

Think Like an Engineer pt. 3

Overview

Daisies design a way to get across a canyon in a hands-on Design Challenge and decide on their Take Action project.

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.

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 Journey, 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. On this Journey, Daisies will learn the Design Thinking Process 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 a Daisy's 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:

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When Daisies leave a meeting, they'll remember how much fun it was to build a Fairy House or to make a car move across the room. 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!).

Program Pairing: The Rosie and Clover petals go well with this Journey!

Prepare Ahead

- Gather supplies.
- If your meeting location doesn't have a flag, bring a small one that Daisies can take turns holding or hang in the room.
- Print copies of the **Daisy Flower Friends poster**.
- Set up a mini obstacle course in the meeting room or outdoors. Use simple objects like cones, hula-hoops, boxes, chairs, and stuffed animals. Line everything up in a way girls have to get from one end of the course to the other.
- Print out **photos of the Grand Canyon**, enough for each pair of girls. (**Note to Volunteer:** These can be black and white if you don't have a color option.)
- Gather materials for Activity 3: Design Challenge: Cross a Canyon.

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- Write Daisies' Take Action ideas from the last meeting on a whiteboard or poster board.
- *Optional:* Decorate the meeting room with pictures of female engineers and pictures of bridges, dams, roller coasters, skyscrapers, airplanes, skateboards, self-driving cars, robots, smart phones, and anything else designed by engineers.
- Read the following handouts (found in the **Meeting Aids** section):

Daisy Think Like an Engineer Journey 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 Journey.

Daisy Think Like an Engineer Journey Glossary: 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.

Take Action Guide: This handout explains the difference between Take Action and Community Service. It also includes tips to make a project sustainable and Take Action project ideas that you and your troop can use as inspiration.

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.
- Bring a camera, smart phone, or video camera to document the meetings.
- Assist with Design Challenge activities.

Award Connection

Daisies will earn two awards:

- Think Like an Engineer award
- Take Action award

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They receive both awards in **Think Like an Engineer PT. 6.**

(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.

Daisies design a way to get across a canyon in a hands-on Design Challenge and decide on their Take Action project.

Materials List

Activity 1: As Girls Arrive: Mini Obstacle Course

- Cones or other objects set up as a mini obstacle course

Activity 2: Opening Ceremony: What's Our Special Skill?

- Flag
- Whiteboard or poster board
- Markers
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Cross a Canyon

- Straws
- Popsicle sticks
- Toothpicks
- Construction paper and/or newspaper
- Toilet paper rolls
- Paper clips
- Masking or Duct tape
- **Photo printouts of the Grand Canyon, enough for each pair of girls**

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Activity 4: Closing Ceremony: Time To Decide on Take Action!

- List of Daisies' Take Action ideas from the last meeting, written on a whiteboard or poster board
- Marker

Awards

Daisies do not receive any awards in this meeting.

Detailed Activity Plan

Activity 1: As Girls Arrive: Mini Obstacle Course

Time Allotment

10 minutes

Materials

- Cones or other objects set up as a mini obstacle course

Steps

Have Daisies walk from one end of the obstacle course to the other. Tell girls they need to climb over, crawl under, walk around, or jump over obstacles to get from one end to the other. Daisies decide what to do.

SAY:

Today you'll be designing a way to get from one canyon to another in the Grand Canyon.

Right now, figure out the easiest way to get from one end to the other of the obstacle course.

Activity 2: Opening Ceremony: What's Our Special Skill?

Time Allotment

10 minutes

Materials

- Flag

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- Whiteboard or poster board
- Markers
- 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.

Have Daisies come up with skills that engineers have.

SAY:

*What kind of skills do engineers have? **Girls may say:** They're smart, they can make things, they can design things, they know how to work with other people, they invent new things, they help other people.*

Write down Daisies' answers on a whiteboard or poster board.

SAY:

Which one of these engineering skills do you want to have?

