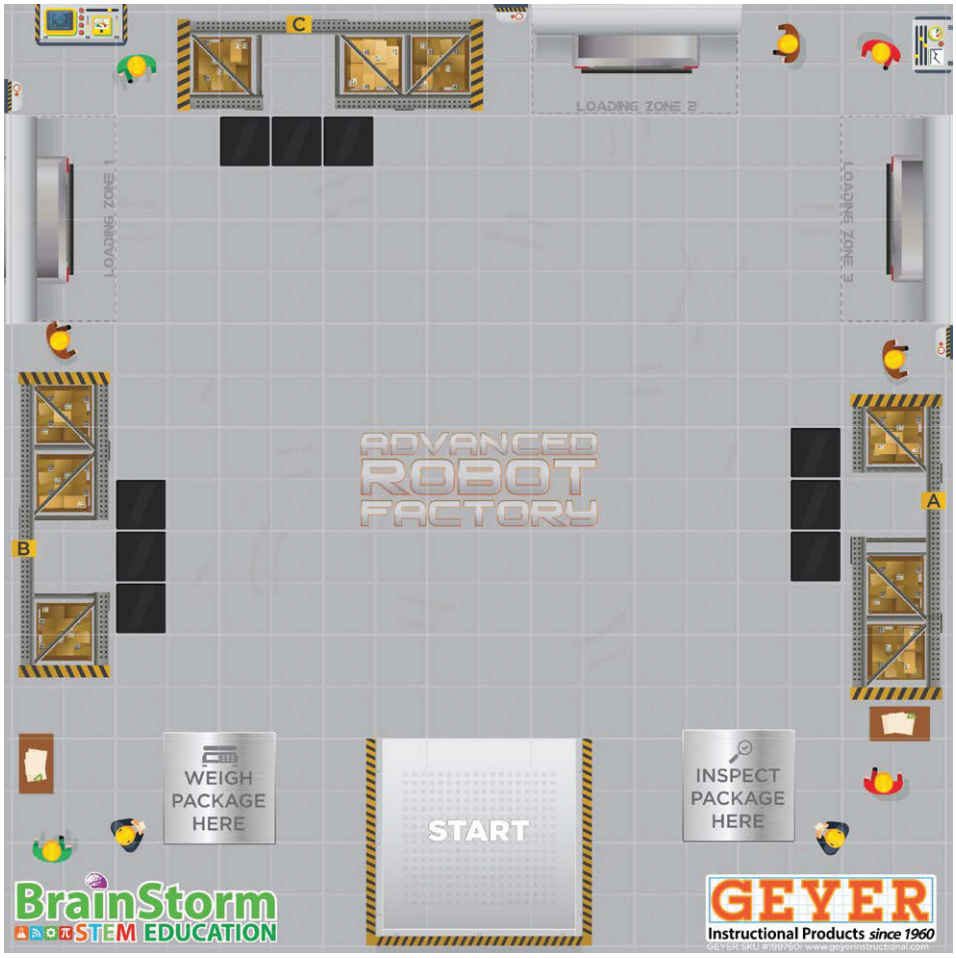
ROBOTIC ACTIVITY MAT

ADVANCED ROBOT FACTORY



NOTE: This activity mat was not designed for a specific robot but was designed to accomodate a large majority of the leading robotic platforms on the market. If you have any questions on the specific robot you have in regards to this activity, please contact us: info@brainstormedu.com

