

Name _____



Marble Maze Project Direction Sheet 4th Grade Science Objectives

SPI 0407.Inq.1 Select an investigation that could be used to answer a specific question.

GLE 0407.11.2 Design a simple investigation to demonstrate how friction affects the movement of an object.

0407.11.2 Design an investigation to identify factors that affect the speed and distance traveled by an object in motion.

4th Grade Math Objectives

SPI 0406.5.4 List all possible outcomes of a given situation or event.

✓ **0406.1.5** Measure using ruler, meter stick, clock, thermometer, or other scaled instruments.

This project will take time, and you may encounter frustration and failure. You may find that your first idea may look good on paper, but will not work as a good design. Trial and error will be necessary to the success of your overall maze. Your success can be judged by the fact that you were an involved problem solver, creative, and most importantly, had fun.



Student Goal

Create a marble maze to investigate how speed, slope, friction, and distance affect the movement of a marble through a maze constructed of cardboard tubes.

Supplies

- One sheet of cardboard (for backing)
- Cardboard plates (multiple sizes – used to attach tubes to backing)
- Cardboard tubes (from tissue or paper towels)
- Duct tape and masking tape
- One marble (provided by your teacher)
- Friction item (your choice)

Directions

Your goal is to create a marble maze to demonstrate how speed, slope, friction, and distance affect a marble traveling through a maze of cardboard tubes.

Before you begin, use graph paper to sketch a couple of possible designs for your marble maze. This is the first step in building a successful maze.

Your drawing(s) should include:

1. A title for your maze.
2. A complete sentence including the goals your project will demonstrate.
3. Written details about your design along with measurements and descriptions of your sketch.
4. Consider the components you would like to include in your maze and color code each component. Include a key which explains your coding. (Examples include vertical drops, zigzags, pinwheels, and various slopes.)
5. Your design of choice must receive teacher approval before you begin construction of your maze.



Maze Requirements:

1. Your maze must be created on one piece of cardboard backing. (The size of the backing must be approved by your teacher. A good rule of thumb is that your backing should not be larger than your desktop.)
2. Cardboard tubes must be attached to cardboard plates (various sizes) which in turn will be tacked to the cardboard backing for testing. This allows you to arrange your maze before actually attaching it to the backing using masking or duct tape. (after testing)
3. Each maze must contain at least five plates.
4. The marble must enter the maze in the top left or top right corner and exit at the opposite corner.
5. Your first plate and last plate must extend at least 4" beyond the backing. This will allow you to attach your marble maze to another student's maze. (Our goal is to attach a minimum of four mazes together creating one large maze.)
6. Your maze must include one 9cm tube and one 5" tube.
7. At least one tube must demonstrate the effects of friction on the marble. The item you choose to create friction is up to you.
8. The marble must stop at the end of the maze.

Types of Tubes (See teacher displays)

1. Vertical – A cardboard tube that extends north to south
2. Horizontal – A cardboard tube that extends east to west
3. Zigzag – A series of tubes that are connected to form a diagonal drop
4. Connectors – Tubes which are cut to connect one tube to another. Used primarily for forming turns. A turn is formed by cutting a fringe at the end of each tube.

Testing Procedure:

1. You will be provided with a standard glass marble and allowed time to test your maze. This will require trial and error. You may find that your marble gets stuck in your maze, jumps track, or experiences a lack of slope and speed to maneuver through your maze.
2. If you experience problems with your maze, you will need to rework your maze to ensure that the marble travels from beginning to end.
3. When your maze works, test your maze with others. You must find three other students to connect your maze with.
4. Remember that four mazes must work together to form one successful maze.

Results:

After testing your maze and connecting it with others, reflect on the success/failures of your design.

1. Did your final design match your original drawing?
**If your final design does not match your original drawing, make a final sketch of your maze.*
2. Did you have to rework your maze to get it to work?
3. How did your maze function when connected with others?
4. Could anything be changed to improve your maze?

Consider these questions and reflect upon your project, then complete “How Did I Do?” student grading sheet.



Online Resources

Friction Game - <http://www.scienceunleashed.ie/Games/scooter.swf>

Forces in Action - http://www.bbc.co.uk/schools/scienceclips/ages/8_9/friction.shtml