Lego Mindstorms EV3: Space Challenge – Learning Missions

Feature	User Story	Description	Review	Funds Upon Completion
Controlled Movements	As a robot, I should be able to move a specified distance with approximate accuracy.	Controlling the basic movements of a robot requires precision and knowledge of the robot. Your mission is to program your robot to move in a straight line with the maximum precision possible without using sensors.	Move your robot straight forward 50 cm; then backward 10 cm and forward 30 cm. Place your robot in starting position 1 on mat 1 and run your program. Write your answers below and use the ruler on the mission mat to measure the distance.	2
Precise Turns	As a robot, I should be able to rotate on the spot, approximately 90, 180, and 270 degrees.	Changing the direction of a robot's driving path is essential when navigating around an area. Your mission is to program your robot to rotate at every angle desired with the maximum precision possible without using sensors.	1. Point turn clockwise for 90 degrees 2. Point turn anti-clockwise for 90 degrees.	2
Very Precise Turns	As a robot, I should be able to rotate on the spot with precision in 45 degree increments.	Rotating using a wheel is not very precise. If you try to turn your robot in the dust or on a slippery surface, it may not reach the right angle. What the Gyro Sensor does is to help you make much more precise movements. Your mission is to program your robot to complete a point turn to an exact angle by using the Gyro Sensor.	1. Clockwise for 45 degrees 2. Clockwise for 180 degrees 3. Clockwise for 360 degrees followed by an anti-clockwise point turn for 360 degrees.	4
Detect Colour	As a robot, I should be able to detect colours.	Your robot can read colours on the mission mat to help identify its position. Your mission is to program your robot to take various actions while reading colour lines on the mission mat.	Create new programs to make your robot move forward and stop at the: 1. First white line 2. Second black line and make a sound when it detects it >3. Red line.	2

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Detect Object	As a robot, I should be able to detect an object, and collect it.	Collecting objects or moving them around are common purposes of robots. Your mission is to program your robot to detect an object and collect it.	Create a new program to move your robot: 1. Forward and stop 5 cm away from the Cuboid 2. Forward and stop as close as possible to the Cuboid. Place the Cuboid at any of the three positions (7.1, 7.2, or 7.3) at position 7 on mat 3. Place your robot on starting position 7 on mat 3 and run your program. Run each program three times and measure the distance between the sensor and the object.	2
Follow a Line	As a robot, I should be able to follow a coloured line so that I can follow a pre-marked route.	Your robot might encounter something special on the ground. In some cases, it might be possible to follow it.	Place your robot on starting position 8 on training mat 2 and run your program. The robot should follow the line.	6
Detect and React	As a robot, I should be able to identify colours and react to them so that I can distinguish my behaviour based on coloured prompts.	Your robot can use the environment to orient itself and describe its surroundings. This includes an ability to distinguish between colours and take action depending on which colour it recognises.	Place your robot in position 6 on mat 3 and run the program. It should read aloud all of the colours it moves over.	4
Intelligent Movement	As a robot, I should be able to carefully control the distance that I move after detecting an obstacle, with precision.	The distance travelled by your robot can be determined by the number of times the wheel is turned.	Create a new program containing variables that make your robot move forward and stop 4 cm from the Cuboid and return to its original position.	4
Calibrate Colour Sensor	As a robot, I should be able to adapt to different levels of ambient light and continue to detect greyscale.	Differences between environments are critical for the control of a robot. Even light variations can affect how they behave. For this reason, calibrating your robot's awareness of light reflection is essential.	Place your robot so that the Colour Sensor points at position 10.1 on mat 3, run the program, and set the minimum by pressing the Down Button. Point the Colour Sensor at position 10.2 and set the maximum by pressing the Up Button. Then put the robot in Position 10 and press the Centre button to have the robot drive down the grey scale.	8

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Active Communications	As a spacefaring robot, I should be able to deploy a communications dish on Mars.	The team must program the robot to travel to the communication dish on Mars and, with a careful motion, deploy the communication dish. *Please note: the dish must be deployed slowly in order to avoid flippage.*	The communications dish must be fully deployed and left in the correct position. The communications dish must be undamaged. The spacefaring robot must be undamaged and successfully return to the hanger.	2
Assemble Your Crew	As a spacefaring robot, I should be able to collect a mission specialist and escort them safely to the spacebase.	The team must devise a way of navigating to the moonbase, distinguishing the mission specialist, and carrying them safely to the space base. *Please note: put the mission specialist down inside the airlock and gently.*	The mission specialist is accurately identified, collected, and delivered to the spacebase. The mission specialist survives the trip. The spacefaring robot must be undamaged, with itself and its passenger fully inside the hanger.	7
Free the MSL Robot	As a spacefaring robot, I should be able to navigate obstacles in order to rescue an MSL robot.	The team must devise a system to help the robot navigate to the ramp, climb up the ramp the correct distance, and deploy a winch to carefully rescure the MSL robot. The MSL robot should be left at the bottom of the ramp. *Please note: you must not deposit the MSL robot in space or deliver it to the spacebase. Leave it on Mars.*	The MSL robot must not be decapitated or otherwise damaged. The MSL robot must be left at the bottom of the ramp. The spacefaring robot must be undamaged and successfully return to the hanger.	4
Launch the Satellite Orbit into Orbit	As a spacefaring robot, I should be able to deploy a satellite a specified coordinate.	The team must devise a system to safely and soundly deploy the satellite, help the robot navigate to the correct location---ideally using colour to hone in on the correct position.	The satellite must be fully deployed within 1cm of the centre of the target position. The satellite must be upright and intact. The spacefaring robot must be undamaged and successfully return to the hanger.	3

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Return the Rock Samples	As a spacefaring robot, I should be able to depart the spacebase, collect rocks on Mars and on the moon of Vesta, and return them safely to the base.	The team needs to help the robot follow a well-defined path, and scoop-up the rock samples. It must carry them to the space base.	All three rock samples are delivered to the spacebase. The spacefaring robot must be undamaged, with itself and its contents fully inside the hanger.	3
Secure Your Power Supply	As a spacefaring robot, I should be able to depart the spacebase, travel to the power plant on Mars, deploy the solar panels, and return safely to the spacebase.	The team needs to help the robot navigate to the power plant. The deployment mechanism is quite intricate. *Please note: this is quite a challenging mission.*	The solar panels are fully deployed and undamaged. The angle/position of the solar panels *must not* be altered. There is no damage to the spacefaring robot or the solar panels. The spacefaring robot should finish in the spacebase.	10
Initiate Launch	As a spacefaring robot, I should be able to safely initiate the rocket launch, such that the rocket reaches its destination.	The team needs to build a robot with a hammering capability.	The rocket successfully reaches the Mars colony, and the Mars colony is fully deployed. There is no damage to the spacefaring robot, the rocket, or the Mars Colony. The spacefaring robot should finish in the spacebase.	---