# NXT (Mindstorms, NXT & EV3)

Delivery 'bot in a manufacturing facility.

You are developing a service robot to be used in a manufacturing facility. The administration has set the following specifications:

- It must have finesse and predictability in order to be safe for both workers and visitors.
- It must be able to hold and drop packages at designated locations. e.g. a 2" long piece of plastic pipe 1 ¼" diameter
- Bonus points will be given if the robot is running under a single program in which it can just be told which room to go to using the brick screen.
- The robot must stay within the 'halls' (white areas) and not hit the walls. Three hits on the wall and the robot will be deemed too destructive to continue any testing.
- To standardize the robots, all of them should be made using the motors and sensors from just one Lego kit. (3 servo motors, colour sensor, touch sensor, distance sensor)
- Using extra sensors or motors are permitted but under penalty.

The Manufactory:

The ward that will be used for testing the robots is laid out as per the diagram to the right. To help the robots navigate the hallways, a black line (17 mm electrical tape) is on the floor. Outside rooms, coloured bars appear and are 17mm x 22 mm bars in either Red, Yellow, Green or Blue (standard electrical tape).

Layout 1
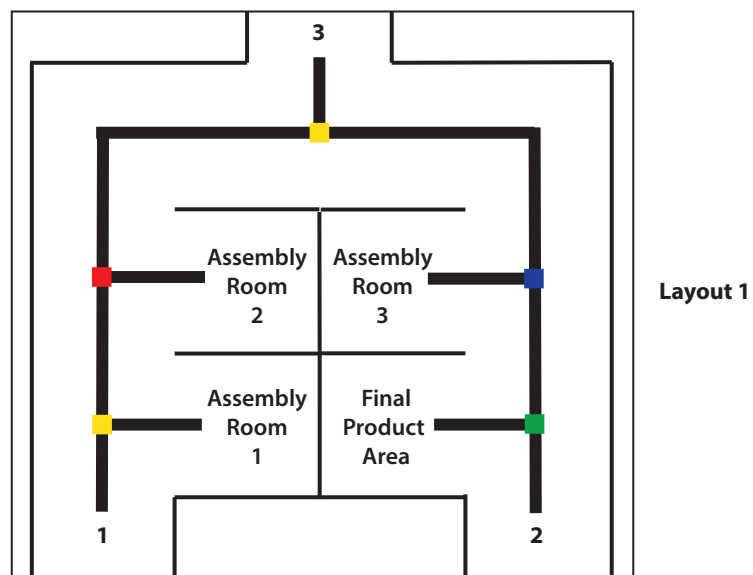
The Tasks:

The robot will be required to perform several tasks that include package delivery, obstacle avoidance and finding the correct rooms. Each task will increase in complexity. A score will be kept for each event and tallied for each competitor. The robot that scores the highest, overall points in the event will win the contract (and the game). Following are descriptions of each task.

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Manufacturing Robotic Layout, 4 rooms, 3 entrances

1) Make a delivery from Entrance 1 to Assembly Room 3, carry the item and drop it off upon arrival

a. Follow a black line	5
b. Does not turn left towards Entrance 3 (does not detect colour)	5
c. Turns right at Assembly room 3 (detects the colour)	5
d. Signal that it has arrived	2
e. Drops the delivery	5
f. Completed under 20 seconds	3
g. Hits the Walls	-2/hit
h. Extra sensors or motors	-5/item
i. Loses package	-5

2) Robot will go from Assembly room 2 to Final Product Area

a. Follow a black line	5
b. Turns right at (colour) when coming out of Assembly room 2	
c. Does not turn left towards Entrance 3 (does not detect colour)	5
d. Turns right at Final Product Area (detects the colour)	5
e. Signal that it has arrived	2
f. Drops the delivery	5
g. Completed under 20 seconds	3
h. Hits the Walls	-2/hit
i. Extra sensors or motors	-5/item
j. Loses package	-5
k. The robot has been preprogrammed so it can just be 'told' which room to find	10

3) Robot will go from Final Product area to Entrance 3 to deliver package, will encounter obstacles in the path and have to signal, and wait until the obstacle has been removed before continuing on the path

a. Follow a black line	5
b. Turns right at (colour) when coming out of Assembly room 2	2
c. Does not turn left towards Entrance 3	5
d. Turns right at Final Product Area (detects the colour)	5
e. Signal that it has arrived	2
f. Completed under 30 seconds	3
g. Detects an obstacle on the path and signals (makes a noise)	3
h. Continues on the path after obstacle has been removed	3
i. Hits the Walls	-2/hit
j. Extra sensors or motors	-5/item
k. Loses the package	-5

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4) Robot starting at Entrance 3 must make its way to Assembly room 1 to deliver materials to start the manufacturing of the product. There will be obstacles in its way, the robot must stop, signal and wait until the obstacles have been removed.

a. Follow a black line	5
b. Turns right at (colour) when coming out of Entrance 3	2
c. Does not turn left towards Assembly room 2	5
d. Turns left at Assembly room 1 (detects the colour)	5
e. Signal that it has arrived	2
f. Completed under 20 seconds	3
g. Detects an obstacle on the path, stops and signals (makes a noise)	3
h. Continues on the path after obstacle has been removed	3
i. Hits the Walls	-2/hit
j. Extra sensors or motors	-5/item
k. Loses the package	-5