

Worksheet: Rotational Sensors and Distance

Name: _____

Date: _____

Answer the following questions: (Show all work)

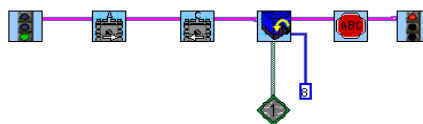
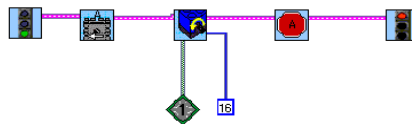
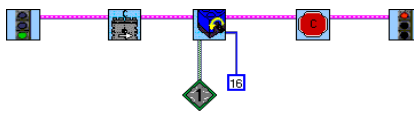
1. What is a rotational sensor? What type of information does it provide?
2. If a wheel, directly connected to a rotational sensor makes 6 revolutions, how many clicks has the rotational sensor counted?
3. A robot has two drive wheels, each connected to a motor and a rotational sensor. Draw two simple programs showing how to make the robot turn left.
4. The width of a robot is 3 inches. The wheels on the robot have a radius of 2 inches. How many clicks of the rotational sensor, connected to the left wheel, are necessary to make a 90° right turn?
5. You want your robot to travel 48 inches in a straight line. How many rotational sensor clicks are required if the wheels have a 3 inch diameter?

Solutions: Rotational Sensors and Distance

1. The **rotational sensor** is a sensor that measures the rotation of an axle. As the axle turns, the rotation sensor counts how much the axle rotates. There are 16 counts (also called clicks or ticks) in one complete revolution of the axle. The number of counts is what the RCX reads as input.
2. Since the wheel is **directly** connected to the rotational sensor, each rotation of the wheel will cause one complete turn of the rotational sensor.

$$6 \text{ revolutions} \times 16 \text{ clicks/revolution} = 96 \text{ clicks}$$

3.



The following assumptions were made:

- a. Motor A is on the left wheel; motor C is on the right wheel.
- b. One revolution of the wheel will make a 90° turn

The top diagram shows a left hand turn with the left wheel stopped and the right wheel turning in the forward direction. The middle diagram shows a left turn with the right wheel stopped and the left wheel turning in the reverse direction. The bottom diagram shows the robot turning on its own axis: the left wheel is turning in the reverse direction and the right wheel is turning in the forward direction.

4. Since a right turn is made by keeping the right wheel motionless while the left wheel turns, the radius of the turn will be same as the width of the robot or 3". The circumference of the turn would be $2\pi r$ or $2 \times \pi \times 3$, which is equal to 18.85". A 90° turn would be $\frac{1}{4}$ of a full turn or $18.85/4 = 4.71$ ". Since the wheels have a radius of 2", the circumference of the wheel would be $2 \times \pi \times 2 = 12.566$ ". Each click then, would be equal to $12.566/16 = 0.785$ " since there are 16 clicks per revolution. The number of clicks necessary to make the turn is equal to $4.71/0.785$ or 6.04. Since there are no partial clicks, the answer is 6 clicks. It should be noted that nowhere in the problem did it state the left wheel was turning in the forward direction. If the left wheel was turning in the reverse direction, the robot would have to make $\frac{3}{4}$ of a turn to be facing in the correct direction, so 18 clicks would also be a correct answer
5. The circumference of a wheel is equal to πd or, in this case 3π or 9.425". Since there are 16 clicks to a revolution, the distance for each click is $9.425/16 = 0.59$ ". The number of clicks necessary to go 48" is $48/0.59$ or 81.5. Since there are no partial clicks, use either 81 or 82 clicks.