Engineering Adventures

Engineering Journal
Bubble Bonanza

Name:_________________________________
Hi everyone,

We’re so excited to meet you! Our names are India and Jacob. We do a lot of traveling all over the world. We meet interesting people and see some amazing countries. Each place is unique, but we’ve found one thing in common. Everywhere we go in the world, we find problems that can be solved by engineers.

Engineers are problem solvers. They’re people who design things that make our lives better, easier, and more fun! We heard you might be able to help us engineer solutions to some of the problems we find. That means you’ll be engineers, too!

Today, we came across an engineering challenge we think you can help us solve. There are some animals living in a swamp along with lots of hungry alligators. The animals need to be at least 10 inches above the alligators to be out of their reach. India and I thought we could build a tall tower that the animals could stand on. Do you think you can engineer a tower to help?

We sent you one tool that we usually find really helpful when we’re trying to engineer a solution to a problem. It’s called the Engineering Design Process. Take a look at it and see if it can help you!

Good luck!
India and Jacob
Prep Adventure 1

Building with Cards

Here are three ways to build with index cards.

Roll it!

Fold it!

Cut it!

Will any of these ideas help your group build a tower? What other ideas do you have?

Talk with your group to figure it out!
Prep Adventure 1

Fearless
8 inches and up

Confident
6-8 inches

Calm
4-6 inches

Nervous
2-4 inches

Terrified
0-2 inches

Heightened Emotions

PANIC!
Draw Your Tower

Use the space below to draw a picture of your tower.

What parts of your tower design would you change if you could do it again?

For the Record

I think engineering is:

☐ Fun
☐ Exciting
☐ Difficult
☐ _______________
Hi engineers,

You did a great job engineering a tower to protect the animals in the swamp! Now you can help us engineer more technologies.

Do you know that the things engineers create to solve problems are called technologies? Most people think technologies have to be electronic, but this isn’t true. A technology is actually anything engineered by a person that solves a problem.

Think about an airplane as an example. An airplane is a technology because people engineered it and it solves the problem of traveling long distances quickly. But something as simple as a paper cup is also a technology. A person engineered it, and it helps people hold drinks without spilling them everywhere.

We have a detective challenge for you today. We sent you some objects and we want you to figure out if they are technologies. Lots of times engineers think about ways to improve technologies. Can you use the Engineering Design Process to imagine ways make some of these technologies even better?

Talk to you soon,
India and Jacob
What is your group’s object?

Is it a technology?

Did a person engineer it?
☐ Yes ☐ No

Did it help you solve a problem?
☐ Yes ☐ No

Bonus: What problem does your object solve?

If you answered YES to both questions, it is a technology!

You’re an engineer. Write or draw how you would make this technology better.

If you could engineer a brand new technology, what would it be? What would it do?
Hi everyone,

We are visiting our friend Miguel in California. He has an awesome job—he’s a materials engineer at an amusement park! Right now he’s helping the park design a bubble show. People who visit the amusement park will come to the show to see all the things bubbles can do. We think they should call the show Bubble Bonanza!

Miguel is working on engineering some bubble wands for the show, and we said we would help out. But before we help engineer bubble wands, we need to know a lot more about bubbles. What do they look like? What can they do? Are there things they can’t do?

We’re going to start with the Ask step of the Engineering Design Process. Can you help us Ask lots of questions about what bubbles can and can’t do?

India and Jacob, the Duo
Did you know?
Some whales blow bubbles to help them catch fish for dinner!
Hi,

Jacob and I learned a lot when we explored what bubbles can and can’t do. We’ve been working with Miguel to do more cool things with bubbles. Yesterday Jacob blew a bubble that floated onto the table. I thought it would pop, but it sat on the table for five whole minutes!

I tried to blow a bubble that would land on the table, but mine kept popping. I asked Jacob how he did it, but he said it was magic. I know that’s not true!

I think I can use the Engineering Design Process to help me Ask more about bubbles and Imagine how to blow a bubble that will land on the table without popping. Maybe I could even figure out how to blow a bubble onto some other materials, like something rough. Maybe sandpaper would work? Or maybe I could catch a bubble and hold it in my hand! That would really impress Jacob and Miguel. Let me know what you find out!

India
Is it possible to make a bubble land on these things without popping?

<table>
<thead>
<tr>
<th>Bubble on a Table</th>
<th>Bubble on Sandpaper</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Bubble on a Table" /></td>
<td><img src="image" alt="Bubble on Sandpaper" /></td>
</tr>
<tr>
<td>Bubble on a Hairbrush</td>
<td>Bubble on your Hand</td>
</tr>
<tr>
<td><img src="image" alt="Bubble on a Hairbrush" /></td>
<td><img src="image" alt="Bubble on your Hand" /></td>
</tr>
</tbody>
</table>
What does it look like when a bubble pops?

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

For the Record

Do you think people would like to see some bubbles that pop during the Bubble Bonanza show?