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

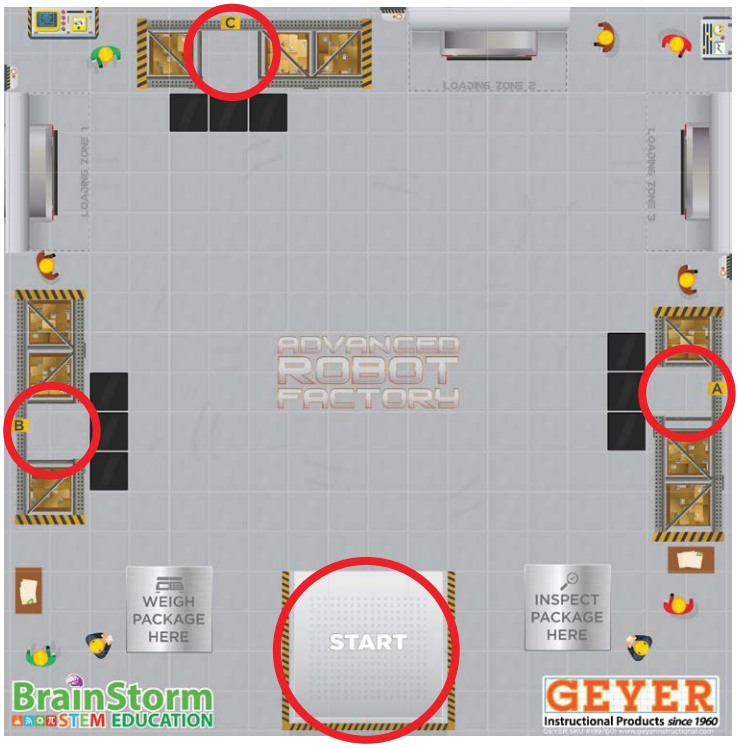
Objective: Collect, weigh, and inspect each package from every shelf before deliverying them each to its designated loading zone.

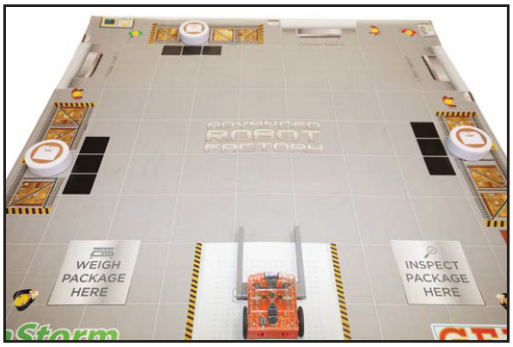
Skills taught: Students will learn programming, problem solving, sequential based navigation, sesor control, and critical thinking.

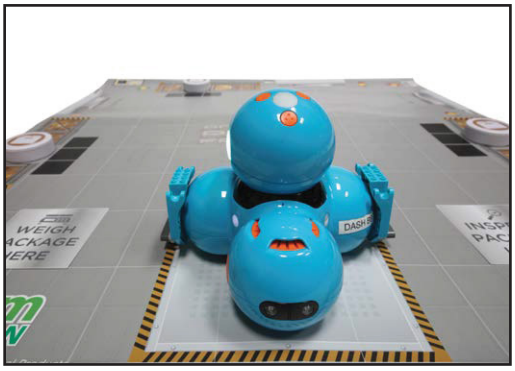
Navigation 1 : Distance Based Navigation

Distance Based Navigation

Students will program robots to navigate from the starting square to the objectives using basic motor control, without driving out-of-bounds.







How to Use:

1. Robots will always begin in the starting square located near the edge of the mat.

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

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

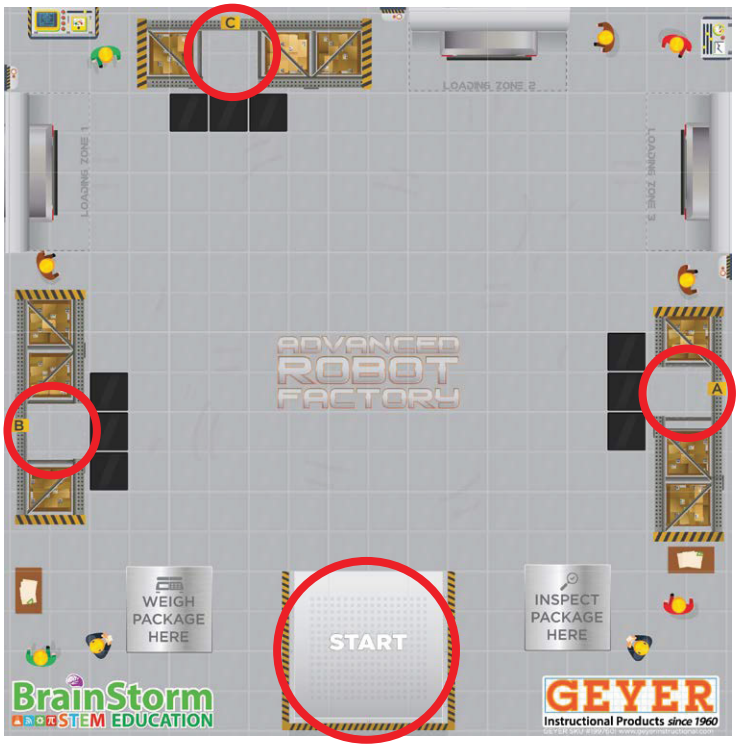
4. Place the robot in the starting square and execute the program.

