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 with GoldieBlox then begin to build a simple roller coaster to test their cars. Daisies complete Step One & 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.

This badge requires 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, buy one kit per them to work in pairs. You can purchase the kit online from the Girl Scout Shop: http://www.girlscoutshop.com/

You will not be able to buy the correct kit from the GoldieBlox website or your council shop.

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.
Roller Coaster Design Challenge 1

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.

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)

PLEASE NOTE: You will need the GoldieBlox Making Things Move kit for girls to complete the requirements and earn the badges. Details for the kit are listed in this section and on the Materials List.

1. Review vocabulary (2 minutes)

This meeting introduces new vocabulary:

- **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.

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 all materials needed for the entire badge.

- **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)
Roller Coaster Design Challenge 1

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.

(Note to Volunteers: You will need the GoldieBlox Making Things Move kit for the girls to complete the requirements and earn the badges. You can purchase this from the Girl Scouts Shop: http://www.girlscoutshop.com/ .)

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 art supplies.
- 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.)

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.
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 with GoldieBlox then begin to build a simple roller coaster to test their cars. Daisies complete Step One & Step Two of the Roller Coaster Design Challenge badge.

**Materials List**

**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**
- 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

**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**
- None
Awards
Girls do not receive any awards in this meeting.

Detailed Activity Plan

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

Time Allotment
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.

Activity 2: Opening Ceremony: All About Roller Coasters

Time Allotment
10 minutes

Materials
• Flag
• Where Does the Roller Coaster Go Fastest? handout
Roller Coaster Design Challenge 1

- 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.

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!*

**Activity 3: Make a Simple Roller Coaster Car**

**Time Allotment**
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 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 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.

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.)

**Activity 4: Build a Model of a Roller Coaster**

**Time Allotment**
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.

**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 Daises 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.
Roller Coaster Design Challenge 1

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

Time Allotment
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...
Roller Coaster Design Challenge 1

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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 to make them more useful.

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

**Friction** is a force that slows moving objects.
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**
- 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.

**Activity 5: Closing Ceremony**
- 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 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

**Activity 2: Opening Ceremony: Share Your Game Board**
- 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
- GoldieBlox Making Things Move kit (one set for each pair or small team)

**Activity 4: Closing Ceremony: Awards**
- Board Game Design Challenge award

*(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

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
  • 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

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

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 parts from the GoldieBlox Making Things Move kit for girls to build on their roller coaster cars

Activity 4: Closing Ceremony: Awards
  • Roller Coaster Design Challenge award

(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

**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.

**Activity 2: 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)

**Activity 3: 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

**Activity 4: Use Model Cars to Test the Friction of Different Surfaces**
- Floats 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.

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
- 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)
Model Car Design Challenge 2 (continued)

Activity 4: Closing Ceremony: Awards
• Model Car Design Challenge award

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)
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.
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.
Where does the roller coaster go fastest?

Draw a line under the part of the track where the coaster goes fastest.
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 (completed in Roller Coaster Design Challenge 1)
Step Two: Build a model of a roller coaster (completed in Roller Coaster Design Challenge 1)
Step Three: Test your roller coaster

This meeting, Daisies learn about motion and gravity by testing and changing their roller coaster design to get different results. Daisies complete Step Three, earning 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.

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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.

**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
Roller Coaster Design Challenge 2

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)

PLEASE NOTE: You will need the GoldieBlox Making Things Move kit for girls to complete the requirements and earn the badges. Details for the kit are listed in this section and on the Materials List.

1. Review vocabulary (2 minutes)

This meeting introduces new vocabulary:

- **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.

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- **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)

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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.

(Note to Volunteers: You will need the GoldieBlox Making Things Move kit for the girls to complete the requirements and earn the badges. You can purchase this from the Girl Scouts Shop: http://www.girlscoutshop.com/.)

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 art supplies.
- 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 this meeting.

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

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.
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 (completed in Roller Coaster Design Challenge 1)

**Step Two:** Build a model of a roller coaster (completed in Roller Coaster Design Challenge 1)

**Step Three:** Test your roller coaster

This meeting, Daisies learn about motion and gravity by testing and changing their roller coaster design to get different results. Daisies complete Step Three, earning the Roller Coaster Design Challenge badge.

**Materials List**

**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 parts from the GoldieBlox Making Things Move kit for girls to build on their roller coaster cars

**Activity 4: Closing Ceremony: Awards**
- Roller Coaster Design Challenge award
(Note to Volunteers: You can buy these awards from your council shop or the Girl Scouts' website.)

Detailed Activity Plan

Activity 1: As Girls Arrive: Prepare for Testing

Time Allotment
10 Minutes

Materials
- 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
Welcome Daisies, and have them work in pairs build one simple ramp to start building their roller coaster for the meeting.

