

**Robotics Worksheet:  
Straight Distance, Swing, and Point Turns**

**Directions:** Given the known values of the diameter of a Robot wheel and the distance between wheels on the Robot, calculate the degrees of rotation needed and movement block programming for the robot to complete the following moves:

**Given Values:**

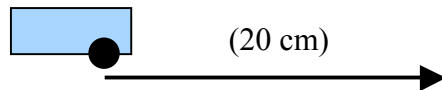
Robot wheel diameter: 5.6 cm

Distance between wheels: 11.3 cm

Pi: 3.14

Degrees in a Circle: 360

**A. Drive straight line forward 20 cm.**



**Straight Line: (In 3 fun and easy steps!)**

**1. Figure out the circumference of the Wheel:**

Circumference =  $3.14 * \underline{5.6 \text{ cm}}$  (Diameter)

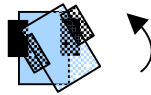
Circumference = \_\_\_\_\_

**2. Figure out the number of rotations needed to go the distance**

$\frac{\text{Distance}}{\text{Circumference}} = \text{Rotations}$

**3. Change Rotations to Degrees for Motor Block Commands.**

Rotations \* 360 = \_\_\_\_\_ (Degrees)



## B. Swing Turn Left 45 degrees.

**Swing Turn: (In 5 fun but not so easy steps!)**

**1. Figure out the circumference of the Wheel:**

$$\text{Circumference} = 3.14 * \underline{5.6 \text{ cm}} \text{ (Diameter)}$$

$$\text{Circumference} = \underline{\hspace{2cm}}$$

**2. Calculate the Circumference of the big circle the robot would make if it turned all the way around in a swing turn.**

$$\text{Big Circumference} = 3.14 * \text{Distance Between Robot Wheels} * 2$$

**3. Calculate the arc segment the robot wheel has to travel to make the swing turn:**

$$\frac{\text{Degree of Turn}}{360} * \text{Big Circumference} = \text{Arc Segment}$$

**4. Figure Out wheel rotations needed to travel arc segment:**

$$\frac{\text{Arc Segment}}{\text{Wheel Circumference}} = \text{Rotations}$$

**5. Change Rotations to Degrees for Motor Block:**

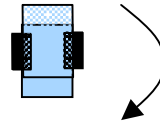
$$\text{Rotations} * 360 = \underline{\hspace{2cm}} \text{ (Degrees)}$$

**6. Decide which wheel to rotate:**

Turning Left -> use wheel on right side of robot

Turning Right -> use wheel on left side of robot

### C. Point Turn Right 180 degrees.



Point Turn (In 5 easy and fun steps!)

1. Figure out the circumference of the Wheel:

$$\text{Circumference} = 3.14 * \underline{\quad 5.6 \text{ cm} \quad} \text{ (Diameter)}$$

$$\text{Circumference} = \underline{\hspace{4cm}}$$

2. Calculate the Circumference of the big circle the robot would make if it turned all the way around in a point turn.

$$\text{Big Circumference} = 3.14 * \text{Distance Between Robot Wheels}$$

3. Calculate the arc segment the robot wheel has to travel to make the swing turn:

$$\frac{\text{Degree of Turn}}{360} * \text{Big Circumference} = \text{Arc Segment}$$

4. Figure Out wheel rotations needed to travel arc segment:

$$\frac{\text{Arc Segment}}{\text{Wheel Circumference}} = \text{Rotations}$$

5. Change Rotations to Degrees for Motor Block:

$$\text{Rotations} * 360 = \underline{\hspace{2cm}} \text{ (Degrees)}$$

6. Decide which wheels to rotate:

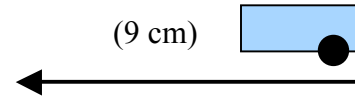
Turning Left ->

Right wheel forward Number of Degrees, Left wheel backward Number of Degrees.

Turning Right ->

Left wheel forward Number of Degrees, Right wheel backward number of Degrees.

## D. Straight line backward 9 cm.



**Straight Line: (In 3 fun and easy steps!)**

### 1. Figure out the circumference of the Wheel:

Circumference =  $3.14 * \underline{\quad 5.6 \text{ cm} \quad}$  (Diameter)

Circumference =  $\underline{\hspace{2cm}}$

### 2. Figure out the number of rotations needed to go the distance

$$\frac{\text{Distance}}{\text{Circumference}} = \text{Rotations}$$

### 3. Change Rotations to Degrees for Motor Block Commands.

Rotations \* 360 =  $\underline{\hspace{2cm}}$  (Degrees)

## OH MYGOODNESS!!! How do I do these problems???

Here is a guide to the formulas and process for solving straight line, swing, and point turn problems

**Straight Line: (In 3 fun and easy steps!)**

**1. Figure out the circumference of the Wheel:**

$$\text{Circumference} = 3.14 * \underline{5.6 \text{ cm}} \text{ (Diameter)}$$

$$\text{Circumference} = \underline{\hspace{2cm}}$$

**2. Figure out the number of rotations needed to go the distance**

$$\frac{\text{Distance}}{\text{Circumference}} = \text{Rotations}$$

**3. Change Rotations to Degrees for Motor Block Commands.**

$$\text{Rotations} * 360 = \underline{\hspace{2cm}} \text{ (Degrees)}$$

**Swing Turn: (In 5 fun but not so easy steps!)**

**1. Figure out the circumference of the Wheel:**

$$\text{Circumference} = 3.14 * \underline{5.6 \text{ cm}} \text{ (Diameter)}$$

$$\text{Circumference} = \underline{\hspace{2cm}}$$

**2. Calculate the Circumference of the big circle the robot would make if it turned all the way around in a swing turn.**

$$\text{Big Circumference} = 3.14 * \text{Distance Between Robot Wheels} * 2$$

**3. Calculate the arc segment the robot wheel has to travel to make the swing turn:**

$$\frac{\text{Degree of Turn}}{360} * \text{Big Circumference} = \text{Arc Segment}$$

**4. Figure Out wheel rotations needed to travel arc segment:**

$$\frac{\text{Arc Segment}}{\text{Wheel Circumference}} = \text{Rotations}$$

**5. Change Rotations to Degrees for Motor Block:**

$$\text{Rotations} * 360 = \underline{\hspace{2cm}} \text{ (Degrees)}$$

**6. Decide which wheel to rotate:**

Turning Left -> use wheel on right side of robot  
Turning Right -> use wheel on left side of robot

**Point Turn (In 5 easy and fun steps!)**

**1. Figure out the circumference of the Wheel:**

$$\text{Circumference} = 3.14 * \underline{\quad 5.6 \text{ cm} \quad} \text{ (Diameter)}$$
$$\text{Circumference} = \underline{\hspace{4cm}}$$

**2. Calculate the Circumference of the big circle the robot would make if it turned all the way around in a point turn.**

$$\text{Big Circumference} = 3.14 * \text{Distance Between Robot Wheels}$$

**3. Calculate the arc segment the robot wheel has to travel to make the swing turn:**

$$\frac{\text{Degree of Turn}}{360} * \text{Big Circumference} = \text{Arc Segment}$$

**4. Figure Out wheel rotations needed to travel arc segment:**

$$\frac{\text{Arc Segment}}{\text{Wheel Circumference}} = \text{Rotations}$$

**5. Change Rotations to Degrees for Motor Block:**

$$\text{Rotations} * 360 = \underline{\hspace{4cm}} \text{ (Degrees)}$$

**6. Decide which wheels to rotate:**

Turning Left ->  
Right wheel forward Number of Degrees, Left wheel backward Number of Degrees.  
Turning Right ->  
Left wheel forward Number of Degrees, Right wheel backward number of Degrees.