

Wheels and Distance

Introductory Presentation

Opening Activity

In “Full Speed Ahead” we made our robot move forward with the program below.



Opening Activity

In this program:

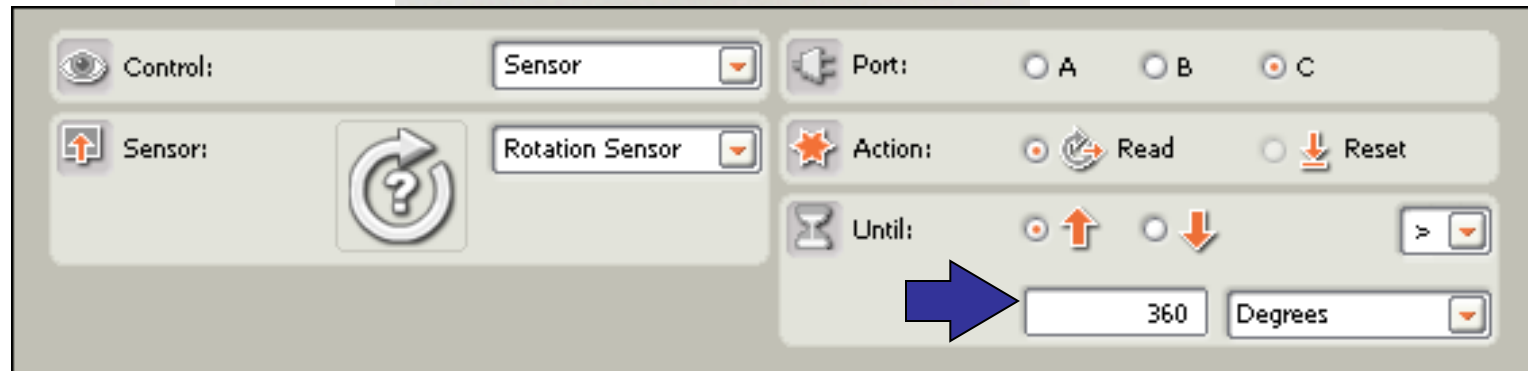


1. How far did your robot move forward?
2. What affected the distance it moved?
3. How could you get it to move a longer distance?
A shorter distance? An exact distance you want?

Opening Activity

Many things affected how far your robot traveled.

- The number of degrees your Wait For block is set to wait for
- The size of your tires



Wheels and Distance

In this activity we're going to program our robot to move an exact distance.

To do so we must understand a few things about circles.



START



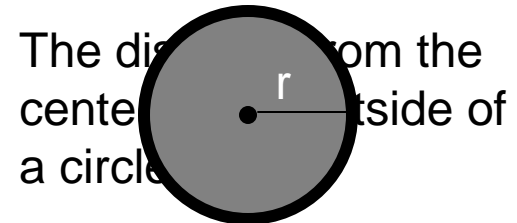
FINISH

Review

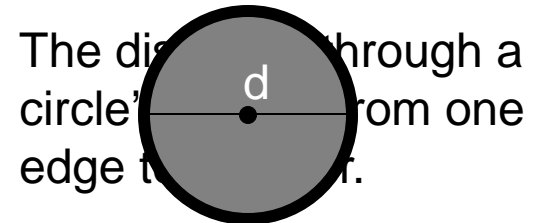
Let's start with the basics.

Answer the following:

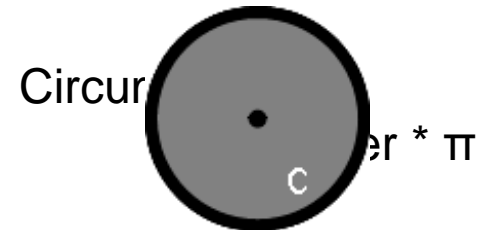
1. What is a radius of a circle?



2. What is a diameter of a circle?

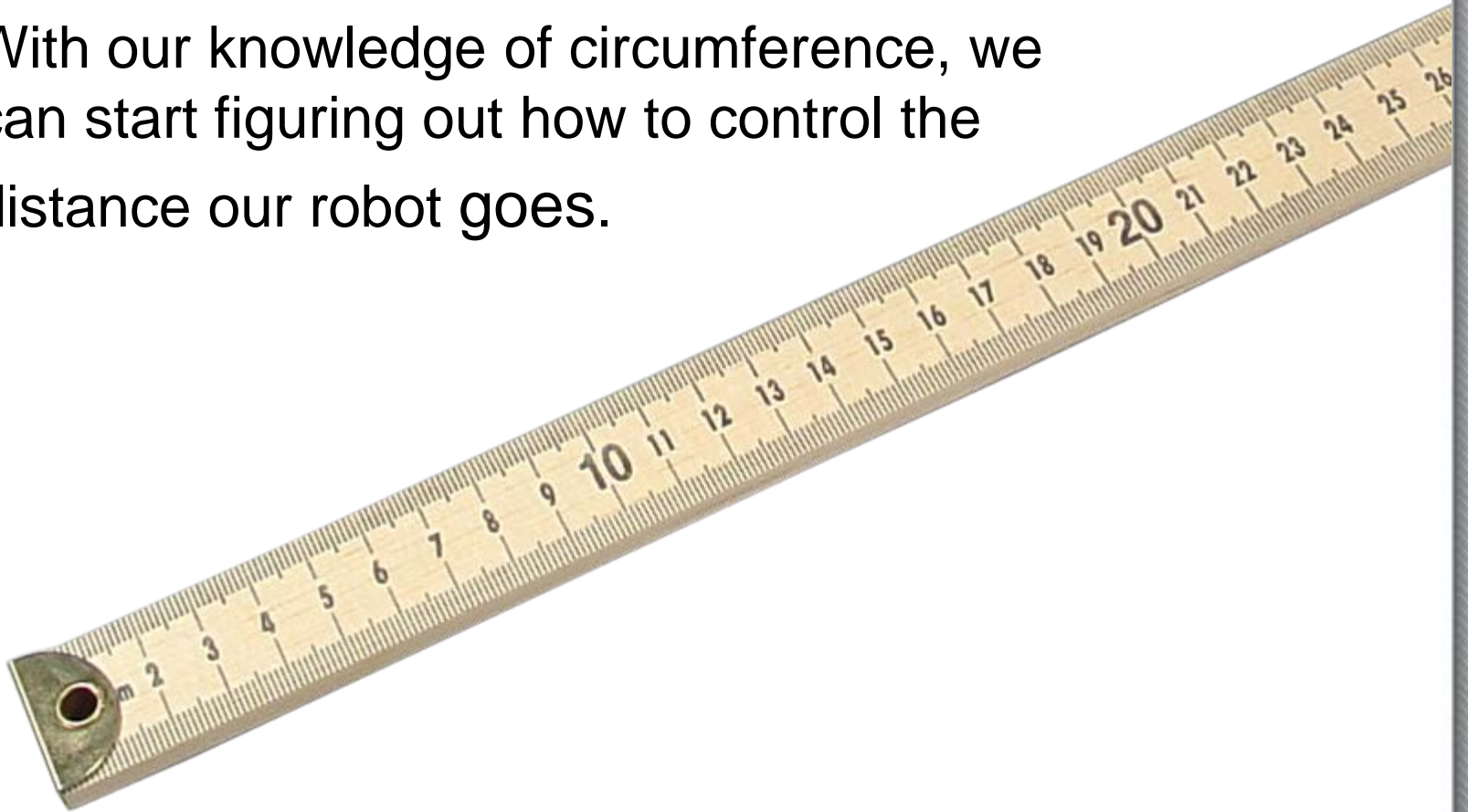


3. What is the formula for the circumference of a circle?



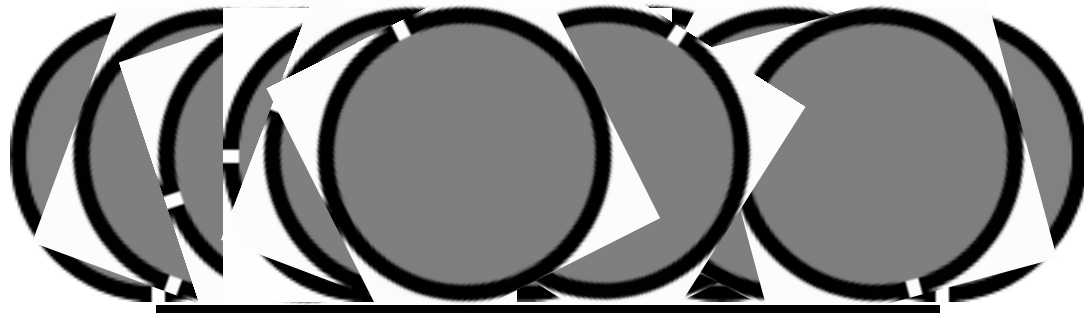
Preview

With our knowledge of circumference, we can start figuring out how to control the distance our robot goes.



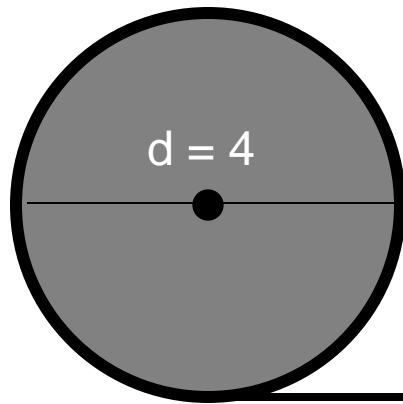
Preview

First, we need to understand that the circumference of a circle is really just a line curled around a center point.



Review

From this, we know that the circumference of a circle and the length of the line it rolls out are equal in length. Finish the following:



$$\text{Circumference} = 4 * \pi$$

So we know that...

$$\text{Length of Line} = \underline{4 * \pi}$$

Preview



Let's try a few more. Finish this chart:

Circumference =	Length of line =
1 meter	1 meter
2 meters	2 meters
7 meters	7 meters

Preview

Predict what would happen if we were to change the number of rotations that the wheel makes?
Or change the diameter of the wheel?



Once you have completed the activity check your prediction

Preview

In the meantime, let's review a few more topics that you will need to successfully complete the Wheels and Distance Investigation.

The screenshot shows a web-based investigation interface titled "Wheels & Distance". At the top, there is a navigation bar with tabs for "Hypothesis", "Condition 1", "Condition 2", and "Analysis". The "Hypothesis" tab is currently selected. Below the navigation bar, the main content area is divided into two columns. The left column contains the title "Investigation Wheels and Distance" and a paragraph explaining the goal: "In this investigation, you will find the relationship between wheel size, motor rotations, and distance traveled. The goal is to find out how to move your robot a certain distance, predictably, in centimeters." Below this, there is a box titled "Dr. Turner's Hypothesis" which states: "For every 300 degrees of wheel rotation, the robot travels one circumference of the robot's tire." and includes the formula $\text{distance traveled} = \text{circumference} \times \text{rotations}$. At the bottom left, there is a button labeled "Review Radius, Diameter, and Circumference". The right column features a large image of a silver flip phone, which is the robot used in the investigation. The phone's screen displays "Wheels & Distance" and "300 rotations". At the bottom of the interface, there is a status bar with icons for navigation and a progress indicator.

Review: Average

To find the **average** of a collection of measurements:

- Add all of your measurements together
- Divide by the number of measurements

$$\text{Average} = \frac{\text{Measurement 1} + \text{Measurement 2} + \text{Measurement 3}}{3}$$



