GSOC
MY STEM LIFE

My STEM Life

ORANGE COUNTY COUNCIL'S OWN CADETTE BADGE

As a "STEM girl" myself, I know that sharpening your problem solving and critical thinking skills will take you far, no matter what you do in life. Stay curious and keep asking questions!

-**Nancy Nygren**, *CEO, Girl Scouts of Orange County B.S., Mathematics / Computer Science*

Do you love music? Hanging out at the beach? Playing sports? No matter what you're interested in, chances are — it's full of STEM! From the apps on your smartphone to the ingredients in your favorite recipe, science, technology, engineering and math are all around us. Get ready to explore the exciting world of **STEM in Orange County**! You'll find out how STEM fits into your everyday life and your future, and how Orange County is leading the way.

Science, Technology, Engineering, Math

STEPS

1. **Explore the world of STEM in OC**
2. **Investigate STEM in your life**
3. **Create your own project using STEM**
4. **Experience STEM in action**
5. **Present what you learned about STEM in OC**

PURPOSE

When I've earned this badge, I'll know how STEM plays an important role in MY life in Orange County.

► Be sure to do at least **one science, one technology, one engineering and one mathematical** option, especially if an area is new to you. Hint: Look for 🟠S, 🟠T, 🟠E, and/or 🟠M next to each choice to see what area of STEM it relates to.

► My STEM Life badge activities can be completed on your own, with a participating company from the GSOC STEM Consortium, or with any other Orange County business or independent professional.

For additional resources and activities to help you complete steps of this badge, including current STEM Consortium Members, check out *www.girlscoutsoc.org/ MySTEMLife.*

STEP
1 Explore

Every step has three choices. Do ONE choice to complete each step. Inspired? Do more!

Get the inside scoop from an expert! There are lots of STEM experts right here in OC. Explore OC to find out what STEM professionals do, how STEM plays a part in the activities you love, and/or how products are made. The world of science, technology, engineering, and math is all around us in OC as you're about to find out!

CHOICES – DO ONE:

☐ **Meet an OC STEM professional.** 🟠S🟠T🟠E🟠M Talking with a professional in a STEM field can help you figure out what kinds of careers might interest you. You'll be surprised at what you find out! Check out the list of OC STEM Consortium members who have STEM experts ready to meet you, or find an OC STEM professional on your own! Prepare yourself by coming up with 10 questions to ask when you meet. Include at least one question that relates to STEM in Orange County.

OR •

☐ **Visit an OC business or organization that uses STEM.** 🟠S 🟠T🟠E🟠M Orange County has lots of companies and locations that use science, technology, engineering and math every day. Think about causes and activities you care about. Then, find out how STEM is used in OC companies that relate to your interests. Some places to consider are wetlands, a native plant nursery, film studios, water plants, waste plants, electrical plants, farms, and businesses that offer high adventure activities like zip lines or SCUBA. *Find GSOC's High Adventure approved vendors list by going to www.girlscoutsoc.org and searching "high adventure" in the Forms & Docs search bar.*

OR •

☐ **Visit an OC STEM manufacturer or designer.** 🟠S🟠T🟠E🟠M How are computers made? Do you know where parts and devices are manufactured? Visit a company from the GSOC STEM Consortium or other OC STEM business to get answers. Ask questions to find out more about how the company learns what its customers need and innovates to stay competitive. List items you use in your everyday life that are designed or made right here in OC.

Green Buildings
of OC

Have you heard of LEED? Leadership in **E**nergy and **E**nvironmental **D**esign certification is a third-party rating system led by the U.S. Green Building Council. OC has been quick to start developing green buildings under LEED certification. Maybe you have visited or even live in one!

Environmental Nature Center, Newport Beach, CA- LEED Platinum Certified

Soka University Performing Arts Center, Aliso Viejo, CA- LEED Gold Certified

More to Explore

GET INSPIRED by Laguna Beach's artist community by visiting the Sawdust Festival or Pageant of the Masters. See how STEM fits into what you observe. Hint: Is there science to glassblowing? What creates the illusion of the live paintings at Pageant of the Masters?

