



Making Things Zoom

GoldieBlox Kit

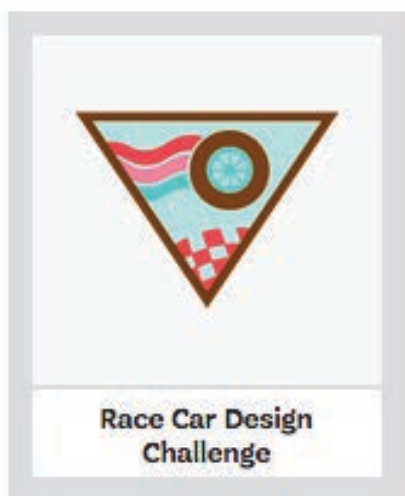
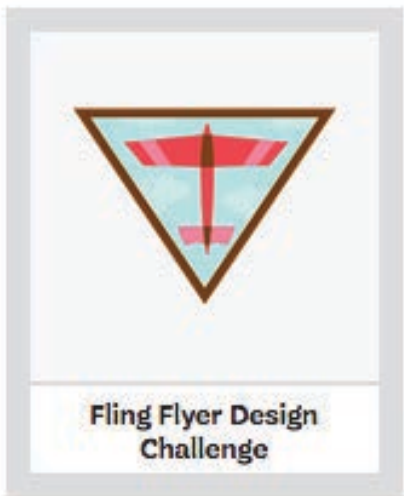




TABLE OF CONTENTS

GoldieBlox: Making Things Zoom Brownie Kit

Front Inside Binder Pocket

6 Brownie Building Parts Library Handouts
(1 handout per group of 2)

Resources

Troubleshooting guide 1
How To Access GoldieBlox Badge Worksheets and Guides 2
Brownie Building Parts Library 3 – 4
Design Challenge Badges Glossary 5

Fling Flyer Design Challenge Badge 6

Fling Flyer Design Challenge Overview 7
Fling Flyer Design Challenge 1 8 – 12
Fling Flyer Blueprint 13
Fling Flyer Investigation Worksheets 14
Fling Flyer Design Challenge 1 15
Fling Flyer Design Challenge 2 16 – 22

Leap Bot Design Challenge Badge 23

Leap Bot Blueprint 24
Leap Bot Design Challenge Overview 25
Leap Bot Design Challenge 1 26 – 30
Leap Bot Design Challenge 2 31 – 34
Leap Bot Recording Sheet 35
Leap Bot Design Challenge 2 36 – 38

Race Car Design Challenge Badge 39

Race Car Design Challenge Overview 40
Race Car Design Challenge 1 41 – 45
Race Car Blueprint 46
Race Car Design Challenge 2 47 – 53

Back Inside Binder Pocket

WD-40 Safety Data Sheet

*Craftstruction pieces are included in the kit



Please read before doing activities!

TROUBLESHOOTING GUIDE

Brownie: Making Things Zoom GoldieBlox Kit

****Please ensure that each bag has its correct number of pieces before returning your kit. Pieces are NOT replaceable.**

FAQ:

1. Q: Are all of the materials I need to earn badges included in the kit?

A: No. Some badges require extra materials such as tape, hole punches, scissors, etc...that need to be provided by the troop.

2. Q: What badges will Brownies be able to earn with the Making Things Zoom kit?

A: Brownies can earn 3 different mechanical engineering badges by using this kit. The badges are Fling Flyer Design, Leap Bot Design, and Race Car Design. Depending on your troop size, it may take more than one meeting to complete a badge.

3. Q: What do I do if I cannot disassemble some of the GoldieBlox pieces?

A: Sometimes the pieces won't come apart easily and can be difficult to disassemble without damaging the piece. Try spraying the pieces with the WD-40 that is included in the kit. If it still won't come apart, email info@gswestok.org and let us know.

4. Q: How many girls does one kit accommodate?

A: There are 6 large resealable bags provided in the kit. Each bag can accommodate 2 girls. Therefore, 1 kit could accommodate up to 12 girls.

5. Q: How do I acquire more worksheets for the Fling Flyer and Leap Bot challenges?

A: Log onto the Volunteer Toolkit and follow the instructions provided in the binder. The instruction page is labeled "How to access GoldieBlox badge worksheets and guides". The guides contain everything that is included in this binder.

6. Q: Why are there 3 small wheel ends missing from the Spring Car pieces bag?

A: There are only 8 small wheel end pieces included in the kit. The Leap Bot requires 3 and the Race Car requires 8. Borrow the 3 small wheel end pieces from the Leap Bot bag in order to build the Race Car.

Tips:

- 1. The pieces are prone to rolling easily off tables.** GSWESTOK recommends keeping pieces in a small tray (provided) until girls have use of them.
- 2. Craftstruction Pieces are not precut.** Troops will need to cut and hole punch pieces before use.
- 3. We want girls to stretch their creativity to the max!** But, we do advise that girls only use the **Pom-poms** for the Pom-Pom-apult activity from the poster.

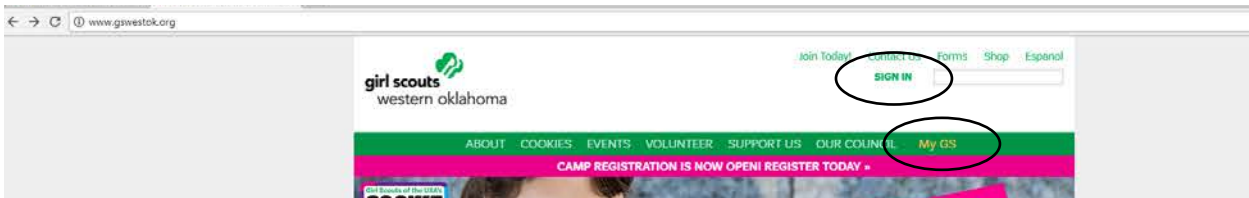


How to access GoldieBlox badge worksheets and guides

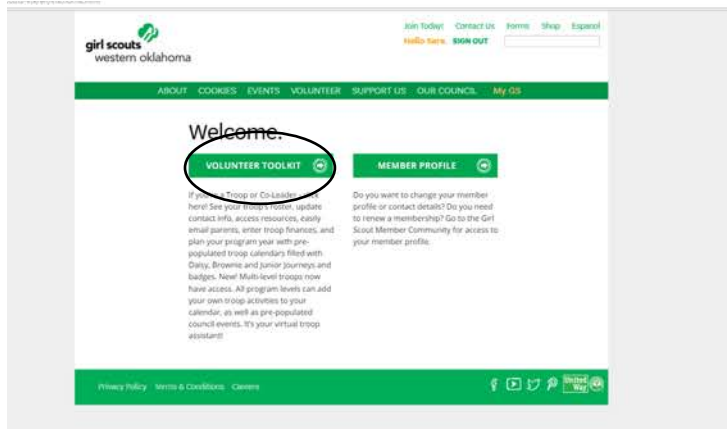
To access the complete guide for the 3 GoldieBlox badges, follow these steps:

***Note: Only Troop Leaders can access the Volunteer Toolkit**

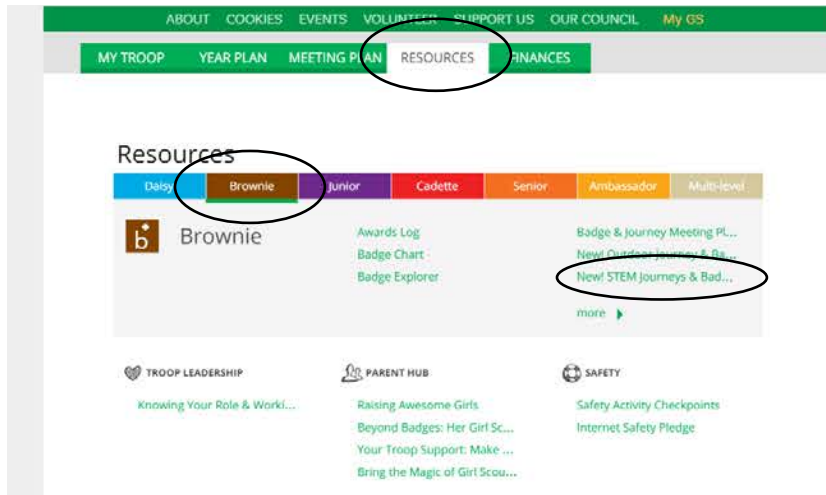
1. Go to www.gswestok.org
2. Sign in by clicking either the “sign in” link or the “My GS” to the top right of the page:



