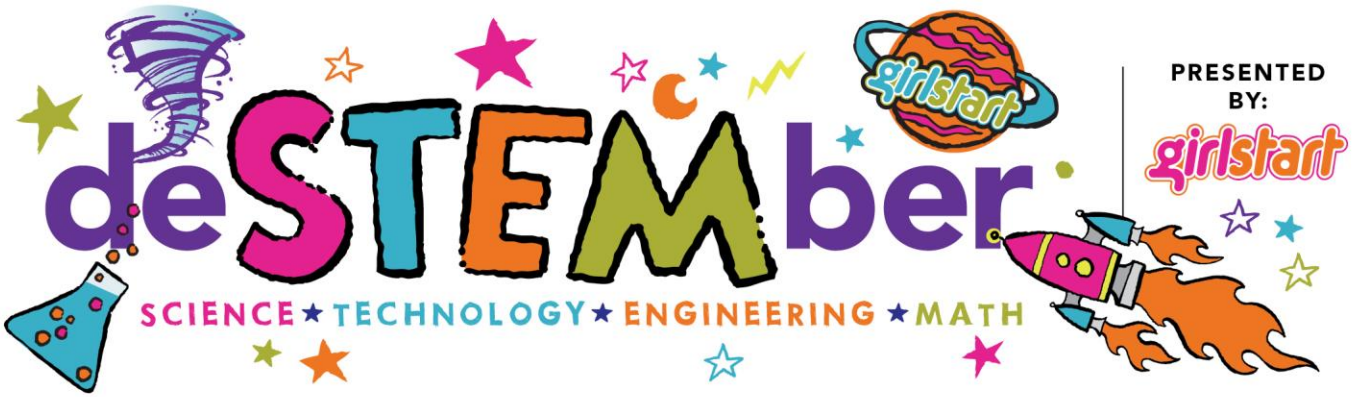

Marble Mazes

Have you ever thought about what it takes to design your own maze? Don't let your marble get lost in this fun activity! Explore how the Law of Conservation of Energy and Newton's 3 Laws of Motion will help you design a challenging maze.

TEKS:

4.6A: Differentiate among forms of energy, including mechanical, sound, electrical, light, and heat/thermal.
6.8A: The student knows force and motion are related to potential and kinetic energy. The student is expected to compare and contrast potential and kinetic energy.
8.6C: Investigate and describe applications of Newton's law of inertia, law of force and acceleration, and law of action-reaction, such as in vehicle restraints, sports activities, amusement park rides, Earth's tectonic activities, and rocket launches.

Materials:

- 1 marble
- Pencil
- 9" x 7" piece of cardboard
- Ruler
- Scissors
- Sharpie
- Tacky glue
- 20 tongue depressors

How To:

1. Draw a perimeter line (about 6.5" x 8.5") with a Sharpie around the inside of the cardboard's edge to create a boundary for your maze. Don't forget to leave spaces to mark where your marble will enter and exit the maze!
2. Use a pencil and a ruler to map out the maze design. Remember, the goal is to create a challenging path for the marble. Be sure to add a few dead ends. Also make sure your paths are wide enough for the marble to move through.

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3. Lay out the tongue depressors along the design, including your outer perimeter. Use scissors to adjust the length of the tongue depressors as needed. **Adult supervision may be needed.**
4. Use tacky glue to adhere the tongue depressor maze walls in place. (Hold each tongue depressor in place for a few seconds to let the glue dry.)
5. Continue the gluing process until all of the maze walls are in place.
6. Test your maze. If needed, gently remove a maze wall to relocate.
7. Your marble's movement through the maze illustrates Newton's 3 Laws of Motion. Newton's 1st Law of Motion states that an object at rest will remain at rest unless a force acts on it. Similarly, an object in motion will stay in motion unless a force acts on it. What force acted on your marble to make it begin moving through the maze? Once the marble was moving in your maze, what force acted on it to prevent it from moving continuously in the same direction?
8. Newton's 2nd Law of Motion states that Force = Mass x Acceleration. In other words, the bigger the mass of an object, the greater the force needed to make it move and accelerate. Did you need to exert a large force or a small force on your marble to get it to move?
9. The 3rd Law of Motion states that for every action, there is an equal and opposite reaction. Think about what happens when you run into somebody. Your force will push that person away from you, while, at the same time, you bounce back off that person; this is Newton's 3rd law. How does the marble in your maze illustrate this 3rd law?

STEM Explanation:

Energy can come in many different forms, such as potential or kinetic. Potential energy is the stored energy an object has because of its position. If you hold the marble just at the edge of the maze, the marble has potential energy. This potential energy can be released and transformed into other forms of energy.

When you release the marble, it begins to move through the maze as you tilt the cardboard base. Releasing the marble into the maze transforms the marble's potential energy into kinetic energy. Kinetic energy is the energy of motion. Any object that has mass and is moving has kinetic energy.

Important laws of physics are demonstrated by your marble maze. Newton's Law of Conservation of Energy says that energy may be transformed from one kind to another, but energy cannot be created or destroyed. That means the marble in the maze has a total amount of energy. The energy changes between potential and kinetic, but it never disappears completely.

The maze also illustrates Newton's 3 Laws of Motion. When you drop the marble into the maze to make it begin moving, you are exerting a force on it and demonstrating the 1st law. Also according to the 1st law, the marble would continue to go in a straight line if the walls weren't there to exert a force on it. Your marble has little mass and doesn't require a lot of force to start moving it through the maze. This is Newton's 2nd law. Finally, when the marble hits the walls of your maze, it bounces off the walls. This is a demonstration of Newton's 3rd law as it shows that every action has an equal and opposite reaction.

Career Connection:

Architects plan and design buildings for various uses. They use their scientific and mathematical knowledge of physics to understand building construction combined with their artistic abilities to design visually appealing structures. Architects are scientists, mathematicians, and artists. To become an architect you need a four year degree and a professional degree from an architectural program.

Resources:

http://www.fabdiy.com/make-your-own-marble-maze/
http://www.tackyliving.com/cheap-n-easy-marble-mazes/
http://teachertech.rice.edu/Participants/louviere/Newton/law1.html

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