Aviation Badge
1963 Cadette Handbook

Purpose: to get first-hand experience in the "airman's world" and to explore its dramatic impact on daily living.

Community service ideas

While completing your My STEM Life badge, you may be inspired to do a community service project!

Here are some ideas:

- **Electronics recycling**
- **Clothing donations**
- **Wetlands, park, or beach cleanups**
- **Food drive or donation**

What else can you think of to help your OC community?

Music Playlist Challenge

Challenge: Estimate the number of songs that will fit into a 1 hour playlist. Select songs that represent Orange County or the way you feel about life in Orange County.

Estimate it – How many songs do you think will fit in your 1 hour playlist?

Check it – List your songs, including the length of each rounded to the nearest half minute. Then, add together all song lengths.

How'd you do? Compare your estimation with the actual length.

● What are some factors to consider when estimating?

● When is estimation a good tool and when is an exact calculation more important?

Typical song lengths:
Pop – 3 minutes
Country – 3.5 minutes
Classical – 5 minutes
Hip hop – 4.5 minutes
Rock – 4 minutes
Soundtrack – 4 minutes

Ready to add up your playlist?
Adding time is different than adding regular numbers because time is written in minutes and seconds (units of 60). You can estimate time by rounding your song lengths to the nearest 30 seconds and writing the number as a decimal. For example, if a song is 3:40, it would be represented as 3.5. A song that is 2:52 would be represented as 3. 0 and one that is 4:10 would be represented as 4.0.   To add these three song lengths together, you would add 3.5+3.0+4.0=10.5.

2 Investigate

The word "investigate" is often used in STEM fields. It means to observe or study by close examination and systematic inquiry. People investigate to really understand a topic and now is your chance! What will you investigate?

CHOICES - DO ONE:

☐ **Get a behind the screens look.** 🔵 Find out how OC is behind nearly every computer screen. Select an OC STEM Consortium company from the list to learn about important inner workings of computers designed right here in Orange County. Tap into the resources around you by searching online, talking to an informed adult, or visiting an OC company to find out more about their involvement in the computer world.

OR •

☐ **Estimating is good sense.** 🔴 Estimation can be helpful when a calculation does not need to be exact. Choose one of the following activities to hone your estimation skills. Find out your chances of winning the California Lottery, how many calories are in your favorite OC Fair food, how many songs will fit in a one hour playlist, or how many steps it takes to walk the pier at your favorite OC beach. Identify ways of estimating to get more accurate information than guessing.
For estimation tips and tricks, check out
http://www.mathsisfun.com/numbers/estimation.html.

OR •

☐ **How many things that you own are from OC businesses, and how were they made?** 🟠🟢🔴 Find out which products are made in OC and what they're made of! Once you do your research, share what you found by telling or teaching someone else, or creating a diagram showing what you learned.
HINT: Try a web search using keywords: OC Businesses, OC STEM Companies, or Made in Orange County. You could also try looking at the OC Business Journal website for ideas: www.ocbj.com.

STEM

science
Knowledge about or study of the natural world based on facts learned through experiments and observation.

Technology
1: The use of science in solving problems (as in industry or engineering).
2: A technical method of doing something.

engineering
The art or science of making practical application of the knowledge of pure sciences(such as physics or chemistry) in the construction of engines, bridges, buildings, mines, ships, and chemical plants.
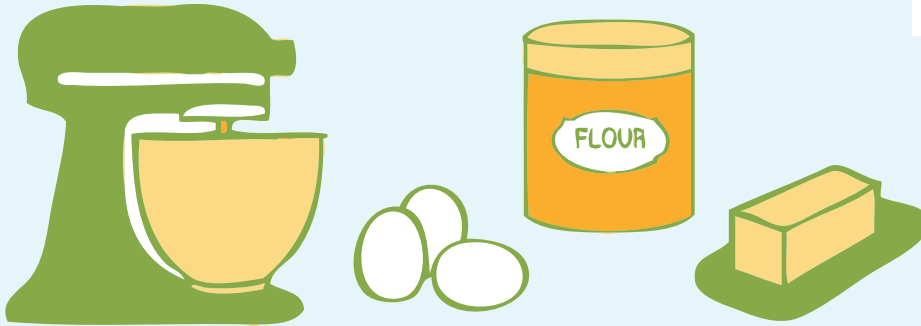
mathematics
The systematic treatment of magnitude, relationships between figures and forms, and relationships between quantities expressed symbolically.

