

Solve a Mirror Maze Challenge with the Law of Reflection

Name: _____

Date: _____

Student worksheet

Part 1: Investigating the Law of Reflection

1. Vocabulary

In the table below, write what each term means and make a drawing that represents the vocabulary.

Vocabulary	Definition	Drawing
Angle of incidence		
Angle of reflection		
Normal line		

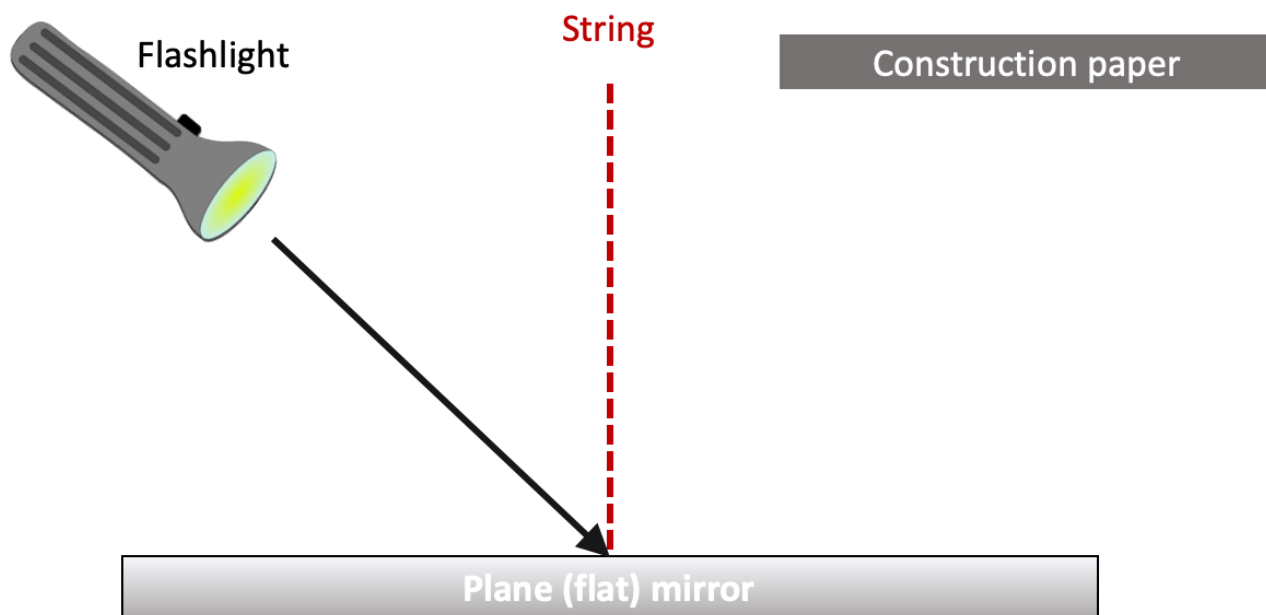
2. Investigation

To investigate the law of reflection, you will:

- Lay the mirror flat on the table with the shiny side up.
- Hold the flashlight at an angle pointing down toward the mirror.
- Try to catch the reflected light with a piece of construction paper.

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One student can hold a string to visualize the normal line. If you do this activity by yourself, you can place the mirror close to a wall and tape the string to the wall. Try to find a relationship between how you hold the flashlight and where the light goes. If you have a partner, the best way to do this is by outlining the angles of incidence and reflection using your fingers or another piece of string.

3. Observations and Results

- Write down your observations below and *what you think* the law of reflection states.
- Write down the law of reflection.

- c. Draw a diagram that visualizes the law of reflection. Include the plane mirror, the normal line, the incident light, the reflected light, the angle of incidence, and the angle of reflection.