3. After signing in, click on the “Volunteer Toolkit” link:

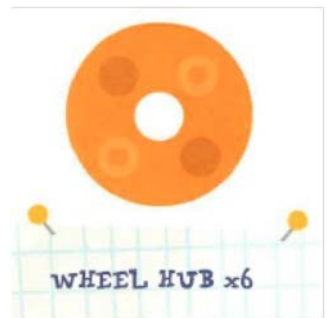
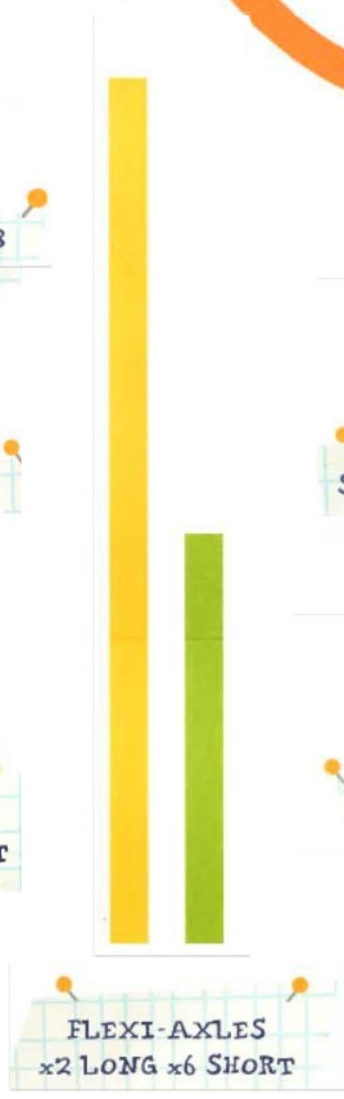
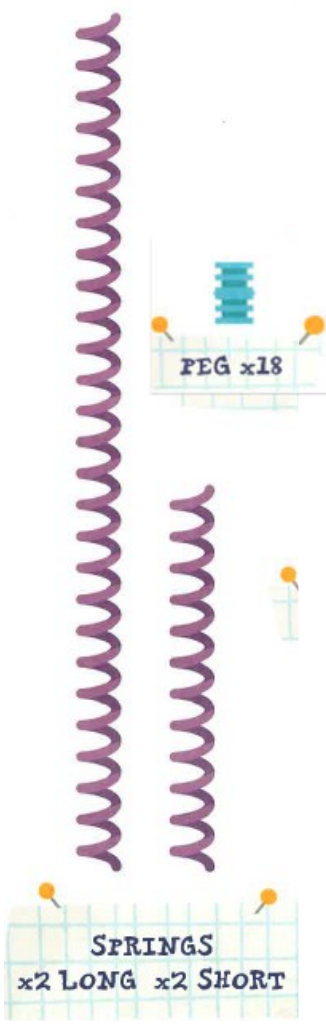
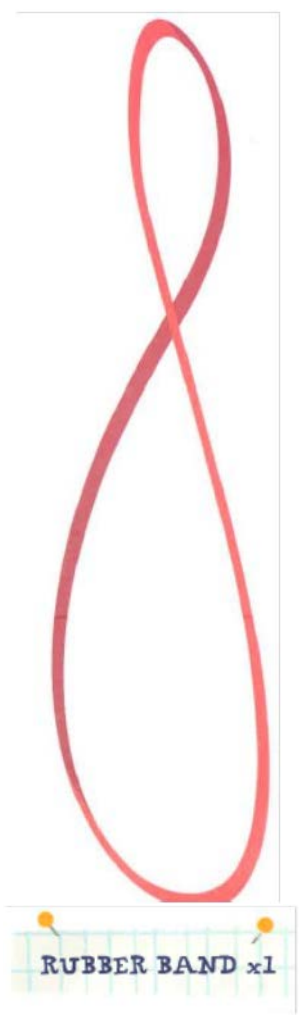


4. Go to the “Resources” Tab and click on “Brownie” and “New! STEM Journeys and Badges”:



5. Click on the Brownie- Fling Flyer Design Challenge Badge, Brownie- Leap Bot Design Challenge Badge, Brownie- Race Car Design Challenge Badge PDF files.

Building Parts Library





CRAFTSTRUCTION x40



SPACER x12



CRANK x1



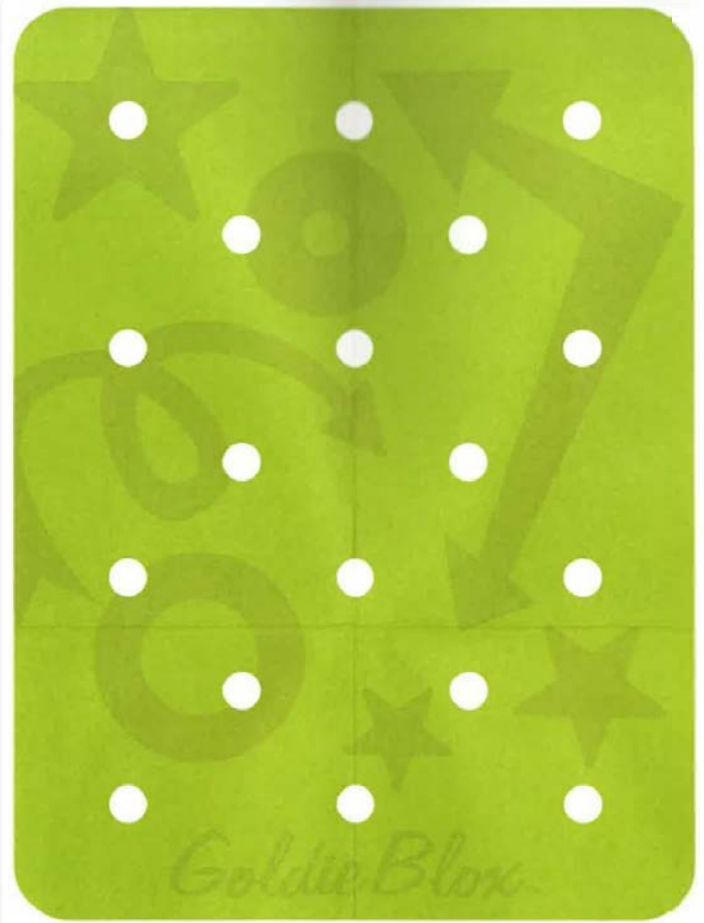
COUPLER JOINT x4



CROSS JOINT x4



POPCORN JOINT x2



QUARTER PEGBOARD x1

AXLES
x16 MINI x12 SHORT
x8 LONG



SMALL WHEEL END x8



ANGLE JOINT x12



TIRE x4



ELBOW JOINT x6



T-JOINT x4



CORNER JOINT x4

Design Challenge Badges Glossary for Brownies

Brownies may not know some of the words used in these badges. Here are definitions you can share with them:

Engineers are people who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges and cars.

Force is the strength or energy that creates movement. Push and pull are examples of force.

Gravity is a force that pulls objects toward each other and towards the earth.

Potential energy is the energy stored in your body and everything else in our world.

When potential energy is released, it becomes **kinetic energy** which bring bodies and object to move.

Thrust is a force that slows moving objects.

Drag is the force (air molecules) that acts against something in flight.

Lift is a force that pushes back up on the wings during flight.

Balanced forces exist when forces are equal on an object. When the forces are balanced, the object does not move.

Unbalanced forces exist when forces are unequal on an object. When the forces are unbalanced, it moves in the direction of the greater force.

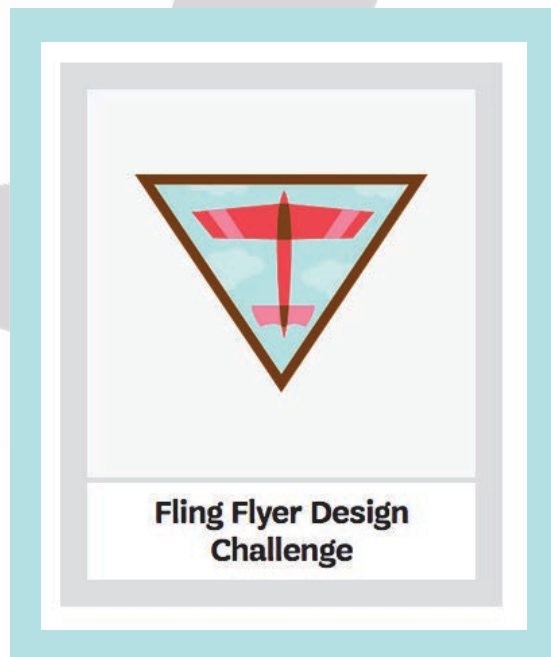
Features are parts of a product that are designed make them more useful.

Friction is a force that slows moving objects.

Fling Flyer Design

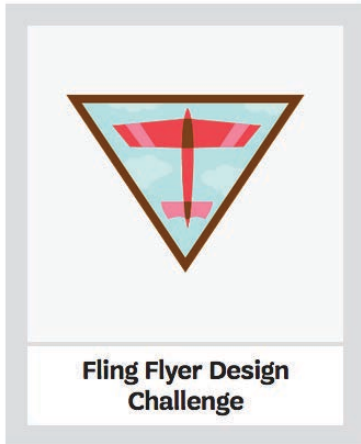


CHALLENGE



Fling Flyer Design

CHALLENGE



Overview

This meeting, Brownies learn about thrust, drag, gravity, and lift before building a Fling Flyer. They complete Step One and Step Two of the Fling Flyer Design Challenge badge.

Challenge 1:

- Activity 1: Engineering Paper Airplanes
- Activity 2: Taking Flight!
- Activity 3: Learn About Forces that Affect Flight
- Activity 4: Design and Build a Fling Flyer
- Activity 5: Closing Ceremony: Fling Flyer Forces

Challenge 2:

- Activity 1: Prepare for Testing
- Activity 2: Forces that Affect Flight
- Activity 3: Test Your Fling Flyer
- Activity 4: Analyze and Share Your Results
- Activity 5: Brainstorm Ways to Improve your Design
- Activity 6: Closing Ceremony: Awards
- Activity 7: Girl Survey

Note to Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you'll find suggested talking points under the heading "SAY." Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It's What Girl Scouts Do!):

Prep time will take Roughly 50 minutes

Each meeting includes a "Prepare Ahead" section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed. Please review materials list that you will need to provide on the left.