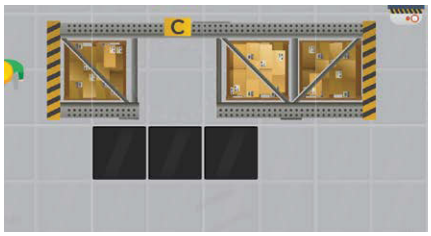
5. Repeat steps 2-4 until the robot has successfully completes the objective without drifting out of bounds.

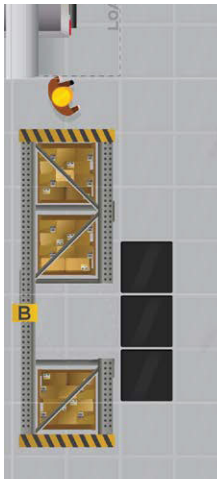
Navigation 2 : Sensor Based Navigation

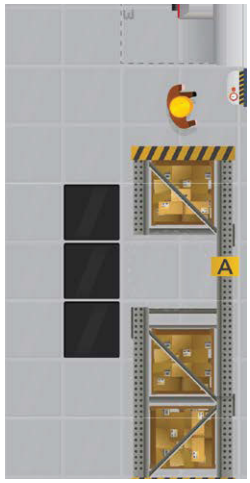
Sensor Based Navigation

Students will program robots to navigate from the starting square to the objectives using motor and sensor controls, without driving out-of-bounds.









How to Use:

1. Robots will always begin in the starting square located near the edge of the mat.

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

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

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

5. Repeat steps 2-4 until the robot has successfully completes the objective without drifting out of bounds.

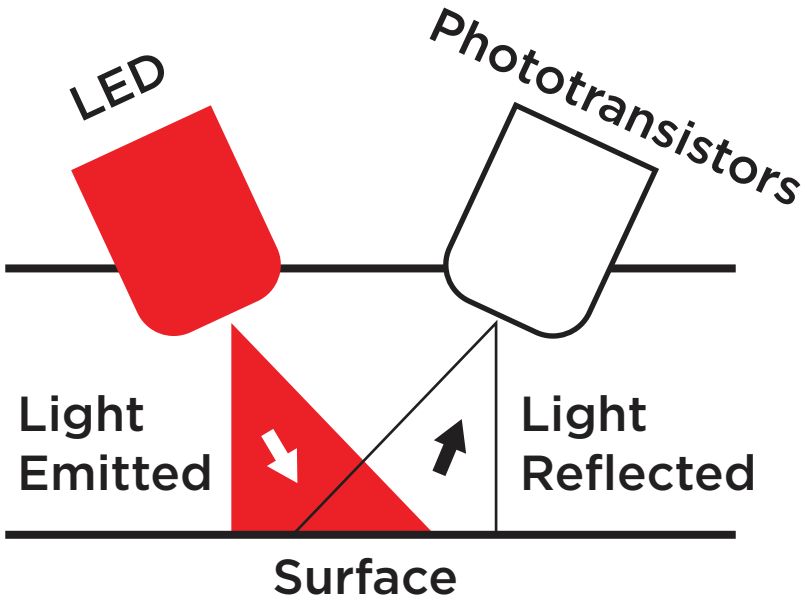
Phototransistors

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)



