

Roller Coaster Design Challenge 1

Overview:

In the Roller Coaster Design Challenge, Daisies learn about engineering and motion by building and testing a roller coaster. Daisies explore how roller coasters work and how to design, build, and test a new product.

Step One: Make a simple roller coaster car.

Step Two: Build a model of a roller coaster.

Step Three: Test your roller coaster. *(To be completed in Roller Coaster Design Challenge 2.)*

This meeting, Daisies make a roller coaster car then begin to build a simple roller coaster to test their cars. Daisies complete Step One and Step Two of the Roller Coaster Design Challenge badge.

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!): 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.

If your troop has the GoldieBlox Making Things Move kit, you can find a set of Activity Instructions for the badge in the Meeting Aids section of this badge meeting under "Activities for the Making Things Move Kit."

Use Girl Scouts' Three Processes: Girl-led, learning by doing, cooperative learning—these three processes are the key to making sure Daisies have fun in Girl Scouts and keep coming back.

"Learning by doing" and "cooperative learning" are built into this Badge, thanks to the hands-on activities and tips. You'll also find specific "keep it girl-led" tips in the meeting plans. They'll help you create an experience where Daisies know they can make choices and have their voices heard.

Fail Fast. Succeed Sooner: That's how engineers solve problems. In this badge, Daisies will learn about engineering through hands-on activities. They'll learn to: Brainstorm ways to solve a problem, design prototypes, test them to see what does and doesn't work, then improve their designs. To engineers, failure is a good thing because every time a design

fails, you learn something and can make it better.

You can help Daisies think this way. When her prototype doesn't work, ask questions like, "Why do you think it didn't work? How can you change your design? Try again—that's what engineers do!" This approach also keeps the activity girl-led and fun because Daisies are free to invent things without feeling the pressure to make them perfect.

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Roller Coaster Design Challenge 1

Leave Time for the Closing Ceremony: If Daisies are having fun doing a Design Challenge, you may be tempted to skip the Closing Ceremony so they can keep going—but the Closing Ceremony is absolutely key to their learning. Here's why:

When Daisies leave a meeting, they'll remember how much fun it was to build a board game or to make a car speed down a ramp. However, they may not realize that they just learned how engineers solve problems or that they're good at engineering—unless you tell them.

That's why the Closing Ceremony is so important. It's where you can connect the dots for Daisies by:

- Pointing out how they acted as engineers. (**For example:** They did rapid prototyping. When one of their prototypes didn't work, they saw that "failure" as helpful feedback and tried something else. They worked together to find solutions. They shared their designs and offered suggestions.)
- Reminding Daisies that they are *already* engineers—and that it's fun to solve problems using engineering.
- Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost Daisies' confidence and interest in STEM—and end the meeting on an upbeat note!

Tell Your Troop Story: As a Girl Scout leader, you're designing experiences that Daisies will remember their whole lives. Try to capture those memories with photos or videos. Daisies love remembering all they did—and it's a great way for parents to see how Girl Scouting helps their Daisies!

And please do share your photos and videos with GSUSA by emailing them to STEM@girlscouts.org (with photo releases if at all possible!).

Prepare Ahead (Roughly 50 minutes)

1. Go over new words Daisies can learn (2 minutes)

This meeting includes the following words Daisies may not know:

- **Engineers** – People who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges, and cars.
- **Brainstorming** – When people come together to think of new ideas and solutions.

See the **Glossary for Daisy Design Challenge Badges** for more vocabulary and examples.

2. Read through this guide and handouts (15 minutes)

This will help you get familiar with the flow of the meeting.

Roller Coaster Design Challenge 1

The following handouts can be found in Meeting Aids.

- **Daisy Design Challenge Badges: Materials List:** Each meeting has its own materials list, but you can use this handout if you like to do all your supply shopping at one time. It includes the materials needed for all three Daisy Design Challenge badges.
- **Glossary for Daisy Design Challenge Badges:** This is a list of words that Daisies may not know and how to define them.
- **Think, Pair, Share:** These facilitation tips will help you to make sure that every girl's voice is heard during brainstorming activities.

3. Gather materials (30 minutes)

Gather materials using the Materials List for this meeting. If your meeting location doesn't have a flag, bring a small one that Daisies can take turns holding or hang in the room.

Prior to the meeting, you may want to create a sample roller coaster car to show to girls. Alternatively, you can show them the Meeting Aid, **Sample Roller Coaster Car**.

If your troop has the GoldieBlox Making Things Move kit, you can find a set of Activity Instructions for the badge in the Meeting Aids section of this badge meeting under "Activities for the Making Things Move Kit."

Get Help from Your Family and Friends Network

Your Friends and Family Network can include:

- Daisies' parents, aunts, uncles, older siblings, cousins, and friends
- Other volunteers who have offered to help with the meeting

Ask your Network to help:

- Bring materials
- Assist with Design Challenge activities

Award Connection

Daisies will earn one award:

- Roller Coaster Design Challenge badge

Daisies receive the award following the completion of all three steps of the badge in **Roller Coaster Design Challenge 2**.

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts' website.)

