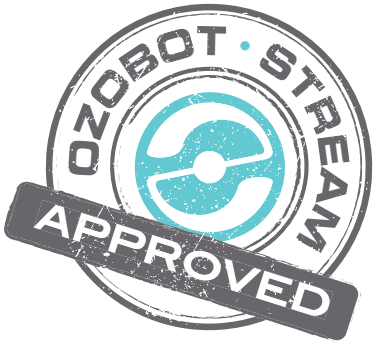

Challenge Lesson: Ozobot Bit—Second Timer

Created by

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Topics

Math (geometry, arithmetic)

Science (Speed)

Programming (algorithm design)

Data Collection (stop watch, mm ruler)

Ages

Grades 6-12

Duration

Approx. 45-60 min

Challenge Lesson:
Ozobot Bit—Second Timer

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Mankind has been enamored with the concept of time for countless millennia—from the changes in how humans look as they age, to the development of devices like clocks and watches to tell the current time, to devices like stop watches to measure time for relatively short events, to discussions on whether or not one can jump back or forward in time, just to mention a few.

Could we turn Ozobot Bit into a timer—specifically, a timer for measuring seconds? We might be able to use it to time how long it takes for a student to run 100 meters on the school's track during a physical education class. Or we might use it to limit the time to solve a problem in a math class to one minute (60 seconds). Or we might use it to measure the time required for a student to read a passage from a short story in a literature class. In a science class it could be used to measure the time for a ball to roll down an inclined plane. The list of possibilities is seemingly endless!

This challenge lesson will involve your knowledge of concepts in geometry and physical science, as well as your ability to write Level 4 (Advanced) OzoBlockly code using light effects, line navigation, and timing. It will also use the "repeat forever" loop from Level 3 (Intermediate). The program need not be more than something on the order of ten OzoBlocks in length. Figure 1 shows a small copy of the "map" or "maze" that you will use when designing your Ozobot Bit "second timer". A larger copy, suitable for printing and using with Ozobot Bit can be found on the last page of this document.

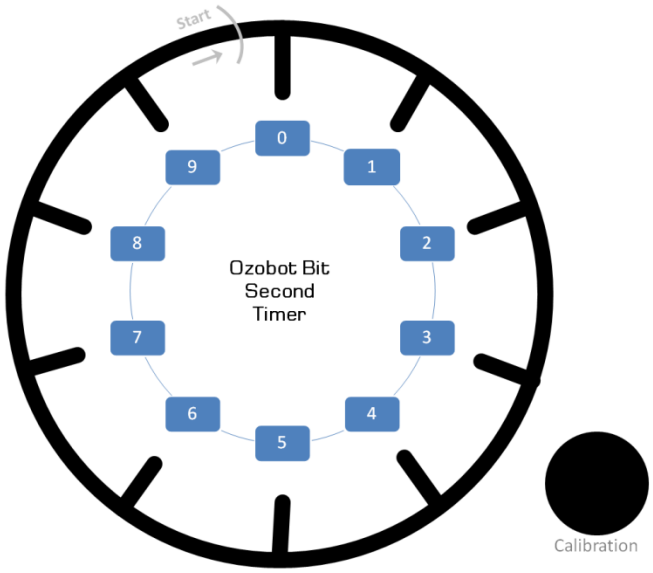
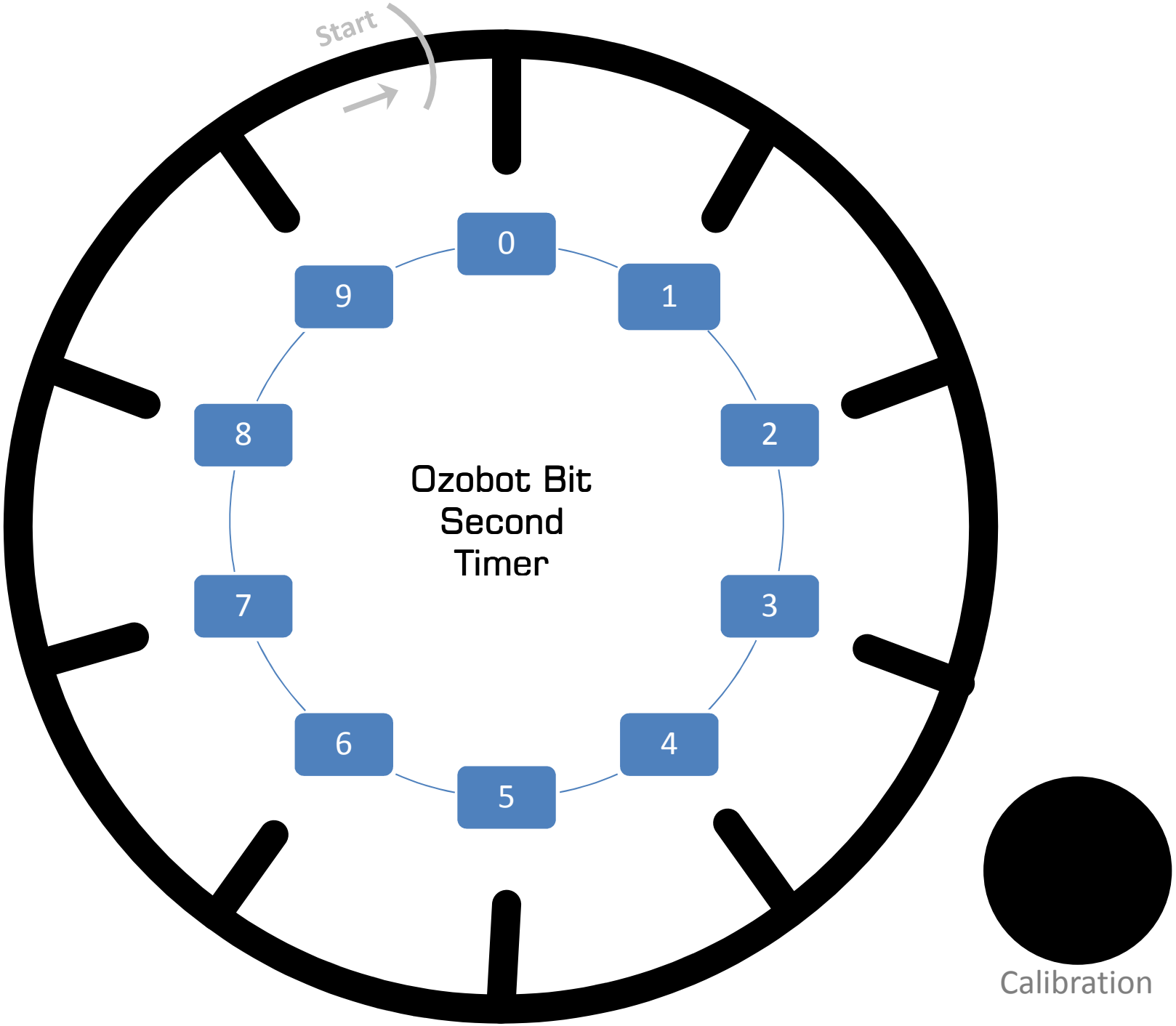


