

# Ozoblockly Lesson 03 Beginner Programs

Exploring Robotics with Ozobot

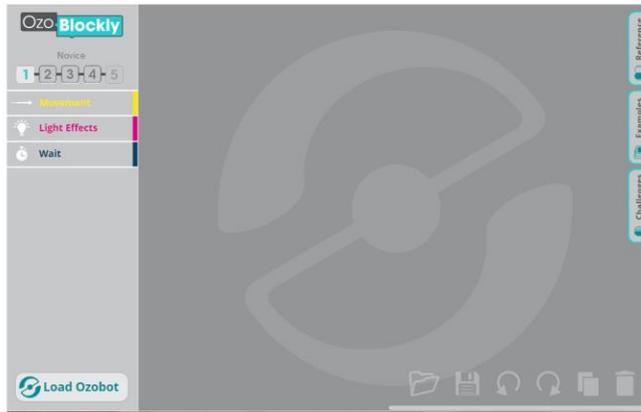


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# Programming Ozobots

► <http://ozoblockly.com/editor>



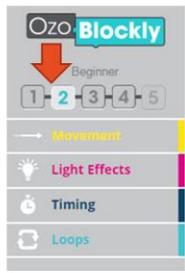
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As we recall from the Getting Started lesson, we start programming the Ozobots by going to the Ozoblockly.com website.

## Beginner Programming Level

- ▶ Movement
  - ▶ Light Effects
  - ▶ Timing
  - ▶ Loops
- 
- ▶ Square Walk Program
  - ▶ Victory Lap Program
  - ▶ Dizzy Program
  - ▶ Program Challenge



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We click on the 2 to set the programming level to Novice. This shows the programming groups of commands:

- Movement
- Light Effects
- Timing
- Loops

These descriptions are pretty self-explanatory. The Movement commands control how Ozobot moves, the Light Effects commands control turning on the LED lights and also have some special light animations. The Timing commands set waits and other time controls. The new category of Loops provides methods of repeating commands. We will go through these commands in more detail.

There are also some sample Beginner programs that we will review:

- The Square Walk Program
- The Victory Lap Program
- The Dizzy Program

We will have some fun with Ozobot by downloading and running these programs. After we review these programs and go through the commands, there will be a programming challenge where we will create our own program using what we have

learned.  
Let's get started.

## Controlling Movements

- ▶ Move
- ▶ Rotate
- ▶ Zigzag
- ▶ Skate
- ▶ Spin
- ▶ Small Circle
- ▶ Big Circle



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Let's start with taking a look at the movement commands. We already know what most of these commands will do. But they look a bit different. The commands now have variables or parameters which are set as part of the command block.

Now instead of setting the speed as normal or turbo before a move command, we set that as a parameter of the command.

For example, the Move block will drive Ozobot forward or backward. The Move block lets you configure the movement direction (forward or backward), the traveling distance (in steps) and the speed using drop-down selectors. We now have 1 to 10 steps for the distance, and each step equals about one centimeter. The speed choices are - slow (25 mm/sec), medium (45 mm/sec), fast (65 mm/sec), and very fast (85 mm/sec).

Next instead of several rotate commands, we have one Rotate block. The Rotate block turns Ozobot in place in either clockwise or counter-clockwise directions. Use the dropdown selector to choose from the following turn options: slight left or slight right (about 45 degrees), left or right (about 90 degrees), and u-turn left or right (about 180 degrees). All turn maneuvers are performed at the default medium speed.

The Zig-Zag block makes Ozobot move forward in an angular left-right-left pattern. Choose the desired speed using the dropdown selector. Just like the move command, the speed options are slow, medium, fast, and very fast.

The Skate Move block makes Ozobot perform an exciting maneuver that resembles a skating motion. Ozobot can travel in both forward and backward directions while going in a preprogrammed wavy pattern. Use the dropdown selectors to choose the movement direction (forward or backward) and the speed.

Use the Spin command to turn Ozobot around 360 degrees in to the right (clockwise) or left (counter-clockwise) directions. While performing the maneuver, Ozobot starts by accelerating to its top speed and then decelerating to a full stop.

This small Circle block makes Ozobot follow a circular path of a small radius. Speed, movement direction (backward/forward), rotation direction (left/right) and the travel time (in seconds) can be selected using dropdown selectors.

This big circle block is similar to the Small Circle block except Ozobot will follow a circular path of a larger radius. Speed, movement direction (backward/forward), rotation direction (left/right) and the travel time (in seconds) can be selected using dropdown selectors.

