

Model Car Design Challenge 1

Overview:

In the Model Car Design Challenge, Daisies learn about engineering and friction by building and testing a model car. Daisies learn how to design and test new things they invent.

Step One: Design and build model cars.

Step Two: Use model cars to test the friction of different surfaces.

Step Three: Race your cars! *(To be completed in Model Car Design Challenge 2.)*

This meeting, Daisies make a Model Car then begin to test their cars. Daisies complete Step One and Step Two of the Model Car 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.

Model Car 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 60 minutes)

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

This meeting includes the following words Daisies may not know:

- **Friction** – A force that slows moving objects.
- **Force** – The strength or energy that creates movement. Push and pull are examples of force.

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

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

Model Car Design Challenge 1

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 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 girls can take turns holding or hang in the room.

Prior to the meeting, you may want to create a sample model car to show to girls. Alternatively, you can show them the Meeting Aid, **Sample Model 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."

4. Create friction stations for Activity 4: Use Model Cars to Test the Friction of Different Surfaces (15 minutes)

Before Daisies arrive for the meeting, prepare 2 or more different friction stations around the room for Daisies to test their cars on. Each station will require a different surface.

Here are some ideas for different surfaces:

- A towel laid on the floor
- Asphalt or concrete right outside the meeting room's door
- A large piece of cardboard laid on the floor (or carpet if you have low-pile carpet)
- Vinyl flooring or a large table

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

Model Car Design Challenge 1

Ask your Network to help:

- Bring materials
- Assist with Design Challenge activities

Award Connection

Daisies will earn one award:

- Model Car Design Challenge badge

Daisies receive the award following the completion of all three steps of the badge in **Model Car 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.

Materials List:

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: 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

Model Car Design Challenge 1

- 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

Awards

Girls do not receive any awards in this meeting.

Detailed Activity Plan

Activity 1: As Girls Arrive: Playing with Force and Friction (10 minutes)

Materials

- Sports and game balls (one for each pair of girls). Bring different types of balls for girls to roll and observe friction. For example, you might bring a marble, tennis ball, basketball, ping pong ball, baseball, etc.
- Create two lines with masking tape on the floor. Each Daisy should sit on the line, facing their partner.

Model Car Design Challenge 1

Steps

Prior to girls arriving, create two masking tape lines. The lines should be close enough that Daisies will be able to roll a ball back and forth between them.

As Daisies arrive, welcome them, and have them pair up.

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

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

SAY:

Roll your ball back and forth with your partner.

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

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

If everyone rolls their ball across to their partner at the same time, which ball gets there first? Last?

Daisies roll their balls, experimenting with force.

Activity 2: Opening Ceremony: All About Friction (10 minutes)

Materials

- 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

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Daisies to the Model Car Design Challenge badge.

SAY:

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

You'll build model cars. Then you'll test how far they roll on different surfaces. Next time, you'll get to improve them based on your tests and race them down ramps!

Model Car Design Challenge 1

Compare how the different balls rolled in Activity 1: As Girls Arrive: Playing with Force and Friction as examples of force.

SAY:

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

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

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

Each time you rolled the ball, you changed the amount of force you used. Force is the amount of strength or energy it takes to move something.

Explain friction to Daisies, using the different balls used in Activity 1: As Girls Arrive: Playing with Force and Friction.

SAY:

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

Girls may say: It was hard to roll the tennis ball on the carpet, the ping pong ball went the fastest, etc.

Each of the balls is made of a different material and weighs a different amount.

For example, the smaller balls may have been easier to roll. Why do you think that is? (Answer: The smaller balls were lighter, so the surface affected it less as it moved.)

When you roll the ball, there is something called friction that stops the ball.

Friction is a force that slows and stops moving objects. Without friction, any object that was pushed or pulled would keep moving forever!

Depending on the ball, there were different amounts of friction at play. For example, there was less friction on the smaller balls, allowing them to move faster than big balls.

Have Daisies quickly predict how they think cars will move on different surfaces.

SAY:

Do you think a toy car would move as fast on asphalt as it would on carpet? Let's take a vote!

