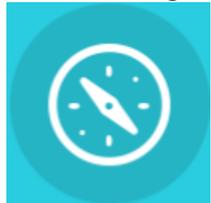
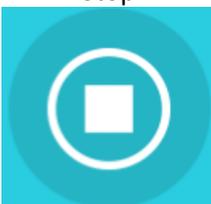




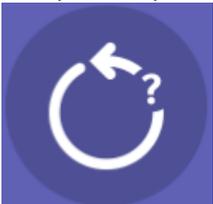
Sphero Lightning Lab – Cheat Sheet

Actions

Actions

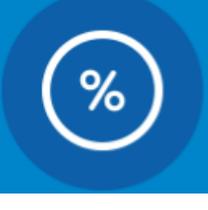
Tool	Description	Variables	Ranges
 Roll	Combines heading, speed and time variables to make the robot roll.	Duration Speed Heading	(0 to 999999 seconds) (0-255) (degrees 0-359)
 Set Speed	Sets the speed of the robot on a scale from 0 to 255. Each robot translates the value differently into a real world speed. For example, Ollie is almost three times faster than Sphero!	Speed	(0-255)
 Set Heading	Sets the direction at which the robot rolls. 0 degrees heading is straight forward, 90 degrees is a right turn, 270 is a left turn, and 180 degrees is straight backwards.	Heading	(degrees 0-359)
 Stop	Sets the speed to zero on the robot and halts all movement. The rest of the program continues to run as normal.		
 Stabilization	Turns robot stabilization system on or off for a duration. Stabilization is normally on and enables the robot's upright position. When it is turned off the robot will not remain upright, enabling unstable behaviors like jumping or wobbling.	Boolean	(on or off)

Tool	Description	Variables	Ranges
Raw Motor 	Controls the power of the left and right motors independently on a scale from 0 to 4095. If you set both motors to full power the robot will jump off the ground. Robot stabilization is disabled for the duration of this unpredictable movement is possible.	Left Motor Power Right Motor Power Duration	(-4095 to 4095) (-4095 to 4095) (0 to 999999 seconds)
Spin 	Spins the robot for a given number of degrees over time. 360 degrees is a single revolution.	Degrees Duration	(-999999 to 999999) (0 to 999999 seconds)
Set Color 	Changes the color of the main LED lights. Set this using the color wheel and brightness slider, or the exact RGB (red, green, blue) values on a scale from 0 – 255.	Red Green Blue Brightness	(0-255) (0-255) (0-255)
Back LED 	Sets the brightnes of the back aiming LED (which is limited to blue only) on a scale from 0 to 255.	Brightness	(0-255)
Fade 	Changes from one color to another over specific time period, measured in seconds.	“From” Color Red Green Blue Brightness Duration “To” Color Red Green Blue Brightness	(0-255) (0-255) (0-255) (0-999999 seconds) (0-255) (0-255) (0-255)
Strobe 	Blinks the main LED lights for a period (time that includes light ON and OFF) for a count of cycles. A short period will produce a fast blink whereas a long period will produce a slow blink.	Red Green Blue Brightness Period Count	(0-255) (0-255) (0-255) (0-999999) (0-65535)

Tool	Description	Variables	Ranges
Delay 	Continues to run active blocks until a given amount of time passes.	Delay	(0-999999 seconds)
Loop (Bracket) 	Repeats the blocks contained within it for the number of loops specified, with a minimum of 1.	Count	(0-65535)
Loop Forever (Bracket) 	Repeats the blocks contained within it forever.		
Loop Until (Bracket) 	Performs the blocks contained within it until a condition is met.	(Condition)	(true or false)
If Then (Bracket) 	Performs the blocks contained within it only if the given condition is true.	(Condition)	(true or false)
If Then Else (Bracket) 	Performs the blocks contained within "then" if the given condition is true. Otherwise performs the alternate "else" blocks instead.	(Condition)	(true or false)

Tool	Description	Variables	Ranges
<p data-bbox="138 134 293 170">Exit Program</p> 	<p data-bbox="349 134 876 205">Stops all code on the canvas from executing on the robot, ending the program.</p>		

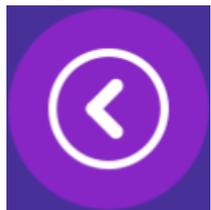
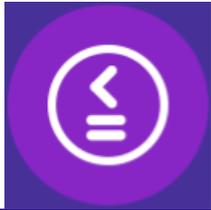
Tool	Description	Variables	Range
Set 	Assigns a value to a given sensor or variable. Set is the only block in the Operators section. All other tools are to be used within the Set block.		
Add 	Adds two values together.	Value Value	(-999999-999999) (-999999-999999)
Subtract 	Subtracts one value from the other.	Value Value	(-999999-999999) (-999999-999999)
Multiply 	Multiplies two values together.	Value Value	(-999999-999999) (-999999-999999)
Divide 	Divides one value from the other.	Value Value	(-999999-999999) (-999999-999999)
Exponent 	Multiplies a value within itself a specific number of times.	Value Value	(-999999-999999) (-999999-999999)

