



# Bolton Robotics

## Pybricks Quick Reference



### Robot Movement

Action		How Much?	Python Code	Parameters
Drive Straight		Distance	<code>r.robot.straight(distance)</code>	<b>distance:</b> Distance to travel (mm), robot runs at default speed example - <code>r.robot.straight(100)</code> - Goes straight forward 100 mm
Drive Straight or Curved		Time	<code>r.robot.drive(speed, turn_rate)</code> <code>wait(time)</code> <code>r.robot.stop()</code>	<b>speed:</b> Speed of the robot (mm/s) <b>turn_rate:</b> Turn rate of the robot (deg/s) 0 = Straight <b>time:</b> How long to drive (mSec) Drives the robot at set speed either straight or while turning <code>r.robot.drive(200, 20)</code> - Drive robot slowly forward while turning gently to right
Curve		Distance	<code>r.robot.arc(radius, degrees)</code>	<b>radius:</b> Radius of the circle (mm) <b>distance:</b> Distance to drive along the circle (mm) Drives center of wheels over specified radius circle for degrees of arc <code>r.robot.arc(50, 180)</code> - drives robot halfway around tight circle
Tank Turn		Angle	<code>r.robot.turn(angle)</code>	<b>angle:</b> Angle of the turn (deg) <code>r.robot.turn(-90)</code> - Make robot spin 90 degrees to the left

### Attachment Motors

Side		How Much?	Python Code	Parameters
Left		Time	<code>r.lam.run_time(speed, time)</code>	<b>speed:</b> Speed of the motor (deg/s) <b>time:</b> Duration of motor running (mSec) <code>r.lam.run_time(1000, 500)</code> - runs lam (left attachment motor) clockwise fast for 0.5 seconds
Left		Angle	<code>r.lam.run_angle(speed, angle)</code>	<b>speed:</b> Speed of the motor (deg/s) <b>angle:</b> Angle by which the motor should rotate (deg) <code>r.lam.run_angle(500, 45)</code> - runs lam (right attachment motor) clockwise at half speed for 45 degrees
Left		Target Angle	<code>r.lam.run_target(speed, target_angle)</code>	<b>speed:</b> Speed of the motor (deg/s) <b>target_angle:</b> Angle in degrees that the motor should rotate to, angle is zero when marks on motor hub and body are aligned. Motor angles can be reset by program, see "Motors with rotation sensors" <code>r.lam.run_target(200, -60)</code> - runs lam to 60 degrees counter-clockwise from reference mark on motor
Left		Stall	<code>r.lam.run_until_stalled(speed, duty_limit=stall_power)</code>	<b>speed:</b> Speed of the motor (deg/s) <b>stall_power:</b> What percent power to is considered a stall (0 - 100) <code>r.lam.run_until_stalled(1000, duty_limit=100)</code> - runs lam clockwise until it pushes hard on something
Right		---	<b>For right attachment motor replace "lam" above with "ram"</b>	
		Maximums	<b>Medium motors = 1100, Large motors = 1050</b>	<b>Direction - Normally positive is clockwise rotation unless switched in robot.py near line 147</b>

