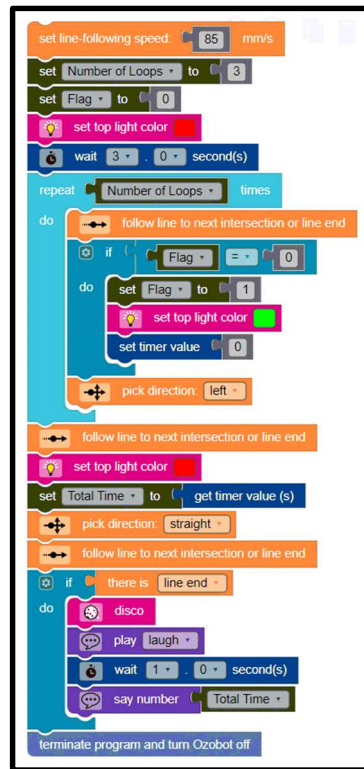


Solution to the Loop-the-Loop Extra Credit Challenge

The figure below shows the lesson author's OzoBlockly program for the timed loop-the-loop.



Before encountering the loop for the first time, the variable *Flag* has the value 0 to indicate that the loop has not yet been encountered. Upon entering the loop at the loop bottom the first time, the variable *Flag* is checked to see if it is 0. Since it is 0, it is set to 1 to indicate that Evo is now on the loop. In addition, the top LED is changed to green, and the timer is started at the value 0. Note that the timer will not be restarted again with each loop that the Evo makes, as we want the total time for all *Number of Loops* loops.

At the instant that Evo finishes the final loop, the “Set *Total Time* to *get timer value*” block captures the time for Evo to make all of the loops. Evo speaks this time just before turning off at the finish.

Physics tells us that $d = vt$, i.e., distance equals velocity times time. Geometry tells that $C = \pi D$, i.e., circumference of a circle equals pi times the diameter. Since Evo travels N loops, then Evo's total distance $d = N\pi D$. Therefore, $vt = N\pi D$. Solving for D , we get the equation:

$$D = \frac{vt}{N\pi}$$

The value of v comes from OzoBlockly “set line-following speed” block. Evo speaks the value of t just before turning off. N comes from the *Number of Loops* variable.