Tool	Description	Variables	Range
Square Root 	Returns the square root of a value.	Value	(-999999-999999)
Round 	Rounds a value to the nearest integer value.	Value	(-999999-999999)
Floor 	Rounds a value down to the nearest integer value.	Value	(-999999-999999)
Ceiling 	Rounds a value up to the nearest integer value.	Value	(-999999-999999)
Absolute Value 	Returns the magnitude of a value, removing its sign.	Value	(-999999-999999)
Sign 	Returns +1 for positive values, -1 for negative values, and 0 for zero.	Value	(-999999-999999)
Modulo 	Returns the remainder after division of one value by another.	Value Value	(-999999-999999) (-999999-999999)

Tool	Description	Variables	Range
Minimum Value 	Returns the lesser of two values. Use this to set a lower bound on a value.	Value Value	(-999999-999999) (-999999-999999)
Maximum Value 	Returns the greater of two values. Use this to set an upper bound on a value.	Value Value	(-999999-999999) (-999999-999999)
Random 	Generates a random value within the given minimum and maximum.	Minimum Value Maximum Value	(-999999-999999) (-999999-999999)

Comparators

Comparators – Comparators are used within Conditions

Tool	Description	Variable	Range
Equal 	Requires the left value to be equal to the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)
Not Equal 	Requires the left value to be unequal to the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)
Less Than 	Requires the left value to be less than the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)
Less Than or Equal 	Requires the left value to be less than or equal to the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)
Greater Than 	Requires the left value to be greater than the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)
Greater Than or Equal 	Requires the left value to be greater than or equal to the right value for this condition to be true.	Value Value	(-999999-999999) (-999999-999999)

Tool	Description	Variable	Range
<p data-bbox="191 138 245 170">And</p> 	<p data-bbox="354 138 894 201">Requires the left and right comparisons to be true for this condition to be true.</p>	<p data-bbox="922 138 1052 170">(condition)</p> <p data-bbox="922 176 1052 207">(condition)</p>	<p data-bbox="1195 138 1357 170">(true or false)</p> <p data-bbox="1195 176 1357 207">(true or false)</p>
<p data-bbox="201 386 235 417">Or</p> 	<p data-bbox="354 386 862 449">Requires the left or right comparison to be true for this condition to be true.</p>	<p data-bbox="922 386 1052 417">(condition)</p> <p data-bbox="922 424 1052 455">(condition)</p>	<p data-bbox="1195 386 1357 417">(true or false)</p> <p data-bbox="1195 424 1357 455">(true or false)</p>

Variables

Variables – Create a variable that can be reused throughout a program to limit redundant logic. You can modify the value of a variable by using a set operator block.

Tool	Description	Variables	Range
Add New 	Create a variable that can be reused throughout a program to limit redundant logic.	Variable Name Default Value	(-999999-999999)
Edit 	Shows “Delete” and “Edit” icons over existing variables.		
“Edit” 	Allows user to edit variable name and default value.		
“Delete” 	Deletes variable.		

Sensors

Sensors – Sensors are variables that tell the program what is going on in the Sphero. These can be used in comparators and with the Set operator.

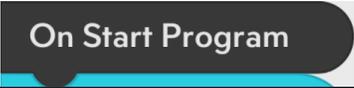
Tool	Description	Reading
<p>Heading</p> 	<p>Reads or writes the real-time heading measurement as a value. Heading is the direction in which the robot rolls. 0 degrees heading is straight forward, 90 degrees is a right turn, 270 is a left turn, and 180 degrees is straight back.</p>	
<p>Location</p> 	<p>Location of the robot in relation to the origin at the start of the program in meters. This sensor reads the location to use as a value.</p>	<p>X-Axis - X location of the robot in relation to the origin at the start of the program. X-axis positive is right of the robot at 90 degrees. This sensor reads the X-axis displacement to use as a value.</p> <p>Y-Axis - Y location of the robot in relation to the origin at the start of the program. Y-axis positive is straight in front of robot at 0 degrees. This sensor reads the Y-axis displacement to use as a value.</p>
<p>Speed</p> 	<p>Reads or writes the real-time speed measurement as a value. Speed is how fast the robot rolls on a scale from 0 to 255.</p>	
<p>Velocity</p> 	<p>Estimated speed along a given axis in meters per second. This sensor reads the speed to use as a value.</p>	<p>Combined - Estimated speed in meters per second of the combined X and Y axis velocity. This sensor reads the speed to use as a value.</p> <p>X-Axis - Estimated speed along the X-axis in meters per second. This sensor reads the X-axis speed to use as a value.</p> <p>Y-Axis - Estimated speed along the Y-axis in meters per second. This sensor reads the Y-axis speed to use as a value.</p>