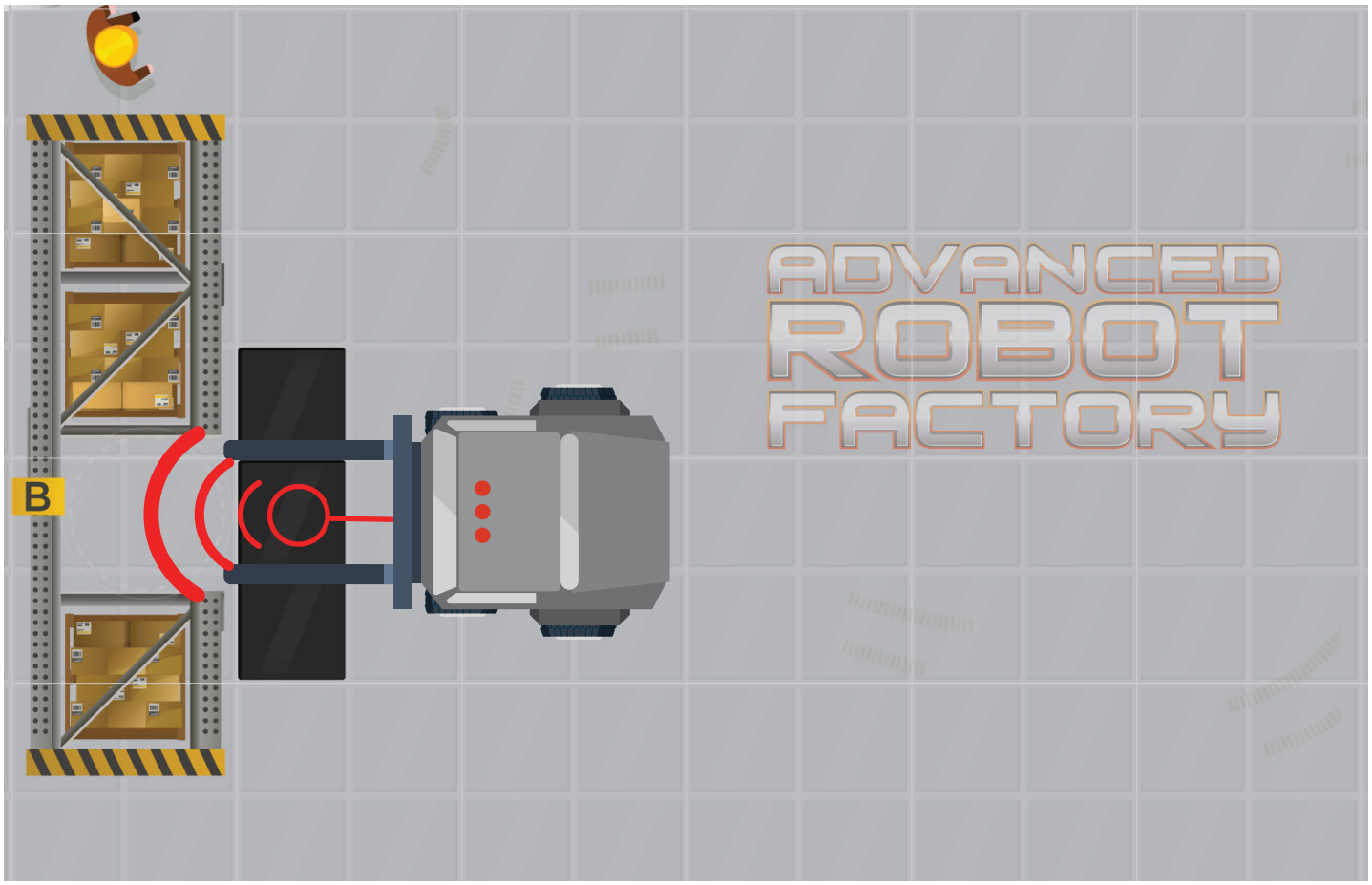
The LED shines light on the surface its driving on and reflects that light into the phototransistor. Try lifting up the robot slightly and have a closer look at the LED light it produces on the surface. Compare how bright the spot of light is when placed on a white surface vs a black surface.