Give Daisies a chance to respond.

SAY:

Try using these skills when you do your next Design Challenge!

Activity 3: Design Challenge: Cross a Canyon

Time Allotment

30 minutes

Materials

- Straws
- Popsicle sticks
- Toothpicks
- Construction paper and/or newspaper
- Toilet paper rolls
- Paper clips
- Masking or Duct tape
- **Photos of the Grand Canyon**, enough for each pair of Daisies

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Steps

(Note to Volunteers: Give Daisies 10- and 5-minute warnings so they can wrap up in time for the Closing Ceremony.)

Set Up. (5 minutes)

Pair Daisies up and give each team a photo of the Grand Canyon. Have them design a way to get the Garden Fairy across a canyon.

SAY:

The Garden Fairy is on one mountain top and needs to get over the canyon to get to the other mountain top.

Point from one mountain top to the other to show girls where she needs to go.

How could you use your engineering skills to help the Garden Fairy across the canyon?

Girls may say: *Build a bridge, put up a zip line, make a glider, etc.*

For each pair of girls, set up two chairs opposite each other, about two inches apart.

Brainstorm and Design. (5 minutes)

Hand out pens and pencils to each team of Daisies.

SAY:

Imagine that each chair is a mountain top and the space between is the canyon.

Your job is to design a way for the Garden Fairy to get across the canyon.

With your Daisy partner, draw some ideas on your Grand Canyon photo of how you can get her across.

Build and Test. (15 minutes)

Hand out materials to each team of Daisies.

SAY:

Now that you have your ideas, use the materials to start making it and then test it out!

Daisies may ask for your help if their design isn't working. Instead of suggesting what they should do, ask questions, such as: *What could you change about your design?*

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What do you think will happen if you do that? Why not try it out?

Share and Reflect. (5 minutes)

Have Daisies share their designs.

SAY:

How did you and your partner come up with your design?

What engineering skills did you use? (Answer: We invented something, we worked together and shared our ideas, we helped the Garden Fairy.)

Activity 4: Closing Ceremony: Time To Decide on Take Action!

Time Allotment

10 minutes

Materials

- List of Daisies' Take Action ideas from the last meeting, written on a whiteboard or poster board
- Marker

Steps

Add Daisies' Take Action ideas the list on the whiteboard or poster board. Have Daisies decide on their Take Action project.

SAY:

By finding a way across a canyon, you solved a problem, just like an engineer.

That's what you do when you Take Action. You spot a problem and come up with a plan to solve it.

Now it's time to decide how you want to Take Action.

Read the ideas on the list. Ask Daisies if they have any new ideas.

Give Daisies time to talk about ideas they like or don't like.

Remind Daisies to speak with respect, listen to other people, and perhaps even develop a new idea together that everyone likes.

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Although it takes a little longer for Daisies to come to a team decision, this process will help them learn to compromise. Instead of stepping in and making the decision for them, help them talk about the pros and cons of each project.

To help Daisies zero in on their top choices, ask open-ended questions, such as:

*Which of these project ideas sounds like the most fun?
Which projects would help you learn something new?
Which ones will make you feel proud when you're done?*

If Daisies are divided between a few ideas, ask them to choose one top idea and keep the others as backups. You can also have them vote — just make sure that anyone whose idea wasn't chosen knows that it was a good idea and that it might be used later.

Daisies may reach an agreement quickly. If they don't, note the top 2 or 3 ideas and facilitate an agreement using "fist to five":

*If you're holding up 5 fingers, you love it!
4 fingers — it's good.
3 fingers — you're OK with the idea.
2 fingers — you're OK with it but perhaps want to make a little change.
1 finger — you'd like to talk about making more changes.
And a closed fist – no fingers – you really don't like it!*

SAY:

At our next meeting, you'll plan your Take Action project.

Have girls form a Friendship Circle.

