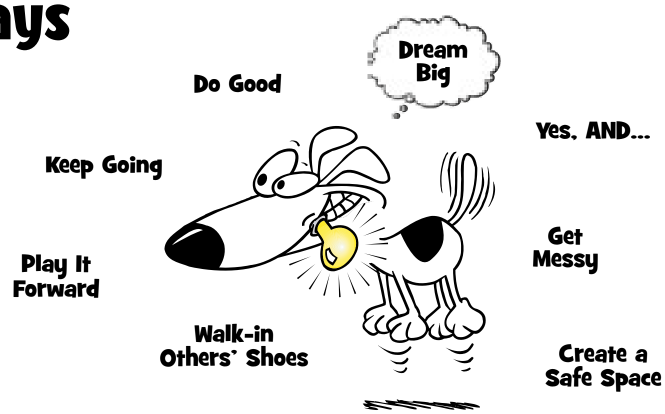


5. What is a **wedge**, and how does it help us?

6. What is a **screw**, and how does it help us?

Before we attempt our **first challenge**, let's review the **WagiWays** we learned in WagiLabs.

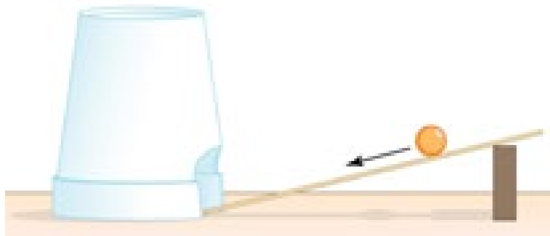
The WagiWays



1. **Create a Safe Space:** We start by being kind to ourselves and each other.
2. **Dream Big:** We brainstorm a lot of amazing ideas — there are no limits to our creativity!
3. **Yes, AND:** We always say: "Yes, **AND**..." when someone shares an idea. That means "I hear your idea ... **AND** I'm ready to learn more and add my ideas to make it grow!
4. **Walk-in Others' Shoes:** We imagine what other people's lives are like by "**trying on their shoes**" so we can see the world through their eyes. Having compassion is how we understand the changes that are needed in the world.
5. **Do Good:** We remember to focus on ideas that will make life better for our community and the world.
6. **Get Messy:** We build prototypes of our best ideas. We conduct experiments and learn through trial and error.
7. **Keep Going:** We never give up. We keep trying to build and sell our ideas, even when we face obstacles. We try different solutions when our first try doesn't work.
8. **Play It Forward:** We leave footprints that become a pathway to invention for kids around the world.

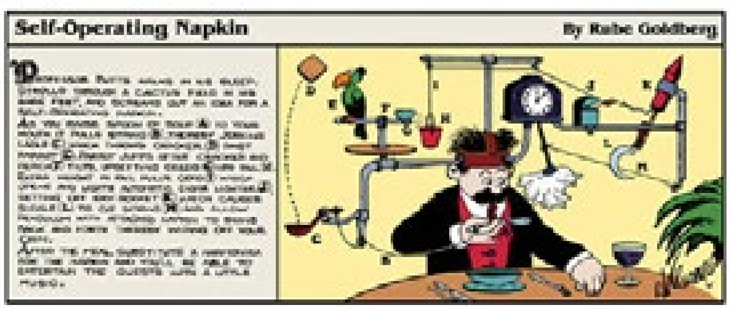
Your STEM Challenge:

Let's Build a Contraption

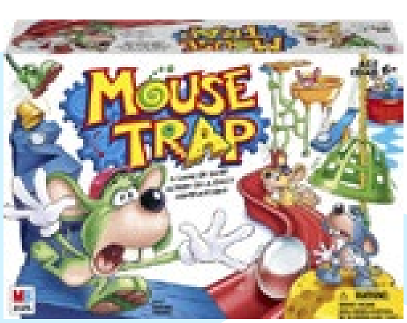


Now that you understand simple machines, we want you to design and build a Rube Goldberg-like contraption **to put a marble into a paper cup**.

Rube Goldberg (1883-1970) was a cartoonist, sculptor, engineer, and inventor. Rube created wacky, complicated contraptions that performed simple tasks like opening an umbrella, scratching someone's back, or sharpening a pencil.

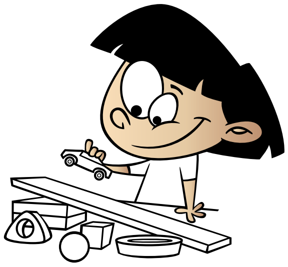


A Rube Goldberg contraption consists of a series of simple machines that are linked together to produce a domino effect, in which each device triggers the next one, and the original goal is achieved only after many steps.



You may be more familiar with his work than you think: If you've played the classic "Mouse Trap" board game, then you've experienced the fun of Rube's creations.

Your contraption must:



- include at least **four** different **simple machines**
- be made with recycled or repurposed materials
- have at least **eight** distinct **steps**
- tell a story about the challenges you are trying to solve with these simple machines and how this exercise relates to your everyday life challenges.

A definition of a step is a single action or movement; for example, a marble rolling down an incline plane would be one step, and putting the marble in the cup is another step.

Win a Prize If You Use 26 Steps?