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 (Cont.)

How do they work?

Robotic sensors are used to estimate a robot's condition and environment. In order for the robot to perform an action we need to give the robot a conditional loop statement. Since the phototransistor detects the color of a surface depending on how reflective it is, we can use the black tile and light grey background colors on the Mat as our two conditions for the robot to detect. Look at the figure below.

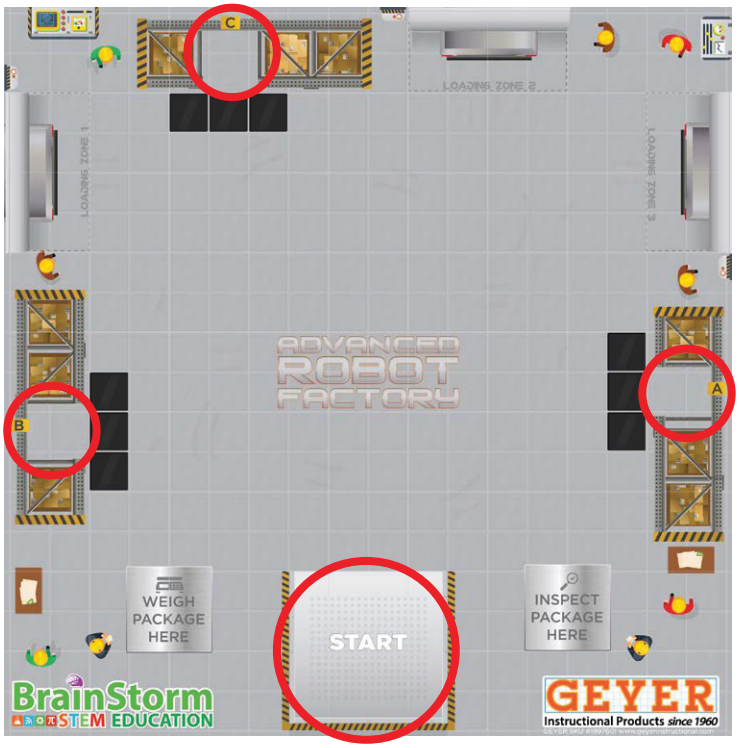


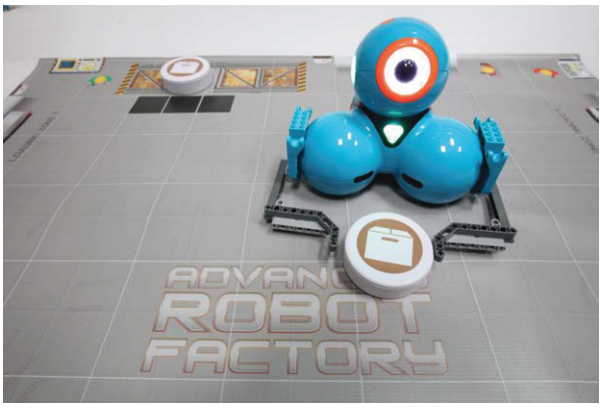
If the sensor sees Black **then** preform action.

Step 1 : Collect the Package

Object Manipulation

Students will program robots to navigate, collect, and deliver items to the necessary objectives, without driving out-of-bounds.





How to Use:

1. Robots will begin in the starting square located near the edge of the mat. Place 1 or all of the game pieces on the mat in a empty shelf section labeled A, B, C.

