Marble Maze Activity

Lesson Skills/Mathematical Concepts: Operations, geometry
Students will use addition, subtract, multiplication, and division in calculating design points and in determining the number and types of design elements to include. They will also make use of geometrical concepts as they determine possible design elements to maximize the amount of time it takes for the marble to pass through the maze.

Vocabulary:

- **Incline:** A slanting surface; a slope.
- **Maximize**: To increase by the greatest amount possible.
- **Engineering Design Process**: A series of steps that engineers follow to come up with a solution to a problem.

Estimated Time: *1 hour 30 minutes*

Materials List
Each team of 3 to 4 students needs the following:

- 1 piece of poster board or foam board
- 2 marbles
- 60 popsicle sticks
- 2 plastic cups
- 20 sheets of construction paper
- 40 index cards
- 10 pipe cleaners
- 1 roll of masking tape
- 10 sheets of foil
- 2 -3 scissors
- Stopwatch

Goal: Design a marble maze which maximizes the amount of time it takes for the marble to pass through the maze.

For more information on this activity, including an introductory video, please see http://www.eie.org/overview/engineering-design-process

Steps

1. Divide students into teams of 3 or 4 and provide each team with the above supplies.
2. Instruct students that they will work together in their teams to build a maze. The maze will be built onto the single piece of poster board or foam board which will be fixed to a wall.
3. The requirements for constructing the maze are as follows:
    a. The marble must start at the top right hand corner and come out at the lower left hand corner.
    b. Each maze must include 20 design points (see score card).
    c. The goal is to for the marble to take as much time as possible to reach the end of the maze. Students should use a stopwatch or other timer to test out their design as they go along.
4. When all teams are finished, have a competition to see which maze takes the longest for a marble to go through. If there is a tie, the maze with the most design points wins.

Extension:
Students can be challenged to come up with other design elements that might be included in their mazes, e.g. funnels or jumps.

This activity is very engaging for many students and they may wish to go further in designing their mazes. There are a number of videos on YouTube of marble mazes designed by other students (see for example the link above). Students may wish to look at other designs for inspiration to improve their mazes.

In addition, this activity lends itself well to introducing the engineering design process.

Name: _____

Marble Maze Score Card

Marble Maze Design Points

Each maze must score at least 20 points for Design Elements and have starting and ending points in the correct locations. Points are awarded as follows:

- Ramp = 1 point each
- Hill (requires marble to go up and then down)= 3 points each
- Loop = 5 points
- Spiral = 7 points each

	Number of Elements in Maze		**Points**
Ramp		x 1 =	
Hill		x 3 =	
Loop		x 5 =	
Spiral		x 7 =	

Total Points: _____

Marble Maze Reflection Questions:

1. What math skills and concepts did you use to build your maze?

2. What design challenges did you face in constructing your maze?

3. What challenges did you face working together as a team?

4. What could you do differently next time to improve how well your team works together?