Be aware that with both the circle blocks, the selected speed also influences the turning radius. Also, the selected time will determine the distance that Ozobot is able travel along the perimeter of the circle.

## Your Turn 01

Create a program that:

- ▶ Moves forward 10 steps fast
- ▶ Spins left
- ▶ Skates backward slow
- ▶ Moves in a small circle forward left at medium speed for 3 seconds
- ▶ Zigzags at fast speed
- ▶ Moves in a large circle backward right at fast speed for 4 seconds
- ▶ Spins right

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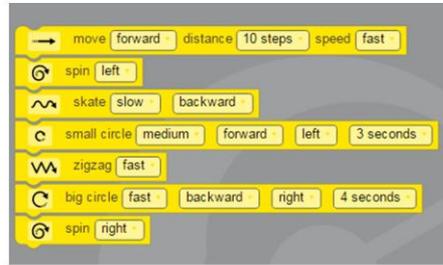
Now let's try these commands. Let's create a program that  
Moves forward 10 steps fast  
Spins left  
Skates backward slow  
Moves in a small circle forward left at medium speed for 3 seconds  
Zigzags at fast speed  
Moves in a large circle backward right a fast speed for 4 seconds  
Spins right

You remember how we calibrate and then load the program onto the Ozobot. Then we place Ozobot onto a table or flat surface and double click the start button to see how this program runs.

## Your Turn 01

Create a program that:

- ▶ Moves forward 10 steps fast
- ▶ Spins left
- ▶ Skates backward slow
- ▶ Moves in a small circle forward left at medium speed for 3 seconds
- ▶ Zigzags at fast speed
- ▶ Moves in a large circle backward right at fast speed for 4 seconds
- ▶ Spins right



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Did your program look like this?

What other moves would you like to add to make it more fun? Would you like to extend the zigzag or skate commands? At this point you can add in another one. For example, you could add a skate fast forward after the existing one.

## Controlling Lights and Timing

- ▶ Turn LED off
- ▶ Set light color
- ▶ Police Car
- ▶ Rainbow
- ▶ Traffic Lights
- ▶ Disco
- ▶ Christmas Tree
- ▶ Fireworks

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The screenshot displays the 'Light Effects' category in the Ozobot programming software. On the left, a vertical list of light effects is shown: 'turn LED off', 'set light color', 'police car lights', 'rainbow', 'traffic lights', 'disco', 'christmas tree', and 'firework'. On the right, a 'set light color' block is shown with a 3x3 grid of colored squares. Below it, a 'wait' block is shown with the value '1' and the unit 'second(s)'. The number '7' is visible in the bottom right corner of the interface.

Next let's control Ozobot's lights. Once again, these commands should be familiar, except for the first one.

Turn LED Off disables Ozobot's LED until another Light Effects block enables the light again.

To turn on an LED we set the light color. Now we have 12 different colors to choose from.

Ozobot will perform all of the subsequent movements while shining the chosen light color until you set the LED to another color later in your program. Remember, if we want Ozobot to shine a color while stationary, we can insert a Wait block from the Timing category right after we set the LED color. We can also use the turn LED off between wait commands to make a flashing light.

The new wait command in the Timing section has a selection of the number of seconds, from 1 to 10.

The remaining light effects work the same as they did in the Novice mode: police car, rainbow, traffic lights, disco, christmas tree, and fireworks. Remember, Ozobot remains stationary while doing the light animations.

## Your Turn 02

Create a program that:

- ▶ Shows Disco lights
- ▶ Waits 1 second
- ▶ Turns on lime green light
- ▶ Waits 1 second
- ▶ Turns off LED
- ▶ Waits 1 second
- ▶ Turns on orange light
- ▶ Waits 1 second
- ▶ Turns off LED
- ▶ Waits 2 seconds
- ▶ Shows Rainbow lights

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Now let's try out some of the light commands. Let's create a program that

- Shows Disco lights
- Waits 1 second
- Turns on lime green light
- Waits 1 second
- Turns off LED
- Waits 1 second
- Turns on orange light
- Waits 1 second
- Turns off LED
- Waits 2 seconds
- Shows the Rainbow colors

Then load the program onto the Ozobot. Then once again we place Ozobot onto a table or flat surface and double click the start button to see how this program runs.