Roller Coaster Design Challenge 1

Meeting Length

60 minutes

- The times given for each activity will be different depending on how many Daisies are in your troop.
- There is no snack time scheduled in these meetings. If girls need a snack, add 15 minutes to the overall time for the meeting.
- Give Daisies 10- and 5-minute warnings before they need to wrap up the last activity so you'll have time for the Closing Ceremony.

Materials List:

Activity 1: As Girls Arrive: How Does It Move?

- None

Activity 2: Opening Ceremony: All About Roller Coasters

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Make a Simple Roller Coaster Car

- **Sample Roller Coaster Car** handout
- Optional: sample roller coaster car made by you

For each roller coaster car, girls will need at least:

- 2 spools
- 2 dowels. Alternatively, you could use other craft sticks with dull ends, straws, BBQ skewers, etc. (**Note to Volunteers:** Make sure the dowels fit in spools.)
- 2 craft sticks
- Clay or poster putty
- Tape (masking or duct)
- Safety scissors
- **Note to Volunteers:** The sample roller coaster car uses two spools, two dowels, and two craft sticks, held together with clay and/or tape, but girls can build upon this with the other materials if you have them available. For example, they could experiment with adding a car to hold figurines using small boxes or paper cups.

Activity 4: Build a Model of a Roller Coaster

- Roller coaster cars created by girls in Activity 3: Make a Simple Roller Coaster Car
- 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

Activity 5: Closing Ceremony: Flash Chat

- None

Roller Coaster Design Challenge 1

Awards

Girls do not receive any awards in this meeting.

Detailed Activity Plan

Activity 1: As Girls Arrive: How Does It Move? (10 minutes)

Materials

- None

Steps

Welcome Daisies, and have them act out how different people, animals, or even machines move.

SAY:

Today, we're going to learn about motion, speed, and engineering.

To get you thinking, can you act out how a human moves? What sort of actions do we make?

How does a dog move? What about a frog?

What about machines? Can you think of a machine that moves? How does a car move?

If you are busy preparing for the meeting, you can have another volunteer lead or the girls take turns thinking of motions for everyone to act out.

Activity 2: Opening Ceremony: All About Roller Coasters (10 minutes)2

Materials

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Daisies to the Roller Coaster Design Challenge badge.

SAY:

Have you ever been on a roller coaster? What were your favorite parts? Why?

Girls may say: I like going on the loops, I like going upside down, etc.

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Roller Coaster Design Challenge 1

Today, we'll start to build our own roller coaster to see how its design affects how fast a roller coaster moves, just like engineers.

Engineers are people who use their imaginations to solve problems as they invent and build things. You'll do the same thing today as you build and test your roller coaster!

Activity 3: Make a Simple Roller Coaster Car (15 minutes)

Materials

- **Sample Roller Coaster Car** handout
- Optional: sample roller coaster car made by you

For each roller coaster car, girls will need at least:

- 2 spools
- 2 dowels. Alternatively, you could use other craft sticks with dull ends, straws, BBQ skewers, etc. (**Note to Volunteers:** Make sure the dowels fit in spools.)
- 2 craft sticks
- Clay or poster putty
- Tape (masking or duct)
- Safety scissors
- **Note to Volunteers:** The sample roller coaster car uses two spools, two dowels, and two craft sticks, held together with clay and/or tape, but girls can build upon this with the other materials if you have them available. For example, they could experiment with adding a car to hold figurines using small boxes or paper cups.

Steps

Daisies build a roller coaster car for Step One of the Roller Coaster Design Challenge.

SAY:

When you've earned this badge, you're going to know how roller coasters work. The first step is to make a car for your roller coaster.

Show girls your sample roller coaster car or the **Sample Roller Coaster Car** handout as an example.

SAY:

Sometimes, engineers don't know exactly how things are built. They have an idea through a picture or model, but then they have to figure out how to make it.

Here's a sample roller coaster car, but you can do it anyway you like, as long as it rolls! What are some other ways you could use the materials to make the roller coaster car?

Roller Coaster Design Challenge 1

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 roller coaster car?

Divide girls into pairs and give each pair materials to build a roller coaster car.

Keep It Girl-Led: Girls may want to work in pairs or small design teams for the activity. Each group will need a full set of supplies, so help the girls to form their teams depending on the amount of materials available.

Let girls put the materials together, either by reverse engineering the sample roller coaster car or by creating something brand new. However, make sure girls' roller coaster cars will be able to roll down a ramp.

Keep It Girl-Led: By having girls reverse engineer the roller coaster car, Daisies have a hands-on opportunity to engineer different solutions instead of following directions exactly as written. When you give girls the chance to do this, they learn more about the materials they're using and get to use their creativity. If they're having trouble, ask them questions like, "What material could you use for the wheels? How could you attach them?" If girls still have trouble, suggest they limit themselves to two spools, two dowels, and two craft sticks, held together with clay and/or tape, to make a simple car with two wheels.

If you have extra time, Daisies can add to their roller coaster cars. Remind girls that their cars must be able to roll down a ramp for the next activity.

(Note to Volunteers: If you can, save the Daisies' roller coaster cars for the next meeting, Roller Coaster Design Challenge 2. Label each car with the girl or group's name(s) and put away until the next meeting. If you are unable to keep the cars, don't worry, the girls will have a chance to rebuild at the start of the next meeting, though this may take longer than the allotted time given.)

