

Imagination Lab Unit Plan: Architecture

STEM Focus: Mathematics (Grades 6-8)

Topic: Geometry/Spatial Reasoning

Goal: Reason with shapes and their attributes.

CCSS Connection: CCSS.MATH.CONTENT.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

**Pre-Activity
Assessment**

1. Read the Smithsonian article on bridges.
2. Answer the questions related to reading.

Central Questions

1. Why are different shapes important?
2. Can they help us build better structures?
3. Can they communicate different moods or ideas?

**Warm-up Activity:
Tangram Challenge**

1. Open your Tangram envelope. How many different shapes do you see? **Count them. Name them.**
2. We have a Triangle, Square, and a Parallelogram. Which one is not a Quadrilateral? Why? **Discuss.**
3. What is the area of the triangle, square, and parallelogram?
4. What is the total surface area of the tangram?
5. [Project the slides] Make a spider using the tangrams. Does the surface area change?

**Book Connection and
Exploration:
Smithsonian article on
Bridges**

1. [Handout] Make a bridge using tangram.
2. Can you make a bridge different from the handout? **Play.**

**Design Challenge Part
1: Building 2D and 3D
Shapes on Tinkercad**

1. Introduce basic functions on Tinkercad: Copy, Paste, Duplicate, Group, Ungroup, Align, Mirror, Creating Holes, Rotate
2. Make a gear. **Count** the number of gear teeth.
3. What angle did you use to create the gear? Try a different angle and see if you can get the rounded gear shape? Why or why not. Discuss.

**Book Connection:
Smithsonian article on
Bridges**

1. Show images of bridges. (Project slide images.) Do you see any Triangles? Explore/Discuss.
2. Discuss the different bridge shapes on the slides. Which one is closest to the one discussed in the article.

**Design Challenge Part
2: Building a Bridge**

1. Design a mini-golf course.

2. A “dangerous river” has now been placed on your mini-golf course. Design a bridge that helps a golf ball safely cross it. Does your design need any Triangles? **Build it.** . Use the cube and triangle net shapes for creating support structures.

3. Now see if you can safely put your golf ball across another team’s bridge.
Play.

4. Find the total surface area of the bridge you created.

Design Journal Entry: 1. Use today’s vocabulary words when sketching and describing your mini-golf course. (I notice..., It reminds me of..., I wonder...)

Additional Focus: 1. But wait! Can shapes also communicate moods or feelings?
2. Explore *Logo Shapes: What They Mean and Why They’re Important (URL in Additional Resources)

Additional Resources:

Categorizing Shapes Check

<https://www.education.com/worksheet/article/categorizing-shapes-check/>

*Logo Shapes: What They Mean and Why They’re Important

<https://looka.com/blog/logo-shapes-meanings/#:~:text=The%20psychology%20of%20shapes&text=Circular%20shapes%3A%20Unity%2C%20community%2C,Aggression%2C%20masculinity%2C%20strength%2C%20progress>

Making Quadrilaterals (updated, see below)

<https://www.education.com/worksheet/article/making-quadrilaterals/>

Naming Quadrilaterals

<https://www.education.com/worksheet/article/naming-quadrilaterals/>

Tangram as Teaching Aid in Mathematics - Part 1 or 2

<https://www.youtube.com/watch?v=D0nu2tvsYsA>

Tangram as Teaching Aid in Mathematics - Part 2 of 2

https://www.youtube.com/watch?v=ye2PmJy16_Y

Using Tangrams to Tell a Story: The Coyote and the Bear

<https://www.youtube.com/watch?v=C4wFwBYebYg>