Learning Edison

-

Individual Packet

Background

1. **Edison Demo**
   - Demo what the Edison can do with barcodes and a little arena.
     i. Show students what the Edison can do to get them interested. Programming is boring if you don't know ***why*** you are doing it or what you can do with it.
     ii. Barcodes let the Edison scan a specific program and run it.
     iii. The barcodes are cool for demonstrating what the robot can do, but aren't really programming. The students will learn how to recreate some of the tasks the barcodes do, but they will be using EdWare programming instead.

2. **What does the Edison Look Like?**
   - See pictures and schematics

3. **What can the Edison do?**

   - **Take input (Use sensors to sense something):**
     i. Detect obstacles on front, left, or right.
     ii. Pause programming until an event happens or until a set amount of time passes. Use this to tell Edison how long to drive forward, or turn, etc.
     iii. Detect Clap
     iv. Determine when the robot is on reflective (white) or a non-reflective (black) surface. This allows the Edison to follow a line

   - **Send an Output (Do something in response to anything):**
     i. Control Two Independent Motors to Drive forward/backward/turn with different speeds
     ii. Play Sounds/Songs (a single note or several notes in succession). Songs are limited to about 16 notes at a time
     iii. Flash LED (lights)
     iv. Change variables in its memory, do basic math and number comparisons

4. **How you can combine Edison capabilities to do many things:**

   Edison can use a combination of its sensors and its internal clock to accomplish many things. For example, you can program the robot to bounce in between the borders of a black line square by using an "if" statement to turn around by some number of degrees (determined by the speed and time the motors will rotate) if it sees the non-reflective (black) line and to drive forward if it doesn't see the line.

    A few examples:
   - Bounce in between borders of dark lines
   - Play a song when it passes an obstacle or hears a clap
   - Follow a line until it sees an obstacle, then turn around and follow the line the other way
   - Speed up when it passes an obstacle or when you clap
   - Go around a track a certain number of times
   - Follow a line and change directions when you clap.

5. **Getting Started with Edison**
   - EdWare Lesson Plans has excellent introductory information. We will be going over <u>some</u> of their lessons. The full collection is available at the following website
     i. https://meetedison.com/wp-content/uploads/2015/04/Your-EdVenture-into-Robotics-10-Lesson-Plans.pdf

Name: _____

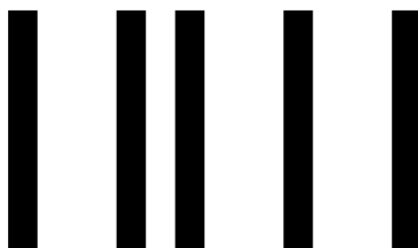# Lesson 1 Worksheet 1.2 – Barcode programming

Reading the barcode

1. Place Edison facing the barcode on the right side
2. Press the record (round) button 3 times
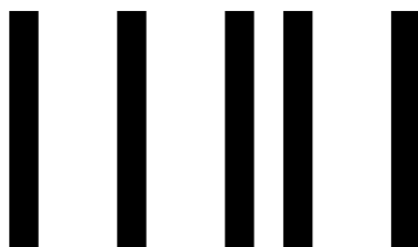3. Edison will drive forward and scan the barcode