SAY:

You found out about the kind of skills engineers have. For example, they find a need, come up with a solution and share it with others.

What skills do you want to get better at or learn? (It can be anything: dancing, reading, drawing, singing, playing a sports game or video game.)

End the meeting with a Friendship Squeeze.

Think Like an Engineer Journey: Take Action Guide

What's the difference between a community service project and a Take Action project?

Community Service makes the world better by addressing a problem “right now.” For example, collecting cans of food for a food pantry feeds people “right now.” Gathering toys for a homeless family shelter makes kids happy “right now.” Providing clothing and toiletries to people after a fire or flood helps them “right now.” These acts of kindness are important ways to help people — right now.

Take Action encourages girls to develop a project that is sustainable. That means that the problem continues to be addressed, even after the project is over. Sustainability simply means coming up with a solution that lasts.

For example, girls might want to do something about trash in a local park. If they go to the park and pick up trash, they've solved the problem for today — but there will be more trash to pick up tomorrow.

Instead, girls could explore why there's so much trash. Here's what they might discover:

1. There aren't enough trash cans in the park.
2. The trash cans are hard to find.
3. People have to walk out of their way to throw away trash because of where the cans are placed.
4. People don't realize the importance of putting trash in the trash cans.

Here's how girls might address these issues:

- **Issues 1 – 3:** Make a presentation to the city council to report on their findings and suggest adding more trash cans or moving them to more visible or convenient positions.
- **Issue 4:** Create a public awareness campaign that encourages people to use the trash cans instead of littering.
- **Variation:** Older girls may want to design interactive garbage cans that make tossing your trash fun. Do an online search for “the fun theory” or “the world's deepest bin” to see this in action.

What are the steps of a Take Action project?

Girls team up to:

- Identify a problem
- Come up with a sustainable solution
- Develop a team plan
- Put the plan into action
- Reflect on what they learned

Keep It Girl-Led: Girls should actively participate in each step in order for this to be girl-led. Younger girls will need more guidance, but they can and should decide as a team what problem they want to address.

How do girls make their project sustainable?

Here are three ways to create sustainable change:

1. Make your solution permanent.
2. Educate and inspire others to be part of the change.
3. Change a rule, regulation or law.

How can I help girls come up with Take Action Ideas?

Next are some specific examples you can use to help girls understand what sustainable Take Action projects look like.

Keep It Girl-Led: These examples are intended to give a sense of what a Take Action project could look like. **Please do not choose a project from this list for girls to do!** Instead, guide them to brainstorm ideas, get feedback, and come up with a plan. Girls will learn key leadership skills, such as decision-making, compromise, conflict resolution, and teamwork, when their Take Action project is girl-led.

Engineering/STEM Take Action Ideas

Issue: We could conserve water if more people collected rain water and used it to water plants.

- **Solution 1: Make it permanent.** Make rain collection devices for family or friends that can be installed in their yards. Give them a list of different ways to use rain water and how they're helping the Earth.
- **Solution 2: Educate and inspire others.** Create a handout, video tutorial, or show-and-tell presentation about how to make a rain collection device, how to use rain water and how that helps the Earth.

Issue: More kids need to know that engineering is a fun, creative way to help others.

- **Solution 1: Educate and inspire others.** For show-and-tell, explain what you've learned about how engineers help others, then lead a design challenge activity with your class.
- **Solution 2: Make it permanent.** Partner with a teacher or principal to create an "engineering space" at school where kids can make prototypes and share ideas for new inventions. Put out a call for donations of recyclable materials or cheap prototyping supplies (cardboard boxes, tape, string, paper towel tubes, etc.) to stock the space.

Issue: More people need to know how exciting and fun STEM can be.

- **Solution 1: Educate and inspire others.** Create a list of great books, movies and documentaries that focus on STEM. Make copies for teachers to hand out or make posters for the school library.
- **Solution 2: Educate and inspire others.** Create a short play based on one of the books and perform it for your class or school.

