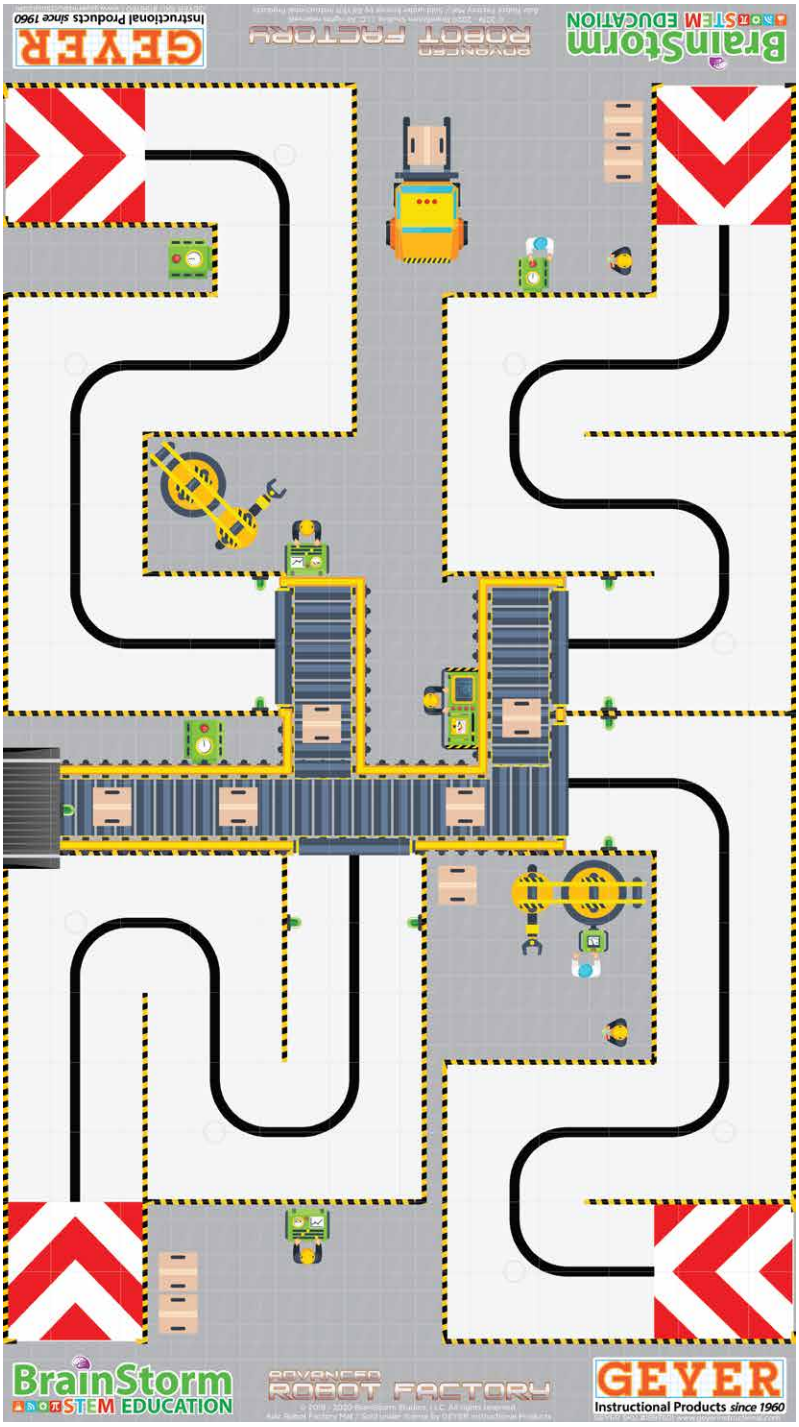
ROBOTIC ACTIVITY MAT

ADVANCED ROBOT FACTORY



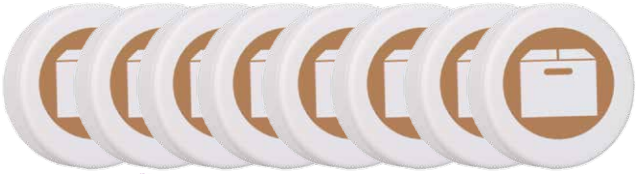
Summary: The advanced robot factory mat challenges students to work together to automate a factory using robots. The mat provides a variety of challenges from navigating mazes, to delivering factory parts.