Part 2: Using the Law of Reflection to Solve a Mirror Maze Challenge

1. Mirror Maze Challenge

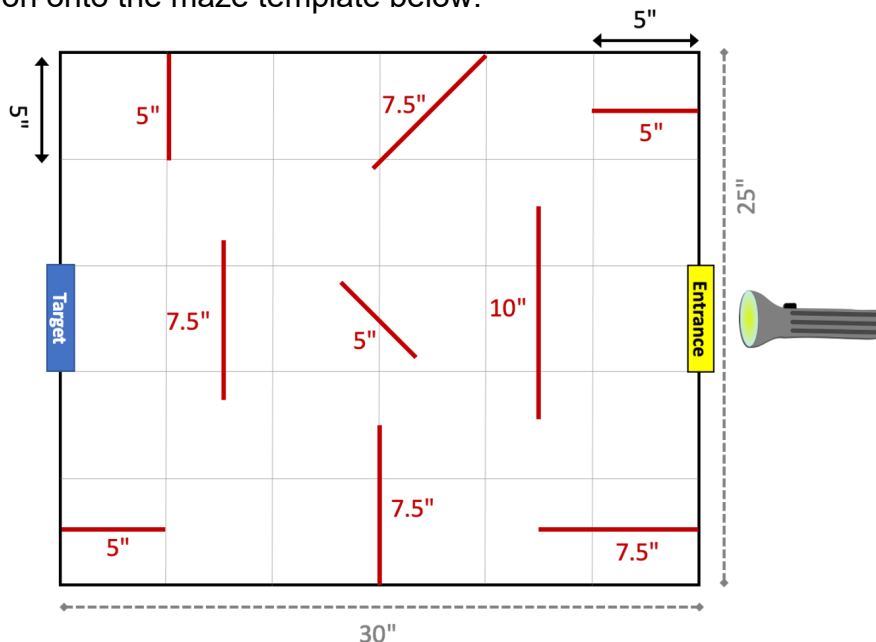
Design goal: Apply your knowledge of the law of reflection to direct a light beam through a maze onto a specific target. The goal is to keep the **number of light interactions (materials used to reflect the light) as low as possible** and to find the **shortest path of light through** the maze.

Design requirements:

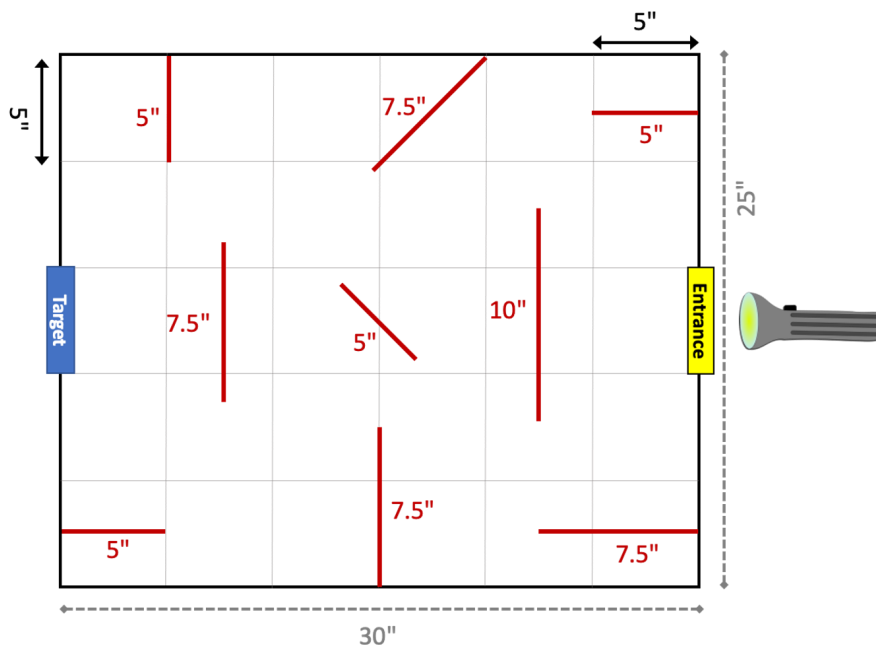
- a. The light beam has to start in the entrance window. The flashlight needs to lie perpendicular to the border line.
- b. The light beam has to cover the whole bullseye target.
- c. Any material used has to stay within the 25" x 30" boundary.