Cookie Bake-Off

Tips for baking your perfect cookie:
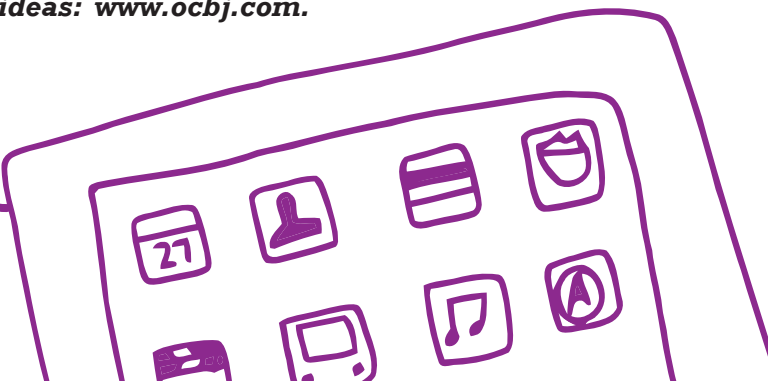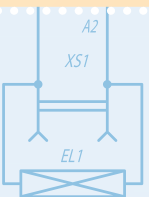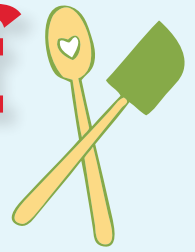
Science and math are two of the basic ingredients when it comes to baking. Math skills are used when measuring, estimating, and timing your baking. Chemistry is how the different ingredients interact and/or react to the heat of the oven. The amount of each ingredient (such as flour, sugar, or butter) that goes into your cookies will determine the softness, crunchiness, or chewiness of your classic dessert.

Choose your favorite cookie recipe and **try baking three batches of cookies, altering the recipe** slightly for each batch. You may consider dividing the recipe for each batch to make your baking day more manageable.

Make a list of the differences and similarities. Be sure your observations include a description of the appearance, texture, and, of course, taste! For more fun, check out one of OC's local cookie shops and see how their cookie recipe compares to yours!

Ooey-gooey: Add 2 cups more flour.

Tan color: Set the oven higher than 350 degrees Fahrenheit. Cookies caramelize, or turn brown, at 356 degrees.

Crispy with a soft center: Use 1/4 teaspoon baking powder and 1/4 teaspoon baking soda.

Chewy: Substitute bread flour for all-purpose flour.

Just like store-bought: Trade the butter for shortening.

Thick (and less crispy): Freeze the batter for 30 to 60 minutes before baking. This solidifies the butter, so the cookies will spread less while baking.

Cakey: Use more baking soda to release carbon dioxide.

Butterscotch flavored: Replace packed light brown sugar for granulated sugar in the recipe.

Uniformity: If looks count, add one ounce corn syrup and one ounce granulated sugar.

More flavor: Try chilling the dough for 24 hours before baking to deepen flavor.

More to Explore

See the science. Watch this short TedEd video to really get a handle on the chemistry of cookies. *http://ed.ted.com/lessons/the-chemistry-of-cookies-stephanie-warren#watch*

There are many ways to create art, physical structures, computer-based programs and more — all using STEM! Try your hand at creating something in a way you have not done before. You may learn that even if drawing or painting isn't your greatest strength, you enjoy being creative! Orange County has many creative businesses that use STEM.

