

Women in Mathematics Badge (Yes, an Actual Badge!) for Girl Scouts

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The Girl Scouts of America program provides girls with the opportunity to learn many important life skills, as well as explore a variety of real-world topics. In 2012, the Girl Scout Research Institute released a report about girls in science, technology, engineering, and mathematics (STEM) fields, based on a survey of Girl Scout members. They concluded that girls are interested in STEM topics and that many of them would like to pursue STEM careers, but in order to realize their goals, they need more exposure to what STEM careers may involve as well as adult support and role models [5]. As a result, Girl Scouts has an initiative to create and make available STEM badges at all levels of Girl Scouting, including encouraging leaders to “Create Your Own Badge” [1], which allows local troops to collaborate with experts in their geographic area to investigate topics for which specific badges do not yet exist.

There is no existing mathematics badge per se (a financial literacy badge is the closest), so we created our own Women in Mathematics badge. Sponsored by High Country Girl Scouts and the Mathematical Sciences Department at Appalachian State University, we also obtained “in cooperation with AWM” status. During a Sonia Kovalevsky type of day, girls in grades 6–9 interacted with women mathematicians and learned about their careers and experiences. Speakers included alumni from our university working in industry as well as faculty members. Participants also learned about AWM and Sonia Kovalevsky, and reflected and shared what they learned on the way to earning the badge pictured in the right-hand column.

The different images on our badge showcase the diversity of careers available for people who study mathematics. The die represents probability and statistics, the beakers connect to experimental research, the binary numbers symbolize computers and numerical analysis, and the earth is for research on the world around us. They were the most mathematical of the symbols available. We selected a green background and white lettering for the binary numbers as a nod to the color scheme of AWM, and to help the girls make that connection. Sadly the binary numbers did not show up as well on the physical version as they did in the online model (although they printed well enough on our program

that the girls recognized what they were). Next time, we will increase the contrast. We thought it was cool that AWM’s green and white color scheme was originally created to match the Equal Rights Amendment (ERA) colors, and we shared this with the girls.



The official colors of Girl Scouts are green (PMS 355), black, and white, furthering the connections. In fact, Girl Scouts encourages anyone building a Girl Scout item to “embrace green” [2]. Our earned badge will be placed on the girls’ tunic, sash, or vest, the same as any other Girl Scout badge. Special badges are highly desired, so there is a collectability factor when other girls see this badge that they don’t (yet) have.

Every Girl Scout earned badge has five steps. The five steps we created for ours were:

1. Learn about a woman who was not afraid to be a first in the field of mathematics
2. Learn about the Association for Women in Mathematics (AWM)
3. Reflect on experiences in mathematics
4. Learn about careers in mathematics
5. Share what you know

As is typical for badges, we presented our steps in a worksheet format, where each step has activities or goals with checkboxes to complete. See our website for our handouts [3]. For step 1, we focused on Sonia Kovalevsky. For step 2, we included the following checkboxes:



What is AWM?



Name two AWM mathematicians who were also Girl Scouts.



What are two services that AWM provides?

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WOMEN IN MATHEMATICS BADGE

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Did you know that AWM's own Newsletter Editor Anne Leggett and Executive Director Magnhild Lien were Girl Scouts? The girls do now, and we also shared information about Ruth Stauffer McKee (1910–1992), who was involved with Girl Scouts. She was a student of Emmy Noether and she worked for the Joint State Government Commission of the Commonwealth of Pennsylvania [4]. It was on a Girl Scout trip in 1953 that she discovered the job opening that would develop into her fascinating career. The Girl Scout leadership is interested in compiling a list of women mathematicians who were once Girl Scouts, so if you were a Girl Scout, please contact us (greenwaldsj@appstate.edu) and let us know so we can pass it on!