This badge challenge is supported by the GoldieBlox Making Things Zoom kit.

MATERIALS:

- PAPER (CONSTRUCTION, WHITE, ETC. A VARIETY OF PAPERS GIVES GIRLS THE OPPORTUNITY TO TRY MAKING PLANES WITH DIFFERENT PAPER WEIGHTS.)
- CRAYONS, COLORED MARKERS
- OPTIONAL: POSTER BOARD WITH THE GIRL SCOUT PROMISE AND LAW
- SAMPLE FLING FLYER
- PAPER
- PENCILS
- OPTIONAL: FLING FLYER INVESTIGATION WORKSHEETS
- FOR EACH FLING FLYER, GIRLS WILL NEED THESE GOLDIEBLOX: 2 MINI AXLES, 1 LONG AXLE, 2 STAR STOPPERS, 1 ANGLE JOINT, 2 T-JOINTS
- 1 CRAFTSTRUCTION WING (ALTERNATIVELY, YOU CAN PREPARE OR HAVE GIRLS CREATE THEIR OWN WINGS USING CARDSTOCK, CONSTRUCTION, OR COPY PAPER AND SCISSORS/PAPER HOLE PUSH.)
- 1 RUBBER BAND
- AWARDS
- FLAG
- MASKING TAPE
- CONE, ROCK, OR ANYTHING ELSE TO MARK THE FURTHEST DISTANCE FLOWN
- OPTIONAL: LAPTOP/TABLET
- OPTIONAL: COPIES OF GIRL SURVEY

Challenge 1



Activity 1: **As Girls Arrive: Engineering Paper Airplanes**

MATERIALS:

Paper (Construction, white, etc. A variety of papers gives girls the opportunity to try making planes with different paper weights.)

Crayons, colored markers

Time Allotment

10 minutes

Steps

Welcome Brownies, and ask them to create paper airplanes.

SAY:

Today, you're going to engineer a Fling Flyer that flies across the room!

To start thinking about flight, can you make a paper airplane?

Here are some different types of paper and supplies to try out and decorate your paper airplane.

Challenge 1



Activity 2: **Opening Ceremony: Taking Flight!**

MATERIALS:

Materials

Flag

Optional: Poster Board with the Girl Scout Promise and Law

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Brownies to the Fling Flyer Design Challenge.

SAY:

Today, we're starting the Fling Flyer Design Challenge badge!

You're going to learn how to create a Fling Flyer, an airplane made with GoldieBlox, and explore what keeps it and other things, like birds, planes, and space ships, in the air.

Engineers use their imaginations to solve problems. They invent and build things. You'll do the same thing today!

Challenge 1



Activity 3: Learn About Forces that Affect Flight

Time Allotment

20 minutes

Steps

Brownies learn about thrust, drag, gravity, and lift for Step One of the Fling Flyer Design Challenge. Have Brownies line up (side to side) with their paper airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes.

SAY:

Let's see you fly your paper airplanes. On the count of three, release your plane! One, two, three...fly! Brownies release their paper airplanes. Introduce the forces that affect flight using the paper airplanes as an example.

SAY:

What makes the best paper airplane? Girls may say: One that flies farthest, stays airborne longest, or does the most flips and tricks.

In order to design the best paper airplane or a Fling Flyer, we need to know a little bit about the forces that act on things when they fly.

What pushes the paper airplane forward through the air? Girls may say: My arm, I threw it, etc.

By bending your elbow and throwing the airplane, you are able to add extra strength or force into your airplane's flight.

Does anyone know what force is? (Answer: Force is the strength or energy that creates movement.) Everything in our world moves because of different forces at play. Push and pull are two examples of forces. You threw the paper airplane, propelling it through the air with force. This is called the "thrust". Thrust is an example of a force, or a push and pull that creates movement.

Why do the paper airplanes slow down? Girls may say: The air stops them, I didn't throw hard enough, etc. The airplanes slow down because there are little molecules of air that act with force against the airplane, slowing it down. When you threw the paper airplane, it came back down, right? Why did that happen? (Answer: Gravity.)

MATERIALS:

Paper Airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes

Challenge 1



Activity 3: **Learn About Forces that Affect Flight**

Continued...

Who knows what gravity is? Girls may say: What makes things fall to the ground or I don't know. Gravity is another force. Gravity is a force that pulls objects toward each other. For example, when you drop a ball, it falls to the ground. That's because the earth's gravity pulls the ball toward it. If you jump up, gravity brings you back down to the ground. Can you show me how gravity brings you back when you jump? Try it out! Brownies jump up and down. Use the paper airplanes to explain lift and balanced forces.

SAY:

Did your airplane fly straight? If it didn't, why do you think this happened? (Answer: Air is in the way.) The wings deflect the air, which pushes back up on the wings. It's why paper flutters to the ground instead of falling straight down. This force is called "Lift." For example, if you dropped a ball, would it flutter like dropping a paper airplane? (Answer: No or very little.) The wings help the airplane to move against and through the air. Even when the airplane is falling, its wings are still at work, slowing its fall to the ground. Now, whose airplane went the farthest? Raise your hand! The Brownie whose airplane went the farthest raises her hand. Explain balanced forces.

SAY:

Great job! You designed the airplane that moved through the air with the most force! Now, what do you think would happen if you tried to fly your airplane outside on a very windy day? Girls may say: It would be harder, it wouldn't fly straight, it wouldn't go very far, etc. It would be very windy, adding more force that would act against your airplane, making it very hard to fly straight or even at all!

What way would your airplane move in the wind? (Answer: In the direction of the wind.) The force of the wind is stronger than the force you put into throwing your airplane, so your airplane would go in the direction of the wind. This is called an unbalanced force. When forces are unbalanced, the object moves in the direction of the greater force, like your airplane moving with the wind on a windy day.

What do you think happens when forces are balanced though? (Answer: Neither force moves the object.) The object, like the airplane, doesn't move at all! The paper airplane won't fly itself, so you add force when you throw it. Now, let's use all this information to build our own Fling Flyers.

Challenge 1



Activity 4: Design and Build a Fling Flyer

Time Allotment

20 minutes

Steps

If you don't have enough supplies for each Brownie to make her own Fling Flyer, divide Brownies into pairs or small groups for Step Two of the Fling Flyer Design Challenge. Show Brownies your sample Fling Flyer. Optional: Distribute Fling Flyer Investigation worksheets for girls to design their Fling Flyer, thinking and considering the forces at work. Give the girls time to design their investigations. Hand out paper and pencils to each team for Brownies to design their Fling Flyer.

SAY:

Now, you're going to use your GoldieBlox to create a Fling Flyer. Before engineers build things, they plan their design. Designing your product before you build allows you to think through any problems and troubleshoot them ahead of time.

Draw your fling flyer to help figure out how to build it. If you already have ideas to make the Flyer fly even better, feel free to try them out! When they're finished designing, hand out the GoldieBlox sets.

(Note to Volunteers: If you do not have enough craftstruction wings for every Fling Flyer, have girls use one as a template to cut and create others with heavy paper and scissors/hole punch.)

Let the girls build their Fling Flyers and practice flying them. Keep It Girl-Led: By having girls reverse engineer the Fling Flyer, Brownies have a hands-on opportunity to learn about the different parts instead of following directions. If they're having trouble, ask them questions like, "What GoldieBlox do you recognize in the Fling Flyer? How are they stuck together?" If girls need help, lead them to connect the angle joint to the long axle. On the other end of the long axle, add a T-Joint, mini axle, and another T-joint. Connect the craftstruction or paper wing by placing the holes on top on the T-joints and attaching the star stoppers. Optional: Show Brownies the "How to Build a Fling Flyer" video here for video instructions. Circulate among the groups, asking questions to prompt further exploration.

(Note to Volunteers: You may want to save the Brownies' Fling Flyers for the next meeting, Fling Flyer Design Challenge 2. If you are able to, label each Flyer with the girl or group's name(s) and put away until the next meeting. If you are unable to keep them together, don't worry, the girls will have a chance to rebuild at the start of the next meeting.)

MATERIALS:

GoldieBlox Making Things Zoom kit
 (one set for each girl, pair, or small team)

Sample Fling Flyer

Paper

Pencils

Optional: Fling Flyer Investigation worksheets

For each Fling Flyer, girls will need these GoldieBlox:

2 mini axles

1 long axle

2 star stoppers

1 angle joint

2 T-joints

1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)

1 rubber band






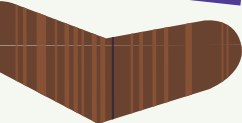

Fling Flyer

engineering concept:
AERODYNAMICS

build date:

I built it!



-  x1
-  x2
-  x1
-  x2
-  x1
-  x1
-  x1



Fling Flyer Design Challenge badge

Challenge 1



Activity 5: Closing Ceremony: Fling Flyer Forces

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle, and discuss with girls how they designed their Fling Flyers.

SAY:

What forces did you think about when designing and building your Fling Flyer?

What pushes the Flyer forward through the air? (Answer: The rubber band. This is called "Thrust.")

Why does the Flyer slow down? (Answer: It has to push air molecules out of the way. This is called "Drag.")

What pulls the Flyer back down to the ground? (Answer: Gravity.)

Why doesn't it fall straight down if gravity is pulling on it? (Answer: Air is in the way--the wings deflect the air, which pushes back up on the wings. It's why paper flutters to the ground. This force is called "Lift.")