CHOICES – DO ONE:

☐ **Design something new.** 🅣 With the guidance of an OC STEM Consortium company or other OC expert you know, learn how to use technology to design something new through computer programming. Some ideas include programming a Raspberry Pi, robotics, or computer animation.

OR •

☐ **Construct something new.** 🅣🅔 Build a piece of hardware designed by an OC STEM company as you learn the parts and terminology, or head to your favorite OC beach to build a sandcastle and test how sturdy your structure is.

OR •

☐ **Combine materials to make something for yourself.** 🅢🅣🅔🅜 Want to be a make-up artist at Segerstrom Center for the Arts or a chef at a top OC restaurant? Mix it up! Create something made up of different ingredients or elements that would be of use in an Orange County business. Activities to consider include: making your own nail polish and makeup, dying yarn with Kool Aid, or baking! Discover what happens when you use different ingredients or techniques!

Almost everything you learn to do at home has some relation to your future world. New inventions and new products are being developed so fast that no one can possibly foresee what jobs will be available on the day you are ready to begin.

Interest in the kitchen may lead to work as a nutritionist or dietician. There is an opportunity for the science-minded in developing plastic and synthetic materials for fabrics, tableware, and household equipment.

-Cadette Girl Scout Handbook, 1963

Combining mathematics, science and technology, **ENGINEERS** produce creative solutions to real world problems. Here is a list of some of the many types of engineers:

- Aerospace
- Agricultural
- Architectural
- Biomedical
- Biomechanical
- Chemical
- Civil
- Construction
- Computer
- Electrical
- Electronics
- Environmental
- Industrial
- Mechanical
- Robotics
- Software
- Structural

4 Experience

Sometimes the best way to fully understand something is to try it out or see an example in person. By visiting one of Orange County's STEM businesses, or one that relies on STEM to be successful, you'll develop an appreciation for how STEM plays a role in Orange County and relates to your life.

CHOICES – DO ONE:

☐ **Experience STEM in action.** S T E M You may have heard that Disneyland is the "happiest place on earth" and Knott's Berry Farm is "America's first theme park," but do you know how much STEM takes place at these iconic Orange County attractions? Visit one of these local theme parks to experience the physics and engineering of how rides create thrills and how energy changes during lifts and drops of rollercoasters. While at the park, make a list of the science, technology, engineering, and math that you observe. You may be surprised at what you find!

OR •

☐ **Play a STEM-related game.** S T E M It's all fun and games when you're playing with STEM! **Go to www.girlscoutsoc. org/MySTEMLife to find a variety of STEM-related games** created just for you by OC STEM Consortium companies! Adapt the game for younger girls or teach your peers to play. As you play, talk about what you learn.

OR •

☐ **STEM around town.** S T E M Hike on one of OC's many trails, such as at Crystal Cove State Park or an Orange County regional park. Talk to a park naturalist to find out about the importance of science, technology, engineering, and math in OC's preserved natural spaces.
HINT: Check out www.ocparks.com for ideas of where to go.

Roller Coaster Rush

Select two different roller coasters to ride.

PHYSICS TERMS AND DEFINITIONS

For both:
- Take a photo, draw or copy the design of each roller coaster on a plain piece of paper, leaving space to write notes.

For the first roller coaster:
- Ride the ride, noting what your body does and how it feels at different parts of the roller coaster.
- Label the parts of the ride on the sheet of paper you prepared, listing feelings or sensations that occurred as you rode the roller coaster.
- Using the terms (with definitions on the right), add the scientific or mathematical principles that occurred as you rode the roller coaster.

For the second roller coaster:
- Look at the design and predict what will happen as you ride it. Use the terms you learned while labeling the first coaster.
- Ride the roller coaster.
- Check to see if what you predicted actually happened.

Discuss with your troop/group or family how STEM is part of Disneyland and Knott's Berry Farm. In addition to the science of physics you learned in this activity, where do you see technology occurring? Try to figure out which types of engineers are needed at amusement parks using the list of engineers on page 8.
Hint: Search online for different types of engineers to find out more about what each does.

