



# CODEBOT MISSION 9 LOG - Lesson 3

Pre-Mission Warm-Up																													
What do you know about gravity?	Answers will vary. They may know that it is a constant, or that the gravitational pull is $9.8\text{m/s}^2$ .																												
What are the three dimensions in our world?	Students could say x, y and z, like in math. Or they might say side to side, forward and backward, and up and down. Or they might use flight terms like pitch, yaw and roll.																												
Mission 9 Lesson 2 – All Systems Go!																													
Mission 9 Introduction																													
What are the goals of this lesson?	<ul style="list-style-type: none"> <li>• Detect orientation with the CodeBot accelerometer and rotate toward the sky.</li> <li>• Make a motion alarm guard robot.</li> </ul>																												
Mission 9 Objective 8																													
What are the directions measured by the accelerometer?	X (side by side) Y (front to back) Z (up and down)																												
What is the range of values for the measurements?	-32767 to +32768																												
Write the code and run the program. Fill out the table with your results from the console panel.  <i>Students can interpret the bot position in many ways, so the measurements will all be slightly different. Here is an example.</i>  The readings will fluctuate, even with the 'bot not moving. Students can pick any measurement for the table.	<table border="1"> <thead> <tr> <th>Bot position</th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Flat on desk, facing you</td> <td>16</td> <td>6336</td> <td>-15184</td> </tr> <tr> <td>On desk, facing away</td> <td>-208</td> <td>6592</td> <td>-15392</td> </tr> <tr> <td>Turned on right wheel</td> <td>0</td> <td>6640</td> <td>-15040</td> </tr> <tr> <td>Turned on left wheel</td> <td>16080</td> <td>-1472</td> <td>-96</td> </tr> <tr> <td>Turned upside down</td> <td>-80</td> <td>1360</td> <td>15536</td> </tr> <tr> <td>“Nose” pointing up</td> <td>352</td> <td>-17008</td> <td>-2128</td> </tr> </tbody> </table>	Bot position	X	Y	Z	Flat on desk, facing you	16	6336	-15184	On desk, facing away	-208	6592	-15392	Turned on right wheel	0	6640	-15040	Turned on left wheel	16080	-1472	-96	Turned upside down	-80	1360	15536	“Nose” pointing up	352	-17008	-2128
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Mission 9 Objective 9																													
Modify the program by following the instructions. Test the code on an incline. What happens?	Answers will vary, but all answers should include something like this: CodeBot just kind of wobbles back and forth and doesn't stay pointing straight up.																												
Mission 9 Objective 10																													

Modify the program by following the instructions. Test the code on an incline. Tilt the incline in several directions. What happens?	Answers will vary. Possible answer: The program works about the same as Obj. 9, but at a higher speed. When the surface is tilted, the bot moves to stay pointed up.
<b>Mission 9 Objective 11</b>	
Explain the constants used for the guard bot algorithm.	DELAY is used in the sleep_ms() function. It is for how long to wait before reading the sensor again. SENS is used for sensitivity. That is how much of a difference is needed in movement before the program sounds the alarm.
What line of code finds the difference between the previous X value and the current X value?	<code>dx = now[0] - before[0]</code>
<b>Mission 9 Objective 12</b>	
What improvements did you make to the program?	Students may write the actual code for their answer. Or, they may summarize the additions like this: added code to check for all three-axes. Also added parameters to the alarm() function so the differences are printed.
What are your final values for SENS and DELAY	SENS = 300 (Will vary by student - these are the original #s) DELAY = 100
<b>Post-Mission Reflection</b>	
What everyday items do you use that might have an accelerometer? How is the accelerometer used?	Answers will vary. They may discuss their phone, game controller, watch, car, etc.
Think back to when you first started programming. How have you changed as a programmer?	Answers will vary. They may say they like programming more, or see the benefits. They may say they make fewer mistakes, or can more easily find the bugs. Hopefully they will have a good insight to their growth as a student.