Have girls close their eyes and raise their hands to vote "yes" or "no."

Model Car Design Challenge 1

Count the number of “no” and “yes” answers and tell the Daisies aloud how the troop voted.

SAY:

Would anyone who voted “no” like to guess which surface will allow the car to travel farthest or fastest?

Have the Daisies give ideas.

SAY:

Today, we’ll find out as we engineer our own model cars!

Activity 3: Design and Build Model Cars (20 minutes)

Materials

- 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.

Steps

Daisies plan and build cars for Step One of the Model Car Design Challenge.

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.

Set Up. (5 minutes)

Before they begin, define the challenge with Daisies.

© 2018 GSUSA. All rights reserved. Not for commercial use. This Material is proprietary to GSUSA and may be used, reproduced, and distributed exclusively by GSUSA staff, councils, Girl Scout volunteers, service units, and/or troops solely in connection with Girl Scouting.

We are pleased to provide these materials solely to our staff, councils, Girl Scout volunteers, service units, and/or troops to use in connection with Girl Scouting. These materials are protected under copyright law and we appreciate your compliance in not reproducing and/or redistributing these materials without our written permission. If you have any doubts as to whether your proposed use violates our copyright law rights, please email us at: permissions@girlscouts.org with your question.

Model Car Design Challenge 1

SAY:

To test how different surfaces affect friction, we first need to build our model cars!

When engineers first want to build something, they think about the problem or challenge, and create a plan for their project.

Now, what is the Design Challenge for today? (Answer: Build a model car to test how friction affects it using different surfaces.)

Brainstorm, plan, and build. (15 minutes)

Show the materials available to girls.

SAY:

Before an engineer begins to build, they think about the challenge and how they can best solve it.

Engineers brainstorm many solutions and look at what materials are available to create their design.

Do you see the materials here? This is what you'll have to build your model car. Look at the materials and draw some different ways you could use them as parts of a car.

Have Daisies plan their model car's design, drawing their car using paper and crayons or markers.

Optional: After a few minutes, have Daisies share their design with a partner or in small groups, talking about what they like and what they could improve. You can tell Daisies that engineers share their plans with others for feedback. Remind them that all feedback should be kind and thoughtful.

After, girls build their model car using the available materials.

(Note to Volunteers: If you are able to, save the Daisies' model cars for the next meeting, Model Car 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: Use Model Cars to Test the Friction of Different Surfaces (10 minutes)

Materials

- 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.

Model Car Design Challenge 1

Steps

Daisies test their cars for Step Two of the Model Car Design Challenge.

Set Up. (5 minutes)

Prior to the meeting, prepare 2 or more friction stations. See Prepare Ahead for more information.

Before Daisies test their cars, help the girls design an investigation.

SAY:

When engineers build something new, they test it to see if there are ways to improve their design.

How could we test which surface is best for cars? (Answer: Roll a car across different surfaces.)

How could we make sure the test is fair?

Girls may say: Test all cars on the same surface. Use the same force on each car on each surface. Use the same car on each surface.

How can we measure how far the cars go?

Girls may say: Eyeball it. Use a yard stick, tape measure, or string. Count floor tiles.

How can we sure our results are right?

Girls may say: Do the test more than once.

This is a great plan for testing your cars on different surfaces.

Now you're going to put your plan into action and test your cars, just like engineers.

Test your car. (5 minutes)

Divide the girls into pairs (most likely the same teams they built their cars in).

Tell Daisies to take turns testing their cars at the different Friction Stations around the room.

SAY:

Test your car by letting it roll down the ramp and onto a surface.

Do this three times for each surface.

Be sure to remember which surface was easier for your car to move on and at which station your car went the farthest.

Engineers do testing, just like this, to design cars that are both fast and safe!

Model Car Design Challenge 1

Optional: If Daisies can read, write, and measure, hand out paper, pencils, and yard sticks (or other measurement tools) to measure how far their cars go at each station and record their results.

Daisies test their cars on each surface.