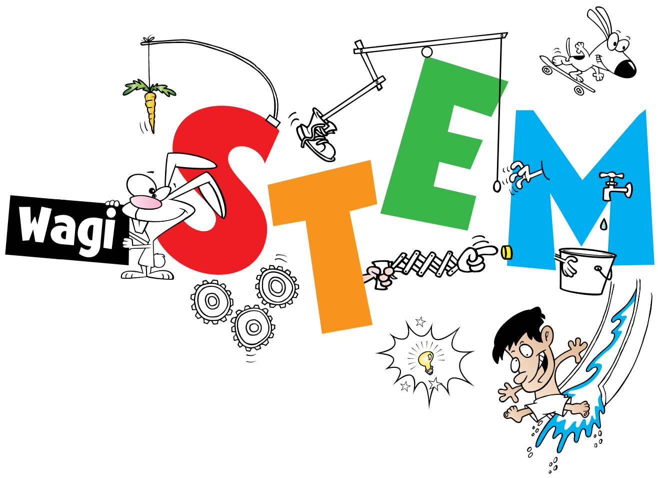
Rube Goldberg said most people go from point A to point B in life as quickly as possible. He wanted to go from A to B **using all of the letters in the alphabet** to see new ideas and experience life. There are 26 letters in the alphabet. Create a contraption with 26 steps and send us a video (email it to woof@wagilabs.org), and if selected, you'll receive a cool prize and social media spotlight for your contraption.

Here are links to some Rube Goldberg videos on YouTube that might give you ideas. It's good to "borrow" some of the ideas demonstrated in the videos.

https://www.youtube.com/watch?v=GEzcO3nfjZk

https://www.youtube.com/watch?v=RBOqfLVCDv8

https://www.youtube.com/watch?v=0lz8_aaKNXA



Here's a fun contraption we drew about **STEM** to inspire you. Have fun designing, experimenting, building, and testing your marble-in-a-cup contraption.

Please **DO NOT** go out and buy materials. The fun of a Rube Goldberg contraption is the challenge of working with and repurposing everyday items.

Needed Materials:

All teams will need identical marbles and paper cups, and then you can use whatever additional materials you'd like.

Think about bringing:

- cardboard
- toilet paper rolls
- egg cartons
- Legos
- string
- clean food containers
- toy cars
- aluminum foil
- duct tape
- ruler

You'll also want an adult to review and judge your contraption using the below criteria. A relative, family friend, your favorite teacher — they all make great candidates for a judge.

Judging Criteria:

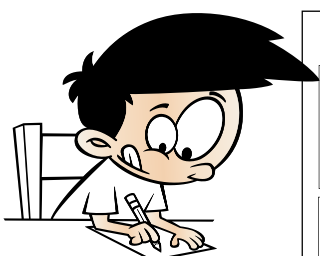
These points will be awarded based on the final run and no points will be awarded on any practice runs.

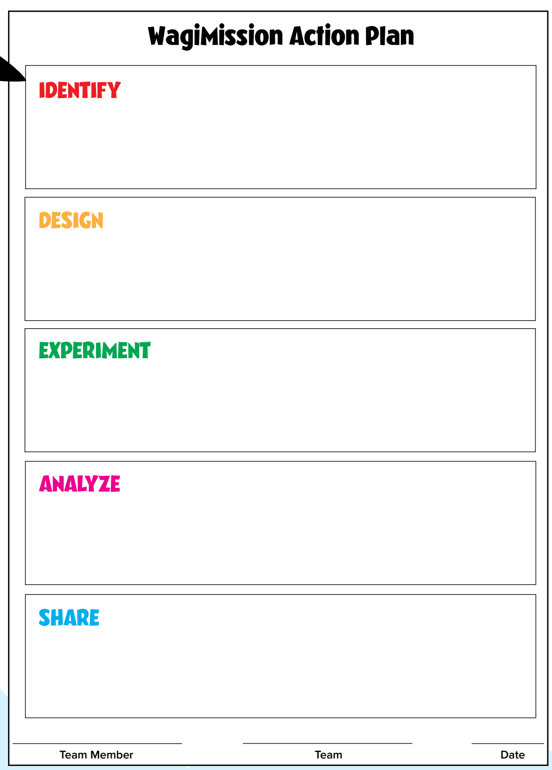
Number of simple machines used	___	x 15 points	=	___
Number of different materials used	___	x 15 points	=	___
Number of fixes to complete run	___	x (-15 points)	=	___
The challenge story you tell (up to 25 points)			=	___
			TOTAL	____

Mission Action Plan

Now it's time to introduce the **Mission Action Plan** that we call the **MAP**.

Please fill this out as you are moving through the mission and turn it in to your teacher to get credit for your participation.





WagiMission Action Plan

IDENTIFY

DESIGN

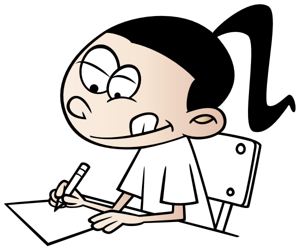
EXPERIMENT

ANALYZE

SHARE

Team Member   Team   Date

Time to Brainstorm:



Your brainstorming goal is to come up with creative ways to put the marble in the cup using as many steps as possible.

