Outline of Badges Snapology Can Offer

1. **Daisies (Kindergarten - 1st Grade)**
    a. Mechanical Engineering Badges (3)
        i. Badge 1 - Board Game Design Challenge
        ii. Badge 2 - Roller Coaster Design Challenge
        iii. Badge 3 - Model Car Design Challenge
    b. Robotics Badge 2 - How Robots Move
    c. Space Science Explorer Badge

2. **Brownies (2nd - 3rd Grade)**
    a. Mechanical Engineering Badge 3 -Race Car Design Challenge
    b. Robotics Badges (2)
        i. Badge 1 - Programming Robots
        ii. Badge 2 - Designing Robots
    c. Space Adventurer Badge
    d. Inventor's Badge

3. **Juniors (4th - 5th Grade)**
    a. Mechanical Engineering Badges (2)
        i. Badge 2 - Balloon Car Design Challenge
        ii. Badge 3 - Crane Design Challenge
    b. Robotics Badges (2)
        i. Badge 1 - Programming Robots
        ii. Badge 2 - Designing Robots
    c. Space Science Investigator Badge

4. **Cadettes (Middle School)**
    a. Robotics Badge 2 - Designing Robots
    b. Digital Movie Master Badge

TOTAL = 17 Badges

Daisy (Kindergarten - 1st Grade)

Mechanical Engineering Badges (3)

Badge 1 - Board Game Design Challenge (1.5 Hour Workshop)

Step 1 - Come up with an idea for your board game
Create a unique LEGO maze as the main game board; use the Maze Activity from Kingdoms, Castles, and Wizards class.

Step 2 - Design a spinner for your game
Create a simple LEGO Game Spinner and design the rules for playing your game. See pages 14-15 for building instructions; will use Fidget Spinner #2 for this activity.

Step 3 - Test your game and make it better
Design the theme of your game through building, add challenges, test, and Improve what you've created.

Badge 2 - Roller Coaster Design Challenge (1.5 Hour Workshop)

Step 1 - Build a model of a roller coaster
Switch to step one, do roller coaster build from Amusement park Engineering

Step 2 - Make a simple roller coaster car
Decorate your roller coaster, work with another team to connect the two coasters, and then design a cart that will flow up and down the tracks.

Step 3 - Test your roller coaster
Test the roller coaster - can you connect more than one hill to the ride? Can you make the roller coaster hill more steep?

Badge 3 - Model Car Design Challenge (1 Hour Workshop)

Step 1 - Design and build model cars
Build a simple car design from Basic Engineers (either push car or parade float). Students can decorate, design, and modify this build in whatever way they see fit.

Step 2 - Use model cars to test the friction of different surfaces
Use different surfaces to test the distance that the car will travel (track this information with worksheet on page 16). Also play around with the friction caused by the bushing - does the car travel father when the bushing are pushed tightly against the car or when they are pulled away from the car some. Why?

Step 3 - Race your cars
Race on a variety of surfaces and with ramps.

Robotics Badge

Badge 2 - How Robots Move (1.5 Hour Workshop)

Step 1 - Learn about the parts of a robot

Learn the basic components of a robot; go over important pieces in the WeDo kit

Step 2 - Find out how robots move

Play Simon Says with the group. You are the programmer and they are the robots. They need to follow each of your commands closely. Then, give them 2-step instructions and 3-step instructions that they must follow.

Then, the girl scouts require the girls to try out writing out their own programs. To do this, ask the girls to move to the walls that are farthest from the door and sit down. Move a few obstacles around the room. Ask the girls to use arrow to draw out their "code" for getting to the door from wherever they are sitting. See attached Worksheet on page 17.

Step 3 - Make a robot move

After learning the basics of robotics, have the girls build the windmill from KinderBots. Then, teach them how to put a line of code together in WeDo and let the students play with their builds using programming. Girl Scouts emphasize exploration and discovery, so try not to give them every answer. If time permits, show them how one of the motion sensors works and how it can be programmed into their existing program. Let them play around with this as well.

