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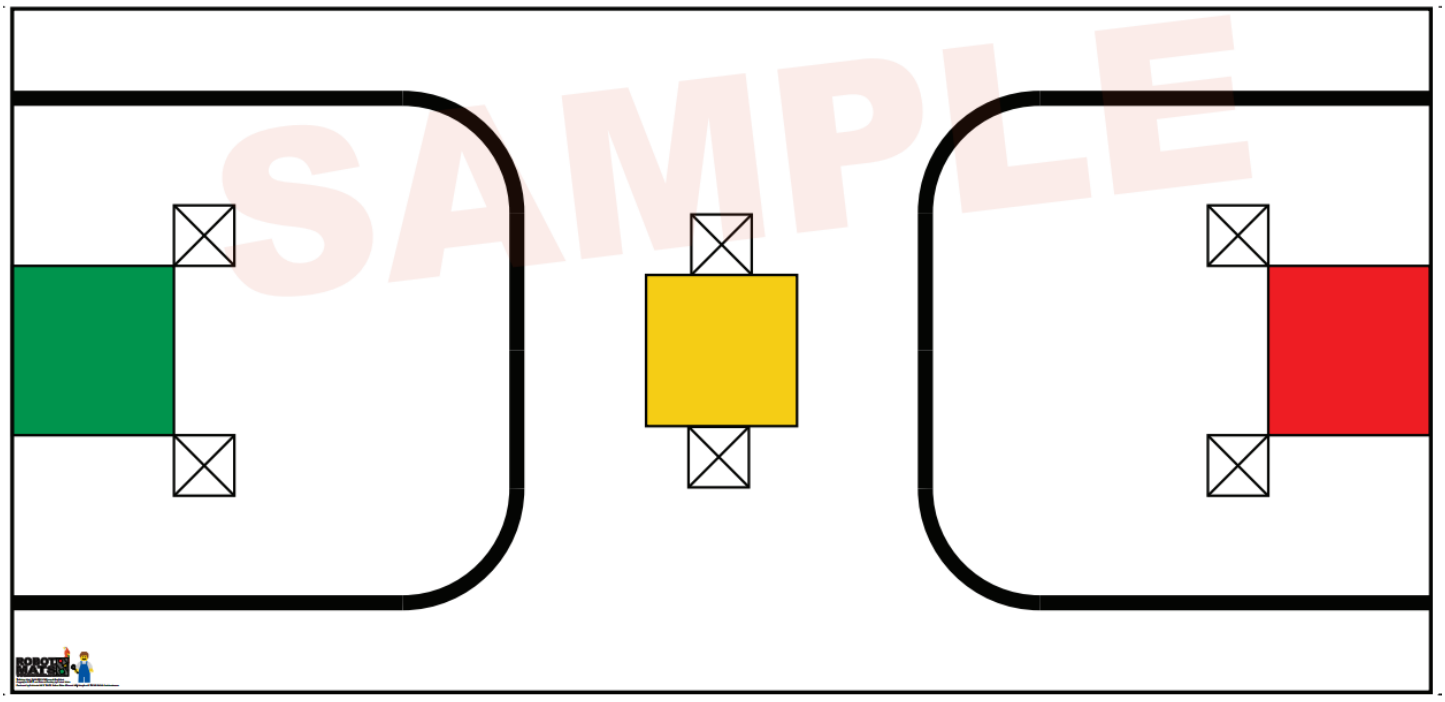
Robotics Project Details

You will be utilizing the LEGO Mindstorms EV3 systems (or similar programmable systems) to learn some of the fundamental elements of robotics including the construction of a purpose-built robot and the programming of that robot. Each group will be provided with the EV3 Core elements (the Core, 2 large motors, 1 medium motor, 6 sensors, battery pack, wire, and basic construction instructions or functional equivalents) and will be tasked with completing several key checkpoints to demonstrate their mastery of skills.

We will have several lessons where students will have the opportunity to learn what the various code blocks do and how they can be changed to fit your purposes, but how the robot is eventually programmed for each checkpoint is up to you and your team.

The arena for the 6 checkpoints:

The blocks with square are obstacles. You should build a tower of blocks at least 10cm tall and with 10x10cm (apx) base. Attach them with dual lock.



On the following page is a suggested initial set of challenges. Be creative!

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Checkpoints:

1. The team will demonstrate the understanding of movement blocks and how they relate to the distances in which the robot moves. The robot must start in the green zone of the mat, travel to and stop within the yellow zone before continuing to and stopping the red zone. Finally, the robot must return to the green zone.
2. The team will demonstrate their understanding of the movement blocks in relation to how the robot can steer itself in a preset path. The robot must start in the yellow zone of the mat, travel around one of the adjacent obstacles, return to the yellow mat, and then repeat for the other adjacent obstacle. The exact path that is followed may vary, but each team must show the utilization of left and right-handed turns without colliding into the walls of the arena or the obstacles present.
3. The team will demonstrate their understanding of proximity sensors in relation to how the robot can navigate itself around obstacles. The robot will start from a randomly assigned location on the mat and must drive and navigate itself for 60 seconds while demonstrating a reaction to any obstacles or arena edges in its way. The team may utilize the touch or ultrasonic sensors to accomplish this objective. If the robot gets stuck in its movement more than 10 seconds, the attempt at this checkpoint will be considered a fail, and must be attempted again.
4. The team will demonstrate their understanding of the light sensor in relation to how the robot can gather information regarding its surroundings. This checkpoint can be completed in one of two ways:
    a. The robot navigates utilizing one of the dark line pathways on the mat without running into any obstacle except the starting & ending barrier.
    b. The robot navigates like checkpoint 3, but reacts to reaching one of the colored zones. The exact nature of the robot's reaction is choice of the team, but the following are acceptable: the robot stops, the robot moves in a specific way, the robot plays a sound, the robot changes button colors, or the robot displays something on the screen.
5. The team will demonstrate a summary of their skills so far to create a robot that can navigate to a specific location and follow a preset pattern to park itself within the yellow zone. The robot must follow one of the lines on the mat until it reaches a location near the yellow zone, and then stops following the line and attempts to park in the yellow zone. The robot must be fully between the obstacles adjacent to the yellow zone to be considered a success.
6. A final checkpoint for the most accelerated groups will have them undergo a debris retrieval program. Their robots must leave one of the parking zones, and retrieve loose elements from across the field, returning them to the robot's home parking zone.

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Each checkpoint will be a graded assignment in two parts:

A. The ability for the robot to accomplish the given task. Based on teacher discretion, a robot may be allowed to move onto a further checkpoint without fully accomplishing every element of a current checkpoint, but this will result in fewer awarded points.
B. The program that was created for the given task. The program must be screencapped and submitted to Google Classroom. For a program to be awarded full points, it must have every block commented with its purpose or the relevant pseudocode.

At the end of the unit, after enough teams have accomplished at a minimum of checkpoints 1 through 4, teams will then redesign and reprogram their robots for a team versus team competition.