☐ Yes
☐ No
☐ Maybe
☐ ____________________
Hi everyone,

India and I are having a blast playing with bubbles! We can make them stick together, catch them with our hands, and even make them land on a hairbrush. We did all this using the round plastic bubble wand that comes with store-bought bubble solution. But Miguel’s job is to engineer wands for the show that do even more cool things than the round store-bought wands. We need to help him engineer even better wands.

Miguel tells us that materials engineers test and explore properties of materials before they use the materials to create things. We found two materials we think would be good for making wands: wire and twist ties. You’ll have to let us know which material you like best.

Let’s start by making wacky-shaped wands! We can use the Engineering Design Process to Ask some good questions. What kind of bubble can you make by using a square wand? What about a triangle? Can you imagine other shapes to try?

Jacob
Wacky Wands

Bend wire along the lines below so that the wire makes the same shape.

Triangle Wand

Square Wand

Fish Wand

Can you make a not-round bubble with these wands?

What will happen if you make a wand shaped like a cube or a pyramid? Can you make a not-round bubble?
Directions: Keep track of your experiments! Draw the bubble wands you use and the shapes of the bubbles they create.

Wand #1

☐ the bubble I made was round
☐ the bubble I made was not round

Wand #2

☐ the bubble I made was round
☐ the bubble I made was not round

Wand #3

☐ the bubble I made was round
☐ the bubble I made was not round

Wand #4

☐ the bubble I made was round
☐ the bubble I made was not round
**Is it possible for a bubble wand to make a not round bubble?**

**For the Record**

My favorite wand material was:

- [ ] Wire
- [ ] Twist ties
- [ ] I’m not sure yet.
- [ ] ________________

**Draw a picture of a wand design you would like to try making next time.**

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**Did you know?**

All sorts of people play with bubbles. Even mathematicians use bubbles to help them solve math problems.
Hi everyone,

We learned a lot trying to engineer wands with different materials last week, but now we want to try even more materials. They’re all different shapes, sizes, and made of different things like paper, wire, and plastic.

Miguel pointed out that some materials might be good to use to make certain kinds of bubbles, but not others. A material that’s good for making tiny bubbles might not be good for making giant bubbles. We made a list of some bubble tricks we want to try out. Use the Engineering Design Process to help you Create and test different bubble wands with the materials. Let us know which materials are good for doing which tricks. After this, we think we’ll be ready to design our bubble wands for the Bubble Bonanza!

India
Did you know?
Some people play with bubbles for their job! They learn about bubbles the same way that you are doing now.
Hi everyone,

Wow! You’ve done some great engineering so far! We’ve asked lots of questions about bubbles and saw what bubbles can and can’t do. We’ve also asked good questions about the materials we can use to make our bubble wands. Now it’s time to engineer our wands!

We want our bubble wand technologies to show people some of the amazing things that bubbles can do. First we need to Imagine some different ways to combine materials. Then we can Plan out our wand and work as an engineering team to Create it. The Engineering Design Process will help us engineer the best wands for the Bubble Bonanza show!

Jacob
Choose your goal, then draw some ideas for your bubble wand. Be sure to label what supplies you will need!

Our Goal
Our bubble wand will:

☐ make lots of bubbles  ☐ make small bubbles
☐ make huge bubbles  ☐ ________________

Idea #1

Idea #2
Adventure 4

My Ideas About My Wand

Draw what your wand looks like. Circle the parts you would like to improve for next time.

What are the materials you used to make your wand?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Engineering Adventures: Engineering Journal
Hi everyone,

Jacob and I are so impressed with the wands you engineered. They are great technologies! We know you’re using the Engineering Design Process to make these wands the best they can be.

Share your ideas with each other and try to Improve your wands even more! If your goal is to make big bubbles, can you Improve your wand so the bubbles it makes are giant? If your goal is to make lots of bubbles, can you Improve your wand so it makes fifty or even one hundred bubbles?

To help you out, we sent you one more special supply to make your wands even more exciting to watch during the Bubble Bonanza. Jacob and I can’t wait to see your final designs.

India
Did you know?

Some scientists think our universe is part of a giant bubble.
Hi everyone,

Thank you for all of your great engineering! Who knew there were so many ways to make bubbles? The wands you engineered are amazing! We can’t wait for you to share your designs with other people. Miguel thinks the amusement park will be really impressed.

We think you should do a test run of the Bubble Bonanza to show people the wand technologies that you engineered. Be sure to tell people your goal and show everyone what your wands can do. Don’t forget to tell people how you used the Engineering Design Process to create your designs!

We’ll be in touch,
India and Jacob, the Duo
Plan your Bubble Bonanza presentation with your group.

- What does your bubble wand do?

- How is your bubble wand a technology?

- What materials did you choose? Why?

- What steps of the Engineering Design Process did you use to help you create your bubble wand?
What was your favorite part about engineering your bubble wand?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Circle the step of the Engineering Design Process that helped you the most.

1. Imagine
2. Ask
3. Plan
4. Create
5. Improve

For the Record
I think engineering is:

☐ more fun than I thought it would be.

☐ harder than I thought it would be.

☐ ____________ than I thought it would be.
California is the third largest state by area, and has the largest population, 36 million.