Space Science Explorer Badge

Space Science Explorer Badge (2 Hour Workshop)

Step 1 - Explore the Sun

In order to begin this badge challenge, you will have to have the cooperation of the troop leader. It is a requirement that the girls complete a day sky book in order to receive this badge (**see attached handout on page 18 that you can share with the troop leader in order to get the girls to do this at home before your workshop**). The girls must bring their day sky book as their "ticket in the door" to completing this Space Science Explorer badge. The first activity that they will complete is to build a mosaic of when they think the sun is most beautiful. This decision will be based on their observations. Remind them that color is important and where the sun sits on the baseplate is important too.

Step 2 - Observe the Moon

Scientists - Astronomy, Moon Mapping

Step 3 - Meet the Stars

Scientists - Astronomy, Constellations Activity

Brownie (2nd - 3rd Grade)

Robotics Badges (2)

Badge 1 - Programming Robots (2 Hour Workshop)

Step 1 - Create a simple machine

Discuss the different types of simple machines and then build the KinderBots Windmill. Identify the pulley system.

Step 2 - Test your robot senses

Play with "senses" using our bodies to pretend we are like robots and then explain what each of the sensors in the WeDo kit do.

Step 3 - Learn about programming

Teach the basics of programming and then how to add the sensors to the program

Step 4 - Try simple programming

Only at this stage let students practice with plugging in code to make their robot work. Provide assistance as needed.

Step 5 - Code a robot

Have students break down their builds and start again with the Space Rover from Real World Robotics. After building, do not distribute the programming sheet. See if the students can program on their own using the programming key card only. Provide assistance as needed, but the girl scouts focus heavily on taking risks and learning from mistakes. Encourage collaboration to solve this challenge. After they finish building and programming, go over what simple machine are present in this build.

Badge 2 - Designing Robots (2-3 Hour Workshop)

Step 1 - Explore how robots imitate nature

Discuss biomimicry (how nature is made up of small parts that work together to create a whole cohesive unit and robotics does the same). Build the Bee from Creature Creator and program.

Step 2 - Learn about the parts of a robot

Discuss the parts of the bee robot and how each of the parts is working independently to make the model move. Compare this to how the body works. Ask the students to consider what small things are happening in the body when to move to reach out and grab something. Have them stand up and test this out. **OPTIONAL** - Have them build the robotic arm to discuss the differences between their movements when going to grab something and the robots. Will require this to be a 3-hour workshop.

Step 3 - Plan your robot

Begin Home Safety lesson from Incredible Inventions

Step 4 - Create a prototype

Let the students work together to build out their idea for home safety

Step 5 - Get feedback on your robot

Share and receive feedback from their peers. Revise and improve the build.

Mechanical Engineering Badge

Badge 3 - Race Car Design Challenge (1-1.5 Hour Workshop)

Step 1 - Learn how design can affect speed

See Girl Scout Guide for this badge.

Step 2 - Design and build your race car

Use the push car build from Basic Engineers and decorate however they want

Step 3 - Design your racetrack

Using a variety of supplies in the room, create a racetrack with ramp to test the speed and durability of your race car

Step 4 - Conduct a fair test and record results

Record what happens when racing

Step 5 - Share what you learned

Present to the group

Space Adventurer Badge

(3-hour workshop or multiple sessions)

Space Adventurer Badge (3 Hour Workshop)

Step 1 - Meet the neighbors

Create the solar system, Scientists - Astronomy

Then, create a fun mnemonic device as a troop to remember the order of the planets

Step 2 - See more than before

Show images of the moon, planets, and start from far away and then close up. Explain how telescopes help us to see those features of the sky in better detail. Have the students construct the moon or stars in close-up detail that we can see because of telescopes (see attached handouts)

Step 3 - Investigate the Moon

Scientists - Astronomy, phases of the moon

Step 4 - Be a stargazer

Scientists - Constellations

Step 5 - Celebrate and share

Share - what was your favorite part of earning this badge? What was the most interesting thing you learned? Share your stories and what you built (Students should be showing off what they built during the lesson too).