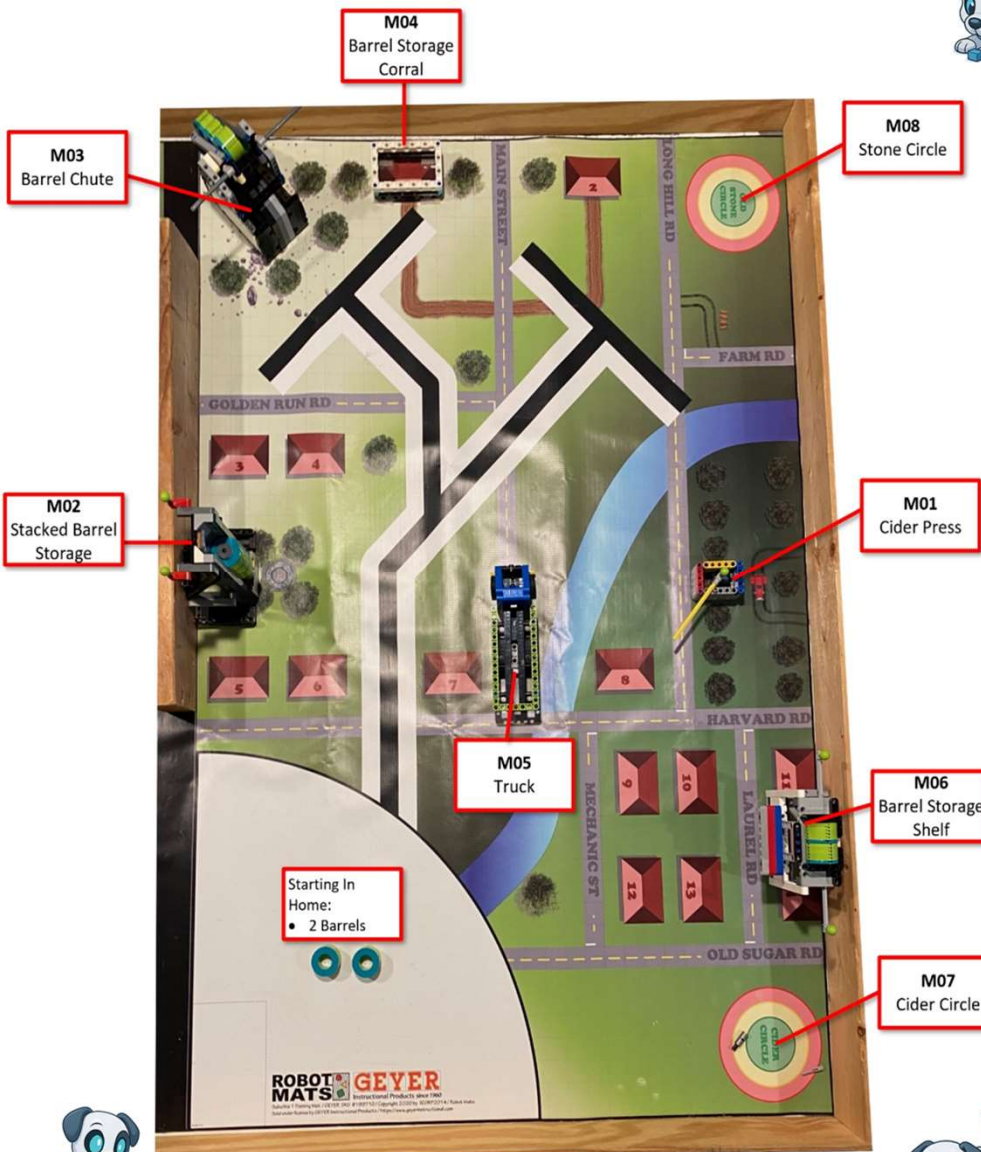
### Other Commands

Action			Python Code	Parameters
Pause the Program			<code>wait(time)</code>	<b>time:</b> How long to pause the program (mSec) <code>wait(500)</code> - keeps program from going to next instruction (waiting) for 500 milliseconds = 0.5 seconds
Print to console			<code>print("your_message")</code>	<b>your_message:</b> Text to be displayed in the console window <code>print("Hello World")</code> - prints message Hello World on console display of computer Bluetoothed to bot
Color Sensor Reflectivity			<code>value = r.rcs.reflection()</code>	<b>Value:</b> is set to reflectivity color sensor sees, use "lcs" for left sensor Code on left followed by <code>print(value)</code> will color sensor reflection values from 0 to 99 on console

### Setting Tire Diameter and Axle Track

To set values for your robot first measure TIRE\_DIAMETER in millimeters. Second find your AXLE\_TRACK by measuring space between the very center of the wheels in millimeters. Now enter these values in robot.py, you'll find these constants around program line 100. A Spike bot will be about TIRE\_DIAMETER = 56 and AXLE\_TRACK = 82, yours may be different if you use different wheels or spacing of the motors on your bot. The exact procedure for setting your robot's values is found in pybricks help menu, search on "robotics and drive bases", then look about half way down the section for the heading "Measuring and validating the robot dimensions". If you follow this procedure your robot will drive as far and turn as much as you tell it.