When forces on an object are balanced, like a box being pushed equally by two girls on opposite sides, what happens? (Answer: Neither force moves the object.)

When forces are unbalanced, like two girls pushing on one side of the box or trying to walk on a windy day, what happens? (Answer: The object moves in the direction of the greater force.)

End the meeting with a Friendship Squeeze.

MATERIALS:

None

Challenge 2



Activity 1: As Girls Arrive: Prepare for Testing

Time Allotment

10 minutes

Steps

Welcome Brownies, and have them practice with their Fling Flyer before the Troop Fling Flyer Competition.

Optional: If you were unable to save the Fling Flyers between meetings, Brownies can rebuild them.

SAY:

Today, we're going to have a competition to see how your Fling Flyers perform!

Take a few minutes to practice flinging your Flyer to get ready.

If there's anything you'd like to change about your Flyer from last time, feel free to try it out!

MATERIALS:

Fling Flyers created by girls in Fling Flyer Design Challenge 1. (Note to Volunteers: If you were unable to save the Flyers between meetings, Brownies can rebuild them during this activity.)

For each Fling Flyer, girls will need these GoldieBlox:

2 mini axles

1 long axle

2 star stoppers

1 angle joint

2 T-joints

1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using

cardstock, construction, or copy paper and scissors/paper hole push.)

1 rubber band

Challenge 2



Activity 2: Opening Ceremony: Forces that Affect Flight

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.
Conduct any troop business.
Review the forces that affect the Fling Flyer's ability to fly with Brownies.

SAY:

What forces affect your Fling Flyer? (Answer: Thrust, drag, lift, gravity.)
What force pushes the Flyer forward through the air? (Answer: The thrust from the rubber band.)
Why does the Flyer slow down? (Answer: The drag pushes air molecules out of the way.)
What pulls the Flyer back down to the ground? (Answer: Gravity.)
Why doesn't it fall straight down if gravity is pulling on it? (Answer: Lift. Air is in the way--the wings deflect the air, which pushes back up on the wings.)

What happens when forces are unbalanced, like throwing a paper airplane on a windy day? (Answer: The object moves in the direction of the greater force.)

What happens when forces on an object are balanced? (Answer: Neither force moves the object.)

Introduce Brownies to today's activities.

SAY:

Today, we're going to test our Fling Flyers in a Troop Fling Flyer Competition! First, we'll decide what we want to test our Fling Flyers for, or our goals. After, you'll have a chance to test and improve your Fling Flyers in a Troop Fling Flyer Competition!

Engineers test and redesign their new creations multiple times to find a design that works well for their goals, whether it's solving a problem or creating a brand new product.

Now that we know we want our Fling Flyers to fly far, stay in the air, and try to do tricks, we have a better idea of how to build them to fit these goals.

MATERIALS:

Flag

Optional: Poster Board with the Girl Scout Promise and Law

Challenge 2



Activity 3: Test Your Fling Flyer

Time Allotment

15 minutes

Steps

Brownies test their Flying Flyers in a Troop Fling Flyer Competition for Step Three of the Fling Flyer Design Challenge. Create goals for the Troop Fling Flyer Competition with Brownies.

SAY:

Engineers design and build things to meet goals or needs they see in the world. For our competition, what should we test? Girls may say: Which Fling Flyer goes farthest, which Flyer goes highest, which Flyer stays in the air longest, etc.

Today, let's test to see whose Flyer goes the farthest, whose stays in the air (or stays airborne) the longest, and who can do the most flips or tricks! Have Brownies improve their Fling Flyers before the Troop Fling Flyer Competition. They can test fling their Flyers to see how different materials work.

SAY:

Now that we know we want our Fling Flyers to fly far, stay in the air, and try to do tricks, we have a better idea of how to build them to fit these goals.

Do you want to rebuild your Flyer? Here are some other types of paper you could try for wings.

Feel free to add or take off any GoldieBlox!

Give the girls time to test and improve their designs. Hold the Troop Fling Flyer Competition. Create a masking tape line for girls to stand on to fling their Flyers.

SAY:

Now it's time to see how your Flyers fling! Let's start by standing on the line to see which Flyer flings the farthest! Brownies fling their Flyers, either by taking turns or all at once. (Note to Volunteers: If taking turns, mark how far the Flyer flings with a cone, rock, or anything else to mark the distance flown. As girls take turn, move the object to the new Flyer's distance if it is farther than the last distance marked.) Repeat, but have Brownies test for longest time airborne, measuring seconds by counting. Repeat once more, with Brownies having their Flyers do flips or other tricks.

MATERIALS:

Fling Flyers created by girls in Fling Flyer Design Challenge 1 or Activity 1:

As Girls Arrive:

Prepare for Testing

Cardstock, construction paper, or copy paper (the heavier the better)

Scissors or hole punches

Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)

Masking tape

Cone, rock, or anything else to mark the furthest distance flown

Challenge 2



Activity 4: Analyze and Share Your Results

Time Allotment

10 minutes

Steps

Brownies review their results and come to conclusions about what it all means for Step Four of the Fling Flyer Design Challenge.

MATERIALS:

None

SAY:

Okay, you've tested your Fling Flyers and we have results from the Troop Fling Flyer Competition. Let's take a look at what you've learned. Our results from the Fling Flyer Competition are called data. Engineers look at all the data from a test to figure out what works best and what needs to be improved. It's a little bit like solving a puzzle! Now you get a chance to do that, too. Divide girls into small groups of 3-4 to brainstorm and analyze their results.

SAY:

Let's take a few minutes to think about our results and see what you can figure out from our data. Figuring out what our data means is called analysis. Engineers work together to brainstorm and analyze their data and results to form bigger ideas on how to improve their designs.

Here are some questions to get you started:

What did the farthest flying Fling Flyers have in common?

What did the longest airborne Fling Flyers have in common?

What did the most acrobatic (most tricks) Fling Flyers have in common?

Give girls 5 minutes or so to brainstorm and discuss in groups.

SAY:

Okay, what did you figure out? Give girls time to report on what they think their results showed.

SAY:

Very interesting! Now take another look and see if you can answer these questions:

How did your Fling Flyer move when gravity and lift were balanced?

How did it move when gravity is stronger? When lift was stronger?

Did weight matter?

Give girls time to report on what they think their results showed. After they're done, move right to the next step (Activity 5: Brainstorm Ways to Improve Your Design).

Challenge 2



Activity 5: Brainstorm Ways to Improve Your Design

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle.

SAY:

You did a great job of gathering data and results and analyzing them. That's what engineers do, too! Then they used what they've learned to make their design even better.

As you tested your Fling Flyers, did you change the design to improve them? How?

If you were going to keep working on your Fling Flyer design, what would you change and why? Let girls answer. Make sure every girl gets a chance to speak.

SAY:

Those are great ideas. Remember, no matter what you're building or what project you're working on, you can always keep making it better. That's what engineers do. If there's extra time, Brownies can redesign their Flyers.

MATERIALS:

Fling Flyers from Activity 3: Test Your Fling Flyer

Cardstock, construction paper, or copy paper (the heavier the better)

Scissors or hole punches

Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small

team)

Challenge 2



Activity 6: Closing Ceremony: Awards

Time Allotment

10 minutes

Steps

Brownies earn the Fling Flyer Design Challenge badge.

SAY:

You've now earned the Fling Flyer Design Challenge badge. Please step forward when I say your name to accept your award. Lead a round of applause for each Brownie as she steps forward.

SAY:

You have earned your Fling Flyer Design Challenge award, which means you have learned about the forces that affect flight as you designed, built, and tested a Fling Flyer. You also learned how to design an investigation--and fine-tune your design after testing it, just like engineers. When you leave here, who do you want to tell about what you learned?

Girls may say: My parents, my brothers and sisters, my friends at school.

That's great! When you learn something, it's fun to pass it on to others. We can all learn from each other. End the meeting with a Friendship Squeeze.

Now that I've earned this badge, I can give service by:

- Showing Daisies that engineering can be fun by demonstrating my Fling Flyer.
- Sharing what I learned about the forces that affect flight with my friends or family.
- Showing friends how to make a fling flyer and then having a contest to see how far they can fly.

MATERIALS:

Fling Flyer Design Challenge award
(Note to Volunteers: You can buy these awards from your council shop or the Girl Scouts' website.)

Challenge 2



Activity 7: Girl Survey

Time Allotment

10 minutes if you are doing the survey during the last meeting.

Steps

Brownies complete the Girl Survey about the Fling Flyer Design Challenge Badge.

SAY:

The people at the Girl Scouts' national office want to know what you think about it, how you think it could be improved, and what you think of STEM in general. This is a great chance for you to help

Girl Scouts create STEM programs that other girls will enjoy!
It will take about 10 - 15 minutes.

Explain to girls how they will be taking the survey, either online or by filling out a printed version.

(Note to Volunteers: We hope that all girls will complete the survey - we want every girl's voice to be heard. However, the survey is voluntary, so girls don't have to take the survey if they don't want to. Also, for young girls, we encourage you to read the questions aloud while girls individually complete the survey.)