Optional: If you were unable to save the roller coaster cars between meetings, Daisies can rebuild them.

SAY:
Today, you're going to work together to build and test your roller coasters.

To start, can you build a simple ramp like last time?

Activity 2: Opening Ceremony: Engineers Work Together!

Time Allotment
10 Minutes

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.

Ask Daisies for advice on building a roller coaster.

**SAY:**
*Now that you’ve built a few simple roller coasters, do you have any tips for others who might want to build a roller coaster?*

**Girls may say:** The ramp needs to be sturdy, make sure the car rolls straight, etc.

Let girls speak. Give each girl a chance to share a tip.

**SAY:**
*Just like you, engineers share their ideas and advice with one another to improve their inventions.*

*Next, you’ll work together in teams to build larger roller coasters!*

**Activity 3: Test Your Roller Coaster**

**Time Allotment**
30 Minutes

**Materials**
- 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 parts from the GoldieBlox Making Things Move kit for girls to build on their roller coaster cars

**Steps**
Daisies learn about motion and gravity by testing their roller coasters for Step Three of the Roller Coaster Design Challenge.

Divide Daisies into small groups of 3-4, and set up the engineering challenge for the day.

**SAY:**
Sometimes, engineers combine what they’ve made to create something brand new.

Work in teams to see if you can combine your ramps to create one roller coaster. Is there a way to put them together? Would you need to improve your roller coaster cars?

Then, test your roller coaster!

Please set your car at the top of the ramp and let it go — but don’t push it!

Then, catch your roller coaster cars at the end of the ride, so you don’t run into other group’s coasters.

Daisies work in teams to build a larger roller coaster.

(Note to Volunteers: If Daisies cannot create a roller coaster with multiple ramps that works with their roller coaster cars, encourage them to instead make a larger ramp than they made before.)

Let girls test their cars on their roller coaster. Make sure every girl gets a turn.

Explain that gravity moves the car down the ramp.

**SAY:**
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 the roller coaster car to roll down the ramp. Does anyone know what that is? (**Answer: Gravity.**)

Gravity is a strong force that pulls objects, including us and roller coasters, 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!

Daisies jump.

Explain how gravity affects the roller coaster.
SAY:
When you jump up, gravity brings you back down to the ground.

How do you think gravity affected your roller coaster? (Answer: It moved the roller coaster car down the ramp!)

Just like gravity brings you back to the ground, gravity moves the roller coaster car down the ramp.

Challenge Daisies to redesign their coasters.

SAY:
Now, try to change your roller coaster so your car rolls down the ramp at three different speeds: slow, medium and fast.

Let girls play around with the ramp to see what changes the speed of the cars.

If they don’t realize that changing the height of the ramp changes the speed, suggest they try that.

It’s okay if not every solution works. The idea is for girls to test out different ideas.

Activity 4: Closing Ceremony: Awards

Time Allotment
10 Minutes

Materials
• Roller Coaster Design Challenge award

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

Steps

Have Daisies form a Friendship Circle and wrap up the Roller Coaster Design Challenge before they receive their awards.
SAY:
Let’s talk about what you learned.

How fast did the car move on the first ramp you set up?

Girls may say: Slow, not very fast.

What did you do to make the car roll faster?

Girls may say: Held the lip up higher, propped it with axles.

What was your favorite part of making and testing a roller coaster? Why?

Let’s go around the circle. Each of you can tell a little story about what you learned.

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

Daisies receive the Roller Coaster Design Challenge badge.

SAY:
You’ve now earned the Roller Coaster Design Challenge badge.

Please step forward when I say your name to accept your award.

Lead a round of applause for each Daisy as she steps forward.

SAY:
You have earned your Roller Coaster Design Challenge award, which means you have learned about engineering and motion by building and testing a roller coaster.

Encourage Daisies to share their new knowledge with others.

SAY:
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.
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Now that I’ve earned this badge, I can give service by:

- Teaching someone else what I’ve learned
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 to make them more useful.

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

- **Friction** is a force that slows moving objects.
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
- 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.

Activity 5: Closing Ceremony
- 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 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

Activity 2: Opening Ceremony: Share Your Game Board
- 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
- GoldieBlox Making Things Move kit (one set for each pair or small team)

Activity 4: Closing Ceremony: Awards
- Board Game Design Challenge award

(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

**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**
- 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

**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

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 parts from the GoldieBlox Making Things Move kit for girls to build on their roller coaster cars

**Activity 4: Closing Ceremony: Awards**
- Roller Coaster Design Challenge award

*(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

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.

Activity 2: 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)

Activity 3: 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

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

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
- 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)

Activity 4: Closing Ceremony: Awards

- Model Car Design Challenge award

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