Inventor's Badge

Inventor's Badge (2 Hour Workshop)

Step 1 - Warm up your inventor's mind

Using loose bricks, have the students grab a hand-full. They will be only using that hand-full for this activity. Have them create five unique things with those bricks. Do one at a time until you get to Five!

ADD IN - BRAIN WARM-UP GAME! From Girl Scout Curriculum

Step 2 - Find lots of ways to solve the same problem

Using the items in the room, have the students create a list of 10 ways that they could make music with only the supplies they can find in the room. Don't touch anything, just brainstorm with a team of 3-4 other girls. Then, test out two of them. Share ideas with the group!

Step 3 - Make a needs list

Individual activity - Girl Scout requirements. Worksheet attached on page 25.

Step 4 - Solve a problem

Have students pick one of the problems from the needs list and build it with loose bricks. Then, have them build a "machine" or invention that will help solve their problem and add it to their model.

Step 5 - Share your invention

Have the students share their idea with group and take feedback. At the end, see if the girls think any of their machines could be used to help with someone else's problem. Have the students find a partner to blend their builds with to create a super machine.

Junior (4th - 5th Grade)

Mechanical Engineering Badges (2)

Badge 2 - Balloon Car Design Challenge (1.5 - 2 Hour Workshop)

Step 1 - Learn about potential and kinetic energy

Use the Girl Scout's content and balloons to introduce the idea of potential and kinetic energy. Make sure to discuss various ways potential and kinetic energy is present in the world around us.

Step 2 - Design and build a balloon car

Use loose bricks and Basic Engineers kits (or assorted tech bricks, if you have them) and let the girls design a balloon-powered car that can drive across the floor. We don't want to give them the answer, it's required that they work together to design it themselves. Use the Engineering Design Process with them to get them to the building stage. They can work in teams of 2-3, but they can collaborate with other teams. There are many ways to make a balloon-powered car!

Step 3 - Test your balloon-powered car

Make sure students are testing as they build. If it moves, can they make it move faster or farther? How? Have them track their results as they do this. Girl Scouts are big on tracking results and progress!

Step 4 - Analyze and share your results

First they should analyze their own results; then, they should share out their results with the group and take feedback. Turn this into a discussion. The Girl Scouts wants for the girls to be discussing their work and gaining new insights from their peers and mentors.

Step 5 - Brainstorm ways to improve your design

Team reflections after sharing to see how they might considering improving their build. If time permits, allow them to make their modifications and then record their results. When recording results, it's important to focus on more than just what happened; the girls should be investigating why it happened.

Badge 3 - Crane Design Challenge (1.5 - 2 Hour Workshop)

NOTE: Recommended to offer balloon-powered car badge before this badge.

Step 1 - Explore simple and compound machines

Discuss what these things are by introducing them with real-life objects we use often. See handout for this on page 26.

Step 2 - Design and build a crane

Use loose bricks and Basic Engineers kits (or assorted tech bricks, if you have them) and let the girls design a crane that can lift 5-10 pennies. We don't want to give them the answer, it's required that they work together to design it themselves. Use the Engineering Design Process with them to get them to the building stage. They can work in teams of 2-3, but they can collaborate with other teams.

Step 3 - Test your crane

Make sure students are testing as they build. If it works, can it lift 5 pennies? If not, can you change it to make it stronger? How? Have them track their results as they do this. Girl Scouts are big on tracking results and progress!

Step 4 - Analyze and share your results

First they should analyze their own results; then, they should share out their results with the group and take feedback. Turn this into a discussion. The Girl Scouts wants for the girls to be discussing their work and gaining new insights from their peers and mentors.

Step 5 - Brainstorm ways to improve your design

Team reflections after sharing to see how they might considering improving their build. If time permits, allow them to make their modifications and then record their results. When recording results, it's important to focus on more than just what happened; the girls should be investigating why it happened.

Robotics Badges (2)

Badge 1 - Programming Robots (2 Hour Workshop)

Step 1 - Learn how robots work

Basic robotics introduction and then build the Mars Rover from Space Wars.