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

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

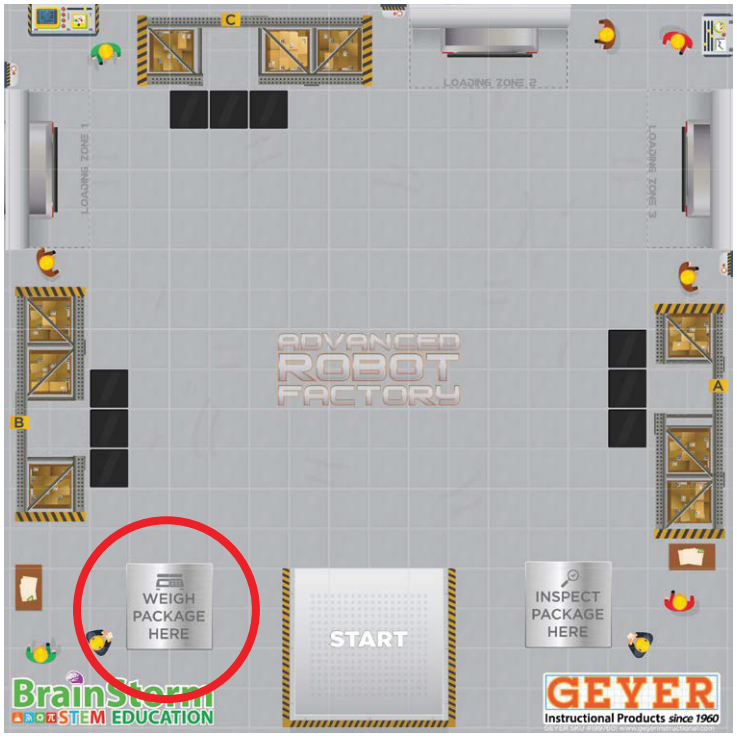
4. Place the robot in the starting square and execute the program.

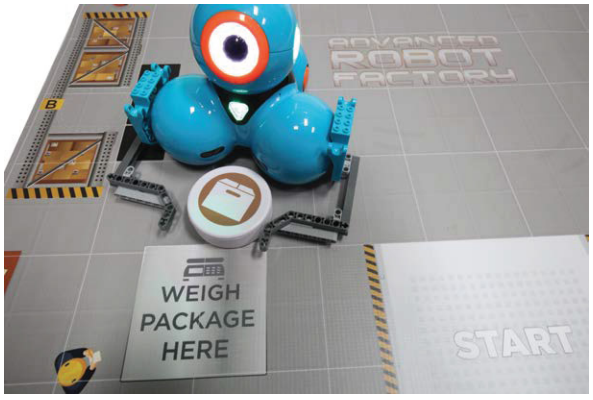
5. Repeat steps 2-4 until the robot successfully reaches and collects the game piece without drifting out of bounds.

Step 2 : Weigh the Package

Object Manipulation

Students will program robots to navigate, collect, and deliver items to the necessary objectives, without driving out-of-bounds.





How to Use:

1. After collecting a package, robots need to bring each package individually to the Weigh Station.

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the factory to the Weighing Station. Located in the corner of the mat.

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

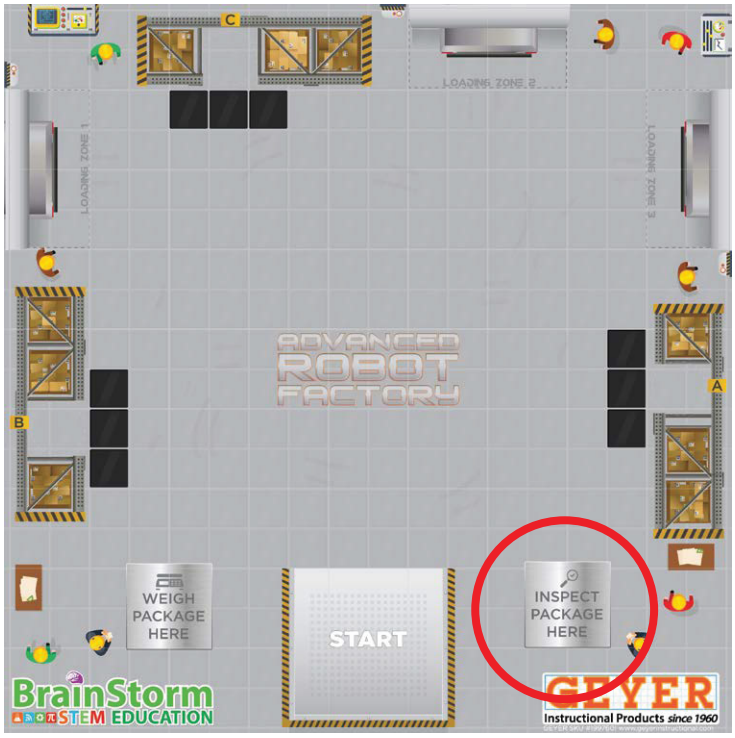
4. Place the robot in the starting square and execute the program.