(Note to Volunteers: If you can, save the Daisies' model cars for the next meeting, Model Car 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 5: Closing Ceremony: Reviewing Our Testing Results (10 minutes)

Materials

- None

Steps

Have Daisies form a Friendship Circle and discuss their test results.

SAY:

Do you see a pattern in our results? **(Answer: Most cars should have traveled the farthest at the same station—the one with the smoothest surface.)**

Which cars traveled farthest? Why do you think that is? **(Answer: The smallest cars should have gone the farthest. This is because it was lighter, so the rough surface affected it less.)**

Why do you think the cars traveled farthest there?

Is that what you thought would happen?

Did the car eventually stop on the smoothest surface? Why?

What sorts of surfaces are the slipperiest? How could make them even more slippery?

What would happen if we put oil on everything? **(Answer: The car would go farther but still stop.)**

Why? **(Answer: On Earth, there is always some friction, even if it's only air resistance.)**

Can you think of an example when friction makes it hard to slide something heavy? **(Example: Trying to slide furniture across a carpet.)**

End the meeting with a Friendship Squeeze.

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.**

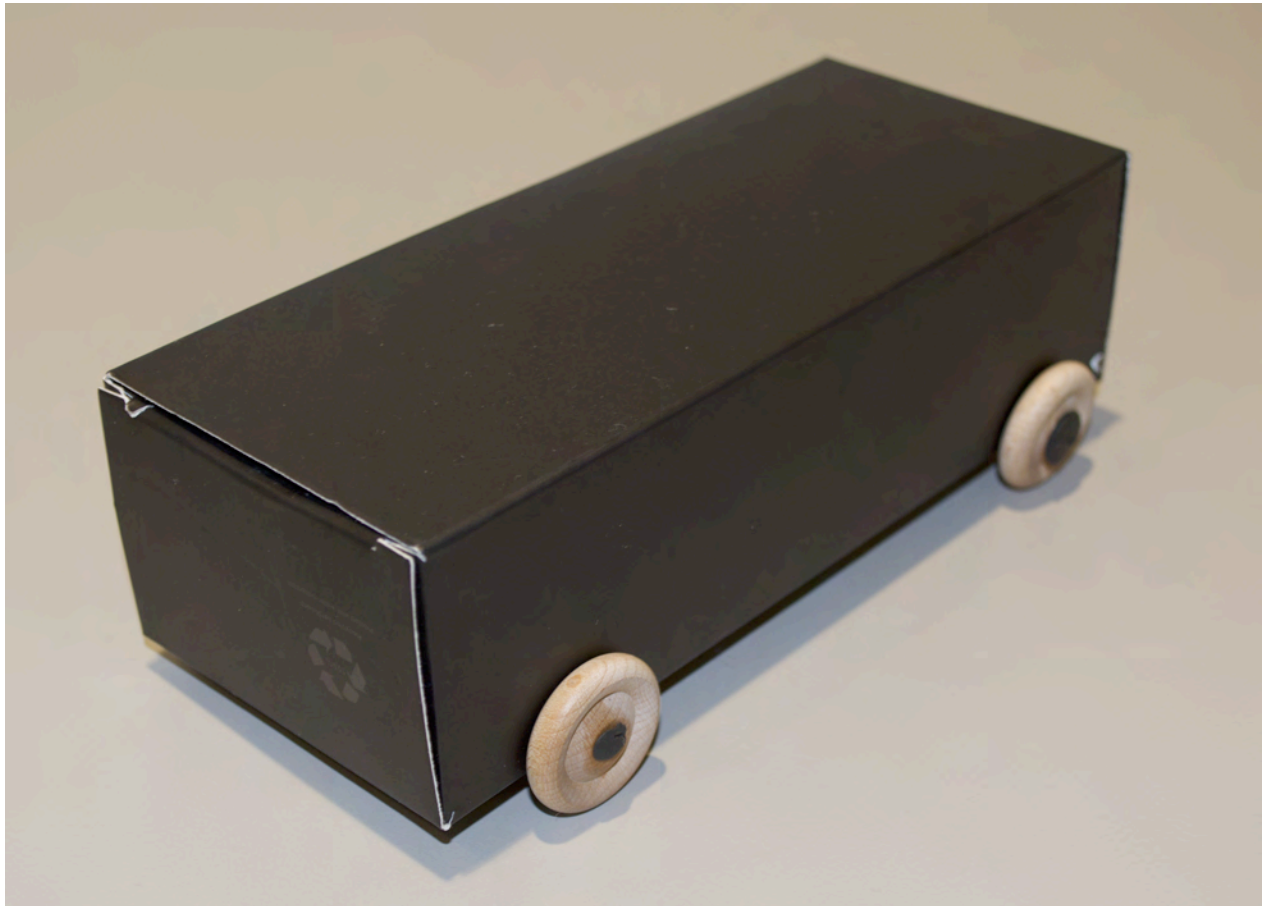
The Girl Scout Law

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.**

Model Car Design Challenge

Sample Model Car



This model car is made from: 1 box, 4 wooden wheels, 2 small dowels/craft sticks, clay.

Model Car 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: 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: 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

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

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

station.

- Optional: Paper and pencils if Daisies can read/write to record data.

Closing Ceremony: Reviewing Our Testing Results

- None

Awards

Girls do not receive any awards in this meeting.

Detailed Activity Plan

As Girls Arrive: Playing with Force and Friction (10 minutes)**Materials**

- Sports and game balls (one for each pair of girls). Bring different types of balls for girls to roll and observe friction. For example, you might bring a marble, tennis ball, basketball, ping pong ball, baseball, etc.
- Create two lines with masking tape on the floor. Each Daisy should sit on the line, facing their partner.

Steps

Prior to girls arriving, create two masking tape lines. The lines should be close enough that Daisies will be able to roll a ball back and forth between them.

As Daisies arrive, welcome them, and have them pair up.

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

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