<b>M01 Cider Press</b> The cider press bar is rotated into a scoring position (0 pts gray, 5 pts red, 10 pts yellow, 15 pts blue) <input type="radio"/> Gray <input type="radio"/> Red <input type="radio"/> Yellow <input type="radio"/> Blue Barrel on Post (20 pts) <input type="radio"/> No <input type="radio"/> Yes	<b>M05 Truck</b> Truck parked inside the dirt driveways (20 pts) <input type="radio"/> No <input type="radio"/> Yes Barrels completely in the truck (10 pts each) while parked inside the dirt driveways. Barrels may not be touching equipment and must be at least be partly in the truck. <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 <input type="radio"/> 10	<b>M08 Methods Used BONUS #11</b> To score points for this mission, the method used must be a meaningful part of the scoring solution. For example, squaring up on a mission model or wall to line up the robot before scoring points would be meaningful but squaring up on a mission model or wall after all scoring has been completed would not be. It is left to the discretion of the referee to determine if the spirit of this rule has been met. Students must point out to the referee when the robot uses one of the methods! Meaningful use of line following to successfully complete one or more missions. (10 pts) <input type="radio"/> No <input type="radio"/> Yes
<b>M02 Stacked Barrel Storage</b> Remove stacked barrels from the dispenser (5 pts each) <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 Barrel on Post (20 pts per post) <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2	<b>M06 Barrel Storage Shelf</b> Collection barrels removed from the storage shelf (5 pts each) <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 Barrel on Post (20 pts per post) <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2	<b>M08 Methods Used BONUS #20</b> To score points for this mission, the method used must be a meaningful part of the scoring solution. For example, squaring up on a mission model or wall to line up the robot before scoring points would be meaningful but squaring up on a mission model or wall after all scoring has been completed would not be. It is left to the discretion of the referee to determine if the spirit of this rule has been met. Students must point out to the referee when the robot uses one of the methods! Meaningful use of squaring up on a wall or mission model to successfully complete one or more missions. (10 pts) <input type="radio"/> No <input type="radio"/> Yes
<b>M03 Barrel Chute</b> Remove Barrels from the Chute (5 pts each) <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3	<b>M07 Barrels Brought to Cider Circle</b> Architectural block at least partially in the Yellow Cider Circle (5 pts each) Barrels may be touching equipment. Barrels do not need to be touching the mat. <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 <input type="radio"/> 10	<b>M08 Methods Used BONUS #30</b> To score points for this mission, the method used must be a meaningful part of the scoring solution. For example, squaring up on a mission model or wall to line up the robot before scoring points would be meaningful but squaring up on a mission model or wall after all scoring has been completed would not be. It is left to the discretion of the referee to determine if the spirit of this rule has been met. Students must point out to the referee when the robot uses one of the methods! Meaningful use of wall following to successfully complete one or more missions. (10 pts) <input type="radio"/> No <input type="radio"/> Yes
<b>M04 Barrel Storage Corral</b> Place Barrel in Corral (10 pts each). Barrels may not be touching equipment and must be at least partly in the corral. <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 <input type="radio"/> 10	<b>M08 Barrels Brought to Stone Circle</b> Architectural block at least partially in the Yellow Old Stone Circle (10 pts each). Barrels may be touching equipment. Barrels do not need to be touching the mat. <input type="radio"/> None <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9 <input type="radio"/> 10	



Common Mistakes	
1. Are you connected to the correct robot?	
2. Did you download your code?	
3. Are you running the new code?	
4. Do you have any spelling errors or are there any spaces that shouldn't be there?	
5. Are there any errors reported on the console?	
Links:	
Lessons:	<a href="https://fssfl.github.io/fssfl/">https://fssfl.github.io/fssfl/</a>
Pybricks IDE:	<a href="https://code.pybricks.com/">https://code.pybricks.com/</a>
Pybricks Docs:	<a href="https://docs.pybricks.com/en/stable/">https://docs.pybricks.com/en/stable/</a>

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