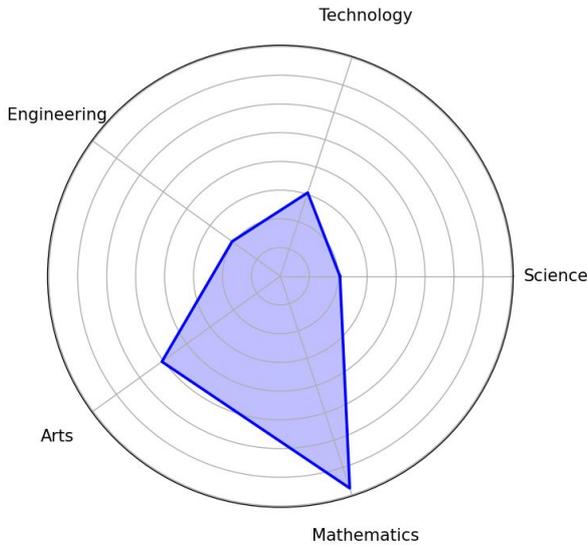




Curricular



PATTERN POWERED MATH

Duration	Age	Difficulty
45	17-18 y/o	Medium
#MATH #PATTERNS		

DESCRIPTION

Have you ever noticed how art, nature, and architecture are filled with patterns and proportions? From seashell spirals to ancient temples, mathematics is quietly shaping beauty around us.

In this activity, students will explore the real-world relevance of geometry, sequences, and ratios by designing a visually engaging infographic or physical art model that illustrates a mathematical concept such as the golden ratio, tessellations, fractals, or symmetry.

They will also explore cross-cultural applications of mathematics in art and design and highlight the work of female mathematicians or designers who helped visualize math in creative ways.

Working in small teams, students will apply math logic, design thinking, and digital tools (like GeoGebra or Canva) to represent their chosen concept. Their goal: communicate both the precision and beauty of math.

KEY COMPETENCES (EU)

- STEM competence
- Personal, social and learning to learn competence
- Cultural awareness and expression competence

ACTIVITY OBJECTIVES

- Understand and apply key mathematical concepts (ratios, sequences, geometry, transformations).
- Analyze how different cultures express math through art and architecture.
- Use digital or physical design tools to represent mathematical ideas.
- Create a visual product that communicates complex math concepts in an accessible way.
- Reflect on the contributions of female/gender-diverse mathematicians or artists.
- Collaborate in inclusive teams using rotating roles.
- Strengthen presentation skills and peer-feedback abilities.



MATERIALS



Color markers and pencils



[Math concepts](#)



[Math art examples](#)



[Data collection and math analysis guide](#)



[Mini-Bios](#)

- Provided by students
- Provided by the teacher/institution
- Downloadable Elements



A3-Size sketch paper



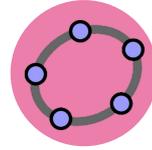
Sticky notes



Ruler, compasses, stencils...



Computers (for videos and information)



Access to Geogebra and/or Canva

PREVIOUS PREPARATION

- Divide the class into groups of 3–4 students, ensuring gender balance and promoting diversity. Assign rotating roles within each team (e.g., Research Leader, Visual Designer, Math Explainer, Presenter).
- Print and prepare the following materials:
 - ❑ Reference cards on mathematical concepts (Golden Ratio, Fractals, Tessellations, Symmetry)
 - ❑ Mini-biographies of female/gender-diverse mathematicians
 - ❑ Peer-feedback forms
- Set up access to digital tools: Ensure that at least one device per group has access to GeoGebra (<https://www.geogebra.org/>) or Canva (<https://www.canva.com/>). These will be used for mathematical modeling and digital design.
- Organize the classroom into collaborative workstations. Each station should have basic drawing tools (rulers, pencils, markers), A3 paper, sticky notes, and sample visuals for inspiration.

CONTEXTUALIZATION AND ADAPTATION

What do a seashell, an ancient mosaic, and a modern logo have in common? They're all designed with math.