SAY:

- *Roll your ball back and forth with your partner.*
- *What happens when you roll it lightly? Does it reach your partner?*
- *What happens when you roll it with a lot of strength?*

Daisies roll their balls, experimenting with force.

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

Opening Ceremony: All About Friction (10 minutes)

Materials

- 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

Steps

Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Daisies to the Model Car Design Challenge badge.

SAY:

- *Today you're going to be engineers as we start the Model Car Design Challenge!*
- *You'll build model cars. Then you'll test how far they roll on different surfaces. Next time, you'll get to improve them based on your tests and race them down ramps!*

Compare how the different balls rolled in As Girls Arrive: Playing with Force and Friction as examples of force.

SAY:

- *Let's get started and learn something important engineers have to think about when they build things.*
- *When you were rolling your balls earlier, what made the balls move faster? (**Answer: Rolling it with more strength or force.**)*
- *When you were rolling your balls earlier, what made the balls move slower? (**Answer: Using less strength or force.**)*
- *Each time you rolled the ball, you changed the amount of force you used. Force is the amount of strength or energy it takes to move something.*

Explain friction to Daisies, using the different balls used in As Girls Arrive: Playing with Force and Friction.

SAY:

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

Girls may say: It was hard to roll the tennis ball on the carpet, the ping pong ball went the fastest, etc.

- *Each of the balls is made of a different material and weighs a different amount.*

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

- *For example, the smaller balls may have been easier to roll. Why do you think that is?*
(**Answer: The smaller balls were lighter, so the surface affected it less as it moved.**)
- *When you roll the ball, there is something called friction that stops the ball.*
- *Friction is a force that slows and stops moving objects. Without friction, any object that was pushed or pulled would keep moving forever!*
- *Depending on the ball, there were different amounts of friction at play. For example, there was less friction on the smaller balls, allowing them to move faster than big balls.*

Have Daisies quickly predict how they think cars will move on different surfaces.

SAY:

- *Do you think a toy car would move as fast on asphalt as it would on carpet? Let's take a vote!*

Have girls close their eyes and raise their hands to vote “yes” or “no.”

Count the number of “no” and “yes” answers, and tell the Daisies aloud how the troop voted.