Issue: It's hard for new students to meet people and make friends at school.

- **Solution: Make it permanent.** Design and build "buddy benches." Partner with the school to have the benches installed on the playground so kids who want to make new friends can find each other.

Other Ideas for Take Action

Issue: Parents often run their engines outside the school as they wait to pick up or drop off their children, which pollutes the air.

- **Solution: Change a rule, regulation or law.** Make a presentation to the school board or administrators about why this is a problem and suggest a new rule that makes the pick-up/drop-off area a "no idling" zone.

Issue: There's no sidewalk along a street near the elementary school, which makes it dangerous for children to walk home.

- **Solution: Make it permanent.** Make a presentation to the city council about the problem and suggest that they build a sidewalk. (Note: Even if the council doesn't vote to create a sidewalk, the girls have earned their Take Action award because they came up with a sustainable solution and took action through their presentation.)
- **Extra Inspiration:** Do an online search for "Girl Scout Brownies Convince City Hall to Build Sidewalk."

Issue: There have been several accidents at a busy intersection that doesn't have a stoplight.

- **Solution: Make it permanent.** Research the number of accidents and make a presentation to the city council, asking that they have a stoplight installed.

Issue: The local park doesn't have a swing for children with disabilities.

- **Solution: Make it permanent.** Make a presentation to the city council explaining the problem and offering to use troop money from the cookie sale to help pay for the swing.
- **Extra Inspiration:** Do an online search for "How One Brownie Troop Became Social Entrepreneurs.")

Issue: We should recognize women who have helped their communities and made the world a better place in all kinds of ways.

- **Solution: Educate and inspire others.** Research the "hidden figures" in your community (unsung women who've done great things). Create a display about their accomplishments for a library or community center.

Issue: The local shelter is having a hard time getting rescue animals adopted.

- **Solution: Educate and inspire others.** Use your photography skills to create pet portraits for the shelter's web site. Use your writing skills to craft heart-warming bios for each portrait.

Need more ideas?

Check out [Girls Changing the World](#) on the GSUSA web site. Girls post their Take Action and Bronze/Silver/Gold Award projects on this site. You can search by project topic or grade level. (And after the troop has done their project, please post it so they can inspire other girls!)

33 Ways to Take Action!

Make your solution permanent.

1. Make and install something outside (benches, bird houses, dog run, ropes course, sensory trail for children with disabilities, Little Library, etc.)
2. Plant something (butterfly garden, tree, wind chime garden, etc.)
3. Make something inside (Maker Space, reading room, etc.)
4. Create a collection (children's books children's hospital or family shelter, oral histories for town museum, etc.)
5. Advocate for building a permanent community improvement (sidewalk, bridge, park, streetlights, stoplight, etc.)

Educate and inspire others to be part of the change.

6. Do a show-and-tell
7. Create a poster campaign
8. Perform a skit
9. Make a "how to" handout
10. Draw a comic
11. Give a speech
12. Write and perform a song
13. Make an animated movie
14. Make a live-action movie
15. Make a presentation
16. Create a workshop (perhaps in partnership with a local business or organization) to teach a skill such as coding, camping, canoeing, robotics, sewing, car care, healthy eating, gardening, home repair, budgeting, etc.
17. Create a workshop to teach others about healthy living (exercise, nutrition, mental health, etc.)
18. Create a social media campaign
19. Make video tutorials to teach a skill
20. Organize an email campaign
21. Organize a petition
22. Organize an event (concert, play, poetry slam, art exhibit, sporting event, field day) to raise awareness about an issue
23. Make a "playbook" to help others follow your lead (how to mentor robotics teams, organize a workshop or event, advocate to city council, create an online petition, change a law, etc.)
24. Make an app that helps people take action on an issue
25. Create a web site
26. Write an op-ed or letter to the editor of a newspaper or magazine
27. Start a blog

Change a rule, regulation or law.