Tool	Description	Reading
<p data-bbox="147 138 289 170">Orientation</p> 	<p data-bbox="354 138 889 205">The tilt angle of the robot along a given axis. This sensor reads the angle to use as a value.</p>	<p data-bbox="922 138 1450 310">Pitch - The forward or backward tilt angle of the robot on a scale from -180 to 180 degrees; imagine an airplane ascending or descending. This sensor reads the pitch angle to use as a value.</p> <p data-bbox="922 352 1450 489">Roll - The left or right tilt angle of the robot on a scale from -90 to 90 degrees; imagine an airplane rolling to the left or right. This sensor reads the roll angle to use as a value.</p> <p data-bbox="922 531 1450 667">Yaw – The spin angle of the robot on a scale from -180 to 180 degrees; imagine a plane turning left or right. This sensor reads the yaw angle to use as a value.</p>
<p data-bbox="126 674 305 705">Accelerometer</p> 	<p data-bbox="354 674 889 774">Motion detection on a scale from -8 to 8 G's. This sensor reads the acceleration along a given axis to use as a value.</p>	<p data-bbox="922 674 1458 810">Combined - Total acceleration of the robot combining all three axes on a scale of 0 to 14 G's. This sensor reads the total acceleration to use as a value.</p> <p data-bbox="922 852 1450 953">X-Axis - Lateral motion detection on a scale of -8 to 8 G's. This sensor reads the X-axis accelerometer reading to use as a value.</p> <p data-bbox="922 995 1458 1096">Y-Axis - Forward motion detection on a scale of -8 to 8 G's. This sensor reads the Y-axis accelerometer reading to use as a value.</p> <p data-bbox="922 1138 1450 1239">Z-Axis - Vertical motion detection on a scale of -8 to 8 G's. This sensor reads the Z-axis accelerometer reading to use as a value.</p>
<p data-bbox="152 1247 279 1278">Gyroscope</p> 	<p data-bbox="354 1247 889 1383">The rate of rotation around a given axis in degrees per second with a range of -2,000 to 2,000. This sensor reads the rate to use as a value.</p>	<p data-bbox="922 1247 1450 1419">Pitch - The forward or backward tilt angle of the robot on a scale from -180 to 180 degrees; imagine an airplane ascending or descending. This sensor reads the pitch angle to use as a value.</p> <p data-bbox="922 1461 1450 1598">Roll - The left or right tilt angle of the robot on a scale from -90 to 90 degrees; imagine an airplane rolling to the left or right. This sensor reads the roll angle to use as a value.</p> <p data-bbox="922 1640 1450 1776">Yaw – The spin angle of the robot on a scale from -180 to 180 degrees; imagine a plane turning left or right. This sensor reads the yaw angle to use as a value.</p>

Tool	Description	Reading
<p data-bbox="142 138 289 201">Vertical Acceleration</p> 	<p data-bbox="354 138 889 275">Acceleration up and down on a scale of -8 to 8 G's, regardless of the robot's orientation. This sensor reads the vertical acceleration to use as a value.</p>	
<p data-bbox="183 415 248 443">Color</p> 	<p data-bbox="354 415 846 516">Color channel of the main LED lights on a scale from 0 – 255. This sensor writes the red, green or blue channel of the color.</p>	<p data-bbox="922 415 1442 516">Red - Red channel of the main LED lights on a scale from 0 – 255. This sensor writes the red channel of the color.</p> <p data-bbox="922 522 1417 623">Green - Green channel of the main LED lights on a scale from 0 – 255. This sensor writes the green channel of the color.</p> <p data-bbox="922 663 1458 764">Blue - Blue channel of the main LED lights on a scale from 0 – 255. This sensor writes the blue channel of the color.</p>

Events

Events

Event	Description
<p>On Start Program</p> 	Blocks within this event activate when "Start" is pressed in the Lightning Lab app.
<p>On Collision</p> 	Conditional logic performed when the robot collides with an object.
<p>On Freefall</p> 	Conditional logic performed when the robot falls through the air, defined by an accelerometer reading of <0.1 G for a duration of ≥ 0.1 seconds. Remember that 1 G is resting.
<p>On Land</p> 	Conditional logic performed when the robot lands after an "On Freefall" event.
<p>On Gyro Max</p> 	Conditional logic performed when the robot reaches the upper limit of rotational velocity. Gyro max can be triggered by spinning the robot extremely fast.

Functions

Functions

Tool	Description	Variable	Range
Add New 	Creates a new Function. Opens "Function" screen which allows user to define parameters and add blocks of code.	Function Name	
Edit 	Shows "Delete" and "Edit" icons over existing functions.		
"Edit" 	Allows user to edit function.		
"Delete" 	Deletes function		

Parameters

Parameters (only shows up in the "Function" screen)

Tool	Description	Variable	Range
Add New 	Creates a new Parameter.	Parameter Name	
Edit 	Shows "Delete" and "Edit" icons over existing parameters		
"Edit" 	Allows user to rename parameter.		
"Delete" 	Deletes Parameter		