## Your Turn 02

Create a program that:

- ▶ Shows Disco lights
- ▶ Waits 1 second
- ▶ Turns on lime green light
- ▶ Waits 1 second
- ▶ Turns off LED
- ▶ Waits 1 second
- ▶ Turns on orange light
- ▶ Waits 1 second
- ▶ Turns off LED
- ▶ Waits 2 seconds
- ▶ Shows Rainbow lights

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Did your program look like this?

Use this program to experiment with different colors and timing and try to create special lighting effects.

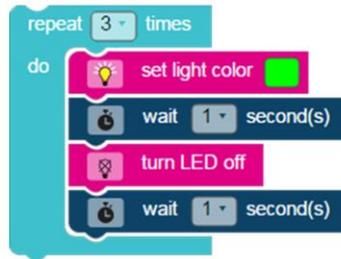
## Loop Commands

- ▶ Repeat forever - do loop
- ▶ Repeat N times - do loop



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### Example



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There are many times that we want to repeat a sequence of commands over and over again. There are two different loop commands that help us do that. For both of these commands, we insert the blocks that we want to repeat inside of them.

The Repeat Forever block is a type of a control structure that will run the block instructions in its body over and over again in an infinite loop. This is often used to make a whole program start over and keep playing again and again until the robot is switched off.

The Repeat N-Times block will run the code in its body the specified number of times. You can select between 2 and 10 repeats in the dropdown list. How would we use this command? An obvious one is to create a light effect that repeats multiple times, as shown in this example which turns the green light on and off 3 times. But we can also create sequences of moves that repeat over and over.

## Your Turn 03

Use the light program we created

- ▶ Repeat Forever
  - ▶ Shows Disco lights
  - ▶ Repeat 2 Times
    - ▶ Waits 1 second
    - ▶ Turns on lime green light
    - ▶ Waits 1 second
    - ▶ Turns off LED
    - ▶ Waits 1 second
    - ▶ Turns on orange light
    - ▶ Waits 1 second
    - ▶ Turns off LED
  - ▶ Waits 2 seconds
  - ▶ Shows Rainbow lights

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Let's start with the light program we created in the last Your Turn.

After the disco lights, add a repeat 2 times and encompass all the commands down to just before the Wait 2 seconds.

Then let's repeat the whole program forever.

Try adding the repeat commands in from the left. This may be easier to insert all the commands at once inside the loop. Then pull out the commands that you don't want inside the loop. Notice that we don't want the Wait 2 seconds and Rainbow lights inside our Repeat 2 times loop.

## Your Turn 03

Use the light program we created

- ▶ Repeat Forever
  - ▶ Shows Disco lights
    - ▶ Repeat 2 Times
      - ▶ Waits 1 second
      - ▶ Turns on lime green light
      - ▶ Waits 1 second
      - ▶ Turns off LED
      - ▶ Waits 1 second
      - ▶ Turns on orange light
      - ▶ Waits 1 second
      - ▶ Turns off LED
    - ▶ Waits 2 seconds
    - ▶ Shows Rainbow lights

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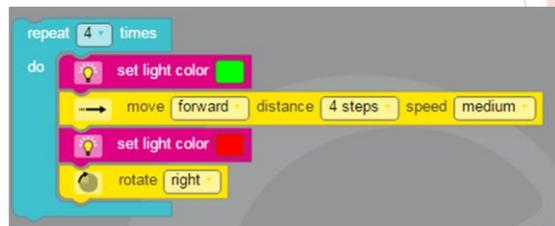


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Did your program look like this?

## Example Square Walk Program

- ▶ Repeat 4 times
  - ▶ Set light color to green
  - ▶ Move forward 4 steps medium
  - ▶ Set light color to red
  - ▶ Rotate right



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Let's take a look at the Example program named square walk.

We see that it repeats 4 times.

While the light is green it is moving forward 4 steps at medium speed.

Then while the light is red it rotates right.

So can you guess what this will look like?

Let's load the program to the Ozobot and run it.

This is a great example of how the repeat N times decreases the number of commands that are needed to accomplish a task.

## Example Victory Lap Program

- ▶ Repeat Forever
  - ▶ Set light color to red
  - ▶ Big circle
  - ▶ Rotate left
  - ▶ Repeat 2 times
    - ▶ Forward 1 step
    - ▶ Backward 1 step
  - ▶ Disco
  - ▶ Rotate right
  - ▶ Set light color green
  - ▶ Big circle
  - ▶ Disco
  - ▶ Spin left

```
repeat forever
do
  set light color red
  big circle slow forward right 3 seconds
  rotate left
  repeat 2 times
  do
    move forward distance 1 step speed medium
    move backward distance 1 step speed medium
  disco
  rotate right
  set light color green
  big circle medium forward right 4 seconds
  disco
  spin left
```

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Next let's look at the example victory lap program.