28. Make a presentation to your school principal
29. Make a presentation to your school board
30. Make a presentation to your city council
31. Speak up at your representative's town hall meeting
32. Create an online petition
33. Advocate for a law with your state government

Think Like an Engineer Journey

Glossary for Daisies

Daisies may not know some of the words used on this Journey. Here are definitions you can share with them:

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

Conflict is when people argue or don't agree about something.

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.

A **prototype** is a sample when you want to show someone your idea. It could be a drawing or something you make to show what your idea looks like.

Think Like an Engineer Journey: Materials List

Think Like an Engineer 1

Activity 1: As Girls Arrive: What Is an Engineer?

- Paper
- Crayons, colored markers

Activity 2: Opening Ceremony: All About Engineers

- Flag
- **Daisy Flower Friends** poster
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Fairy House

- “Found” nature items (twigs, leaves, acorns, etc.)
- Buckets, bags or other containers for “found” materials girls pick up
- Glue
- Modeling clay
- Construction paper
- Cardboard
- Disposable cups
- Markers/crayons
- Popsicle sticks
- Glitter, stickers, and any craft supplies that will add sparkle
- **Daisy Flower Friends** poster

Activity 4: Closing Ceremony: Take Action Like Engineers

- Take Action Guide

Think Like an Engineer 2

Activity 1: As Girls Arrive: Draw a Flower Friend Engineer

- **Daisy Flower Friends** poster
- Colored markers
- Paper

Activity 2: Opening Ceremony: Working as a Team

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law
- **Daisy Flower Friends** poster

Activity 3: Design Challenge: Puff Mobile

- Pinwheels (one for each team of girls)
- Straws
- Tape
- Construction paper
- Lifesavers candy
- Paper clips
- Scissors

Think Like an Engineer Journey: Materials List

Think Like an Engineer 2 (continued)

Activity 4: Closing Ceremony: Take Action Brainstorm

- Take Action Guide

Think Like an Engineer 3

Activity 1: As Girls Arrive: Mini Obstacle Course

- Cones or other objects set up as a mini obstacle course

Activity 2: Opening Ceremony: What's Our Special Skill?

- Flag
- Whiteboard or poster board
- Markers
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Challenge: Cross a Canyon

- Straws
- Popsicle sticks
- Toothpicks
- Construction paper and/or newspaper
- Toilet paper rolls
- Paper clips
- Masking or Duct tape
- Photo printouts of the Grand Canyon, enough for each pair of girls

Activity 4: Closing Ceremony: Time to Decide on Take Action!

- List of Daisies' Take Action ideas from the last meeting, written a whiteboard or poster board
- Marker

Think Like an Engineer 4

Activity 1: As Girls Arrive: Draw Your Skill

- Paper
- Crayons or colored markers

Activity 2: Opening Ceremony: Name Your Engineering Skill

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

Activity 3: Designing Our Take Action Project

- Paper
- Markers
- Pens/pencils

Think Like an Engineer Journey: Materials List

Think Like an Engineer 5

Activity 1: As Girls Arrive: What Is an Engineer, Part 2

- Daisies' engineer drawings from Think Like an Engineer 1
- Paper
- Crayons or colored markers

Activity 2: Opening Ceremony: Getting Ready to Take Action

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

Activity 3: Creating Take Action

- Any materials Daisies need for their Take Action project

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Activity 1: As Girls Arrive: Get Ready to Celebrate!

- Girl Scout Promise and Law poster(s)
- Daisy Flower Friends poster(s)
- Any items Daisies want to display (such as photos or videos from their Take Action project)
- Photos and videos from the Journey meetings
- Music system
- Decorations
- Snacks

Activity 2: Opening Ceremony: Welcome!

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

Activity 3: Awards Ceremony and Celebration

- Think Like an Engineer award
- Take Action award

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

Activity 4: Girl Survey

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

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.