Barcode - Clap controlled driving
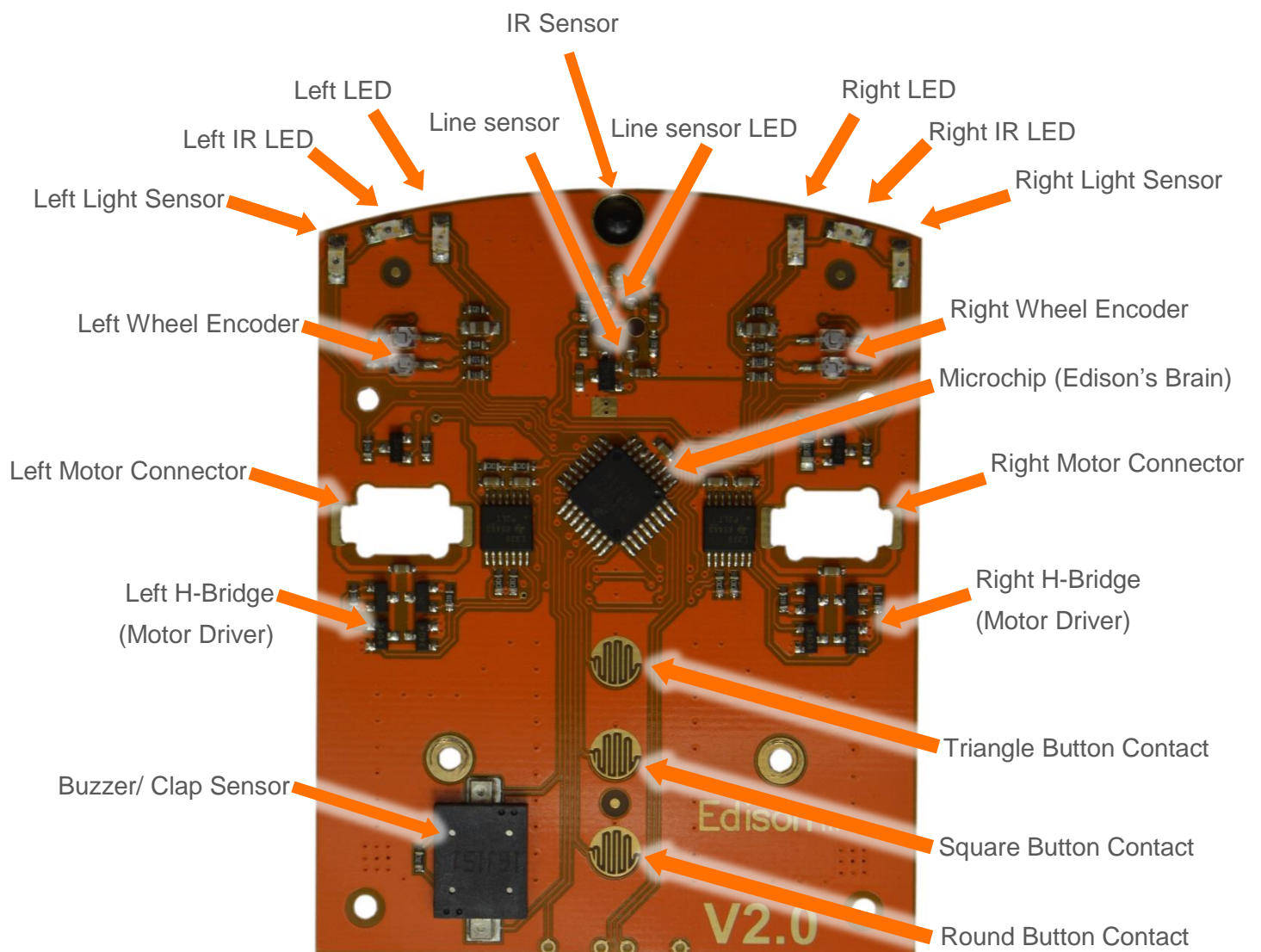
Barcode – Avoid obstacles

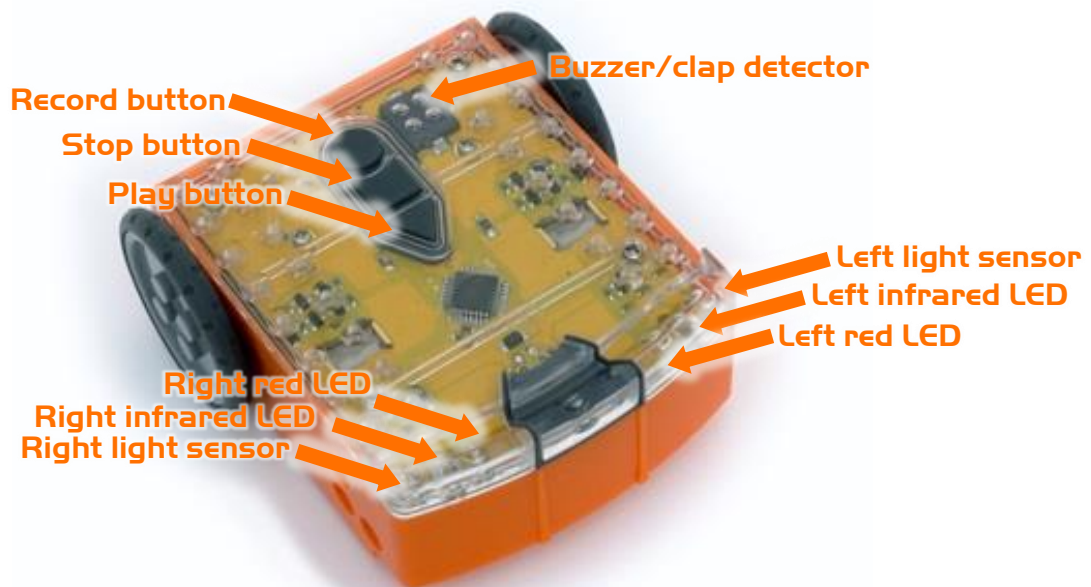Barcode – Line tracking

Barcode – Follow torch

Motherboard layout

IR Sensor

Left LED

Line sensor

Line sensor LED

Right LED

Left IR LED

Right IR LED

Left Light Sensor

Right Light Sensor

Left Wheel Encoder

Right Wheel Encoder

Microchip (Edison's Brain)

Left Motor Connector

Right Motor Connector

Left H-Bridge
(Motor Driver)

Right H-Bridge
(Motor Driver)

Triangle Button Contact

Buzzer/ Clap Sensor

Square Button Contact

Round Button Contact

Meet Edison (Worksheet 1.1)

You will need to be familiar with Edison and know where all the sensors are and what the three buttons do. A labeled image of the Edison and its sensors is shown below.

Get to know Edison's sensors and buttons

Play button (Triangle) – Start program (Triangle)
Stop button (Square) – Press to stop a program
Record button (Circle)– 1 press = download program, 3 presses = read barcode

Edison's line tracking sensor is made up of two parts a red LED light and a light sensor.

The line tracking sensor also reads special barcodes that activate pre-installed programs.

Edison's power switch and line tracking sensor

The EdComm cable is used to download your programs to Edison. It connects into the headphone socket on your computer or tablet.

EdComm programming cable

LESSON 1: GET FAMILIAR AND SET UP

Technology skills – Students familiarise themselves with the programming environment and how to download a program to the robot.

Before we can use Edison we need to get a few things ready.

Get Edison ready

Ensure the batteries are the right way

Open the battery compartment and remove the programming cable. Now insert 4 'AAA' batteries. Refer to the image to ensure that the batteries are the correct way around and clip the battery cover on.

Turn Edison on by sliding the power switch to the on position. Edison's red LED lights will now start flashing.

Edison is ready to go!

Push the switch towards the on symbol

Connect the EdComm cable to the headphone socket on the computer or tablet and turn up the volume to full. Plug the other end of the EdComm cable into Edison as shown.


To download the test program follow these steps:

1. Press Edison's record (round) button once

2. In EdWare press the 'Program Edison' button and then 'Start Download'

3. Remove the cable from the Edison and put the Edison upright

4. Press Edison's play (triangle) button to start the program

The program goes from the computer/tablet through the cable to the Edison robot. The cable converts the sounds from the headphone jack into light, which the robot receives and stores the program in its memory.