You might not notice it at first, but math is everywhere: in nature, in buildings, in your favorite designs, even in the music you listen to. What if you could use that math to create something beautiful and make someone understand it without words?

In this activity, you'll explore the hidden connection between mathematics and design. You'll work with a concept like the Golden Ratio, Fractals, or Tessellations, and you'll bring it to life as a visual piece, something that not only looks great, but also teaches others how math works.



Now here's the exciting part:

- Different cultures have used math visually for centuries—Islamic art, African village patterns, Roman mosaics, Japanese origami... all built with ratios, symmetry, and repetition.
- And you're not alone—women and gender-diverse pioneers have been at the heart of making math more visual and accessible. You'll meet some of them today.

Imagine this: you're a mathematical designer creator of logic-based beauty. You'll take something abstract and turn it into a visual message others can understand. You'll be a mathematician, an artist, a storyteller, all in one.

In teams, you'll:

- Choose a mathematical concept
- Find real-world inspiration
- Sketch, design, and build
- Use tools like GeoGebra or Canva
- Present and explain your design as clearly and creatively as possible

By the end, your work could help someone younger, or someone scared of math, finally see its beauty and meaning. Ready to let math move people?

Box for complementary tools and exercises:

Watch video 🧠 - "Math is the hidden secret to understanding the world | Roger Antonsen + <https://youtu.be/ZQEIzjCsl9o>

Watch video 🧠 - "The complex geometry of Islamic design-Eric Broug + <https://youtu.be/pg1NpMmPv48>

Watch video 🧠 - "Can Geometry Be Art? | Tate Kids + https://youtu.be/Xsg_54t7T-k

Classroom activity 💡 - "Math Across Cultures – Pattern Match"

Instructions for Students:

1. On your table, you'll find 4 printed images of art from different cultures:

- An Islamic mosaic
- A piece of African fractal architecture
- A Japanese origami pattern
- A Mayan calendar segment

2. With your group, observe each image and discuss:

- What shapes do you notice?
- What patterns or repetitions can you identify?
- What kind of math might be behind the design?

3. On sticky notes or a mini whiteboard, write down:

- One mathematical concept that might be involved (e.g., symmetry, rotation, ratio)
- One cultural insight or unique visual element you see

4. Share 1–2 observations with the class.



**Note for the teacher** **1. Solutions/Examples:**

- Islamic mosaic → tessellations, symmetry, rotation
- African fractals → self-similarity, recursive patterns
- Japanese origami → geometry, transformation
- Mayan calendar → circular symmetry, mathematical time tracking

2. Tips for Implementation:

- Encourage visual description before diving into math—some students may engage more by first discussing color, shape, or symbolism.
- Highlight how each example represents different parts of the world, reinforcing the intercultural relevance of math.

3. Key Takeaway to Emphasize:

Math isn't just universal, it's expressed differently in every culture. This moment helps students make cross-disciplinary and cross-cultural connections, essential for creative design thinking.

ACTIVITY

STEP 1: Visual Deconstruction and Re-Design

- **Materials used:**
 - Printed cultural art samples (from the previous classroom activity)
 - Rulers, compasses, stencils
 - A3 sketch paper
 - Math concept reference sheets
 - Sticky notes
 - Colored pencils or markers
- **Instructions:**
 - Pick 1 image from the cultural art pieces you just explored (e.g., an Islamic mosaic or African fractal structure).
 - On your A3 sketch paper, recreate the image by tracing or lightly redrawing the main shapes using rulers, compasses, and stencils.
 - Identify the math principles involved in the pattern:
 - Are there repeated units? → Tessellations
 - Are shapes shrinking or growing? → Fractals
 - Is the shape balanced on both sides? → Symmetry
 - Is there a spiral or smooth ratio? → Golden Ratio / Fibonacci Sequence
 - Write annotations around the sketch using sticky notes:
 - What math concept is represented?
 - How is the pattern structured mathematically?
 - What transformations (e.g., reflection, rotation, scaling) are involved?