Activity 4: Build a Model of a Roller Coaster (15 minutes)

Materials

- Roller coaster cars created by girls in Activity 3: Make a Simple Roller Coaster Car
- 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

Steps

Daisies build a simple roller coaster (ramp) and begin to test their roller coasters for Step Two of the Roller Coaster Design Challenge.

Roller Coaster Design Challenge 1

SAY:

Now, you're going to build a model of a roller coaster.

Once you're done, you can test how fast your car goes on the roller coaster.

First, you're going to build simple ramps. Next meeting, you'll get to test your cars against one another on a roller coaster you build.

Create a sample ramp for Daisies to see. You may make simple ramps by placing strips of cardboard on textbooks or a similar setup with different materials.

Show Daisies how the roller coaster rolls down the ramp.

SAY:

Now, create your own ramp. Once you build it, see how your roller coaster car rolls down.

Have Daisies create simple ramps and begin to test their roller coasters.

If there's time, encourage Daisies to redesign their ramps to see how it affects the roller coaster car's speed.

SAY:

Engineers test their new creations, just like this, to see how the different parts, like the roller coaster and car, work together.

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. Daisies will be looking at this more Roller Coaster Design Challenge 2.

Activity 5: Closing Ceremony: Flash Chat (10 minutes)

Materials

- None

Steps

Have girls form a Friendship Circle and discuss how they designed their roller coaster cars and ramps.

SAY:

Roller Coaster Design Challenge 1

Did you notice anything when you changed the design of the roller coaster ramp? How did the car move differently? (Answer: The design of the ramp affected the speed of the car. The height/incline of the ramp affects the speed that the car goes down, i.e. slower when less slope, faster when more incline.)

How could you expand or improve the roller coaster or your car?

What was your favorite part of the day's activities? Let's give every girl a chance to share.

End the meeting with a Friendship Squeeze.

(Note to Volunteers: If you can, save the Daisies' roller coaster cars for the next meeting, Roller Coaster Design Challenge 2. Label each car with the girl or group's name(s) and put away until the next meeting. If you are unable to keep the cars, don't worry, the girls will have a chance to rebuild at the start of the next meeting, though this may take longer than the allotted time given.)

Daisy Design Challenge Badges (DIY Activity Version)

Daisy Design Challenge Badges: Materials List**Board Game Design Challenge 1****Activity 1: As Girls Arrive: Paper Games**

- Paper
- Pencils
- Optional: Find and print out puzzles, mazes and other simple paper games

Activity 2: Opening Ceremony: All About Games

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Come Up with an Idea for Your Board Game

- Paper
- Markers and/or crayons

Activity 4: Design a Spinner for Your Game

For each spinner:

- 1 spool. Alternatively, you could use washers, or other small items with a hole in the middle. **(Note to Volunteers:** Girls will need at least one item for the spinner, but a variety of options gives girls the opportunity to engineer different and original solutions.)
- 1 wooden dowel. Alternatively, you could use straws, pencils, or BBQ skewers. **(Note to Volunteers:** Make sure it fits through the spool or other item with a hole.)
- 4 popsicle sticks
- Clay or poster putty
- Tape (masking or duct)
- Small piece of cardboard to attach as the base of the spinner

Activity 5: Closing Ceremony: Flash Chat

- **Spinner Paper Pieces** (one for each Spinner created)

Board Game Design Challenge 2**Activity 1: As Girls Arrive: Create Your Game Board**

- Spinners created in Board Game Design Challenge **(Note to Volunteers:** If you were unable to save the spinner between meetings, Daisies can rebuild their spinners during this activity.)
- **Spinner Paper Pieces**, one for each Spinner created
- Large paper, construction paper, or poster board
- Markers and/or crayons
- **Optional:** Additional decorations for game boards, like stickers, construction paper, and tape/glue

Daisy Design Challenge Badges (DIY Activity Version)

Board Game Design Challenge 2 (continued)

Activity 2: Opening Ceremony: Share Your Board Game

- Flag
- Spinners and game boards created by Daisies
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Test Your Game and Make It Better

- Spinners and game boards created by Daisies
- Small toy figures for girls to use as game players, at least one for each girl
- **Optional:** Variety of additional supplies for girls to expand their game boards or improve their spinner, like spools, dowels, craft sticks, clay, and tape.

Activity 4: Closing Ceremony: Awards

- Board Game Design Challenge award, one for each girl

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

Roller Coaster Design Challenge 1

Activity 1: As Girls Arrive: How Does It Move?

- None

Activity 2: Opening Ceremony: All About Roller Coasters

- Flag
- **Where Does the Roller Coaster Go Fastest?** handout
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Make a Simple Roller Coaster Car

- **Sample Roller Coaster Car**, handout
- Optional: sample roller coaster car made by you

For each roller coaster car, girls will need at least:

- 2 spools
- 2 dowels. Alternatively, you could use other craft sticks with dull ends, straws, BBQ skewers, etc.) (**Note to Volunteers:** Make sure the dowels fit in spools.)
- 2 craft sticks
- Clay or poster putty
- Tape (masking or duct)
- Safety scissors
- **Note to Volunteers:** The sample roller coaster car uses two spools, two dowels, and two craft sticks, held together with clay and/or tape, but girls can build upon this with the other materials if you have them available. For example, they could experiment with adding a car to hold figurines using small boxes or paper cups.