Features:
- Fits up to 8 students
- 8 Fun game pieces
- 4 Awesome activities!

Objective: Help the factory deliver packages to the conveyor belt by navigating through the challenging mazes with basic motor navigation or line follow programming.

Skills taught: Students will learn programming, problem solving, sequential based navigation, line-following, and critical thinking

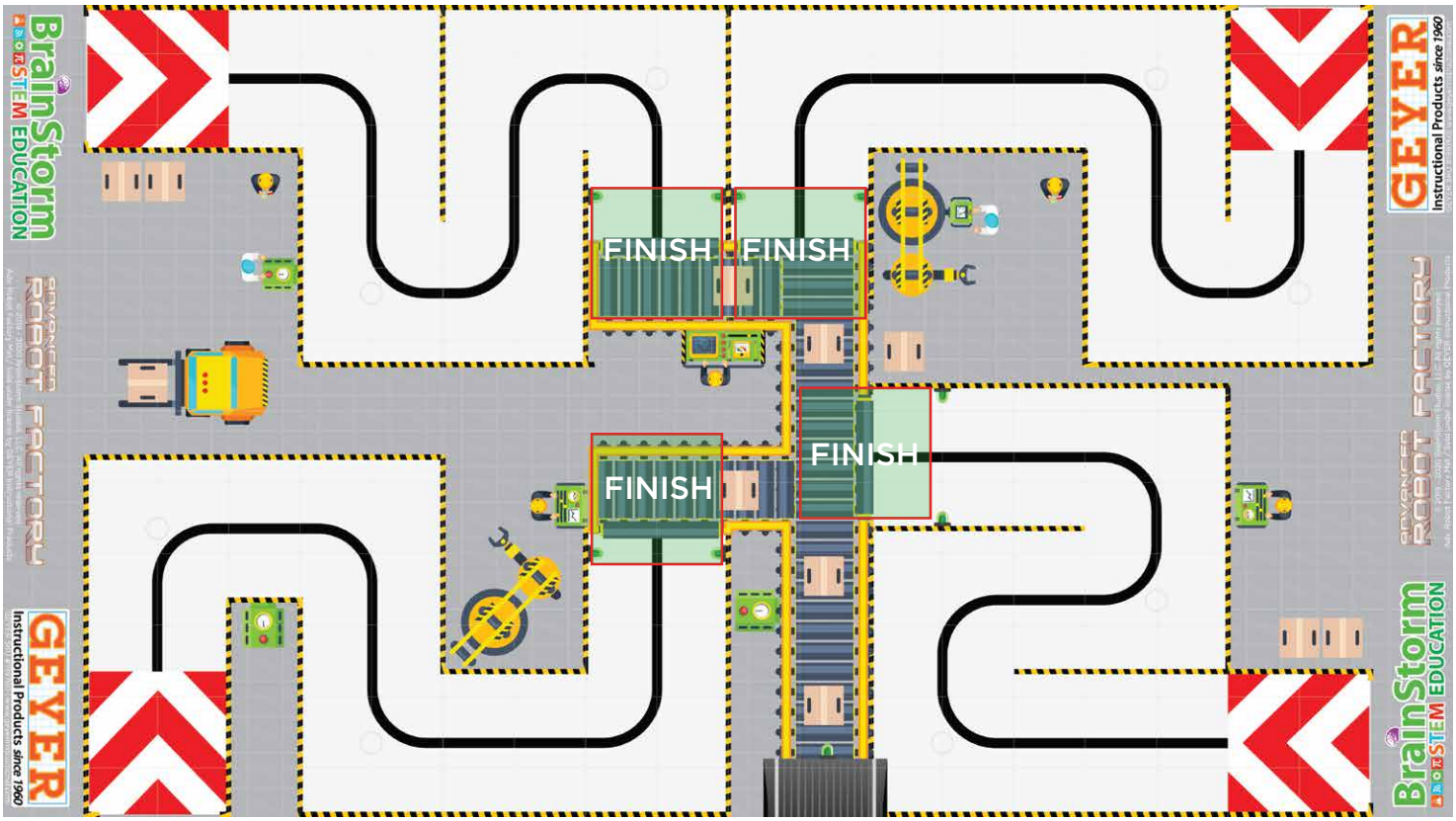
Game Pieces(8 Total)**:**



Activity 1 : Distance Based Navigation

Distance Based Navigation