Keep your brain racing with more info from these sites:

Visit www.pbslearningmedia.org or www.howstuffworks.com and search "roller coaster"

ACCELERATION – Measurement of the change in something's velocity over time

$$A = \frac{\text{change in velocity}}{\text{change in time}}$$

G-FORCE - The force of gravity

GRAVITY – The force of attraction by which terrestrial objects tend to fall toward the center of the earth.

GRAVITATIONAL POTENTIAL ENERGY – This is the energy stored (potential energy) based on how high something is.

$$GPE = \text{mass} \times \text{gravity} \times \text{height}$$

KINETIC ENERGY – Energy an object has while in motion

$$KE = \tfrac{1}{2} \times \text{mass} \times \text{velocity}$$

MASS - The quantity of matter that a body contains.

POTENTIAL ENERGY – Energy an object stores as a result of where it is or what it has been doing.

VELOCITY - The rate of speed with which something happens; rapidity of action or reaction.

Sandcastle Engineering

Head to your favorite Orange County beach and build a sandcastle!

This is called structural engineering. Structural engineers analyze and design structures that support or resist loads; in this case, **WAVES**!

Here's what to do:

- Go to the beach.
- Make a sandcastle close to the shore.
- Does your castle withstand the waves?
- Yes? That's STRUCTURAL ENGINEERING that works!
- No? Change up your building techniques and try again!

Questions to ask yourself:

What did you do to make sure your sandcastle stayed intact?

Is there something you would do differently to you rebuild your castle that would make it stronger?

How much stronger was your sandcastle the second time? Third time?

5 Present

Now that you have learned about STEM in your OC life, it is important to share what you have learned so others can understand the significance of STEM in their OC lives too. Think about what you discovered about STEM in Orange County and how STEM is relevant to you. Did anything surprise you along the way? Choose your audience and decide what and how you will present.

Presentation Ideas: Talk it out, lead a discussion, prepare an electronic presentation, poster, presentation board, blog, or video.

CHOICES – DO ONE:

☐ **Present on how STEM relates to your OC life.** ⑤①ⓔⓜ
Now that you have found out more about how STEM fits into your OC life, choose your favorite piece and share it with others to highlight the importance of STEM in Orange County industries and/or activities.

OR ·

☐ **Present how your future will include STEM.** ⑤①ⓔⓜ
How is STEM part of your future career or everyday life? Describe some of the forward-looking concepts that OC STEM Consortium companies are using that you see yourself getting involved with.

OR ·

☐ **Present the significance of STEM in OC.** ⑤①ⓔⓜ
Now that you have learned about the significance STEM has in your OC life, share with another generation who may not know about the new things you are learning.

STEM Careers

Three of the top five fastest growing occupations projected for Orange County by 2018 represent STEM fields (biomedical engineers, medical scientists, and network systems and data communication analysts).
(State of California, Employment Development Department)

Some STEM Careers that are important to OC:

- Biomedical Engineer
- Medical Scientist
- Network Systems Analyst
- Data Communication Analyst
- Aerospace Engineer
- Health Care Professional
- Computer Programmer
- Environmental Scientist

Now that I've earned this badge, I can give service by:

- Organizing a workshop to share with others the importance of science, technology, engineering, and mathematics in Orange County.

- Helping a friend (who thinks he or she doesn't like STEM) understand that it is part of practically everything we do and love.

- Getting involved in more STEM activities as a way to develop important skills that will prepare me for my future career and life.

I'm Inspired to:

GIRL SCOUTS OF ORANGE COUNTY
STEM CONSORTIUM

Thank you to Girl Scouts of Orange County's
2015 STEM Consortium
for their support and partnership in the creation of the
My STEM Life badge for OC Cadettes.

Broadcom Foundation | Capital Group | Cox Communication | Deloitte
Fluor | Ingram Micro | Kaiser Permanente | PAAMCO | Western Digital