Daisy Design Challenge Badges (DIY Activity Version)

Roller Coaster Design Challenge 1 (continued)

Activity 4: Build a Model of a Roller Coaster

- Roller coaster cars created by girls in Activity 3: Make a Simple Roller Coaster Car
- 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

Activity 5: Closing Ceremony: Flash Chat

- None

Roller Coaster Design Challenge 2

Activity 1: As Girls Arrive: Prepare for Testing

- Roller coaster cars created by girls in Roller Coaster Design Challenge 1. (**Note to Volunteers:** If you were unable to save the roller coaster cars between meetings, Daisies 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

Activity 2: Opening Ceremony: Engineers Work Together!

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Test Your Roller Coaster

- Roller coaster cars created by girls in Roller Coaster Design Challenge 1 or rebuilt in Activity 1: As Girls Arrive: Prepare for Testing
- Ramps created in Activity 1: As Girls Arrive: Prepare for Testing
- Leftover materials from Activity 1: As Girls Arrive: Prepare for Testing for girls to build on ramps
- Leftover or additional materials for girls to build upon their roller coaster cars

Activity 4: Closing Ceremony: Awards

- Roller Coaster Design Challenge award, one for each girl

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

Model Car Design Challenge 1

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

- 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 Daisy should sit on the line, facing their partner.

Daisy Design Challenge Badges (DIY Activity Version)

Model Car Design Challenge 1 (continued)

Activity 2: Opening Ceremony: All About Friction

- Flag
- Optional: Print out pictures of a bicycle wheel (including brake pads), a golf ball on a putting green, a baseball player sliding, and a sled loaded with supplies (or other examples of friction).
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design and Build Model Cars

- Blank paper
- Crayons or markers
- **Sample Model Car** handout, for your reference
- Optional: Create a sample model car for girls to reverse engineer.

Suggested materials for each model car:

- 2 or 4 (depending on length and size of cabin) wooden dowels or other material to attach wheels to car cabin. Alternatively, you could bring straws, BBQ skewers, etc. (**Note to Volunteers:** Make sure the dowels or other wheel attachments fit in the wheels and allow wheel rotation.)
- 4 wooden wheels. Alternatively, you could bring round soda caps, cds, or other round materials for girls to test.
- Clay, foam, or poster putty
- Tape
- Small and medium boxes (assorted sizes.) A variety of boxes give girls the opportunity to try different materials for their car.
- Optional: Other materials for girls to use in their model car, such as paper towels, pieces of cardboard, cups, etc.
- **Note to Volunteers:** Depending on what you have available, Daisies can experiment using the different materials to create their model car.

Activity 4: Use Model Cars to Test the Friction of Different Surfaces

- Model cars created in Activity 3: Design and Build Model Cars
- 2+ Friction stations for girls to test their cars (including a different surface at each station). See Prepare Ahead for more information on how to create the stations.
- Optional: Yard sticks, rulers, or string for Daisies to measure how far their cars go at each station.
- Optional: Paper and pencils if Daisies can read/write to record data.

Activity 5: Closing Ceremony: Reviewing Our Testing Results

- None

Daisy Design Challenge Badges (DIY Activity Version)

Model Car Design Challenge 2

Activity 1: As Girls Arrive: Build A Simple Ramp

- Model cars created by girls in Model Car Design Challenge 1. (**Note to Volunteers:** If you were unable to save the model cars between meetings, Daisies 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

Activity 2: Opening Ceremony: Reviewing Force and Friction

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Race Your Cars!

- Model cars created by girls in Model Car Design Challenge 1 or rebuilt in Activity 1: As Girls Arrive: Build a Simple Ramp
- Sample ramp or ramps created in Activity 1: As Girls Arrive: Build a Simple Ramp
- Tape
- Toy figurine, at least one for each Model Car
- Leftover or additional materials for girls to rebuild their model cars. You may want to bring dowels, wheels, boxes, cups, cardboard, paper tubes, clay or poster putty, tape, etc.
- Surface for bottom of ramp (towel, carpet, or asphalt)

Activity 4: Closing Ceremony: Awards

- Model Car Design Challenge award, one for each girl

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

Design Challenge Badges

Glossary for Daisies

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

Inventors are people who think of and build new products and ideas.

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.

Brainstorming is what happens when you and your troop get together to come up with ideas.

Features are parts of a product that are designed make them more useful. For example, windshield wipers or automatic door locks are features of a car.

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

Friction is a force that slows moving objects.

Brainstorming Tips: Think, Pair, Share

How to Run a Think, Pair, Share Activity:

Tell girls that they're going to brainstorm answers to your question using "Think, Pair, Share."

Lead girls through the basic steps by telling them they will:

1. Break into small groups.

2. Listen to the question or prompt.

3. Think about their answers.

- Girls may want to write their answers down.
- Twenty seconds should be enough time, since girls will need to sit quietly.