Students will program robots to navigate from the Red starting squares to the conveyor belt to finish, without driving out-of-bounds.



How to Use:

1. Robots will start in one of the red starting squares located near the corners of the mat.

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the factory to the conveyor Belt.
(Tip: program your code two sequential commands at a time).

3. Code the sequential navigation commands into the robots program.

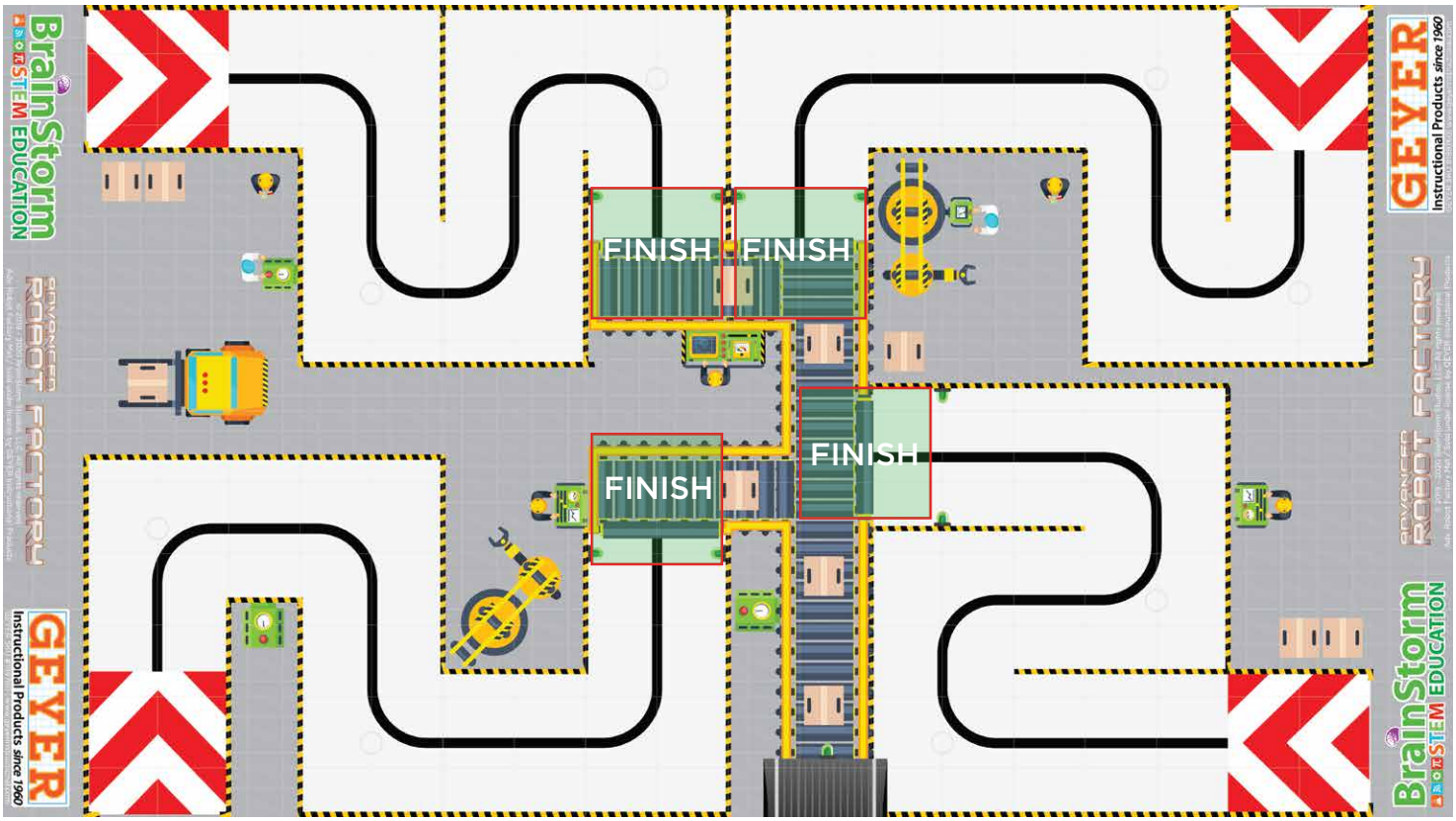
4. Place the robot in the specific starting square and execute the program.