SAY:

- *Would anyone who voted “no” like to guess which surface will allow the car to travel farthest or fastest?*

Have the Daisies give ideas.

SAY:

- *Today, we'll use the GoldieBlox to find out!*

Step One: Design and Build Model Cars (15 minutes)

Materials

- 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

Steps

Daisies build cars for Step One of the Model Car Design Challenge.

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

SAY:

- *To test how different surfaces affect friction, we first need to build our model cars!*
- *Choose one GoldieBlox Parade Float to build in pairs for your model car. If you don't like any of the designs, feel free to build your own!*

Have Daisies choose one of the floats from the end of “Goldie Blox and the Parade Float” or **GoldieBlox Parade Floats** handout to build in pairs:

- Katinka's Parade Float
- The Whirly Mobile
- Nacho's Swing Wheeler
- A simple rectangle with one wheel in front and one behind (four short axles, four blox, two wheels)

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

Step Two: Use Model Cars to Test the Friction of Different Surfaces (15 minutes)

Materials

- 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.

Steps

Set Up. (5 minutes)

Prior to the meeting, prepare 2 or more friction stations. See Prepare Ahead for more information.

Before Daisies test their cars, help the girls design an investigation to help them complete Step Two of the Model Car Design Challenge.

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

SAY:

- *When engineers build something new, they test it to see if there are ways to improve their design.*
- *How could we test which surface is best for cars? (Answer: Roll a car across different surfaces.)*
- *How could we make sure the test is fair?*

Girls may say: Test all cars on the same surface. Use the same force on each car on each surface. Use the same car on each surface.

- *How can we measure how far the cars go?*

Girls may say: Eyeball it. Use a yard stick, tape measure or string. Count floor tiles.

- *How can we sure our results are right?*

Girls may say: Do the test more than once.

- *This is a great plan for testing your cars on different surfaces.*
- *Now you're going to put your plan into action and test your cars, just like engineers.*

Test your car. (10 minutes)

Divide the girls into pairs (most likely the same teams they built their cars in).

Tell Daisies to take turns testing their cars at the different Friction Stations around the room.

SAY:

- *Test your car by letting it roll down the ramp and onto a surface.*
- *Do this three times for each surface.*
- *Be sure to remember which surface was easier for your car to move on and at which station your car went the farthest.*
- *Engineers do testing, just like this, to design cars that are both fast and safe!*

Optional: If Daisies can read, write, and measure, hand out paper, pencils, and yard sticks (or other measurement tools) to measure how far their cars go at each station and record their results.

Daisies test their cars on each surface.

Model Car Design Challenge 1 (Version for the Making Things Move Kit)

Closing Ceremony: Reviewing Our Testing Results (10 minutes)

Materials

- None

Steps

Have Daisies form a Friendship Circle and discuss their test results.

SAY:

- *Do you see a pattern in our results? (Answer: Most cars should have traveled the farthest at the same station—the one with the smoothest surface.)*
- *Which cars traveled farthest? Why do you think that is? (Answer: The smallest cars should have gone the farthest. This is because it was lighter, so the rough surface affected it less.)*
- *Why do you think the cars traveled farthest there?*
- *Is that what you thought would happen?*
- *Did the car eventually stop on the smoothest surface? Why?*
- *What sorts of surfaces are the slipperiest? How could make them even more slippery?*
- *What would happen if we put oil on everything? (Answer: The car would go farther but still stop.)*
- *Why? (Answer: On Earth, there is always some friction, even if it's only air resistance.)*
- *Can you think of an example when friction makes it hard to slide something heavy? (Example: Trying to slide furniture across a carpet.)*

End the meeting with a Friendship Squeeze.

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

© 2017 GSUSA. All rights reserved. Not for commercial use. This Material is proprietary to GSUSA and may be used, reproduced and distributed exclusively by GSUSA staff, councils, Girl Scout volunteers, service units and/or troops solely in connection with Girl Scouting.