4. Pair with other girls.

- Girls talk with one to three other girls (depending on group size), making sure everyone has a chance to share their answers. If there's time, it's OK for girls to ask questions about each other's answers.
- For pairs, 20 seconds should be enough time. If your troop enjoys discussion, consider extending this to 1 to 2 minutes.

5. Share with the group.

- Girls share their answers with the larger group.
- This can be completed in 20 – 30 seconds, but will run longer based on group size and how the group sharing is done.

There are two ways to set up group sharing:

- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you're running short on time. It also helps develop conflict resolution and compromise skills.
- **Optional:** Each girl shares her partner's answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.

The Girl Scout Promise

On my honor, I will try:

To serve God and my country,

To help people at all times,

And to live by the Girl Scout Law.

The Girl Scout Law

I will do my best to be

honest and fair,

friendly and helpful,

considerate and caring,

courageous and strong, and

responsible for what I say and do,

and to

respect myself and others,

respect authority,

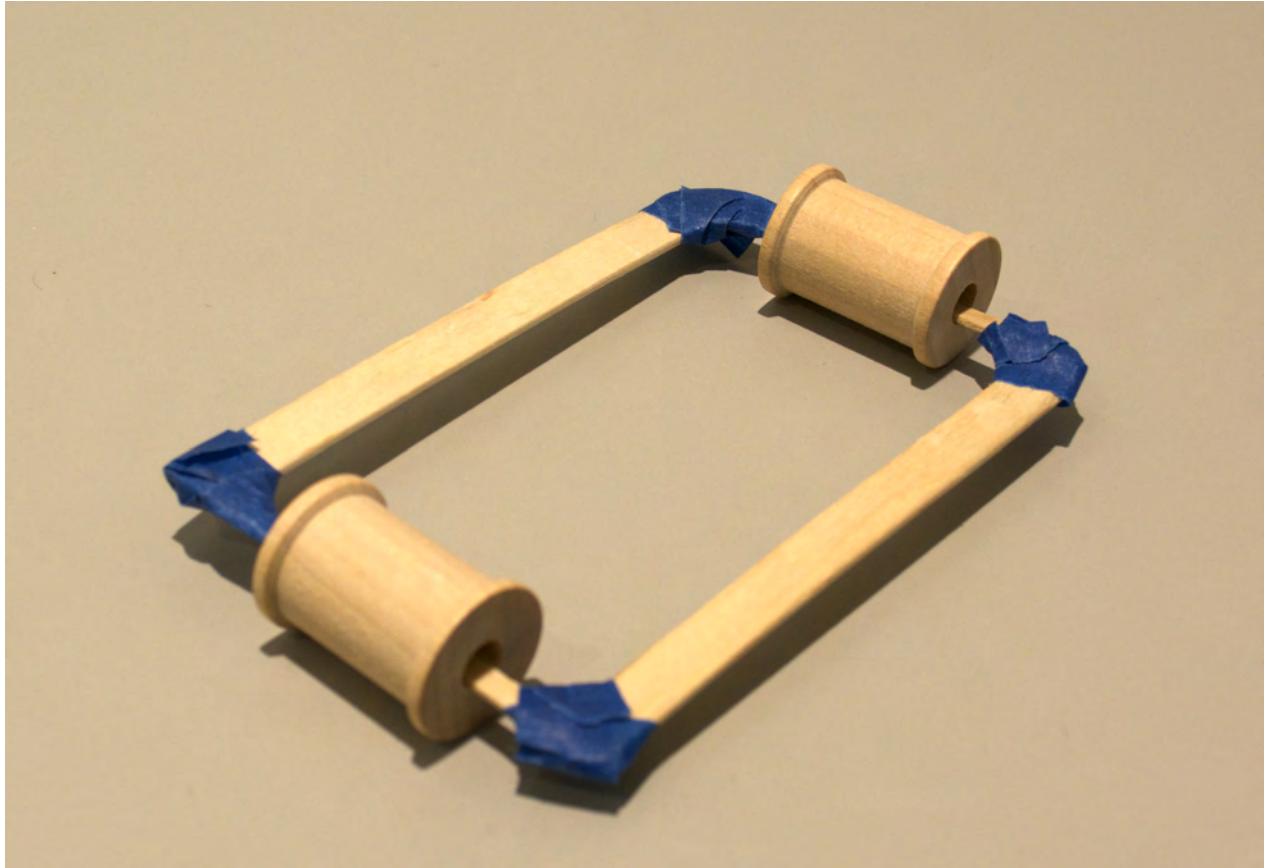
use resources wisely,

make the world a better place, and

be a sister to every Girl Scout.

Roller Coaster Design Challenge

Sample Roller Coaster Car



This roller coaster car is made from: 2 spools, 4 craft sticks, tape.

Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

Note to Volunteers on the GoldieBlox Making Things Move kit:

This version of the badge uses the GoldieBlox Making Things Move kit. Each kit includes 6 sets of GoldieBlox parts for the badge, (i.e. you can create 6 of any Daisy Design Challenge badge from one kit). Inside the kit are six sets of GoldieBlox parts that allow girls to earn all 3 Daisy Design Challenge badges. Two to four girls can use each set. So if you have 12 girls, you will need one kit for them to work in pairs.