5. Repeat steps 2-4 until the robot has successfully reached the conveyor belt without drifting out of bounds.

Activity 2 : Sensor Line Follow

Sensor Based Navigation

Students will program robots to sense and navigate from the Red starting squares to the conveyor belt to finish, without driving out-of-bounds.



How to Use:

1. Robots will start in one of the red starting squares located near the corners of the mat.

2. Code the line-follow sensor-based commands into the robots program.

3. Place the robot in the specific starting square and execute the program.

4. Repeat steps 2-3 until the robot has successfully reached the conveyor belt by following the line autonomously without steering off-course.

The next page features information that will help students understands how a robot is able to sense and follow a line.(See page 4).

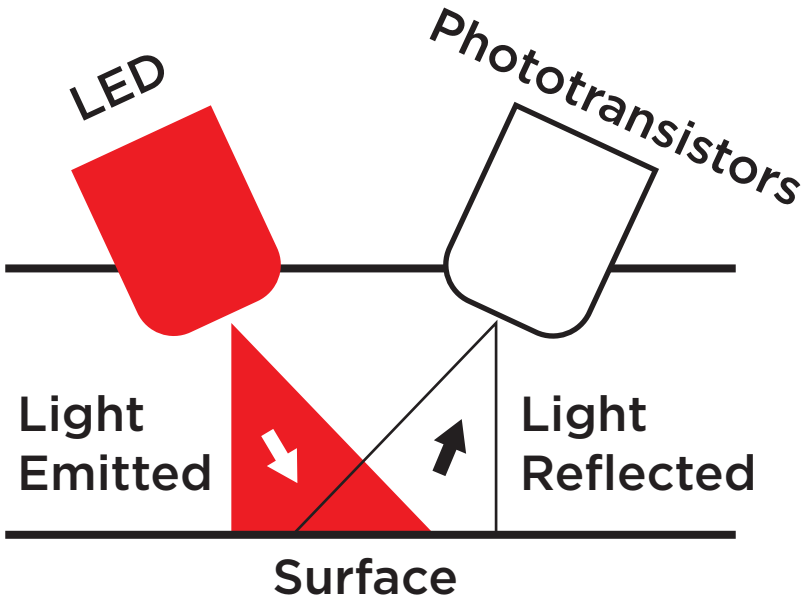
Phototransistors (Light Sensor)

What are they?

Phototransistor: a phototransistor is a light sensor that detects and measures the amount of light that has been reflected from a surface.

