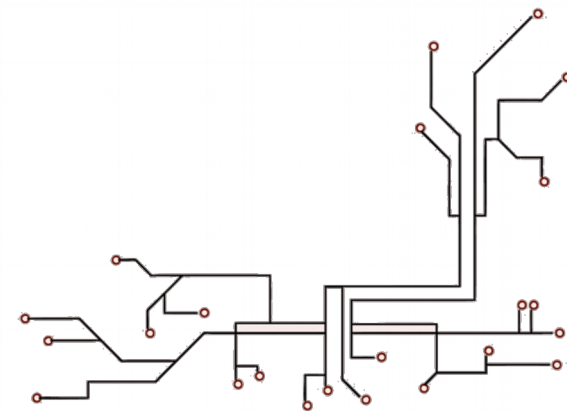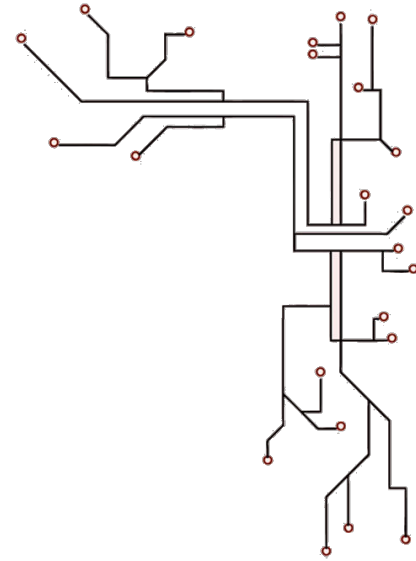# 2-Wheel Robots
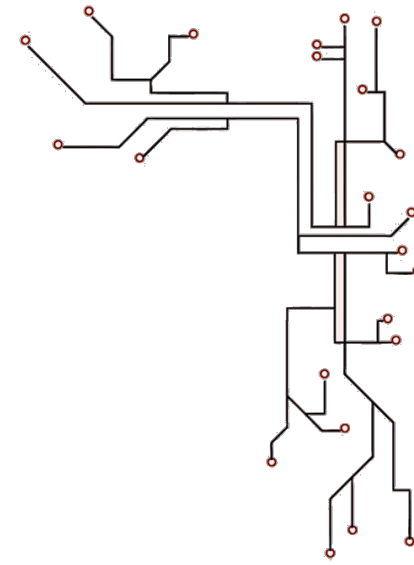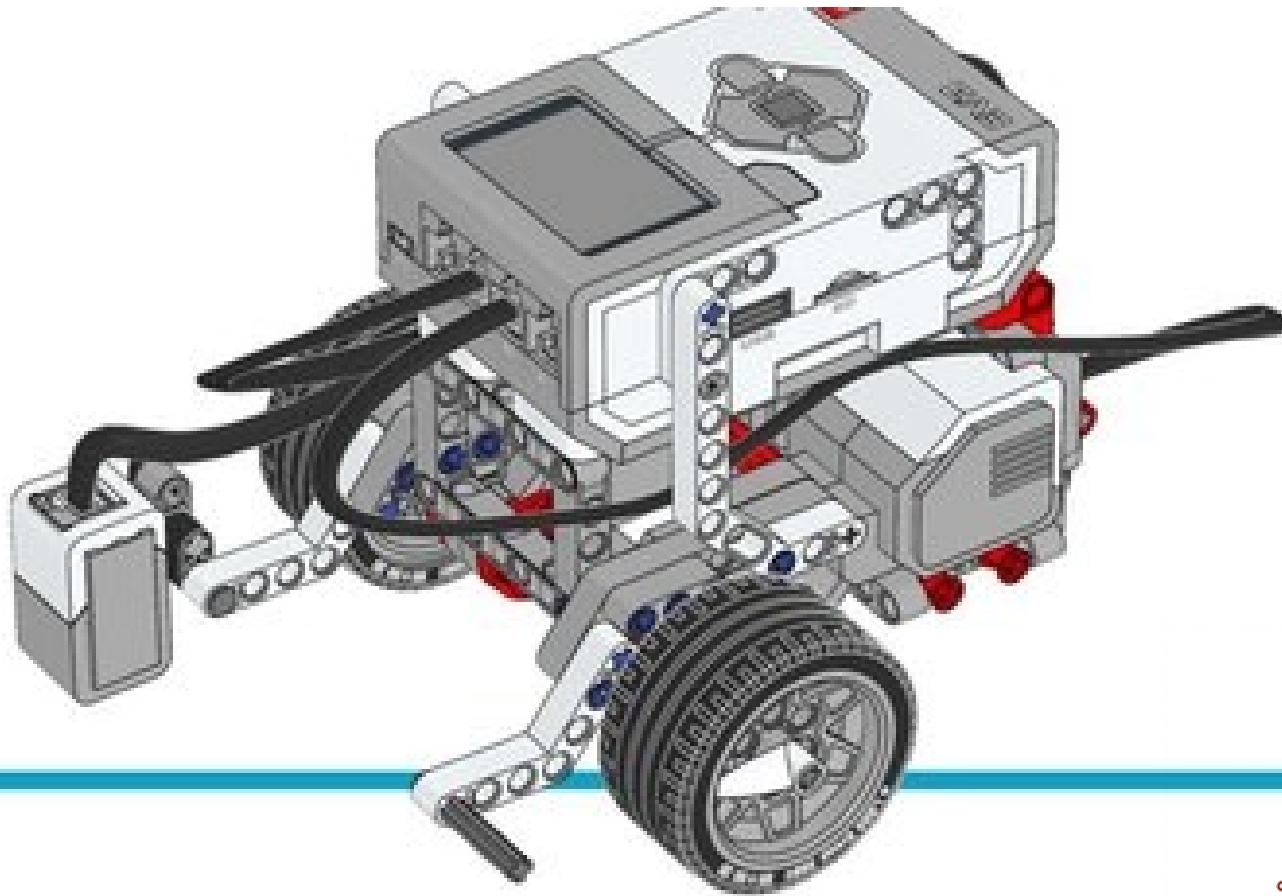
- 2-Wheel Robots (Review)