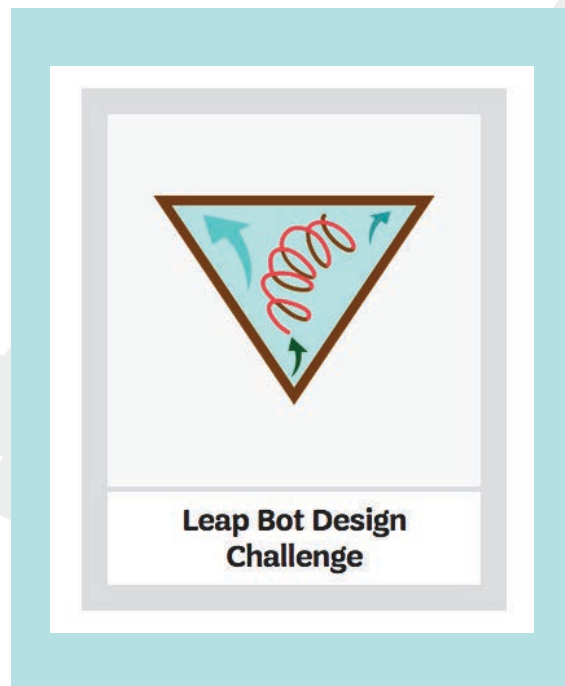
MATERIALS:

If girls are taking the survey online:
Laptop/tablet

If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids) and pen or pencil

Leap Bot Design

CHALLENGE



Leap Bot Design Challenge badge



Leap Bot

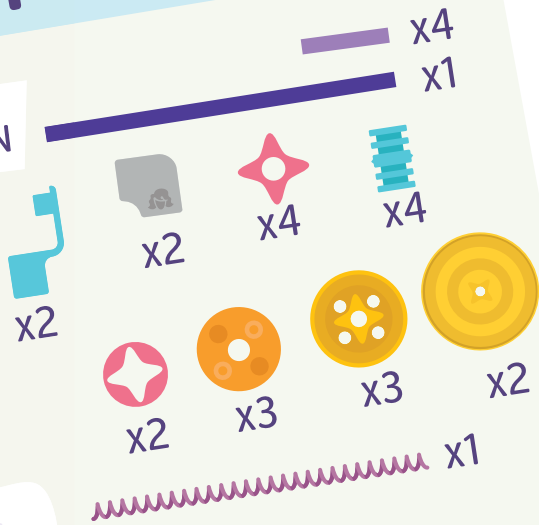
engineering concept:

COMPRESSION

build date:

I built it!

Bloxsome!

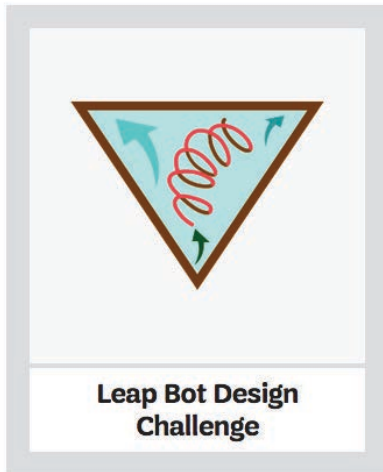


All GoldieBlox products, characters, illustrations, text, copyrights, and trademarks are the sole property of GoldieBlox, Inc.

Leap Bot Design

CHALLENGE

brownies



MATERIALS:

- FLAG
- OPTIONAL: POSTER BOARD WITH THE GIRL SCOUT PROMISE AND LAW
- SAMPLE LEAP BOT MADE FROM THE GOLDIEBLOX MAKING THINGS ZOOM KIT
- GOLDIEBLOX MAKING THINGS ZOOM KIT (ONE SET FOR EACH PAIR OR SMALL TEAM)
- AWARDS
- RULERS, YARDSTICKS, ETC.
- TAPE
- PAPER
- LEAP BOT RECORDING SHEET
- LONG AND SHORT SPRINGS FROM THE GOLDIEBLOX MAKING THINGS ZOOM KIT
- LEAP BOT DESIGN CHALLENGE AWARD
- OPTIONAL: LAPTOP/TABLET
- OPTIONAL: COPIES OF GIRL SURVEY
- PEN OR PENCIL

Overview

In the Leap Bot Design Challenge, Brownies learn about engineering, gravity, and force by building and testing a Leap Bot. Brownies learn how to build and test a new product.

Challenge 1:

- Activity 1: As Girls Arrive: Jump Up!
- Activity 2: Opening Ceremony: What Do Engineers Think About?
- Activity 3: Learn About Springs
- Activity 4: Build Your Leap Bot
- Activity 5: Closing Ceremony: Talk About Your Leap Bot

Challenge 2:

- Activity 1: Prepare for Testing
- Activity 2: Leap Bot Forces
- Activity 3: Create a Way to Test How Well Your Leap Bot Performs
- Activity 4: Record the Results of Your Test
- Activity 5: Share Your Results
- Activity 6: Closing Ceremony: Awards

Note to Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you'll find suggested talking points under the heading "SAY." Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It's What Girl Scouts Do!):

Prep time will take Roughly 90 minutes

Each meeting includes a "Prepare Ahead" section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed. Please review materials list that you will need to provide on the left.

Challenge 1



Activity 1: As Girls Arrive: Jump Up!

MATERIALS:

None

Time Allotment

10 minutes

Steps

Welcome Brownies, and ask them to try jumping three different ways. Brownies will start to explore the concepts of energy and gravity which will be reiterated throughout the meeting.

SAY:

Today, we're going to be creating something called a Leap Bot! You will be testing the Leap Bot to see how high you can make it jump.

Do you think you could be a human Leap Bot?

Try jumping three different ways: Jump with your knees straight, jump with your knees bent, and crouch down really low (into a ball) before jumping as high as you can!

Which type of jumping gets you the highest? Try it out!

Challenge 1



Activity 2:

Opening Ceremony: What Do Engineers Think About?

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.
Conduct any troop business.
Brownies are introduced to the Leap Bot Design Challenge badge.

SAY:

Today, we're starting the Leap Bot Design Challenge badge! You're going to learn how design, build, and test things like an engineer.

Who knows what engineers do?

Girls may say: Drive trains, build things, invent things, etc.

Engineers use their imaginations to solve problems. They invent and build things that can be used in the real world. Every day you see a problem an engineer has solved. For example, engineers design bridges so your car can cross a river. They design planes so you can fly to another place. They design really tall buildings for lots of people to work or live in.

To solve problems and create products that work, engineers have to think about all of the different things that might affect their design.

If you were an engineer building a rocket ship, what would you think about?

Girls may say: How to make the rocket fly, how to steer the rocket, what to make it out of, etc.

One of the things an engineer building a rocket would need to think about is how to make a rocket ship that can fly. Engineers have to think about is how different forces, like gravity, affect their design.

Today, you'll find out more about forces like gravity by using GoldieBlox to build a Leap Bot that goes as high as it can!

MATERIALS:

Flag

Optional: Poster Board with the Girl Scout Promise and Law

Challenge 1



Activity 3: Learn About Springs

Time Allotment

15 minutes

Steps

Brownies learn about gravity, force, and potential energy for Step One of the Leap Bot Design Challenge.

Explain force and gravity using Activity 1: As Girls Arrive: Jump Up! as an example.

SAY:

Was it easier to jump with your knees straight or bent? Why do you think that is? (Answer: It is easier to jump with your knees bent because you are able to put more force into your jump.) When you jump, you push yourself off the ground. By bending your knees, you are able to add extra strength or force into your jump.

Does anyone know what force is? (Answer: Force is the strength or energy that creates movement.) Everything in our world moves because of different forces at play. Push and pull are two examples of forces. But every time you jumped up, you came back down, right? Why did that happen? (Answer: Gravity.)

Who knows what gravity is?

Girls may say: What makes things fall to the ground or I don't know. Gravity is another force. Gravity is a force that pulls objects toward each other. For example, when you drop a ball, it falls to the ground. That's because the earth's gravity pulls the ball toward it. When you jump up, gravity brings you back down to the ground.

Let's take a look at the kit! Show girls the kit.

SAY:

You can see there's a spring in the kit. The spring force uses compression to push Leap Bot into the air, just like you bend your knees to jump higher. The spring stores something called potential energy when you push it down (or even when you pull it), just like your knees are able to boost your jump or bring you down. When you release your Leap Bot, the energy turns into kinetic energy, and your Leap Bot launches into the air, just like your knees help to move you off the ground!

Potential energy is the energy stored in you and everything else in our world. When potential energy is released, it becomes kinetic energy, making you move. But why does the Leap Bot come back down? (Answer: Gravity.)

The force that pulls the Leap Bot back to the ground is gravity. Just like us, the Leap Bot will eventually come back down. How long do you think something can go up before it must come down? Give girls time to answer.

SAY:

Next, use GoldieBlox to build a Leap Bot and look more at these different forces!

MATERIALS:

Sample Leap Bot made from the GoldieBlox Making Things Zoom kit

Challenge 1



Activity 4: Build Your Leap Bot

Time Allotment

25 minutes

Steps

Divide Brownies into pairs or small groups to build Leap Bots for Step Two of the Leap Bot Design Challenge. Give each group a set of parts from the Making Things Zoom kit to build a Leap Bot without instructions.

SAY:

Sometimes, engineers don't know exactly how things are built. They have an idea through something like this sample, but then they have to figure out how to make it.

Testing out different parts gives engineers a chance to learn more about how each piece works and may even give them new and better ideas!

Can you put together a Leap Bot?
Let girls put the parts together.

Keep It Girl-Led: By having girls reverse engineer the Leap Bot, Brownies have a hands-on opportunity to learn about the different parts instead of following directions. If they're having trouble, ask them questions like, "What GoldieBlox parts do you recognize in the Leap Bot? How are they stuck together? What parts do you see in the launch pad?"