We are pleased to provide these materials solely to our staff, councils, Girl Scout volunteers, service units and/or troops to use in connection with Girl Scouting. These materials are protected under copyright law and we appreciate your compliance in not reproducing and/or redistributing these materials without our written permission. If you have any doubts as to whether your proposed use violates our copyright law rights, please email us at: permissions@girlscouts.org with your question.

Model Car 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

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

© 2017 GSUSA. All rights reserved. Not for commercial use. This Material is proprietary to GSUSA and may be used, reproduced and distributed exclusively by GSUSA staff, councils, Girl Scout volunteers, service units and/or troops solely in connection with Girl Scouting.

We are pleased to provide these materials solely to our staff, councils, Girl Scout volunteers, service units and/or troops to use in connection with Girl Scouting. These materials are protected under copyright law and we appreciate your compliance in not reproducing and/or redistributing these materials without our written permission. If you have any doubts as to whether your proposed use violates our copyright law rights, please email us at: permissions@girlscouts.org with your question.

Model Car Design Challenge badge



BLUEPRINT Parade Float Base

Step 1



Step 2



Step 3



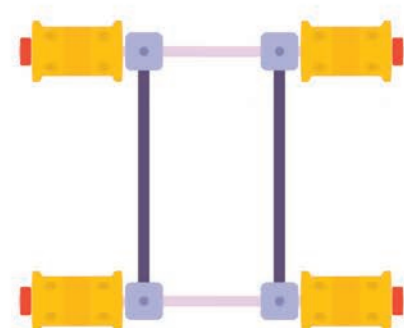
Step 4



Step 5

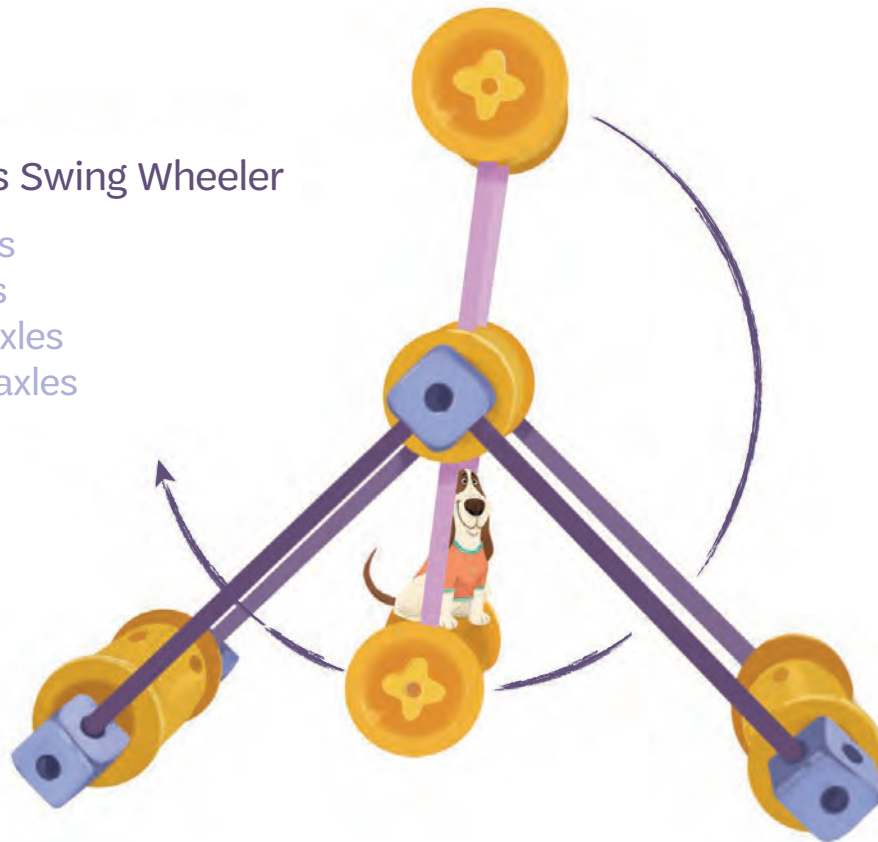


Step 6



Nacho's Swing Wheeler

5 wheels
6 blocks
4 long axles
7 short axles

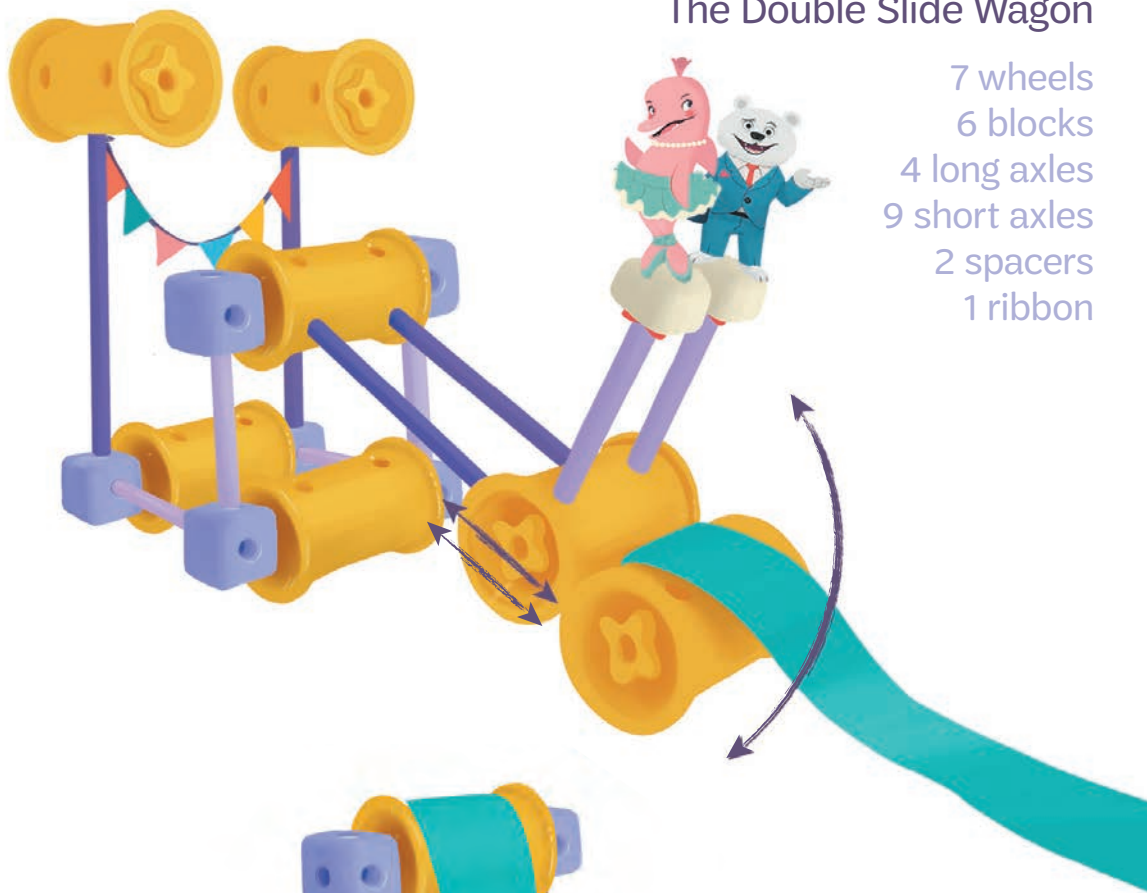


5 wheels
4 blocks
2 long axles
6 short axles
1 ribbon

Goldie's Ribbon Roller



The Double Slide Wagon



- 7 wheels
- 6 blocks
- 4 long axles
- 9 short axles
- 2 spacers
- 1 ribbon



- 3 wheels
- 6 blocks
- 4 long axles
- 6 short axles
- 1 ribbon
- spacers

Space-r-Launcher



Katinka's Parade Float

7 wheels
6 blocks
4 long axles
9 short axles
4 spacers
1 ribbon



7 wheels
3 blocks
2 long axles
7 short axles
4 spacers

The Whirly Mobile

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.)