2. Mirror Design

- a. Think of a way to guide the light beam through the maze. Do not forget the design requirements! Draw your suggested setup and the predicted light path based on the law of reflection onto the maze template below.



- b. If you are working in a group, review the different design solutions. Compare the number of reflective materials and measure the length of each light path with a ruler to evaluate the different designs. Within your group, agree on a single design solution that you will test. This can be a combination of two or more design solutions. Draw your chosen design solution, including the predicted light path, below.



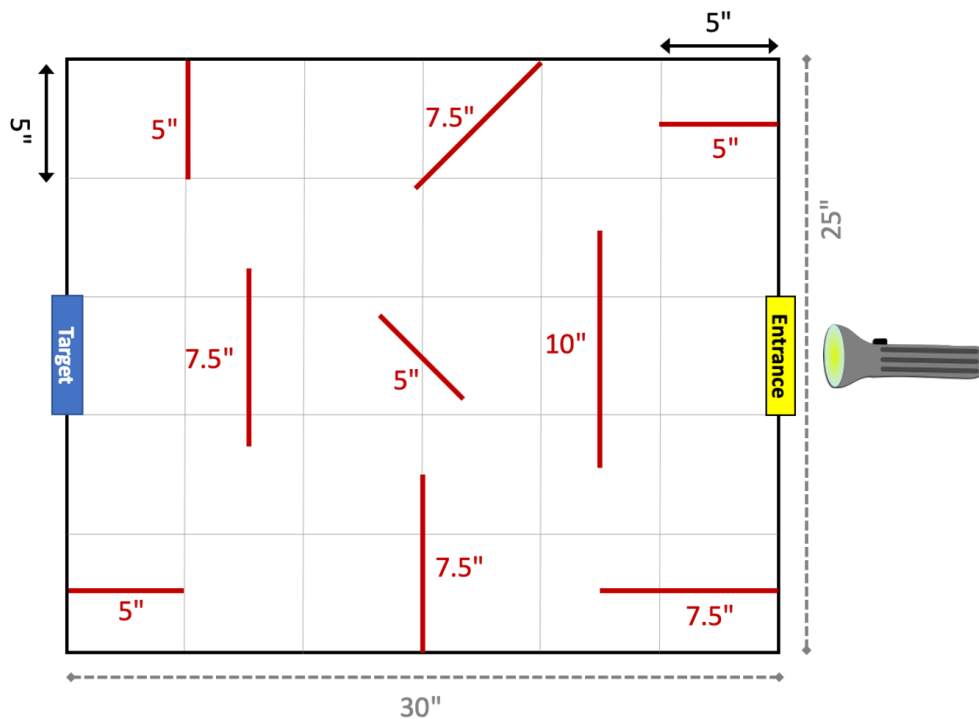
- c. Test your solution and set up the reflective materials in the maze, as drawn in your selected design. Use the flashlight to see where the light goes. Based on your results, improve your design. Go through at least two design iterations. If you hit the target in your first design solution, think about if you can reduce the number of reflective surfaces or if you can find a shorter light path through the maze. Use this table to record your results and the changes you made to improve your design. Use a ruler, yardstick, or string to measure the total length of the light path in your maze setup.

Design #	Whole bullseye target covered by light?	Number of reflective surfaces	Length of light path (in inches)	Comments on design changes
1				
2				
3				

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- d. Draw your final optimized design, including the observed path of light, onto the maze diagram below.



Did you cover the whole bullseye target with light?

☐ YES

☐ NO

How many reflective surfaces did you use?

What is the length of your light path (in inches)?