Circulate among the groups, asking questions to prompt further exploration.

(Note to Volunteers: You may want to save the Brownies' Leap Bots for the next meeting, Leap Bot Design Challenge 2. If you are able to, label each Bot with the girl or group's name(s) and put away until the next meeting. If you are unable to keep them together, don't worry, the girls will have a chance to rebuild at the start of the next meeting.)

MATERIALS:

GoldieBlox Making Things Zoom kit
(one set for each pair or small team)

For each Leap Bot, girls will need these GoldieBlox:

- 4 mini axles
- 1 long axle
- 2 angle joints
- 2 elbow joints
- 4 spacers
- 4 pegs
- 1 star coupler
- 3 wheel hubs
- 3 small wheel ends
- 2 big wheel ends
- 1 long spring
- 1 pegboard

Challenge 1



Activity 5: Closing Ceremony: Talk About Your Leap Bot

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle and talk about their Leap Bots.

SAY:

What is causing the Leap Bot to leap?

(Answer: The energy and force from the spring.)

What do you think would happen if you changed the mass of the Bot?

(Answer: It would affect how high the Bot leaps.)

What force is pulling the Bot back to the ground?

(Answer: Gravity.)

How could you make the Bot leap higher/further?

(Answer: Decrease its weight or add more springs.)

How could you test how well your Leap Bot does on each jump?

(Answer: Measure how high it goes.)

End the meeting with a Friendship Squeeze.

MATERIALS:

None

Challenge 2



Activity 1: As Girls Arrive: Prepare for Testing

Time Allotment

10 minutes

Steps

Welcome Brownies, and ask them to explore how changing the shape of their Leap Bot affects its jump.

Optional: If you were unable to save the Leap Bots between meetings, Brownies can rebuild them.

SAY:

Today, we're going to test our Leap Bots!

Before we begin, see if you can change your Leap Bot's leap by changing pieces of the Bot's body.

What happens when you add more pieces to the Bot?

What happens when you take away pieces from the Bot?

MATERIALS:

Leap Bots created by girls in Leap Bots Design Challenge 1. (Note to Volunteers: If you were unable to save the Bots between meetings, Brownies can rebuild them during this activity.)

Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team).

For each Leap Bot, girls will need these GoldieBlox:

- 4 mini axles
- 1 long axle
- 2 angle joints
- 2 elbow joints
- 4 spacers
- 4 pegs
- 1 star coupler
- 3 wheel hubs
- 3 small wheel ends
- 2 big wheel ends
- 1 long spring
- 1 pegboard

Challenge 2



Activity 2: Opening Ceremony: Leap Bot Forces

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.
Conduct any troop business.
Review the forces that affect the Leap Bot's jump with Brownies.

SAY:

Does anyone remember how the Leap Bot is able to jump? (Answer: Force and energy!)

The spring on the launchpad stores potential energy when you push it down.

When you release your Leap Bot, the energy turns into kinetic energy, and your Leap Bot launches into the air!

Potential energy is the energy stored in you, your Leap Bot, and everything else in our world.
When potential energy is released, it becomes kinetic energy, making you and your Bot move.

But why does the Leap Bot come back down? (Answer: Gravity.)

The force that pulls the Leap Bot back to the ground is gravity. Just like us, the Leap Bot will eventually come back down.

MATERIALS:

Flag

Optional: Poster Board with the Girl Scout Promise and Law

Challenge 2



Activity 3:

Create a Way to Test How Well Your Leap Bot Performs

Time Allotment

10 minutes

Steps

Brownies brainstorm how to test their Leap Bots for Step Three of the Leap Bot Design Challenge.

SAY:

In order to test and improve your Leap Bot, you need to come with a way to measure how well it performs.

How can you accurately measure how high your Leap Bot is jumping?

Girls may say: Catching the bot and measuring how high your hands are, marking height on the wall, taping a ruler to the launchpad, filming the leap on a tablet to play back.

What tools will you need?

Girls may say: Rulers, poster paper and markers, tape, or iPads. Which method do you think will work best?

What makes it the "best" method?

Girls may say: Taping a poster is more work initially, but easier than lining up rulers each time. iPad videos would need editing to compare leaps. Catching Leap Bot at the apex of the jump could be tricky.

Which do you think would be the most accurate method?

Girls may say: Taping a poster or ruler up.

Divide Brownies into Leap Bot testing teams. (Note to Volunteers: These groups can be the same as the groups Brownies divided into to build their Leap Bots in Leap Bot Design Challenge 1.)

Hand out rulers, yardsticks, tape, and paper. Note that you can use other methods if you have the right tools and the time.

SAY:

You came up with some great ways to test your Leap Bots! Here are the tools we have today. Engineers are very creative and can use what they have to do their projects. In your Leap Bot testing team, set up your testing station. Help girls tape large sheets of paper to the walls and place rulers or yardsticks by each testing station.

MATERIALS:

Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
Rulers, yardsticks, etc.

Tape

Paper

Challenge 2



Activity 4: Record the Results of Your Test

Time Allotment

20 minutes

Steps

Brownies test their Leap Bots for Step Four of the Leap Bot Design Challenge. Give each group a Leap Bot Recording Sheet.

SAY:

Now that we've thought about what we want to test, it's time to see how your Leap Bot performs! First, try testing the Bot using the short spring. What happens? What do you think will happen if you combine the short and long springs?
Give girls time to answer.

SAY:

Those are interesting predictions! Let's test them out and see if they're right. Give girls time to test their Leap Bot and record the results.

SAY:

Are you ready for a challenge? Make your Bot leap at least 5 times for each of the three different spring combinations (Small spring, large spring, combination of two springs) and record how high the Bot jumped each time.
Wait for girls to try the different jumps and make their recordings.

SAY:

Why do you think your results turned out this way?

Keep It Girl-Led: Let girls talk and analyze their results. They may reach the conclusion that springs store potential energy, so the greater the length of the spring, the more energy there is to be converted into motion. Using their test results, they could say along the lines of "the short spring caused the shortest leap, the long spring a longer leap, and both springs caused the longest.")

MATERIALS:

Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing

Leap Bot Testing Stations created by girls in Activity 3: Create a Way to Test How Well Your

Leap Bot Performs
Leap Bot Recording Sheet

Long and Short springs from the GoldieBlox Making Things Zoom kit (3 or more from each set for each pair or small team)

Leftover pieces from the GoldieBlox Making Things Zoom kit (for each pair or small team)

NAME _____

Leap Bot Recording Sheet

	Short Spring	Long Spring	Both Springs
1			
2			
3			
4			
5			

Do you see a pattern?

What do you conclude about springs?

How do you know?

Challenge 2



Activity 5: Share Your Results

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle and share their results for Step Five of the Leap Bot Design Challenge.

SAY:

After engineers create and test something, they share what they've learned with others. Why do you think they do that?

Girls may say: To help other people who want to do the same thing, to get ideas about how to make their invention better, etc.

When you tell the group about what worked and didn't work with your Leap Bot, you help them know what they could do differently. And they may have ideas about how you can make your Leap Bot better.

So, let's act like engineers! We'll go around the circle and each group can talk about what you did and what you learned.

If girls need some help getting started, try these prompts:

What was your favorite part of making and testing your Leap Bot? Why?

What worked?

What didn't work?

What did you do when something didn't work?

Let girls answer. Make sure every girl gets a chance to speak.

MATERIALS:

Leap Bot Recording Sheets, filled out by girls in Activity 4: Record the Results of Your Test.

Challenge 2



Activity 6: Closing Ceremony: Awards

Time Allotment

10 minutes

Steps

Brownies earn their Leap Bot Design Challenge badge.

SAY:

You've now earned the Leap Bot Design Challenge badge. Please step forward when I say your name to accept your award. Lead a round of applause for each Brownie as she steps forward.

SAY:

You have earned your Leap Bot Design Challenge award, which means you have learned about engineering, gravity, and force by building and testing a Leap Bot. You also learned how to build and test a new product.

When you leave here, who do you want to tell about what you learned?

Girls may say: My parents, my brothers and sisters, my friends at school.

That's great! When you learn something, it's fun to pass it on to others. We can all learn from each other.

End the meeting with a Friendship Squeeze.

Now that I've earned this badge, I can give service by:

Showing Daisies that engineering can be fun by demonstrating my Leap Bot.

Sharing what I learned about gravity, force, and energy with my friends or family.

Letting others know what engineers do by doing a Show-and-Tell with my Leap Bot at school.

MATERIALS:

Leap Bot Design Challenge award
(Note to Volunteers: You can buy these awards from the GSWESTOK council shop or online at www.gswestok.org/shop.)

Challenge 2



Activity 7: Girl Survey

Time Allotment

10 minutes if you are doing the survey during the meeting.

Steps

Brownies complete the Girl Survey about the Leap Bot Design Challenge Badge.

SAY:

The people at the Girl Scouts' national office want to know what you think about it, how you think it could be improved, and what you think of STEM in general. This is a great chance for you to help Girl Scouts create STEM programs that other girls will enjoy!

It will take about 10 - 15 minutes.

Explain to girls how they will be taking the survey, either online or by filling out a printed version.

(Note to Volunteers: We hope that all girls will complete the survey - we want every girl's voice to be heard. However, the survey is voluntary, so girls don't have to take the survey if they don't want to. Also, for young girls, we encourage you to read the questions aloud while girls individually complete the survey.)