The kit is no longer available to purchase, but you can find a full parts list at the end of this handout if you want to pull together the GoldieBlox for the badges. If you do not have the GoldieBlox, we recommend completing the badge using the DIY instructions now included as the Meeting Plan on VTK.

Materials List

As Girls Arrive: How Does It Move?

- None

Opening Ceremony: All About Roller Coasters

- Flag
- **Where Does the Roller Coaster Go Fastest?** handout
- Optional: Poster Board with the Girl Scout Promise and Law

Step One: Make a Simple Roller Coaster Car

- GoldieBlox Making Things Move kit (one set for each pair or small team.) (**Note to Volunteers:** A simple roller coaster car uses 2 wheels, 4 blocks, and 4 short axles, but girls can build upon this with the other pieces. Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.)
- **Simple GoldieBlox Roller Coaster Car** handout

Step Two: Build a Model of a Roller Coaster

- Roller coaster cars created by girls in Step One: Make a simple roller coaster car
- 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

Closing Ceremony: Flash Chat

- None

Awards

Girls do not receive any awards in this meeting.

Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

Detailed Activity Plan

As Girls Arrive: How Does It Move? (10 minutes)

Materials

- None

Steps

Welcome Daisies, and have them act out how different people, animals, or even machines move.

SAY:

- *Today, we're going to learn about motion, speed, and engineering.*
- *To get you thinking, can you act out how a human moves? What sort of actions do we make?*
- *How does a dog move? What about a frog?*
- *What about machines? Can you think of a machine that moves? How does a car move?*

If you are busy preparing for the meeting, you can have another volunteer lead or have the girls take turns thinking of motions for everyone to act out.

Opening Ceremony: All About Roller Coasters (10 minutes)

Materials

- Flag
- **Where Does the Roller Coaster Go Fastest?** handout
- Optional: Poster Board with the Girl Scout Promise and Law

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Daisies to the Roller Coaster Design Challenge badge.

SAY:

- *Have you ever been on a roller coaster? What were your favorite parts? Why?*

Girls may say: I like going on the loops, I like going upside down, etc.

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Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

Show Daisies (or hand out) the **Where Does the Roller Coaster Go Fastest?** handout.

SAY:

- *Take a look at this picture. Where do you think a roller coaster would go faster? Slower? Why?*

Give girls time to answer.

SAY:

- *Today, we'll start to build our own roller coaster to see how its design affects how fast it moves, just like engineers.*
- *Engineers use their imaginations to solve problems as they invent and build things. You'll do the same thing today as you build and test your roller coaster!*

Step One: Make a Simple Roller Coaster Car (15 minutes)

Materials

- GoldieBlox Making Things Move kit (one set for each pair or small team.) (**Note to Volunteers:** A simple roller coaster car uses 2 wheels, 4 blocks, and 4 short axles, but girls can build upon this with the other pieces. Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.)
- **Simple GoldieBlox Roller Coaster Car** handout

Steps

Daisies build a roller coaster car for Step One of the Roller Coaster Design Challenge.

SAY:

- *When you've earned this badge, you're going to know how roller coasters work. The first step is to make a car for your roller coaster.*

Show girls your sample roller coaster car or the **Simple GoldieBlox Roller Coaster Car** handout as an example.

SAY:

- *Sometimes, engineers don't know exactly how things are built. They have an idea through a picture or model, 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 roller coaster car?*

Divide girls into pairs, and give each pair a set of GoldieBlox parts.

Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

Let girls put the parts together.

Keep It Girl-Led: By having girls reverse engineer the roller coaster car, Daisies 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 piece could you use to attach the wheels?" If girls still have trouble, suggest they limit themselves to four blocks and four short axles or use the GoldieBlox parts to demonstrate how to make a simple car with two wheels.

If you have extra time, Daisies can add to their roller coaster cars, however, make sure the cars are still able to roll down a ramp for the next activity.

(Note to Volunteers: You may want to save the Daisies' roller coaster cars for the next meeting, Roller Coaster 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.)

Step Two: Build a Model of a Roller Coaster (15 minutes)

Materials

- Roller coaster cars created by girls in Step One: Make a simple roller coaster car
- 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

Steps

Daisies build a simple roller coaster (ramp) and begin to test their roller coasters for Step Two of the Roller Coaster Design Challenge.

SAY:

- *Now, you're going to build a model of a roller coaster.*
- *Once you're done, you can test how fast your car goes on the roller coaster.*
- *First, you're going to build simple ramps. Next meeting, you'll get to test your cars against one another on a roller coaster you build.*

Create a sample ramp for Daisies to see. You may make simple ramps by placing strips of cardboard on textbooks.

Show Daisies how the roller coaster rolls down the ramp.

SAY:

- *Now, create your own ramp. Once you build it, see how your roller coaster car rolls down.*

Have Daisies create simple ramps and begin to test their roller coasters.

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Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

If there's time, encourage Daisies to redesign their ramps to see how it affects the roller coaster car's speed.

SAY:

- *Engineers test their new creations, just like this, to see how the different parts, like the roller coaster and car, work together.*
- *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. Daisies will be looking at this more Roller Coaster Design Challenge 2.