Step 2 - Discover the robot brain

Basics on how a Robot thinks - starts with a coded sequence and when the robot is work autonomously, it is constantly sensing, thinking, and acting based on the coded program. Explore how sensor work and what they do. Have the students brainstorm how they might interact with robots on a daily basis (doors that open automatically, lights that turn on with motion and off when motion has stopped, the temperature in some building and houses is maintained by a robot that is constantly sensing the temperature of the air and sending out temperature regulated air to keep the temperature constant).

Step 3 - Learn about programming

Tangrams activity - print out the resources and cut out tangrams. Students will work in pairs. One student is the programmer and one is the robot. The programmer has an image card and their goal is to communicate how to put the image together with the tangrams without telling their partner what they are building. The robot must follow the programmer exactly in order to build the final image. The programmer needs to be detailed in their descriptions to explain exactly where the tangrams go. Switch turns after an image is finished.

Step 4 - Try simple programming

Using the cups handout and key, the students will work with a partner to create a line of code using only directional signals to explain how cups should be moved in order to get the final building result. Details provided in handout. Once a pair finishes their program, they can partner with another group and swap programs. Each team will try to complete the program as it is written and get the correct final result. Teams will go one at a time and the programmer team will watch the "robot" in order to see where they might have made mistakes in their program.

Step 5 - Code a robot

Finally, teach the girls basics of WeDO programming. Once they have a basic understanding, pass out the WeDo programming key guide and see if they can figure out how to properly program their Mars Rover! Provide assistance and give suggestions, but don't just give them the answer to this!

Badge 2 - Designing Robots (3+ Hours Program)

This lesson can be followed according to the Girl Scouts plans, just using our WeDo kits and loose brick/tech bricks as a resource for creating a prototype. See Girl Scout Booklet for plans.

Step 1 - Discover the future of robots

Step 2 - Determine your robot's expertise

Step 3 - Plan your robot

Step 4 - Create a prototype

Step 5 - Get feedback on your robot

Space Science Investigator Badge

Space Science Investigator (3 Hour Workshop)

Step 1 - Model the Solar System

Scientists, Astronomy, Planets - each student creates a different planet so that the whole solar system is created. See attached handouts.

Step 2 - Circle the Sun

FIgure out your age on other planets - can use the provided handout or
www.girlscouts.org/SpaceSciencePlanetAges

EXTENSION - write a letter to yourself in 10 years; see attached worksheet.

Step 3 - Discover the stars

Scientists, Astronomy, Constellations

Step 4 - Use tools to explore

Build the Mars Rover from Space Wars (Review pictures of Mars)

OR

Create a brochure for a planet

Step 5 - Share your sky

May need to be completed after the workshop or with the troop. The only reasonable option would be to have the girls create a "space show" by doing something creative like a song, rap, skit, poem, short story, etc… to explain their experience of learning about the Solar System.

Cadettes (Middle School)

Robotics Badge

Badge 2 - Designing Robots

You can do this program as it is written by the Girl Scouts; however, it's project-based and would require either several sessions to complete or for the troop leader to do steps 1-3 with the girls prior to interacting with Snapology. After the girls have picked a challenge and planned their prototype, the should be taught basic robotics before using the materials to bring their prototype to life. It's recommended that they use WeDo kits, various additional tech pieces (of you have them), and loose bricks to complete step 4. This could be a 2-3 session class or a 2-3 hour workshop. It depends on a variety of factors. See attached Girl Scout plans.

Step 1 - Pick a challenge
Step 2 - Explore possible solutions
Step 3 - Plan your prototype
Step 4 - Build a prototype
Step 5 - Get feedback on your robot

Digital Movie Maker Badge

Digital Movie Maker Badge

Use Snapology's Animation program to earn this badge. Recommended to be taught as a 3-hour workshop or multi-day class. Can follow provided Snapology curriculum for this!

Step 1 - Learn digital video basics
Step 2 - Practice filming
Step 3 - Pick the perfect subject
Step 4 - Action!
Step 5 - Edit and premier your movie!