- Based on the pattern you just analyzed, create a simplified or modified version using your math tools.
 - Try changing the scale, applying a new color scheme, or inserting an element of symmetry that wasn't in the original.
 - Think about how you could teach this math concept to someone through this visual representation.
 - Your goal here is not just to copy the pattern, but to understand the math and reinterpret it creatively.

STEP 2: Choose Your Concept with a STEAM Role Model

- **Materials used:**
 - Role Model Bios
 - Math Concept Sheets
 - Sticky Notes
 - Sketch Paper
 - Team Role Cards
 - Internet-enabled device (optional)
- **Instructions:**
 - As a team, read through 2–3 bios of real-life women who worked in math, data, or design.
 - Select one who will guide your creative process. Ask yourselves:
 - What challenges did she solve?
 - How did she communicate ideas visually or mathematically?
 - What values (precision, creativity, clarity, activism) did she work with?
 - Write her name at the top of your sketch paper. She's now part of your team!
 - On sticky notes, write answers to:
 - What kind of pattern or message might she choose to communicate?
 - What math concept does her work relate to—geometry, statistics, ratios, symmetry, growth?
 - What kind of audience would she want to reach with this design?
 - Choose one math concept to focus your design on:
 - Golden Ratio / Fibonacci
 - Fractals
 - Tessellations
 - Symmetry
 - Define what message or story your final design will tell. Use this sentence starter:
 - “Inspired by [her name], we want our design to show how [math concept] can express [idea: balance, growth, harmony, resistance, justice, beauty...].”

STEP 3: Design and Build Your Final Product

- **Materials used:**
 - A3 sketch paper
 - Compasses, rulers, stencils
 - Poster boards or Canva (digital design option)
 - Colored markers, pencils
 - Sticky notes
 - Math concept sheet (for reference)
 - Notes from Step 1 and 2
 - Cultural art image (for reference or adaptation)
- **Instructions:**
 - Use your sketch paper and tools to draft the base layout of your design.
 - Map out your use of space, symmetry, proportions, or repetition.
 - Highlight where your chosen math concept will be clearly shown.
 - Use arrows or brief labels to annotate mathematical features.



- Begin shaping your final version on poster board (physical) or Canva (digital). Incorporate:
 - A color palette or visual motif from your selected culture
 - Design choices inspired by your role model's work
 - Mathematical annotations (ratios, patterns, coordinates, transformations...)
 - Optional: a title, slogan, or quote that enhances your message

Bonus: Consider adding a short sentence next to your model explaining what it mean emotionally, not just mathematically.

Mini-award category: If your group wants an extra challenge... "Best Sustainable Math-Art Design":

- Choose recycled, reused, or low-impact materials for your physical/digital (explaining it) poster.
- Explain why you selected these materials.
- Write a short note next to your design: "We chose [material] because it reduces waste and supports eco-friendly design."

CONCLUSION AND SHARING

Classroom activity "Tell the Story Behind Your Design"

Your design is more than just a pattern—it tells a story about math, culture, and human creativity. In this part of the activity, it's time to present your work, explain your choices, and listen to the ideas of others.

Instructions for Students

1. Each team will briefly present their creation to the rest of the class or another group. Your presentation should include: the math concept (What is the mathematical principle behind your design? where and how is it used in your piece?) cultural influence (What cultural art, design, or symbolism inspired your pattern? how did you adapt or interpret this visually?) STEAM Role Model (Which mathematician inspired you? what did you learn from her work that influenced your process?), design reflection (What challenges did you face—mathematical or artistic? what message do you hope people take away from your creation?)

2. After your team presents your design, ask your classmates:

- Did this help you better understand the math concept? what part of the design made the idea clearer or more memorable?
- Then, complete a quick reflection:
 - "One way our design successfully communicated math was..."
 - "One thing we could improve to increase impact is..."

Don't forget to take a photo of your experience and share it with us!



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[X](#)