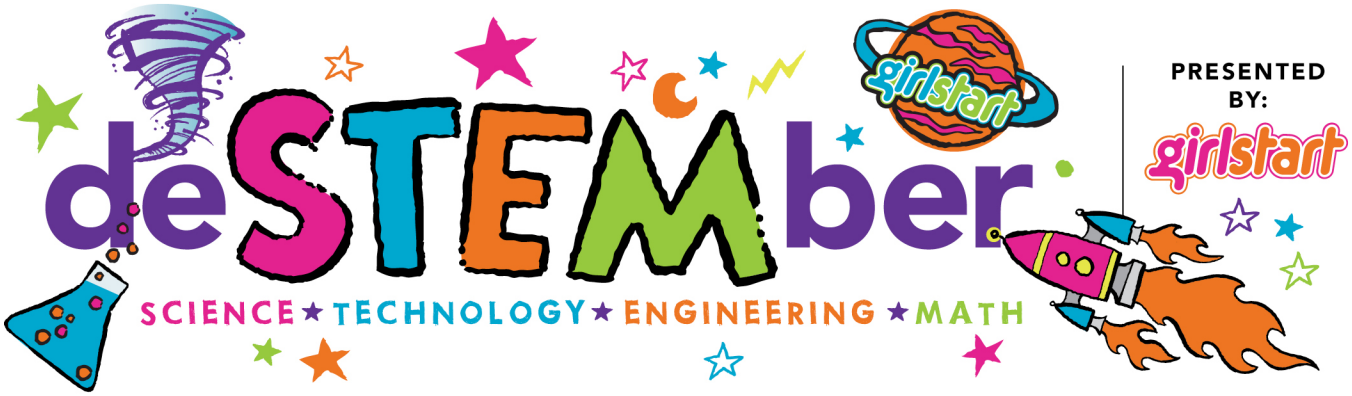


Non-Round Rollers

When you think about objects that roll, you usually think of a circle. Do you think you can use other shapes to do the same thing?

TEKS:

MATH 3.6 A: The student is expected to classify and sort two- and three-dimensional figures, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language.
MATH 4.6 A: The student is expected to identify points, lines, line segments, rays, angles, and perpendicular and parallel lines.

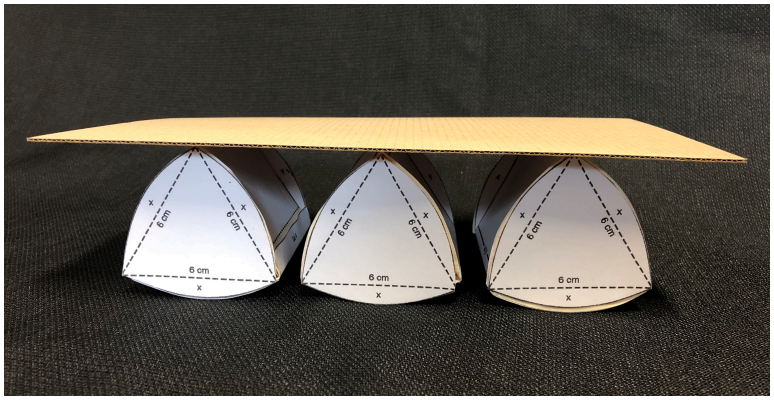
Materials:

- 3 printed Non-Round Rollers Templates (attached)
- 3 file folders or 1 large piece of poster board
- Glue stick
- 6 x 12-inch piece of cardboard or foam board
- Scissors

How To:

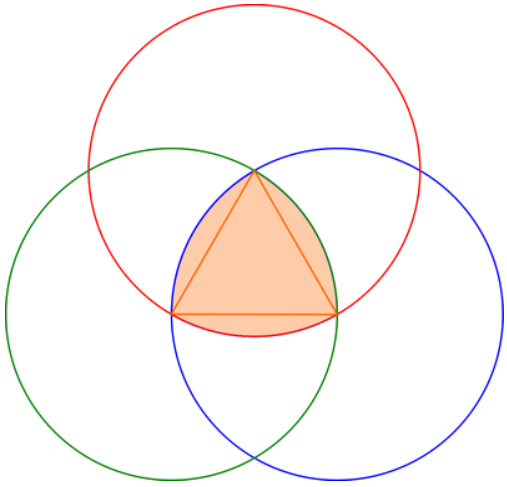
1. Print three copies of the attached Non-Round Rollers Template.
2. Use the glue stick to glue each copy onto a file folder or large poster board.
3. Cut out one of the large pieces of the templates. This will become the axle of your roller.
4. Fold the axle on the horizontal lines to create a triangular prism. Fold Tab A over area A and glue them together.
5. Fold the axle flanges "x" and "y" outward, away from the center of the axle.
6. Cut out the two small pieces of the template. These are the ends of your roller.
7. Glue the ends to the axle by matching up the lettered areas of the end pieces to the lettered flanges.
8. Repeat steps 3-7 with the two other templates to create three rollers total.

9. Place the three rollers in a row on a flat surface with the "x" ends lined up on the left side and place the piece of cardboard/foam board across the top of all three of them.
10. Move the board forward and backward and watch how the board remains at the same constant height and the rollers roll smoothly underneath it, even though the rollers are not perfectly circle-shaped.



STEM Explanation:

Round wheels work because, in a circle, the distance from the center to the edge of the wheel, called the radius, is the same all the way around. As the wheels turn, the vehicle attached to them stays at the same constant height. The rollers in this activity are based on Reuleaux triangles, or spherical triangles. These shapes, named after an engineer who studied machines that translate one type of motion into a different type, are formed by overlapping three circles where each one's center point lies on the intersection of the other two circles' edges. The bulging triangle shape formed where all three circles overlap is called a Reuleaux triangle.



https://hackaday.com/2018/04/30/the-quest-for-the-reuleaux-triangle-bearing/

While each Reuleaux triangle has three vertices, or points, they have arced edges connecting the vertices that are the same distance from the center of the shape. This means that, as our rollers turn on each vertex, the distance to the opposite side of the roller remains constant, keeping the vehicle attached at the same height, just like circular wheels.

Career Connection:

Engineers design and develop many different ideas that help solve everyday problems. They use advanced math skills to help them design types of machines, bridges, electronics, and much more. There are several different types of engineers that specialize in certain areas such as electrical engineers, mechanical engineers, structural engineers, robotic engineers, etc.

Resources:

https://www.exploratorium.edu/snacks/non-round-rollers
https://en.wikipedia.org/wiki/Reuleaux_triangle

Non-Round Rollers Template: