

Calculating the Circumference of the EV3 or NXT drive wheels

Background: The LEGO robots have no way of knowing what size wheel is on the robot, nor can they tell how far apart the wheels are, or whether there are any gears between the motor and the wheels. The only thing the robot can know is how many times it turns the axle sticking out of the motor. This experiment evaluates the distance the robot will travel for each rotation of that axle, a useful thing for every roboteer to know.

Materials:

1. EV3 or NXT robot with drive wheels attached directly to the motors using one axle/wheel per motor. See examples of robots on line.
2. Masking or painters tape.
3. Tape measure.

Procedure:

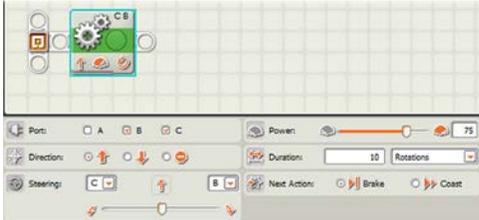
1. Write a program that drives the robot exactly 10 rotations.
2. Download the program to the robot.
3. Place a tape marker on the floor so that there is at least 10 feet ahead of the tape for the robot to run.
4. Place the robot so that the drive wheels rest exactly on the tape marker (always measure from the same place, such as where the wheel touches the floor or the front edge of the wheel).
5. Run the 10 rotation program.
6. Measure the distance from the tape marker to the robot wheel after the program runs.
7. Enter the distance measured on the chart below.
8. Repeat Steps 4-7 a total of three times.
9. Calculate the average of the three distances to get the average distance per run and enter the number below.
10. Divide the average by 10 (the number of rotations) to get the distance the robot will run for one rotation and enter the number below.
11. Divide the distance for one rotation by 3.14 (π , pi) to get the diameter of the wheel.

Trials	Distance (indicate inches or centimeters)
First trial, 10 rotations	
Second trial, 10 rotations	
Third trial, 10 rotations	
Total length for all three trials (add three trials)	
Average length for 1 trial (divide total by 3)	
Calculate distance for 1 rotation (divide average by 10)	
Diameter of the wheel (divide 1 rotation distance by 3.14)	

PROGRAM EXAMPLES:

Note: in both the NXT and EV3 versions of the MindStorms software, this is a 1 block program.

NXT Program to drive both motors (B + C) forward for 10 rotations, and then stop. (Move Block)



EV3 Program to drive both motors (B + C) forward for 10 rotations, and then stop. (Move Steering Block)