1. Each team member will work on their own for **20 minutes** and sketch a draft of a contraption and a story for what challenge you are trying to overcome.
2. The first step starts with releasing the marble, and the last step is the marble dropping into a cup.
3. Share your design with your team members.
4. As a team, decide which components you like from each person's design.
5. Combine your best ideas to sketch your team's contraption and the story your team will tell.

Time to Build:

1. Start building your contraption.
2. Label each step and each simple machine used.
3. Give your turns and twists fun and descriptive names.
4. Celebrate success with sounds, flags, and billboards, whatever you can dream up!
5. Do trial runs of the marble through the simple machines.
6. Tweak the machines to allow a flawless run of the marble into the cup.
7. Now, it's time to present your story and do your final run.
8. Have fun!!!

Time to Present:

1. Every contraption needs to tell a story of overcoming a life challenge. What story does your machine tell?
2. You'll be presenting your story before you launch your final run in the competition.
3. Pick who the presenters will be.
4. Practice telling your story and following the story with a demonstration of your contraption.
5. Pick the guides that will help out if your marble gets stuck.

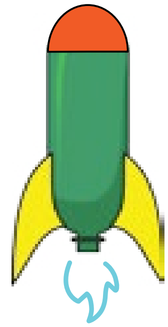
Time to Journal:

1. What did you learn from this exercise?

2. How did you use **STEM** in building the contraption?

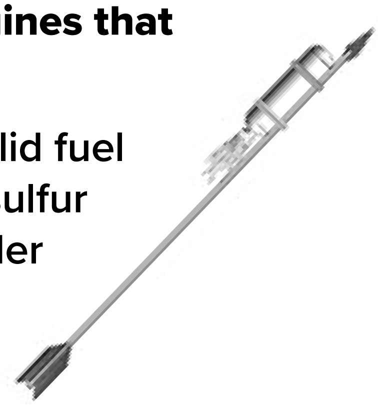
3. What ideas from this exercise can you apply to other life challenges? Did you experience what engineers call learning from "trial and error."

2. Liftoff!



We are now going to build a bottle rocket and blast off… **outside**!!!
First, we need to learn what is a rocket and what physical and chemical reactions allow it to overcome gravity and take off into the sky.

A rocket is a vehicle propelled by one or more engines that launches something into the sky.



In 1232, the Chinese invented **solid fuel** rockets. Solid fuel rockets typically burn a mix of nitrate, carbon, and sulfur — which are the same ingredients used in gunpowder but mixed in proportions to allow them to burn rapidly without exploding.

Solid-fuel rockets work well for some tasks (such as blasting satellites into space), but the engine and thrust cannot be controlled.

So, scientists invented a different kind of rocket that burns **liquid fuel**, such as liquid oxygen and liquid hydrogen.

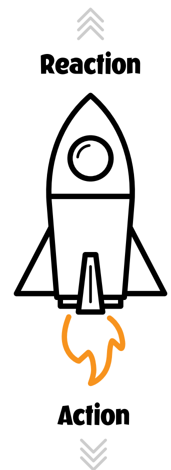
The engines and thrust on these rockets can be controlled, making them ideal for space missions like sending a spacecraft with people in it to the moon!

Only three countries have built a rocket powerful enough to break through the earth's gravity and lift a manned spacecraft into outer space.

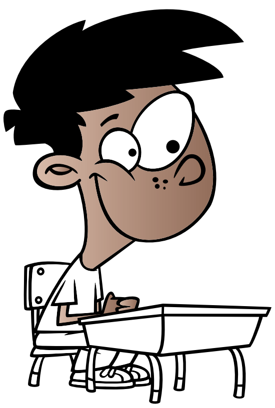
Who are those countries?

Are there any other countries working on rockets to take them into space in the future?

Newton's Third Law of Motion



To understand the physics behind how a rocket works, you must first understand Isaac Newton's Third Law of Motion, which says **"for every action, there is an equal and opposite reaction."**

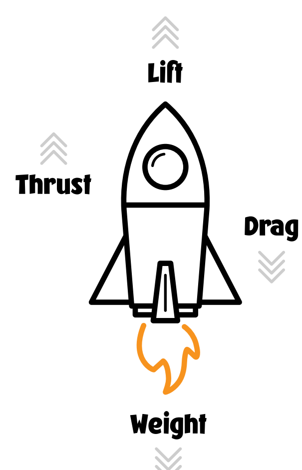


For example, when you sit in your chair, your body exerts a downward force on the chair and the chair exerts an upward force on your body.

In a rocket, there is a very powerful engine designed to cause a chemical action that results in a rapid and robust reaction. Exhaust gasses come out of the nozzle of the engine located at the tail of the rocket at very high speeds. This explosive force pushes the rocket off the launchpad.

The strength of a rocket is its **Thrust**. It takes a lot of thrust to get a rocket off the ground, and it takes a lot of fuel to create so much thrust. One of the biggest challenges of rocket design is how to lift off with enough fuel on board the rocket to complete the mission. No one wants to only go half way to the moon.

Rockets fly because they can generate a force called **Lift**, which moves the rocket upward. The forward motion of the rocket creates **Lift** through the air. This motion is produced by the **Thrust** of the engine(s).