Closing Ceremony: Flash Chat (10 minutes)

Materials

- None

Steps

Have girls form a Friendship Circle and discuss how they designed their roller coaster cars and ramps.

SAY:

- *Did you notice anything when you changed the design of the roller coaster ramp? How did the car move differently? **(Answer: The design of the ramp affected the speed of the car. The height/incline of the ramp affects the speed that the car goes down, i.e. slower when less slope, faster when more incline.)***
- *How could you expand or improve the roller coaster or your car?*
- *What was your favorite part of the day's activities? Let's give every girl a chance to share.*

End the meeting with a Friendship Squeeze.

(Note to Volunteers: You may want to save the Daisies' roller coaster cars for the next meeting, Roller Coaster 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.)

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Roller Coaster Design Challenge 1 (Version for the Making Things Move Kit)

GoldieBlox Making Things Move kit – Parts Breakdown

GoldieBlox	# in set	# in kit (6 sets)
Wheel	7	42
Blox (18 mm) 2.0	6	36
Short Axle	9	54
Long Axle	4	24
Spacer	4	24
Teal Ribbon	1	6
Elastic Band	1	6
Character – Nacho	1	6
Character – Flavio	1	6
Character – Katinka	1	6
Book – GoldieBlox and the Parade Float	1	6
Small Wheel Hub	4	24
Small Wheel End	8	48
Big Wheel End	2	12
Washer	8	48
Spacer	4	24
Tire	4	24

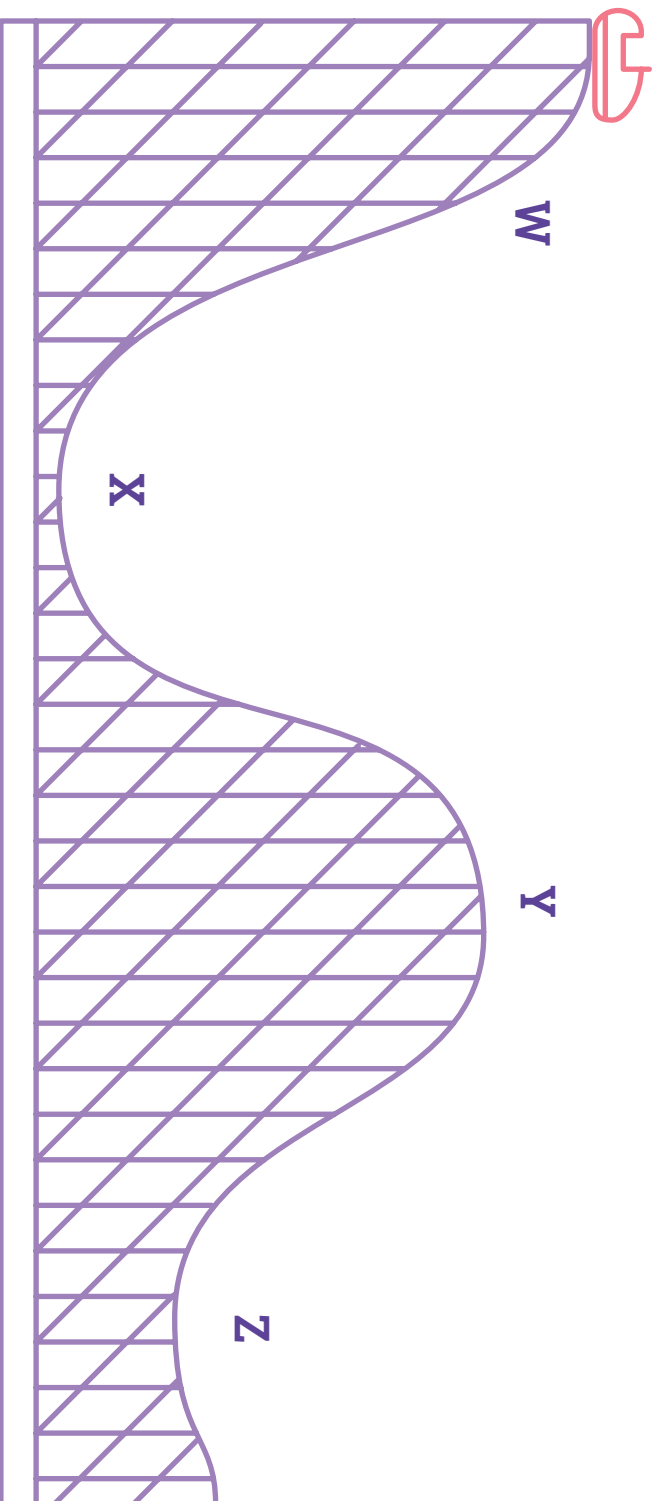
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Where does the roller coaster go fastest?

NAME _____



Draw a line under the part of the track where the coaster goes fastest.

Simple Roller Coaster Car

Roller Coaster Design Challenge

A simple roller coaster car uses:

- 2 wheels
- 4 blocks
- 4 short axles



Girls can build upon the simple roller coaster car with the other GoldieBlox.