Figure 1

Challenge Requirements

Refer to Figure 1 while studying the follow challenge requirements:

1. Use OzoBlockly codes from Mode 4 (Advanced). You may also use the "loop forever" code from Mode 3 (Intermediate).
2. Make sure that you calibrate Ozobot Bit on the black calibration circle in the bottom right corner of the map before running your program.
3. To start Ozobot Bit's program, you need to double-press the start button.
4. Ozobot Bit should be started at the location labeled "Start" facing the direction shown by the arrow and with the front of Ozobot behind the curved gray line.
5. Ozobot Bit should travel in a clockwise direction around the circle, repeating the circle, *ad infinitum*, or until the battery is depleted or you remove Ozobot from the map. It should take Ozobot Bit 10 seconds to make one complete cycle. That way, if you mentally (or by a tally on paper) keep track of the number of cycles, you can time events exceeding 10 seconds.
6. The Reference section of the OzoBlockly web site tells us that the allowable line-following speeds for Ozobot Bit are 15 mm/s to 85 mm/s. So you need to determine the speed for Ozobot Bit in such a way that it will take 10 seconds to travel once around the circle. This will require your knowledge of the geometry of a circle—specifically, that $C = 2\pi R = \pi D$, where C is the circumference, R is the radius, and D is the diameter. You will also need to use your knowledge from physical science on how to calculate the speed of an object moving at a constant speed $s = d/t$, where d is the distance traveled and t is the time required to travel that distance. You can measure the diameter of the circle of your printed .pdf file by using a ruler with mm markings. Once you have computed the required speed for Ozobot Bit, you can proceed to Step 7.
7. Ozobot Bit's LED color should be initially set to RED, and that followed by a 2-second wait. Program him so that as he travels around the circle, his LED color will alternate between RED and BLUE during each second of travel. To make this clear, the LED should be RED between 0 and 1 second, BLUE between 1 and 2 seconds, RED between 2 and 3 seconds, etc. as Ozobot Bit travels around the circle.
8. You will probably need to make adjustments to Ozobot Bit's speed. Use a stop-watch (or a stop-watch app on your cell phone) to measure the time required for Ozobot Bit to make three complete cycles on the maze. If the reading is exactly 30 seconds, you are good to go. But how do you need to adjust the line-following speed if your reading is above 30 seconds? Or if it is below 30 seconds? Using trial-and-error, make adjustments until you get the time to as close to 30 seconds as possible. Once this is done, your Ozobot Bit is calibrated and read to use with some real timings!
9. Can you think of some reasons why you needed to make some adjustments to Ozobot Bit's speed in Step 8?


Start
0
1
2
3
4
5
6
7
8
9
Ozobot Bit
Second
Timer
Calibration