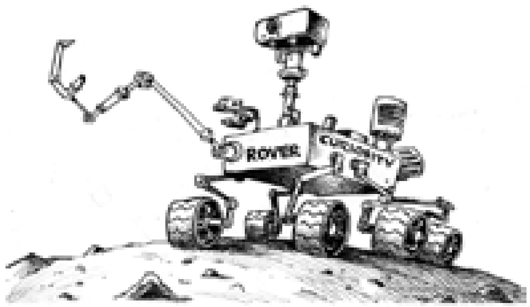
Here's a diagram of the four forces acting on a rocket: **Thrust**, **Lift**, **Drag**, and **Weight**.

Drag is the force produced by the resistance of the air to the forward motion of the rocket. Swish your hand rapidly side-to-side, and you will feel that resistance on your hand.

Weight is the force created by the pull of gravity toward the center of the earth. You will feel the effect of this force if you jump up from the floor. Your weight will force you back down.

When the **Thrust** produced by the engine(s) is greater than the force of **Drag**, the rocket moves forward. When the forward motion is enough to create a force of **Lift** that is greater than the **Weigh**t, the rocket moves upward.

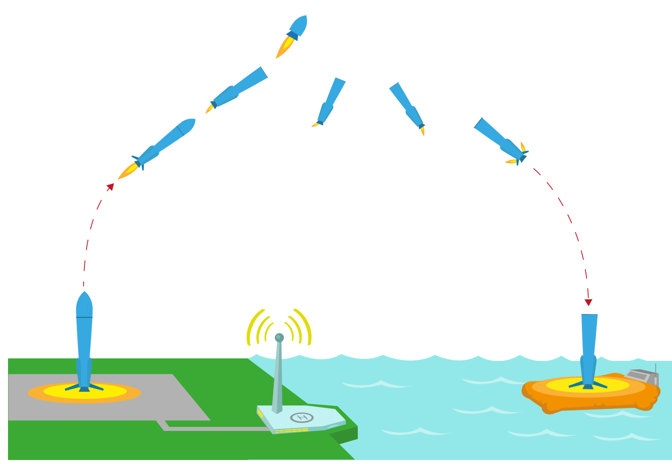
The size and weight of a rocket are determined by the size of the payload, what it's carrying into space, and the amount of fuel it needs to provide enough thrust to lift off.



For example, the Mars Rover Curiosity is about the same size as a car, weighs almost 2,000 pounds. Curiosity was designed to explore the crater Gale on Mars and was launched on a two-stage Atlas V 541 rocket with all the fuel needed for liftoff and sending the payload to Mars.

That's a lot of fuel!

Rockets are built-in stages, with the first and most significant stage used for breaking through the earth's gravity. Additional stages are used for delivering the payload to its in-space destination.



Your STEM Challenge:

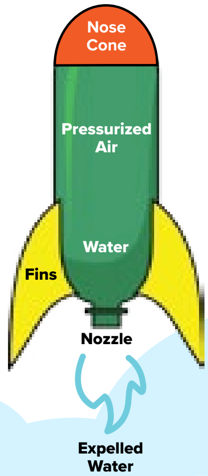
Let's Build a Bottle Rocket!

Needed Materials:

- A large, empty plastic soda bottle (no larger than 2 liters)
- Cardboard, tape
- A cork that fits the neck of the soda bottle
- A bicycle pump with a needle adapter
- Water
- If you want to decorate your rocket, you'll need markers or paint and tin foil.

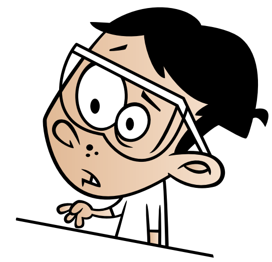
Time to Brainstorm and Build:

1. The large soda bottle will serve as the body of the rocket.
2. Paint the bottle and use tin foil to create a nose cone or cover the fins.
3. Cut four triangles out of cardboard to make fins 4-inches tall.
4. Use tape to attach fins around the top neck of the bottle, near the cap. You will turn the bottle upside down, so the neck of the bottle is at the bottom of the rocket.
5. Create a nose cone out of cardboard for the top of rocket.
6. At this point, the bottle should look something like this.
7. Fill the bottle one-quarter full of water.



8. Make sure the needle on the air pump is longer than the cork. If not, trim the cork so that the needle is longer.
9. Push the cork into the opening of the bottle. It should fit snugly and prevent the water from leaking out.

Now go outside and find an open space where you can conduct this experiment without risking the well-being of others, animals, or property.



It's time to put on your safety goggles.

1. Connect the bottle to the pump by inserting the needle into the cork.
2. Set it up with the top of the bottle with the cork in it pointed down at the bottom of the rocket.
3. Make sure the fins are strong enough to hold it up on its own. If not, modify the fins or create a launch stand.
4. Stand back from your rocket.
5. Carefully pump air into the bottle. The bottle will launch as the air pressure inside the bottle increases.
6. This pressure increase will knock the cork out of the bottle while pushing water out in the downward direction, pushing the bottle skyward.
7. Did your rocket launch? If not, try to figure out why and what you need to change to achieve liftoff. Then try it again.
8. If it did launch, how high did your rocket go? Did it go higher than your house or your tallest tree? Did it reach the clouds?
9. Is there anything else you would change about your rocket design to improve its performance?