It has a variety of moves and lighting effects. There is a repeat forever, so it will keep running till we turn the robot off .

There is also a small section that repeats 2 times and has a couple of moves in it.

There are some fun disco lights and some circle and spin moves.

Let's load the program to the robot and run it.

## Example Dizzy Program

- ▶ Repeat 5 times
  - ▶ Set light color blue
  - ▶ Big circle
  - ▶ Small circle
  - ▶ Rotate left
  - ▶ Set light color green
  - ▶ Big circle
  - ▶ Set light color red
  - ▶ Small circle
  - ▶ Rotate



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Next let's look at the Example Dizzy Program. This is a pretty long program. We see there is a section that is repeated 5 times. It has a lot of turning in circles in it. This is a good example of how a dance routine can be created by using the repeat loop. There are also a lot of spins before and after the repeated section. So we can see why they call this one Dizzy. Let's load it to our robot and watch it run.

## Programming Challenge 1: Rectangle Walk

- ▶ Draw a rectangle with a pencil and ruler. Make the lengths of each side whole cms (not fractions).
- ▶ Create a program where you make Ozobot trace the rectangle.
- ▶ Have Ozobot's LED shine green when going on the short edge of the rectangle and red when going on the long edge.
- ▶ After Ozobot has completed the rectangle, make Ozobot spin and do an LED animation of your choice.
- ▶ Try to use as few blocks as possible (you will have to use a loop for that).

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### Extra Credit:

- ▶ Make sure that Ozobot goes counter-clockwise when tracing the rectangle. Then, make Ozobot do the same again, but this time clockwise. Do the spin and LED animation in the very end, after both rectangles have been completed.
- ▶ Create your own LED animation instead of using one of the pre-programmed ones.

OK Here is a programming challenge for you.

First, draw a rectangle with a pencil and ruler. Make the lengths of each side whole cms (not fractions).

Then create a program where you make Ozobot trace the rectangle.

Have Ozobot's LED shine green when going on the short edge of the rectangle and red when going on the long edge.

After Ozobot has completed the rectangle, make Ozobot spin and do an LED animation of your choice.

Try to use as few blocks as possible (you will have to use a loop for that).

### Extra Credit:

Make sure that Ozobot goes counter-clockwise when tracing the rectangle. Then, make Ozobot do the same again, but this time clockwise. Do the spin and LED animation in the very end, after both rectangles have been completed.

Create your own LED animation instead of using one of the pre-programmed ones.

## Programming Challenge 2: Word Walk

- ▶ Draw a short word with block letters using a pencil and ruler. Make the lengths of each side whole cms (not fractions). Connect the letters together with a line either on top or bottom.
- ▶ Create a program where Ozobot traces over the letters and the line. The tracing does not have to be perfect. Close counts.
- ▶ At the end add in a light animation and a victory dance.
- ▶ Try to use as few blocks as possible (you will have to use a loop for that).

**W O W**

**ROBOT**

- ▶ *Hint: you may need to adjust the size of the drawn lines, circles and curves after you have tried your program several times.*

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Here is another Programming Challenge.

Draw a short word with block letters using a pencil and ruler. Make the lengths of each side whole cms (not fractions). Connect the letters together with a line either on top or bottom.

Create a program where Ozobot traces over the letters and the line. The tracing does not have to be perfect. Close counts.

At the end add in a light animation and a victory dance.

Try to use as few blocks as possible (you will have to use a loop for that).

*Hint: you may need to adjust the size of the drawn lines, circles and curves after you have tried your program several times.*

## Review - Beginner Programming Level

- ▶ Movement
- ▶ Light Effects
- ▶ Timing
- ▶ Loops
  
- ▶ Square Walk Program
- ▶ Victory Lap Program
- ▶ Dizzy Program
- ▶ Program Challenge



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Now we have mastered the Beginner Programming level for Ozobots.

We know how to control movements, create light effects, change the timing, and create loops.

We tried out and learned from the example programs: square walk, victory lap, and dizzy.

We also took on the challenges and wrote our own programs.

We are now ready to tackle the Intermediate level of programming – level 3.

The End

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