MATERIALS:

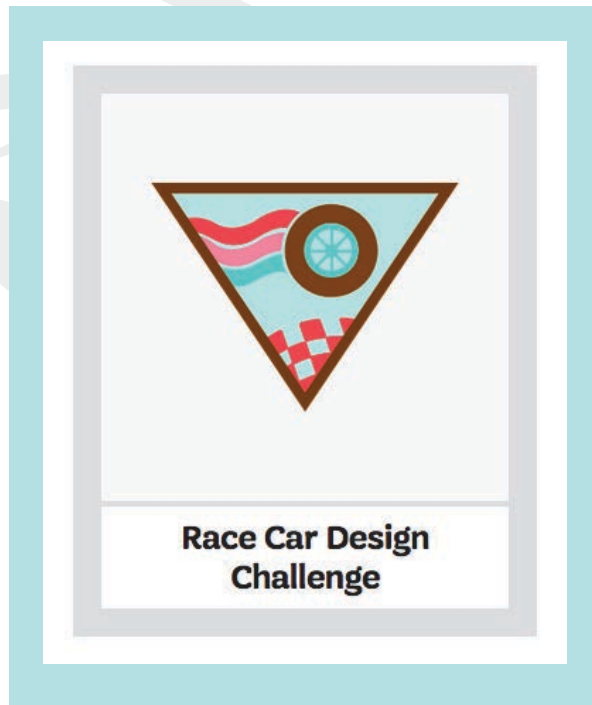
If girls are taking the survey online:
Laptop/tablet

If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids) and pen or pencil

Race Car Design



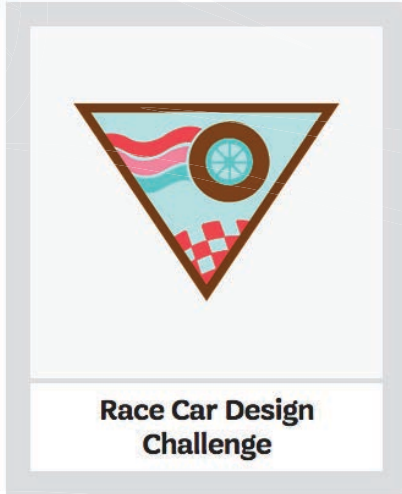
CHALLENGE



Race Car Design

brownies

CHALLENGE



Overview

In the Race Car Design Challenge, Brownies design cars and race tracks, then carry out “fair tests” to learn how design affects speed. Brownies learn how to design and test a car — and how design affects speed.

Challenge 1:

- Activity 1: As Girls Arrive: Playing with Force and Friction
- Activity 2: Opening Ceremony: Engineering Speed
- Activity 3: Learn How Design Can Affect Speed
- Activity 4: Design and Build Your Race Car
- Activity 5: Closing Ceremony: Share Your Design

Challenge 2:

- Activity 1: Build a Simple Ramp
- Activity 2: Reviewing Force and Friction
- Activity 3: Design Your Racetrack
- Activity 4: Conduct a Fair Test and Record Results
- Activity 5: Share What You Learned
- Activity 6: Closing Ceremony: Awards

Note to Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you’ll find suggested talking points under the heading “SAY.” Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It’s What Girl Scouts Do!):

Prep time will take Roughly 90 minutes

Each meeting includes a “Prepare Ahead” section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed. Please review materials list that you will need to provide on the left.

MATERIALS:

- SPORTS AND GAME BALLS
- MASKING TAPE
- FLAG
- OPTIONAL: POSTER BOARD WITH THE GIRL SCOUT PROMISE AND LAW
- TOY CAR TO DEMONSTRATE FORCE AND FRICTION
- GOLDIEBLOX MAKING THINGS ZOOM KIT
- AWARDS
- FOLDERS, POSTER BOARDS, CARDBOARD, ETC., TO LEAN AGAINST SOMETHING TO CREATE A RAMP
- BOOKS, BOXES, TABLES, ETC. TO CREATE THE HEIGHT AND TOP OF A RAMP
- YARDSTICK
- OPTIONAL: PHONE OR CAMERA TO CAPTURE “PHOTO FINISHES”
- RACE CAR DESIGN CHALLENGE BADGE
- OPTIONAL: LAPTOP/TABLET
- OPTIONAL: COPIES OF GIRL SURVEY

Challenge 1



Activity 1: As Girls Arrive: Playing with Force and Friction

Time Allotment

10 minutes

Steps

Prior to girls arriving, create two masking tape lines. The lines should be close enough that

Brownies can roll a ball back and forth between them. As Brownies arrive, welcome them, and have them pair up.

Hand each pair a ball, and have them sit facing each other on the lines and roll their ball back and forth.

Brownies can roll their ball a few times, then exchange it with another pair to try another.

SAY:

Roll your ball back and forth with your partner.

What happens when you roll it lightly? Does it reach your partner?

What happens when you roll it with a lot of strength?

Brownies roll their balls, experimenting with force.

MATERIALS:

Sports and game balls (one for each pair of girls). Bring different types of balls for girls to roll and observe friction. For example, you might bring a marble, tennis ball, basketball, ping pong ball, baseball, etc.

Create two lines with masking tape on the floor. Each Brownie should sit on the line, facing their partner.

Challenge 1



Activity 2: Opening Ceremony: Engineering Speed

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.
Conduct any troop business.
Introduce Brownies to the Race Car Design Challenge badge.

SAY:

Today, you're going to be engineers as we start the Race Car Design Challenge!

You'll design, build, and test race cars made from GoldieBlox.

Next time, you'll get to improve them based on your tests and race them down a race track!

MATERIALS:

Flag

Optional: Poster Board with the Girl Scout Promise and Law

Challenge 1



Activity 3: Learn How Design Can Affect Speed

Time Allotment

15 minutes

Steps

Brownies explore the concepts of speed and friction through a volunteer demonstration for Step One of the Race Car Design Challenge. Compare how the different balls rolled in Activity 1: As Girls Arrive: Playing with Force and Friction as examples of force.

MATERIALS:

Toy car to demonstrate force and friction

SAY:

Let's get started and learn something important engineers have to think about when they build things.

When you were rolling your balls earlier, what made the balls move faster?
(Answer: Rolling it with more strength or force.)

When you were rolling your balls earlier, what made the balls move slower?
(Answer: Using less strength or force.)

Each time you rolled the ball, you changed the amount of force you used. Force is the amount of strength or energy it takes to move something. Explain friction to Brownies, using the different balls used in Activity 1: As Girls Arrive: Playing with Force and Friction.

SAY:

Were there any balls that were easier or harder to roll? Why do you think that was?

Girls may say: It was hard to roll the tennis ball on the carpet, the ping pong ball went the fastest, etc. Each of the balls is made of a different material and weighs a different amount. For example, the smaller balls may have been easier to roll.

Why do you think that is? (Answer: The smaller balls were lighter, so the surface affected it less as it moved.)

When you roll the ball, there is something called friction that stops the ball. Friction is a force that slows and stops moving objects. Without friction, any object that was pushed or pulled would keep moving forever! For example, if there wasn't friction on the road, a car would keep moving forward forever, crashing into other things. Demonstrate how a car is moved by force and speed, and how the wheels against the road create friction.

Challenge 1



Activity 3: Learn How Design Can Affect Speed

SAY:

Why do cars have wheels?

Girls may say: To help it to move, etc.

Cars have wheels that turn to push the car forward with force. The toy car also moves because you push it with force, just like the balls moved before. As the car moves, friction between the car's wheels and the road slow it down so that it doesn't keep going forward forever.

Designing a car with wheels allows the car to move with more force and less friction. Wheels reduce the amount of the space touching the ground, allowing the car to move with more ease.

Hold up the car, and ask girls what they could do to the wheels or the race track to make the car go faster.

Spin the wheels and point out the axles. You might talk about reducing friction between the wheels and the track, reducing friction between the wheels and axles, reducing friction between the wheels and the body, keeping the car rolling straight, changing the center of gravity, etc.

SAY:

Race car designers add or create special features, parts of something, that help their car to go fast. Engineers create these features to make their products more useful.

Today, we'll use GoldieBlox to design and build race cars! How can we use science to make a faster Race Car?



Challenge 1



Activity 4: Design and Build Your Race Car

Time Allotment

25 minutes

Steps

Divide Brownies into pairs or small groups to design and build their race car for Step Two of the Race Car Design Challenge. Hand out paper and pencils to each team for Brownies to design their Race Car.

SAY:

Now, you're going to use your GoldieBlox to create a Race Car.

Before engineers build things, they plan their design. Designing your product before you build allows you to think through any problems and troubleshoot them ahead of time. Draw your Race Car to help figure out how to build it. Look at the pieces in the kit to see what fits together to create your car.

When they're finished designing, hand out the GoldieBlox sets.

Let the girls build their Race Cars.

Keep It Girl-Led: By having girls reverse engineer a Race Car, Brownies have a hands-on opportunity to learn about the different parts instead of following directions. If they're having trouble, ask them questions like, "What GoldieBlox should you put into your car? How do you attach the wheels?"

If girls need help, lead them to connect the angle joint to the long axle. On the other end of the long axle, add a T-Joint, mini axle, and another T-joint. Connect the craftstruction or paper wing by placing the holes on top on the T-joints and attaching the star stoppers.

Circulate among the groups, asking questions to prompt further exploration.