WagiMission Action Plan

IDENTIFY

DESIGN

EXPERIMENT

ANALYZE

SHARE

Team Member

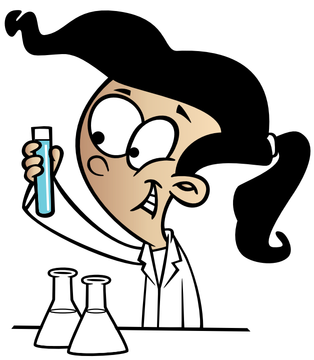
Team

Date

Your STEM Challenge:

Let's Create Rocket Fuel!

Needed Materials:



- Three plastic 16 oz water bottles
- Three balloons
- 3 Tablespoons of baking soda
- 8 ounces of water
- 8 ounces of club soda
- 8 ounces of vinegar
- Measuring cup
- Funnel
- Tape

In this exercise, we are going to "test" the properties of different combinations of simulated "rocket fuel." This exercise may get messy, so make sure you dress appropriately and again wear your safety goggles!

1. One experiment will test water and baking soda.
2. The second experiment will test club soda and baking soda.
3. The third will test vinegar and baking soda.

The balloons will contain the baking soda and be attached to the water bottles so that when the two ingredients mix, the balloon captures the gas produced by the chemical reaction.

Instructions:

1. With a funnel, add one tablespoon of baking soda inside each of the balloons.
2. Set up three water bottles. Each one will have 8 ounces of liquid. The first one will have water, the second will have club soda, and the third will have vinegar. You can write the type of liquid on the outside of the bottle to keep track.
3. Carefully attach one of the balloons to the neck of each bottle. Be sure that you don't add the powder to the liquid. The balloon should fit tightly over the neck of the bottle. You can tape the balloon onto the bottleneck to make sure it stays on during the chemical reaction.
4. When all three bottles are set up, carefully lift the balloons to empty the powder from the balloon into the liquid.
5. Observe the reactions.
6. Can you explain what happened?
7. What happens if you gently shake the liquid in the bottles?
8. Which mixture would you choose to fuel your rocket, and why?

Time To Journal:

1. What did you learn from these exercises?
2. How did you use **STEM** in building the fuel and the rocket?
3. What ideas from this exercise can you apply to other life challenges?

WagiMission Action Plan

IDENTIFY

DESIGN

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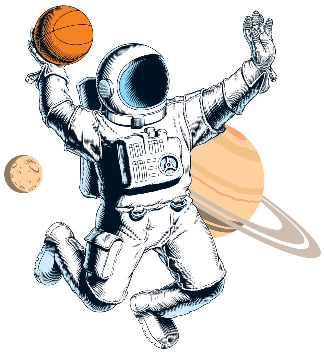
Team Member

Team

Date

Fun Space Facts

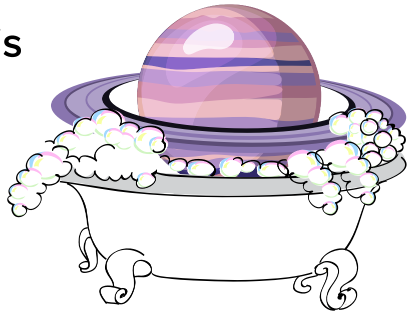
Space is **completely silent**. The radio signal a spacecraft uses to contact Earth has no more power than a refrigerator light bulb.



The gravity on Mars is **one-third that on Earth**. You'd be able to jump high enough to dunk a basketball on a Martian court.

If you could stand at the Martian equator, the temperature at your feet would be like a warm spring day, but at your head it would be freezing cold!

The average temperature on Venus is more than 480 degrees Celsius (about 900 degrees Fahrenheit) — **hotter than a self-cleaning oven**.



Saturn is the only planet in our solar system that is **less dense than water**. It could float in a bathtub, if anybody could build a bathtub big enough.

Neptune's winds are the **fastest in the solar system**, reaching 2,575 kilometers per hour (1,600 miles per hour)! Neptune's giant, spinning storms could swallow up the whole Earth.

Astronaut footprints on the moon can be there for **100 million years**. Unless another astronaut or Rover unit travels over them!

3. Life In Space

Right now, there could be as many as nine people living and working on the International Space Station, also known as ISS. These astronauts and cosmonauts are living in zero gravity, and such a drastically different environment can be disruptive to an astronaut's health.

Living in zero gravity can feel like having a constant head cold because the fluids in your body rise to your head, and moving around in zero gravity can cause you to experience motion sickness.

While our day on earth is 24 hours long with one sunrise and one sunset, the ISS orbits the Earth 16 times per day. That makes for a **sunrise every 90 minutes**.

To keep the crew comfortable, the ISS has a galley, refrigerator, freezer, and kitchen table, as well as exercise equipment, sleeping cabin, toilet, and washbasin.

When it is time to sleep, astronauts have sleeping bags attached to the wall of their small crew cabins. They can sleep just about anywhere in the ISS as long as they connect their sleeping bags to something while they are sleeping. They typically sleep for eight hours after a 16-hour mission day, and to block out the light and noise; they may wear sleep masks and earplugs.