Lesson 3 Activity sheet 3.1 – Turning

START 0°

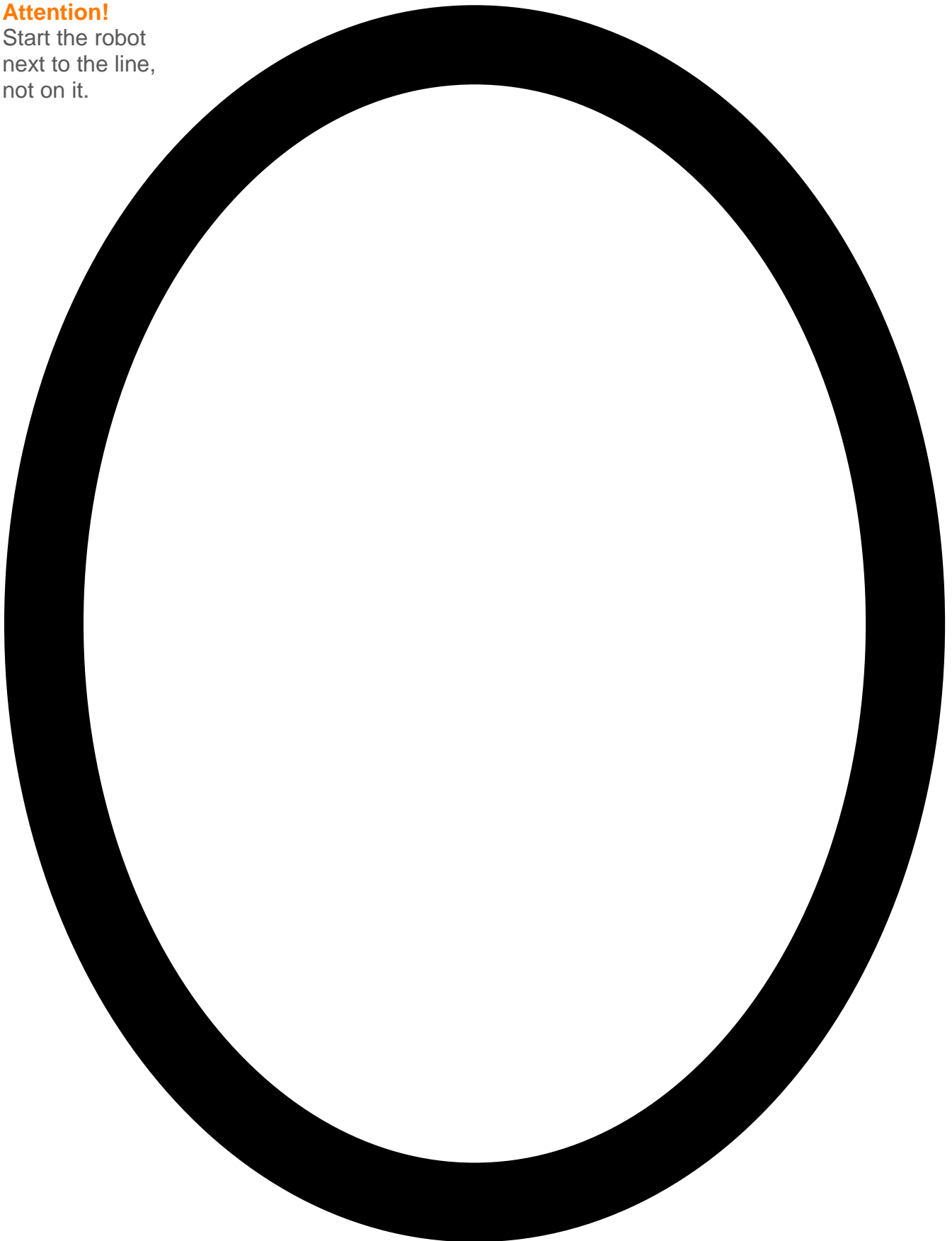90° right turn

90°

180° left turn

END 180°
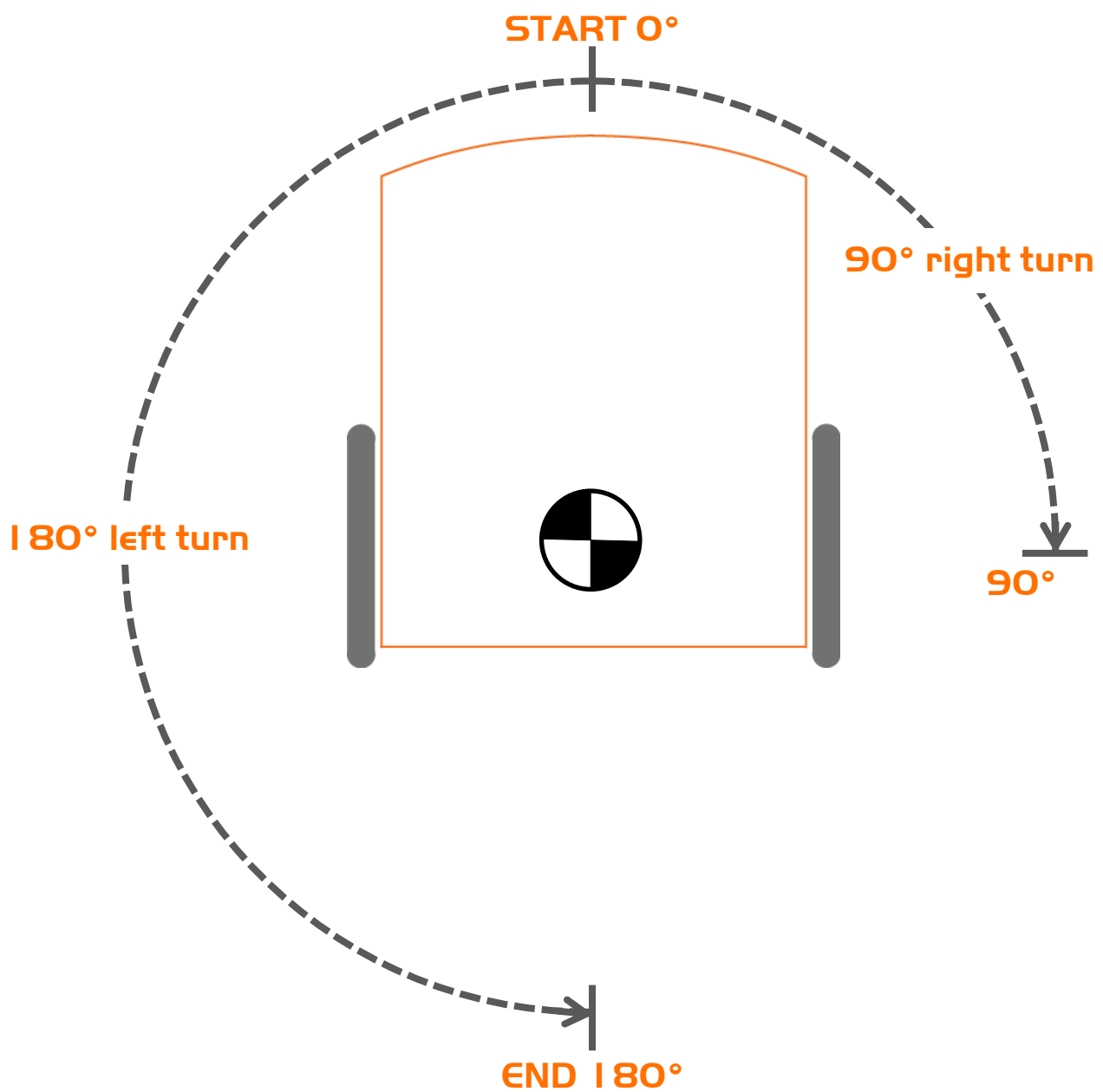
Name: _____

Lesson 8 Activity sheet 8.2 – Line tracking sensor

Challenge Problem

Come up with a program to have the Edison follow the circle track, but turn around and drive the other direction if an obstacle is encountered. The robot should beep and light up both LED's temporariliy when the obstacle is detected.

Extra Information

Collection of EdWare resources (from EdWare website):

https://meetedison.com/robot-programming-software/edware/

What Edison <u>can't do</u> that students will likely have to figure out:

- Figure out the right speed and time for the motors to turn to make a 90 degree spin. It doesn't have a specific angle control. This also depends on how much friction there is on the surface the robot is driving on. Make sure the students/teachers find the right time and speed to turn the robot 90 degrees while the robot is on the same material as the track they will be testing it on.
- Move a specified distance. Students will have to figure out the actual speed (maybe inches/second) for each speed setting (0-10) and use the distance to calculate the time to drive forward if they want to move an exact distance.

Edison Performance Tips, Tricks, and Notes (Gained from Personal Experience) :

- Permanent marker on white paper works well for <u>making a line-following track</u>, if you use the line tracker block on nonreflective surface
- <u>Edison can't follow really tight curves very well</u>, and driving faster makes it worse. Recommendations for line thickness is a black line about 0.6 inches thick.
- Edison reads a light value on the sensor as soon as a line-following program starts and uses it as a comparison for a white surface, so <u>make sure it's on a white surface to start before following the line</u>. The Edison should start off of the black line (next to it) and turn to the line when the program starts. See the following page for more information:
  - https://meetedison.com/forum/edware-graphical-programming/line-tracking-problem/
- Noticed some funny behavior in the Edison that didn't make any sense with the program that was running. Changing the batteries helped, so perhaps <u>failure of the Edison to run programs as commanded may be due to low-battery</u> power
- The Edison <u>robot turns and drives faster on smoother surfaces</u>, even with the same time and speed settings. Make sure students anticipate the environment the robot will be in before programming motor movements too carefully
- You can set how close an object has to be to the Edision for it to register as an obstacle by <u>setting the sensitivity on the obstacle detector</u> (see page 44 of EdWare Lesson Plans).

- <u>Switching directions when following a line</u> is a little bit more complicated than one might imagine. When you want to turn around and follow the line the other way, make sure the robot turns a few degrees (maybe 60 degrees of a turn) in the direction that the robot will turn when it is not over the line. This small turn is just enough to put the line sensor past the line it was previously scanning. The robot will now rotate as part of the "line-following" loop until it is facing 180 degrees backwards. Make sure not to pass the line with the turnaround command, otherwise it will continue turning around and face the same direction it originally came from.

Additional Thoughts:

- EdPy is an excellent (and free) way to get older or more experienced students interested in programming. It is based on Python programming language. Make sure the interested students know Python is a free programmig language that is WIDELY used for many things in many fields (making simple video games, programming robots, control systems, many types engineering, etc.). Knowing this is a good way to motivate interested students to get into programming using a language