(Note to Volunteers: You may want to save the Brownies' Race Cars for the next meeting, Race Car Design Challenge 2. If you are able to, label each car with the girl or group's name(s) and put away until the next meeting. If you are unable to keep them together, don't worry, the girls will have a chance to rebuild at the start of the next meeting.)

If Brownies have extra time, they can practice pushing their cars around the room using different amounts of force.

MATERIALS:

GoldieBlox Making Things Zoom kit (one set for each pair or small team.)
Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.

Challenge 1



Activity 5: Closing Ceremony: Share Your Design

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle, and have them share their race cars from Activity 4: Design and Build Your Race Car.

Each girl has a chance to share about her design decisions.

SAY:

How did you design your car?

What special features did you add to your car?

Did you improve the speed of your car? How?

How could you make your car go even faster?

End the meeting with a Friendship Squeeze.

MATERIALS:

Race Cars built by Brownies in Activity 4: Design and Build Your Race Car

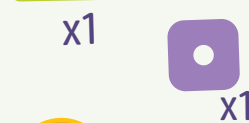
Race Car Design Challenge badge

Spring Car

engineering concept:
SIMPLE MACHINES

build date:

I built it!



All GoldieBlox products, characters, illustrations, text, copyrights, and trademarks are the sole property of GoldieBlox, Inc.

Challenge 2



Activity 1: As Girls Arrive: Build a Simple Ramp

Time Allotment

10 minutes

Steps

Prior to the meeting, create a sample ramp for Brownies. You may make a simple ramp by placing strips of cardboard or folders on textbooks.

As Brownies arrive, welcome them, and have them work in pairs or small teams to build a simple ramp to start testing their race cars. Optional: If you were unable to save the race cars between meetings, Brownies can rebuild them.

SAY:

Today, you're going to redesign and race your cars.

Looking at my ramp, do you think you could create one for your race car? Once you create it, see how your race car rolls down.

Have Brownies create simple ramps and begin to test their race cars.

If there's time, encourage Brownies to redesign their ramps to see how it affects their car's roll.

SAY:

What happens if you change the height your ramp? Does it affect how fast your car rolls down the ramp?

Lead them to discover that the height/incline of the ramp affects the speed of the car as it goes down, i.e. it goes slower when there is less slope, and faster when there is more incline.

MATERIALS:

Race cars created by girls in Race Car Design Challenge 1. (Note to Volunteers: If you were unable to save the race cars between meetings, Brownies can rebuild their cars during this activity.)

Folders, poster boards, cardboard, etc., to lean against something to create a ramp

Books, boxes, tables, etc. to create the height and top of a ramp



Challenge 2



Activity 2: Opening Ceremony: Reviewing Force and Friction

Time Allotment

10 minutes

Steps

Recite the Pledge of Allegiance and the Promise and Law.
Conduct any troop business.
Review force and friction with Brownies, and explain today's engineering challenge to Brownies.

SAY:

Does anyone remember what force is? What's friction?

(Answer: Force is the strength or energy that creates movement. Friction is a force that slows moving objects.)

What did you learn about force and friction from testing your cars last time?

Girls may say: Friction affects how fast it goes, the size of the car affects its speed, wheels reduce friction, etc.

Last time, you built your race car. You learned about force, friction, and how the size and weight of a car can affect its speed. Then, you just built mini ramps to test how your car rolls down an incline.

Did you discover anything about your car's speed?

Girls may say: It went faster down the ramp than along the ground, the speed changed with the ramp's height, etc.

How does the car roll down the ramp? Girls may say: It rolls, etc.

There's something all around us that keeps us on the ground. It also helps your race car to roll down the ramp without you pushing it. Does anyone know what that is? (Answer: Gravity.)

Gravity is a strong force that pulls objects, including us and rolling cars, to the ground. For example, what happens when you jump up? Want to test and find out? Jump on the count of three! One, two, three, jump! Brownies jump. Explain how gravity affects the race car.

SAY:

When you jump up, gravity brings you back down to the ground. How do you think gravity affects your race car? (Answer: It move the car down the ramp!)

Just like gravity brings you back to the ground, gravity moves the race car down the ramp without you having to push it. Today, you'll have the chance to use all you've learned to design a giant racetrack before we have a Troop Car Chase to see whose car goes the furthest!

MATERIALS:

Flag

Challenge 2



Activity 3: Design Your Racetrack

Time Allotment

10 minutes

Steps

Divide girls into small groups to build their racetrack for Step Four of the Race Car Design Challenge.

Explain fair tests to the Brownies.

SAY:

Now, it's time for you to design a race track and test your car on the track. When we do this experiment, we need to make sure it's a "fair test." A fair test means that we're only changing one thing at a time. Everything else needs to stay the same.

So, say we want to measure which race car gets down the ramp fastest. If we release one car slowly but give the second one a push, that's not a fair test.

If you want to do a fair test, you can't give another car an advantage. Only one thing gets changed in a fair test, and in this example the only change would be the car itself. Brownies design their racetracks in small groups.

SAY:

Now, work in groups to create larger ramps that more than one car can go down at a time. You might lean a big piece of heavy cardboard against a table or something else might work even better. Put tape at the end of the table as a finish line.

Float around the room as girls design their race tracks using the materials and masking tape.

If girls have trouble keep their cars on the tracks, encourage them to create "side rails" on their ramps by attaching rolled up paper or newspaper to the sides of their ramp with masking tape.

If girls ask you for help with their designs, try not to tell them what to do. Instead, ask questions, such as, "What have you tried so far? What do you think would happen if you tested your car on that track? How could you change the track? How do you think that will change the way your car races?"

Remind them that they will get to test their ideas when they do the next activity.

MATERIALS:

Poster boards, cardboard, etc., to lean against something to create ramps
Table(s) or books to create the top of ramps
Paper or newspaper
Masking Tape

Challenge 2



Activity 4: Conduct a Fair Test and Record Results

Time Allotment

20 minutes

Steps

Divide Brownies into pairs or small groups to test their cars for Step Four of the Race Car Design Challenge.

Give the girls time to test their cars on their race tracks, keeping the following definitions in mind:

Fair test: Change only one factor at a time while keeping all other conditions the same.

Failure point: The specific part of a design or build that isn't working.

Circulate among the groups of girls to guide the testing process.

When a new design improves the car, ask them to talk about why they think the improvements helped. If a new design "fails," ask the girls to talk about what went wrong. Remind them that failure in design is an opportunity to collect valuable data that can help spark ideas for new solutions.

Have the girls race their finished cars.

Use a yardstick as the starting line. Raise the yardstick straight up to make sure all the cars go at the same time.

Optional: Set up a camera or phone to capture "photo finishes."

MATERIALS:

Yardstick

Ramp created by girls in Activity 3:

Design Your Racetrack

Race cars created by girls in Race Car Design Challenge 1 or rebuilt in

Activity 1: As Girls Arrive:

Build a Simple Ramp

Optional: Phone or camera to capture "photo finishes"

Challenge 2



Activity 5: Share What You Learned

Time Allotment

10 minutes

Steps

Have Brownies form a Friendship Circle and share their results for Step Five of the Race Car Design Challenge.

Let girls present in their own way, offering prompts as needed to help them consider what they've learned.

Sample prompts include:

What made the fastest car so fast?

What could make the slowest car go faster?

When did you fail? How did you improve your design?

Were the races fair tests? How could you improve the track?

If you had more time, what would you try next?

Make sure every girl gets a chance to speak.

MATERIALS:

Race cars redesigned by girls in Activity 4: Conduct a Fair Test and Record Results

Challenge 2



Activity 6: Closing Ceremony: Awards

Time Allotment

10 minutes

Steps

Brownies receive their Race Car Design Challenge badge.

SAY:

You've now earned the Race Car Design Challenge badge.
Please step forward when I say your name to accept your award.
Lead a round of applause for each Brownie as she steps forward.

SAY:

You have earned your Race Car Design Challenge award, which means you have designed cars and race tracks, then carried out "fair tests" to learn how design affects speed.

When you leave here, who do you want to tell about what you learned?

Girls may say: My parents, my brothers and sisters, my friends at school.

That's great! When you learn something, it's fun to pass it on to others. We can all learn from each other.

End the meeting with a Friendship Squeeze.

Now that I've earned this badge, I can give service by:

Showing Daisies that engineering can be fun by demonstrating my race car.

Sharing what I learned about force and friction with my friends or family.

Letting others know what engineers do by doing a Show-and-Tell with my race car at school.

MATERIALS:

Race Car Design Challenge award
(Note to Volunteers: You can buy these awards from the GSWESTOK shop or online at www.gswestok.org/shop. website.)

Challenge 2



Activity 7: Girl Survey

Time Allotment

10 minutes if you are doing the survey during the last meeting.

Steps

Brownies complete the Girl Survey about the Race Car Design Challenge Badge.

SAY:

The people at the Girl Scouts' national office want to know what you think about it, how you think it could be improved, and what you think of STEM in general. This is a great chance for you to help

Girl Scouts create STEM programs that other girls will enjoy!
It will take about 10 - 15 minutes.

Explain to girls how they will be taking the survey, either online or by filling out a printed version.

(Note to Volunteers: We hope that all girls will complete the survey - we want every girl's voice to be heard. However, the survey is voluntary, so girls don't have to take the survey if they don't want to. Also, for young girls, we encourage you to read the questions aloud while girls individually complete the survey.)

MATERIALS:

If girls are taking the survey online:
Laptop/tablet

If girls are filling out the survey on paper: Copies of Girl Survey (pdf available in Meeting Aids)
and pen or pencil