Most robots are equipped with a light sensor. This sensor is made up of two main electronic components:

1. Red Light Emitting Diode (LED)
2. Phototransistor (light sensor)



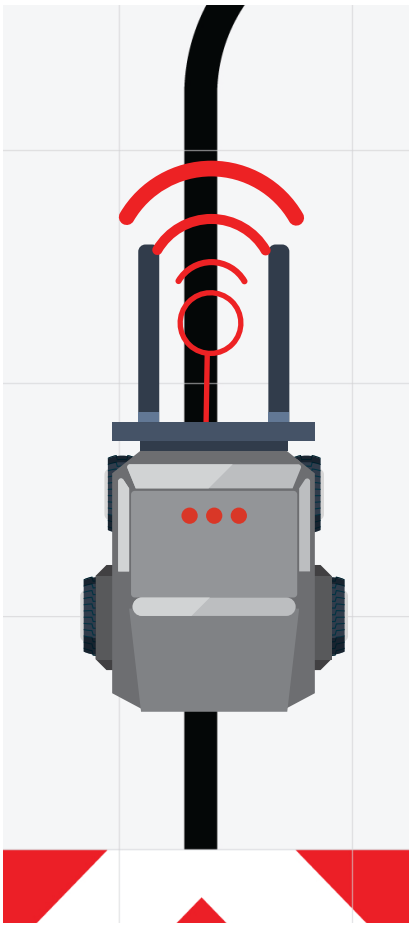
The LED shines light on the surface its driving on and reflects that light into the phototransistor. Try lifting up the robot slightly and have a closer look at the LED light it produces on the surface. Compare how bright the spot of light is when placed on a white surface vs a black surface.

When light is emitted, some of its energy is reflected and absorbed by objects it strikes. White light holds all the wavelengths of the visible spectrum, so when the color white is being reflected, that means all wavelengths are being reflected and none of them absorbed. This makes white the most reflective color. Therefore the phototransistor gives the robot a higher light reading when reflecting off a white surface than on a black surface. A black surface is considered to be 'non-reflective' and a white surface is considered 'reflective'.

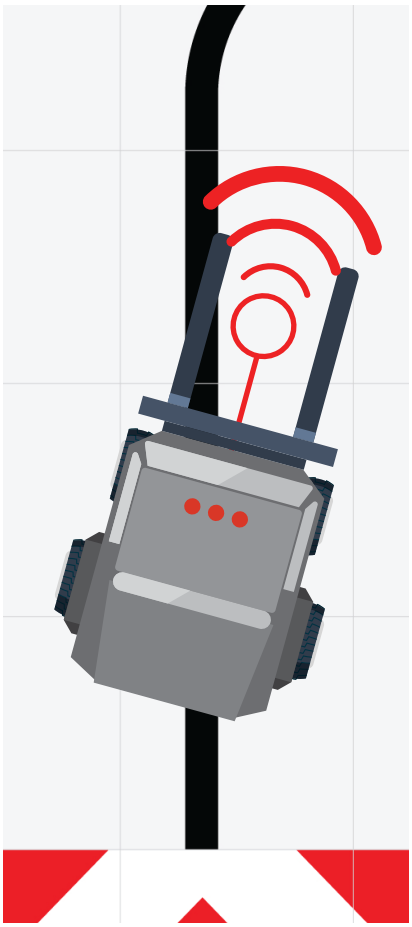
Phototransistors (Light Sensor) Cont.

How do they work?

Robotic sensors are used to estimate a robot's condition and environment. In order for the robot to perform a line-follow we need to give the robot two conditional loop statements. Since the phototransistor detects the color of a surface depending on how reflective it is, we can use the black line and white background colors on the Mat as our two conditions for the robot to detect. Look at the figures below and answer the following questions:



If sensor sees Black
then turn _____

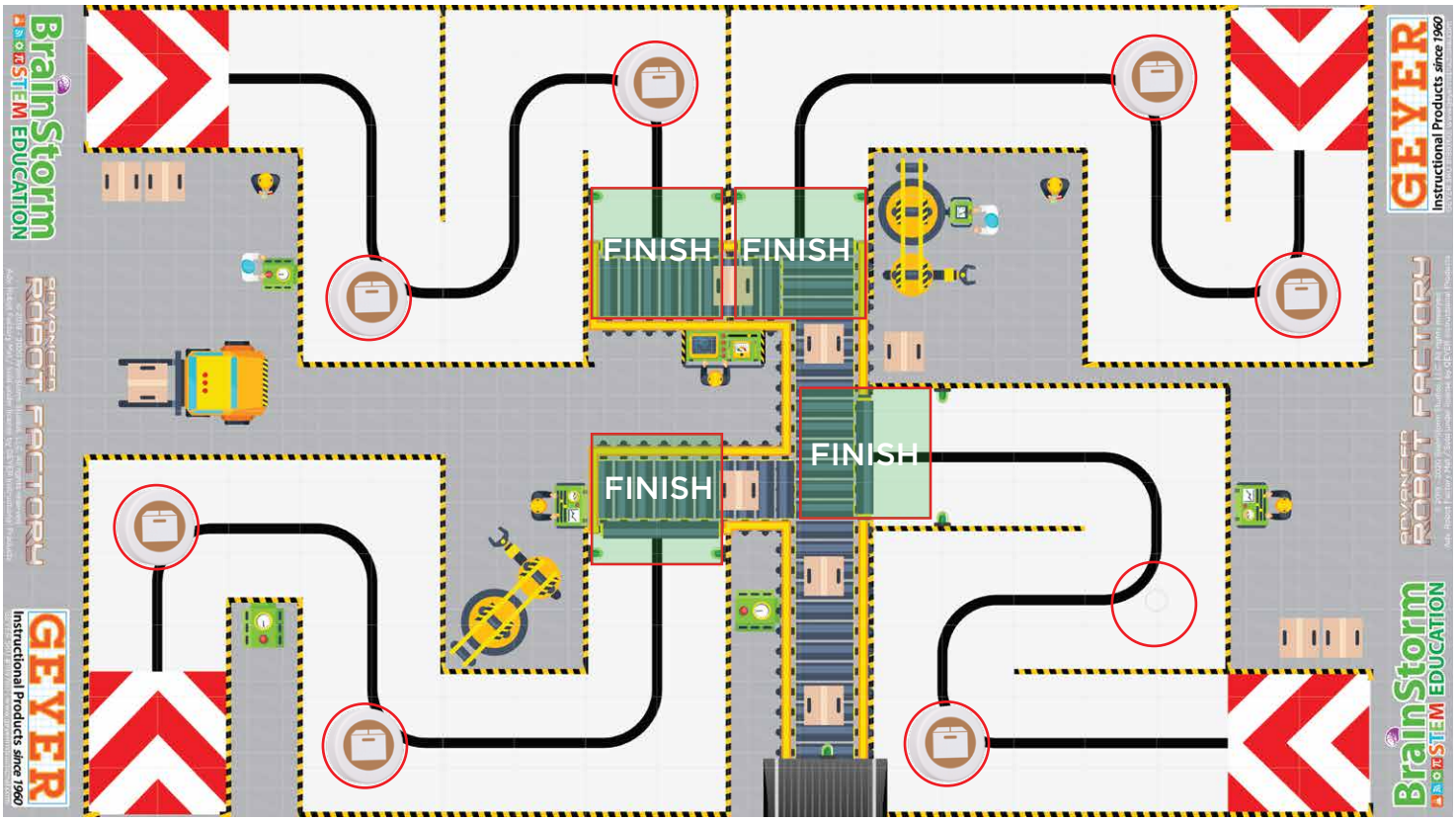


If sensor sees White
then turn _____

Activity 3 : Object Manipulation

Object Manipulation

Students will program robots to navigate, collect, and deliver items to the conveyor belt to finish, without driving out-of-bounds.



How to Use:

1. Robots will start in one of the red starting squares located near the corners of the mat. Place 1 or 2 game pucks in your section of the mat on the designated game piece placement circles: ◯

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the factory to the game pieces and conveyor belt.
(Tip: Build an attachment for your robot to help it collect the game pieces).

3. Code the sequential navigation commands into the robots program.

4. Place the robot in the specific starting square and execute the program.

5. Repeat steps 2-4 until the robot has successfully reached the conveyor belt with the game pucks placed at the start without drifting out of bounds.