Review: Average

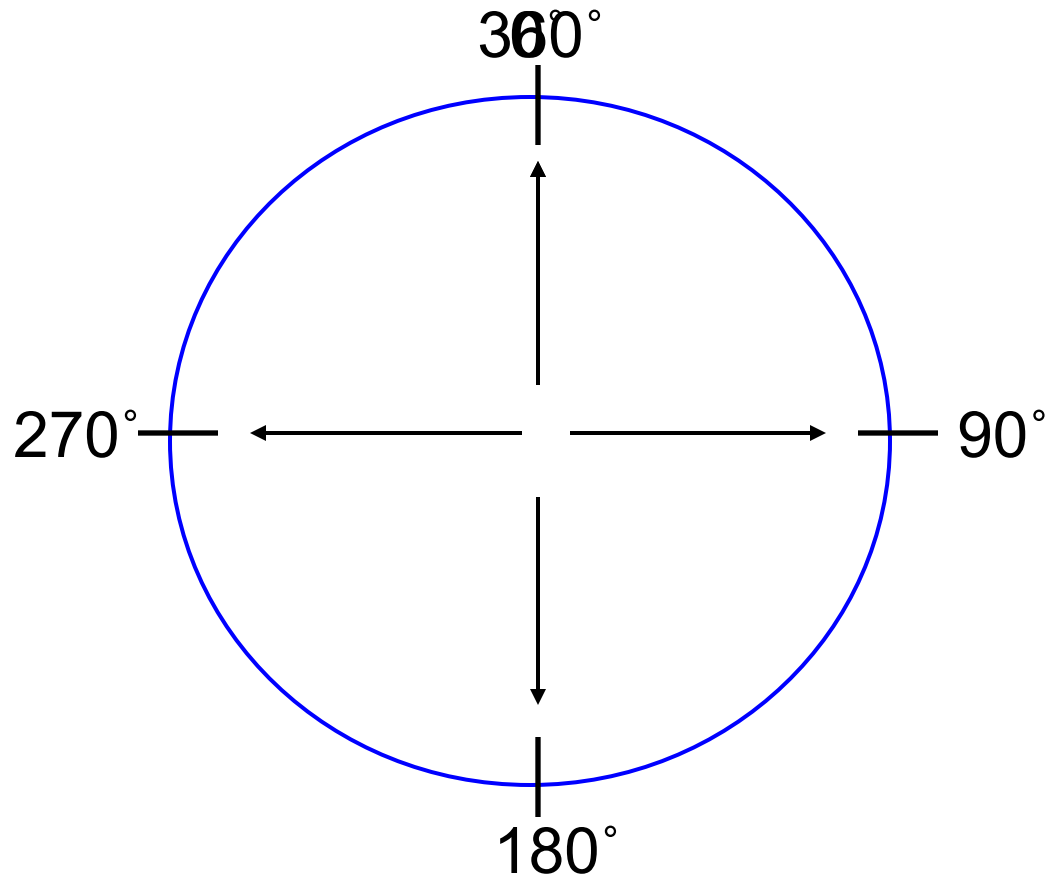
Suppose your robot moved forward three times with distances of 5, 6, and 10 meters. What is the average distance it moved forward?

$$\text{Average} = \frac{\text{Measurement 1} + \text{Measurement 2} + \text{Measurement 3}}{\text{\# of measurements}}$$

5 meters 6 10

7 meters 3

Review: Degrees



There are 360° in one full rotation of a wheel

Review: Degrees

If there are 360° in one rotation of a wheel,
how many degrees are there in two rotations?

Answer: 720°

$$720^\circ = 2 \text{ rotations} * 360^\circ$$

Go to the next page for more practice!

Review: Degrees

Complete the following chart to get some practice:

# Of Rotations	# of Degrees
1 rot.	360°
3 rot.	1080°
1.5 rot.	540°

Review

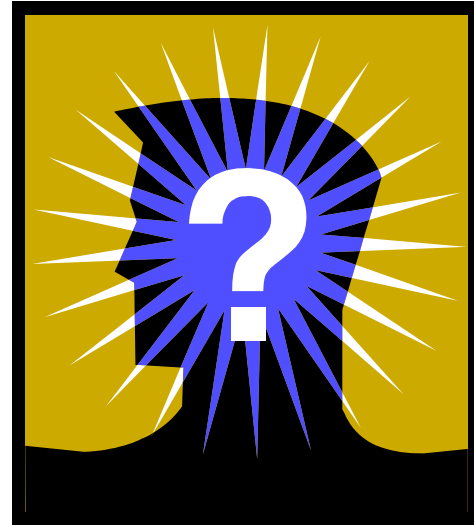
Keep the following in mind as you complete the Wheels and Distance Investigation:

- Circumference - the length of line a circle rolls out
- Circumference = diameter * π
- Average = $\frac{\text{sum of measurements}}{\text{number of measurements}}$
- There are 360° in one rotation of a circle

Review: Scientific Inquiry

Scientific Inquiry

This is the process by which people ask questions, and seek out answers to their questions through the use of experiments and scientific knowledge.



Review: Scientific Inquiry

Hypothesis

A key element to Scientific Inquiry is the scientist's hypothesis. A hypothesis is an educated guess concerning the outcome of the inquiry process and the experiments conducted within.



Good Luck!

Now you have the necessary knowledge to get started in the Wheels and Distance Investigation.