5. Repeat steps 2-4 until the robot successfully placed the package on the correct station without drifting out of bounds.

Step 3: Inspect the Package

Object Manipulation

Students will program robots to navigate, collect, and deliver items to the necessary objectives, without driving out-of-bounds.



How to Use:

1. After weighing a package, robots need to bring each package individually to the Inspection Station.

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the factory to the Inspection Station. Located in the corner of the mat.

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

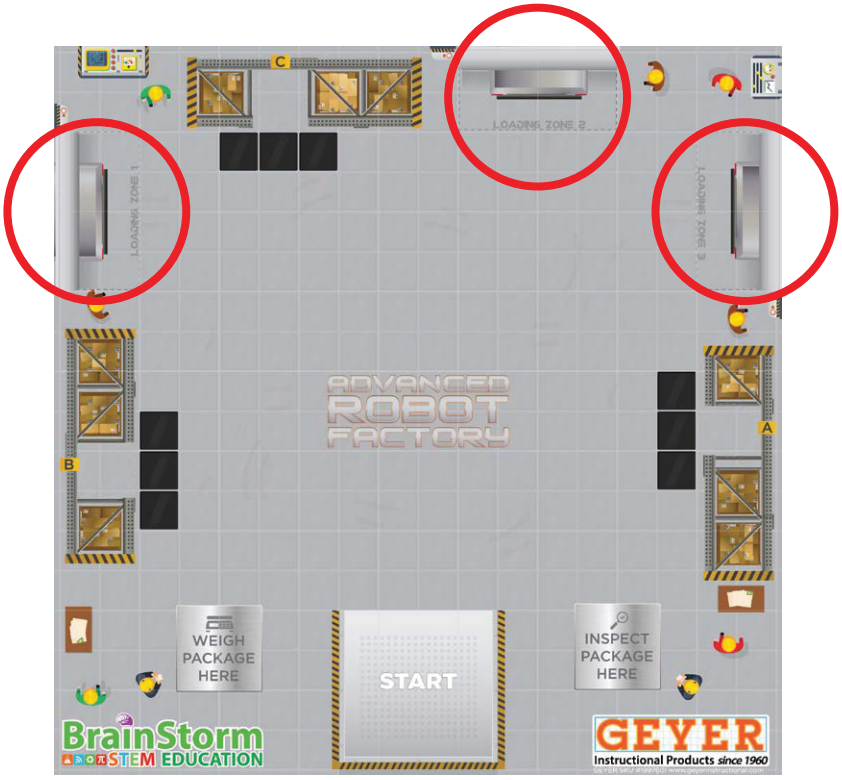
4. Place the robot in the starting square and execute the program.

5. Repeat steps 2-4 until the robot successfully placed the package on the correct station without drifting out of bounds.

Step 4: Deliver the Package

Object Manipulation

Students will program robots to navigate, collect, and deliver items to the necessary objectives, without driving out-of-bounds.



How to Use:

1. After inspecting a package, robots need to bring each package individually to a Loading Zone

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the factory to a Loading Zone.

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

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

5. Repeat steps 2-4 until the robot successfully delivered the package to the correct zone without drifting out of bounds.

6. Students can create a variety of gameplay and challenges by interchanging which package goes to which delivery zone.