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Daisy Design Challenge Badges: Materials List

Board Game Design Challenge 1

As Girls Arrive: Paper Games

- Paper
- Pencils
- Optional: Find and print out puzzles, mazes and other simple paper games

Opening Ceremony: All About Games

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Step One: Come Up with an Idea for Your Board Game

- Paper
- Markers and/or crayons

Step Two: Design a Spinner for Your Game

- GoldieBlox Making Things Move 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.

Closing Ceremony

- **Spinner Paper Pieces** (one for each Spinner created)

Board Game Design Challenge 2

As Girls Arrive: Create Your Game Board

- Spinners created in Board Game Design Challenge 1. (**Note to Volunteers:** If you were unable to save the spinner between meetings, Daisies can rebuild their spinners during this activity.)
- **Spinner Paper Pieces** (one for each Spinner created)
- Large paper, construction paper, or poster board
- Markers and/or crayons

Opening Ceremony: Share Your Game Board

- Flag
- Spinners and game boards created by Daisies
- Optional: Poster Board with the Girl Scout Promise and Law

Step Three: Test Your Game and Make It Better

- Spinners and game boards created by Daisies
- GoldieBlox Making Things Move kit (one set for each pair or small team)

Closing Ceremony: Awards

- Board Game Design Challenge award, one for each girl

(**Note to Volunteers:** You can buy these awards from your council shop or on the Girl Scouts' website.)

Daisy Design Challenge Badges: Materials List

Roller Coaster Design Challenge 1

Opening Ceremony: All About Roller Coasters

- Flag
- **Where Does the Roller Coaster Go Fastest?** handout
- Optional: Poster Board with the Girl Scout Promise and Law

Step One: Make a Simple Roller Coaster Car

- GoldieBlox Making Things Move kit (one set for each pair or small team.) (**Note to Volunteers:** A simple roller coaster car uses 2 wheels, 4 blocks, and 4 short axles, but girls can build upon this with the other pieces. Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.)
- **Simple Roller Coaster Car** handout

Step Two: Build a Model of a Roller Coaster

- Roller coaster cars created by girls in Step One: Make a simple roller coaster car
- 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

Roller Coaster Design Challenge 2

As Girls Arrive: Prepare for Testing

- Roller coaster cars created by girls in Roller Coaster Design Challenge 1. (**Note to Volunteers:** If you were unable to save the roller coaster cars between meetings, Daisies 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

Opening Ceremony: Engineers Work Together!

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Step Three: Test Your Roller Coaster

- Roller coaster cars created by girls in Roller Coaster Design Challenge 1 or rebuilt in As Girls Arrive: Prepare for Testing
- Ramps created in As Girls Arrive: Prepare for Testing
- Leftover materials from As Girls Arrive: Prepare for Testing for girls to build on ramps
- Leftover parts from the GoldieBlox Making Things Move kit for girls to build on their roller coaster cars

Closing Ceremony: Awards

- Roller Coaster Design Challenge award, one for each girl

(**Note to Volunteers:** You can buy these awards from your council shop or on the Girl Scouts' website.)

Daisy Design Challenge Badges: Materials List

Model Car Design Challenge 1

As Girls Arrive: Playing with Force and Friction

- 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 Daisy should sit on the line, facing their partner.

Opening Ceremony: All About Friction

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law
- Optional: Print out pictures of a bicycle wheel (including brake pads), a golf ball on a putting green, a baseball player sliding, and a sled loaded with supplies (or other examples of friction)

Step One: Design and Build Model Cars

- GoldieBlox Making Things Move kit (one set for each pair or small team.) (**Note to Volunteers:** Depending on what model car Daisies decide to build, pieces will vary. Feel free to add additional pieces from personal Goldieblox kits that you or your Girl Scouts may own.)
- “GoldieBlox and the Parade Float” or **GoldieBlox Parade Floats** handout

Step Two: Use Model Cars to Test the Friction of Different Surfaces

- Floats created in Step One: Design and Build Model Cars
- 2+ Friction stations for girls to test their cars (including a different surface at each station). See Prepare Ahead for more information on how to create the stations.
- Optional: Yard sticks, rulers, or string for Daisies to measure how far their cars go at each station.
- Optional: Paper and pencils if Daisies can read/write to record data.

Model Car Design Challenge 2

As Girls Arrive: Build a Simple Ramp

- Model cars created by girls in Model Car Design Challenge 1. (**Note to Volunteers:** If you were unable to save the model cars between meetings, Daisies 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

Opening Ceremony: Reviewing Force and Friction

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Step Three: Race Your Cars!

- Model cars created by girls in Model Car Design Challenge 1 or rebuilt in As Girls Arrive: Build a Simple Ramp
- Sample ramp or ramps created in As Girls Arrive: Build a Simple Ramp
- Leftover parts from the GoldieBlox Making Things Move kit for girls to rebuild their model cars
- Surface for bottom of ramp (towel, carpet, or asphalt)

Daisy Design Challenge Badges: Materials List

Model Car Design Challenge 2 (continued)

Closing Ceremony: Awards

- Model Car Design Challenge award, one for each girl

(**Note to Volunteers:** You can buy these awards from your council shop or on the Girl Scouts' website.)