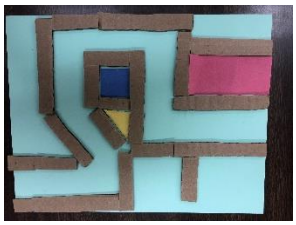


Title: Marvelous Maze STEM Challenge

Estimated Time: 1-2 periods

Core Ideas (GSE Standard and elements):

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). MGSEK.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. MGSEK.G.2 Correctly name shapes regardless of their orientations or overall size. MGSEK.G.3 Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). Analyze, compare, create, and compose shapes.

Literacy Connections: Books	**Literacy Connections: Close Reads**
Inch by Inch, Leo Lionni Shapes, John J. Reiss	Marvelous Mazes Close Read
Science and Engineering Practices: **Asking Questions and Defining Problems** Ask questions based on observations to find more information about the natural and engineered world. **Analyzing and Interpreting Data** Analyze date from tests on ab object or tool to determine if it works as intended.	**Crosscutting Concepts:** **Patterns:** Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. **Scale proportion and Quanity:** Relative scales allow objects and events to be compared and described.

STEM Challenge Overview:

In this STEM Challenge, the student's task is to build a maze for a marble that includes at least one square, rectangle, and triangle. It should also have a start and a finish and they should be able to carefully roll the marble through each twist and turn.

Ask	Ask students if they know what a maze is. After sharing ideas, show them pictures of a couple of cool mazes like the Dole Pineapple Maze and a crop maze. Discuss how mazes are a network of paths. If time permits, show this quick 2 minute video of a family that gets lost in a corn maze. https://www.youtube.com/watch?v=osigyT3hbxo
Imagine/Brainstorm	Students **brainstorm** ideas for how they could design a maze that can serve as a network of paths for a marble. After brainstorming with a partner, they should consider the strengths and weaknesses of each idea.
Plan/Design	In order to learn more about mazes and shapes, read them the article ***Marvelous Mazes*** showing them the pictures as you go**.** After researching, have students **plan** and **design** a maze for a marble that includes at least one square, rectangle, and triangle. It should also have a start and a finish and they should be able to carefully roll the marble through each twist and turn.

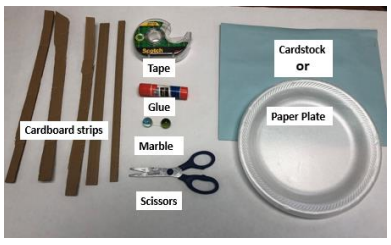
Create/Test	Students follow their plan, and **create** their mazes. Once they are created, students **test** their mazes in a measureable way to evaluate their effectiveness. Their results should be recorded, organized, and analyzed.
Improve	After discussing and **evaluating** their results, students **improve** their maze, redesign some part of it, and re-test if possible.

Teacher Notes:

A **maze** is a network of paths. Mazes are usually designed as a puzzle through which something has to find their way. Most mazes also have a **start** and a **finish**. The most famous maze in the world is the Dole Pineapple Maze that is located in Hawaii. People walk through this huge maze trying to find their way into the center to find the giant Pineapple. Mazes are also made frequently in corn fields in the fall.

Since this STEM challenge is designed for kindergarten students, the mathematical focus of this challenge is on basic geometric shapes. It is relatively simple to construct the borders of a maze so that they form a variety of different shapes. As a starting point, students should be able to identify and describe each of the shapes that they include in their maze (square, rectangle and triangle). As appropriate, they should also describe the shapes as two- dimensional or three-dimensional. Finally, you can encourage them to describe the relative position of each shape within the maze, using terms such as in front of, next to, and behind. If your students are advanced, you can even have them include additional shapes such as hexagons and parallelograms. Make sure they take time to evaluate and improve their maze as your emphasize the nature of the engineering design process.

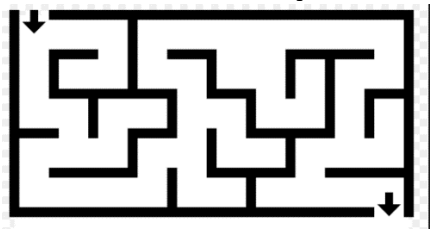
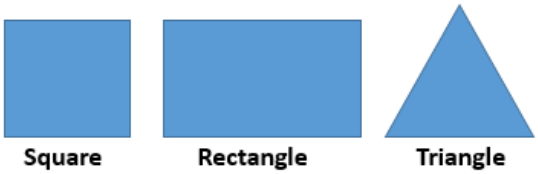
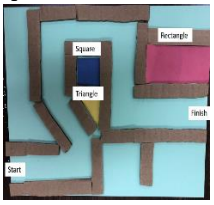
In setting up this STEM Challenge, let your students choose what materials they want to use to engineer their maze. We have found that a piece of cardstock paper or a large paper plate makes for an excellent foundation. We also let kids build with snap cubes if they prefer. With respect to the border of the maze, thin cardboard strips work very well as they are easy for kids to cut and glue (cut them with a paper cutter). Straws can also be used but use tape for them as their shape makes them tough to glue.

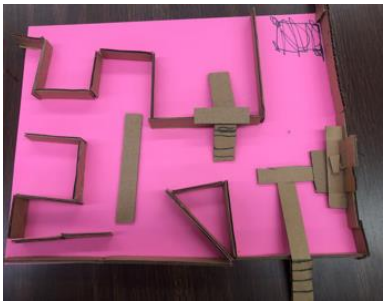


Suggested materials for students to use: (per group)

Cardboard strips (5-6 pieces per group) or 5-6 straws, piece of cardstock or paper plate, glue stick, scissors, marble, bag of snap cubes.

Vocabulary Cards:

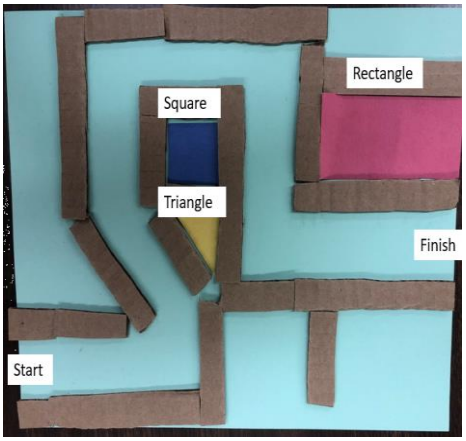
maze a network of paths 	**shape** the form of an object 
square an object with four equal sides and angles  	**rectangle** an object with two equal sides and four equal angles 
triangle an object with three sides and three angles  	**engineer** to design, build, and improve things 



Marvelous Maze STEM Challenge:

Can you design, build, and test a maze that acts as a network of paths for a marble to move from the start to the finish.

Designing and constructing your pliers:



1. After learning about mazes, **plan** and **design** a maze that provides a network of paths for a marble.
2. Using the materials provided and your plan, **construct** your maze. Your maze should include a start and a finish and a **square**, **rectangle** and **triangle**.
3. Once your maze is constructed, carefully **test** it with your marble and see if acts properly as a network for paths. Observe and record how the marble responds.

Evaluating and Improving:

1. As a group, discuss how you were able to construct your maze and explain how the shapes that you included (square, rectangle and triangle) are different from each other.

2. As a group, **evaluate** the effectiveness of your maze and discuss how you would change your design moving forward to **improve** it. If time permits, make these improvements and re-test.