The crew's average workday is 16 hours a day, and their activities focus on conducting experiments to understand how the human body reacts to this unique environment in space.

Maintaining the station is a full-time job in itself. The crew is continuously checking the station systems, cleaning air filters, maintaining equipment, and updating computer equipment to keep it in good condition. The crew also has to be ready for emergency repairs, spacewalks, and trash duty!

The crew practices daily hygiene, much like they would living on earth. To conserve water, they take sponge baths daily using washcloths and use a rinse-less shampoo to wash their hair.

Any excess water has to be captured with a vacuum and suctioned into a tank so it can be recycled and reused the next day. This vacuum also prevents any water from escaping and float around in space.

The next time you wash your hands or take a shower, think about how lucky we are living on earth with so many water resources and how gravity is working for you.

And just because we know you're wondering: **using the bathroom without gravity is a very different experience.**

The toilet aboard the ISS doesn't require flushing because it has fans that suck air and urine through a funnel, through a hose, and then into the wastewater tank.

The toilet consists of a toilet bowl and the urine funnel. The astronauts position themselves on the toilet seat using leg restraints and thigh bars. Remember, they are weightless in space and need to use the restraints, **so they don't float away.**

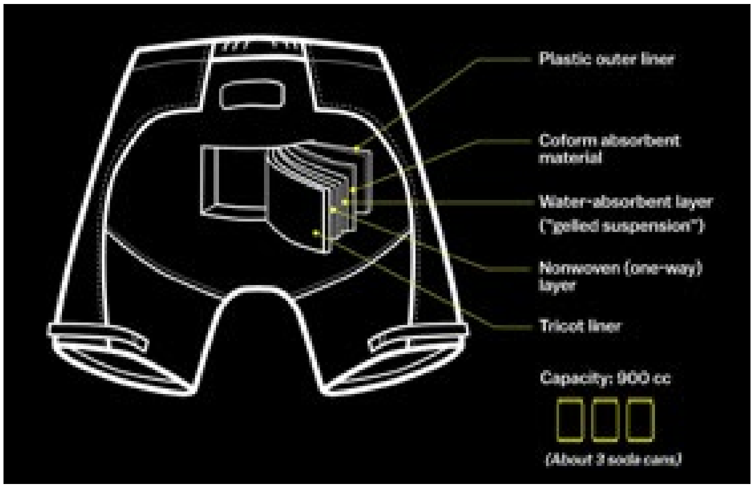
The toilet works like a vacuum cleaner with fans that suck air and waste into the commode. Each astronaut has a personal urinal funnel, which has to be attached to the hose's adapter. Fans use air that is sucked into containers to capture solid waste products and pull the urine through the funnel and hose into the wastewater tank — **no flushing is needed**.

Your STEM Challenge:

Let's Create a Space Diaper!

Managing fluids in space comes with a load of unique problems. So NASA developed a "Maximum Absorbency Garment" (MAG) for the shuttle program. They're sometimes called "space diapers."

MAGs are more like hyper-absorbent bike shorts. Several thin layers of material move urine quickly away from the body. Then sodium polyacrylate, a super-absorbent polymer (SAP) crystal material, capable of taking on 400 times its weight in water, locks away the moisture. A MAG can soak up 2 liters — or 2.1 quarts — of liquid. That's like absorbing all the liquid in 3 cans of soda!



Time to Brainstorm:

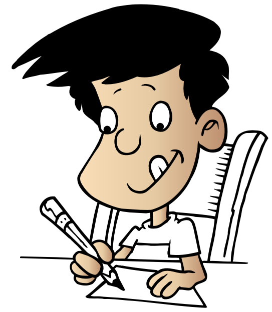
Can you think of three more uses for these super-absorbent polymer crystals besides NASA space diapers?

1)

2)

3)

Your Mission:



To experiment with different materials to determine their absorbency properties.

1. Are polycarbonate crystals the best absorber?
2. Rank all of the materials by best absorbency.
3. Rank all of the materials by cost.
4. What materials offer the best value based on the absorption and the cost?

Needed Materials:

1. 10 small cups
2. Different absorbent materials:
    - polycarbonate crystals
    - cotton balls
    - polyester stuffing
    - clay powder
    - paper towels
    - sponges
    - baking soda
    - silica gel
    - activated carbon
    - cut up washcloths
3. Water and a water dropper
4. Notebook and pencil

Time to Build:

1. Set up each material in a single cup and count how many drops of water are absorbed by the material.

    - polycarbonate crystals _______
    - cotton balls _______
    - polyester stuffing _______
    - clay powder _______
    - paper towels _______
    - sponges _______
    - baking soda _______
    - silica gel _______
    - activated carbon _______
    - cut up washcloths _______

2. Which material absorbed the most water drops?

3. Which material absorbed the least amount of water?

4. Which materials absorbed the liquid like you thought?

5. What other materials can you think of to absorb liquids?

6. Draw a sketch of a “Maximum Absorbency Garment.” It can be for any use you can think of and include your favorite absorbent materials.

7. What if you created a prototype of the MAG you designed?
    - How would you test your design?
    - Would you try it on?
    - Would you test it with water to see if it works?

When you test it out, you'll learn some very important information you can use to modify and improve your design.

Time to Present:

Share your new, breakthrough "Maximum Absorbency Garment" with your classmates and tell them about it's super absorption capabilities and comfortabe design.

Listen to their feedback and make revisions to your design. Then present to your family and friends. Look for more feedback to improve your design.

Time to Journal:

1. What did you learn from these exercises?

2. How did you use **STEM** in creating your MAG?

3. What ideas from this exercise can you apply to other life challenges?

WagiMission Action Plan

IDENTIFY

DESIGN

EXPERIMENT

ANALYZE

SHARE

Team Member

Team

Date

4. Return Home

Returning to earth might seem like it should be the easiest part of the mission, but it's one of the most challenging!

The Orion spacecraft designed for human exploration has to re-enter the earth's atmosphere traveling at speeds expected to exceed 20,000 mph. While the earth's atmosphere will initially slow the spacecraft down to 325 mph, a unique parachute system is deployed to achieve a safe landing speed of 20 mph or less.

Since earth is continuously spinning, as soon as the spaceship hits the earth's atmosphere, the particles of air creates friction. This friction helps to slow the spacecraft down but also causes intense heat during the initial re-entry phase of the landing.

In addition to carrying astronauts, the spacecraft has many delicate sensors and instruments that collect essential data, and need to be kept safe from the extreme pressure and heat of landing.

NASA has used multiple ways to slow down and soften the landing of their spacecraft, from balloons to parachutes.

Check out these resources on different spacecraft landings:

https://mars.jpl.nasa.gov/mer/mission/overview/

https://video.nationalgeographic.com/video/news/00000144-0a21-d3cb-a96c-7b2d0bb60000

https://www.youtube.com/watch?v=tdmZAvwznOU

Take a parachute, for example. It allows humans to land safely by decreasing what's known as their terminal velocity. When a human is free-falling, gravity makes the person accelerate quickly at first. However, as air resistance builds up, eventually, the two forces equalize until the human falls at a constant speed. This continuous speed, known as terminal velocity, is still too dangerous for humans to land safely.

By employing a parachute (which dramatically increases air resistance), the human can then decrease their rate of descent to a safe speed, at which point they can land on their feet.

Time to Brainstorm:

Which materials would make an excellent parachute, and why?

1.
2.
3.
4.

Which materials would not work for this experiment, and why?

1.
2.
3.
4.

Your STEM Challenge:

Let's Land an Egg!

Without Breaking It!

You are to build a container that will prevent a raw egg from breaking when dropped from a height of at least 9 feet. Your design will hopefully:

1. Reduce the final speed of the egg by using air resistance.
2. Increase the time of impact by using cushioning.

Needed Materials:

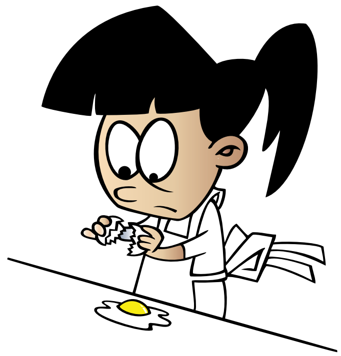
Each group of students gets the following:

- 2 balloons
- 2 small paper cups
- 4 straws
- 1 sq. ft. of plastic wrap
- 1 sq. ft. of aluminum foil
- 4 rubber bands
- 4 popsicle sticks
- 2 ft. of tape
- 1 egg
- 1 bull's eye floor target
- 1 floor covering (newspaper, tarp)
- 1 pair of scissors

Guidelines:

1. If your egg breaks, **it will be a mess.** All teams are responsible for cleaning up after themselves!
2. Your container must be designed so the egg can be inserted easily before competing, and quickly checked after the drop.
3. The egg must stay inside the structure throughout the drop.
4. The final competition egg will be provided by the judges at the time of the competition. It will be a grade A raw egg.
5. There can be no manipulation of the egg to strengthen it.

Scoring Criteria:



1. All unbroken eggs beat all cracked or broken eggs.
2. All cracked eggs beat all broken eggs.
3. If the egg survives the first drop without breaking, the container can be dropped a second time to score more points.
4. If it survives the second drop without breaking, it can be dropped a third time.
5. **The least materials used in building the structure gets 10 bonus points every drop.**

First Drop:

Hits the bull's eye	10 egg points
Egg is unbroken and not cracked	10 egg points
Egg shell is only cracked	5 egg points
Egg is broken	-10 egg points
Container with least materials used	10 egg points

Second Drop:

Hits the bull's eye	10 egg points
Egg is unbroken and not cracked	10 egg points
Egg shell is only cracked	5 egg points
Egg is broken	-10 egg points
Container with least materials used	10 egg points

Third Drop:

Hits the bull's eye	10 egg points
Egg is unbroken and not cracked	10 egg points
Egg shell is only cracked	5 egg points
Egg is broken	-10 egg points
Container with least materials used	10 egg points

Total Egg Points Score: ___________

Time to Journal:

1. What did you learn from these exercises?

2. How did you use **STEM** in safely landing your egg?

3. What ideas from this exercise can you apply to other life challenges?

WagiMission Action Plan

IDENTIFY

DESIGN

EXPERIMENT

ANALYZE

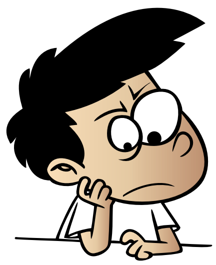
SHARE

Team Member	Team	Date

5. Everyday Challenges

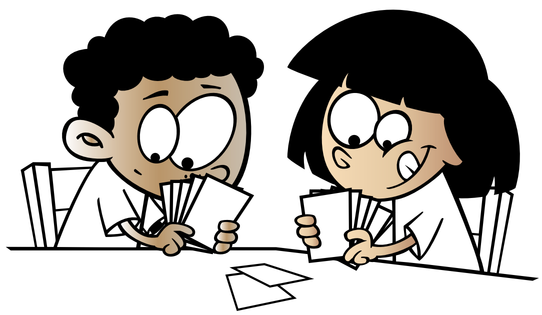
Congratulations, you were successful with your **WagiSpace** experiments. It's time now to develop a brainstorming process you can use on any future challenge, on earth or in space.

Think back to the last time you were stuck and needed to brainstorm solutions to a challenge. Were you sitting in a classroom with your friends eager to help you?



Probably not... you were most likely staring at your challenge with your arms crossed and teeth clenched.

So, we have designed a creative process to help you conduct a brainstorm and you can invite all of your friends to play.



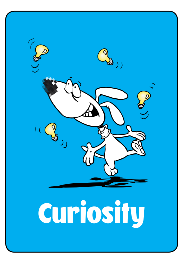
The "Ideas for Good" Card Game

In the card play, you will use your **curiosity**, **compassion**, and **courage** to come up with ideas to help solve your challenge.

Game Set-Up

1. To start, divide into teams and give your team a great name! You can also play as one team or just play by yourself.
2. Stack the seven playing cards facedown into piles by category: **Wagi Challenge**, **Lucky Break**, **Curiosity**, **Compassion**, **Courage**, **Pitch** and **Twist of Fate**.
3. Have a team member, one from each team, choose one **Wagi Challenge** card and read the description out loud to their team members.

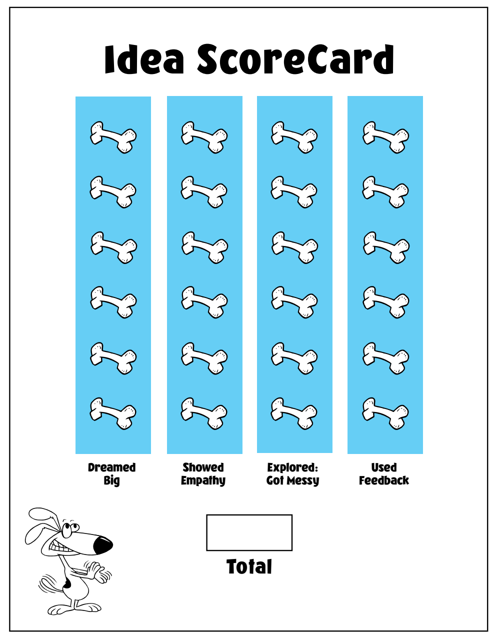
4. Then, have another team member pick a **Lucky Break** card from the pile to find out what help the team will get to solve their challenge. Spend a couple of minutes with your teammates talking about the challenge and your “lucky break.”
5. Each team builds a “Problem-Solver Toolkit” by picking a **Curiosity** card, a **Compassion** card, and a **Courage** card.



6. The teams start collaborating on the challenge using the techniques on the cards for 20 minutes. Their language is based on improv and saying **“Yes, and…”** to all suggestions and recording all ideas.
7. At the 20-minute mark, the teams each draw one **Twist of Fate** card. They must incorporate the message on this card into their problem-solving solution.

8. The teams start collaborating again for another 20-minute period.

9. At the 45-minute mark, each team picks a **Pitch** card and starts to refine their ideas to create a pitch for their idea.
10. At the 60-minute mark, the teams start giving a 2-minute presentation of their idea. The other teams give their feedback for 2-minutes.
11. After the presentations, all team members now become individual voters. They use the **ScoreCard** to vote and recognize the best idea of the day.



12. It's now time to celebrate and reflect upon the learning from the game. Did you work together as a team and build off of everyones ideas and strengths?

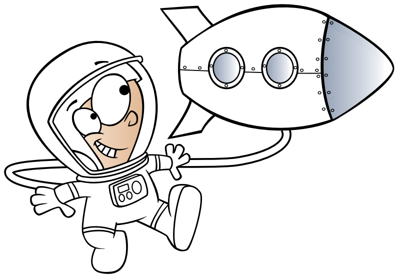
Idea ScoreCard

Dreamed Big	Showed Empathy	Explored: Got Messy	Used Feedback

Total

Resources

Our Team



NOW IT'S YOUR TURN TO GO INTO SPACE!

To get there, be curious and keep exploring new ideas. Learn all you can by taking **STEM** classes in Science, Technology, Engineering, and Mathmatics.

www.wagilabs.org/wagispace