As part of Steps 3 and 4, the speakers shared stories about themselves (e.g., there were once two sisters, one who struggled with mathematics and the other who found it easy ... they both ended up in mathematical careers!). We also focused on the diversity of careers in mathematics and the utility and applicability of mathematics in business, farming, the film industry and more. Each application or story related to a speaker. For example, one of our speakers was alumnus Ashley Cox, now a Market Research Analyst at North Carolina Electric Membership Corporation (NCEMC). We included a few interactive mathematical activities that



Poster Making

connected to the presenters. One of the more engaging ones was the “Greenwaldian Theorem” on the sphere from *Futurama*, which was another green connection—the girls laughed when they saw the green blackboard with the theorem on it. Others included research questions that statistician Jill Thomley had encountered in her consulting work, and a financial mathematics activity connected to Amber Mellon's research.

With a little bit of support, you too can create your own event, and we would be happy for you to use our badge steps and design [3]. Working with the Girl Scouts has many advantages. For one, it is the largest organization for girls in the nation. The Girl Scout culture of completing these directed activities makes them a very receptive audience for Sonia Kovalevsky types of programs, and we found this invigorating. The girls are also used to paying a small fee for badge events and bringing their own lunches—we charged \$6 for the day, most of which went directly to the cost of the badge. Our department provided a room as well as printing and photocopy support, and High Country Girl Scouts paid for the poster supplies and covered any overages. We the organizers split the cost of lunch for the speakers. Our wish list for the future includes a grant that would help us provide travel support and a stipend for the speakers, lunch for everyone and professionally printed pamphlets of the badge steps. However, we found that the program is quite doable without grant funding.

One unexpected problem was that only about half of our preregistered Girl Scouts attended the program. Saturday school requirements for a missed snow day (the hazards of



“Greenwaldian Theorem” String Activity

living in the mountains!) partially explained why we ended up with only seven girls. However, this was a perfect number for a first run of the event. The girls told us they enjoyed the day and we did too. We did have a lot of interest from younger girls for whom we didn't plan, so next October, we will add girls from grade 5 to the mix, since we'll be ready to test the program on a larger audience. What other changes will we make? We found that we have to be very careful about what we ask the girls to do. For instance they researched Sonia Kovalevsky on the web prior to the event, but we needed to be clearer that they should write down what they found and bring it with them.



Earned Badges (with Ashley Cox, Amber Mellon and Sarah Greenwald)



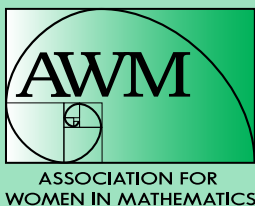
Girl Scouts Getting to Know Ashley Cox

The requirements for our culminating step were for the girls to chat with one another and with at least one of the speakers, create a poster on what they had learned in the other steps and explore the other posters. Girl Scouts has an eye toward giving back, as with any other badge, so our event ended with the prompt “Now that I’ve earned this badge, I can give service by ...” as well as: “I’m inspired to....” Because the girls have a physical reminder of the day in the form of the badge, we hope that this will help them continue to make mathematical connections in the future.

Thanks to Anne Leggett for helpful conversations.

References and Further Readings

- [1] Girl Scouts of America. <https://www.girlscouts.org/program/basics/science/>
- [2] Girl Scouts of America. “Girl Scout Brand Cheat Sheet.” http://www.girlscoutsgcnwi.org/media/forms/GS_GUIDELINES_poster_200210d.pdf
- [3] Greenwald, Sarah, Amber Mellon and Jill Thomley, “Women in Mathematics Earned Badge.” <http://cs.appstate.edu/~sjg/awm/earnedbadge.html>
- [4] Kenschaft, Pat. “A Career of Mathematics in Government: Ruth Stauffer McKee.” *AWM Newsletter* 41(3), May–June, 2011. <http://www.drivehq.com/file/df.aspx?isGallery=true&shareID=8755087&fileID=1241589926>
- [5] Modi, Kamla, Judy Schoenberg, and Kimberlee Salmond (2012). *Generation STEM: What Girls Say about Science, Technology, Engineering, and Math*. New York: Girl Scouts of the USA. https://www.girlscouts.org/research/publications/stem/generation_stem_what_girls_say.asp



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