- Robot Educator Build (Finish)

- EV3 Ports (Input/Output)

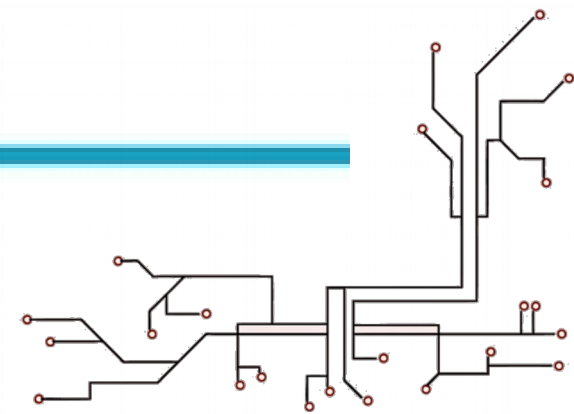- Mini-Challenge: Travel Distance

A POSTERIORI
Play · Experience · Learn

EV3 Robot Educator

Review 2-Wheel Drivetrain

A POSTERIORI
Play · Experience · Learn
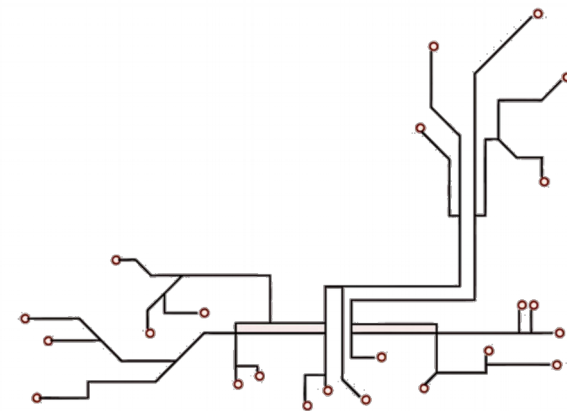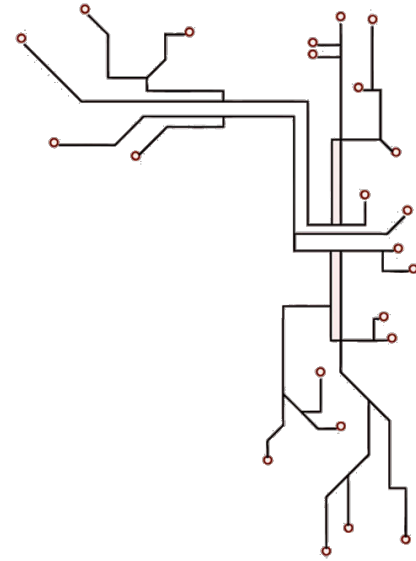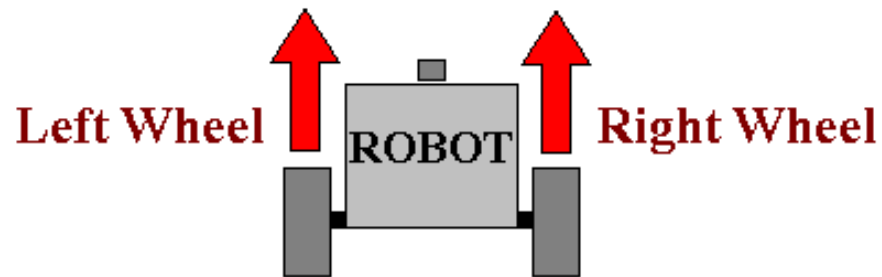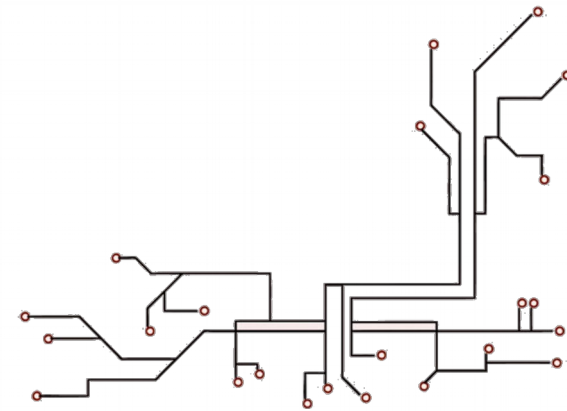
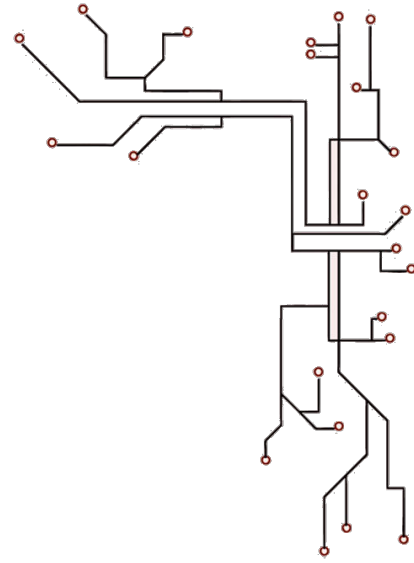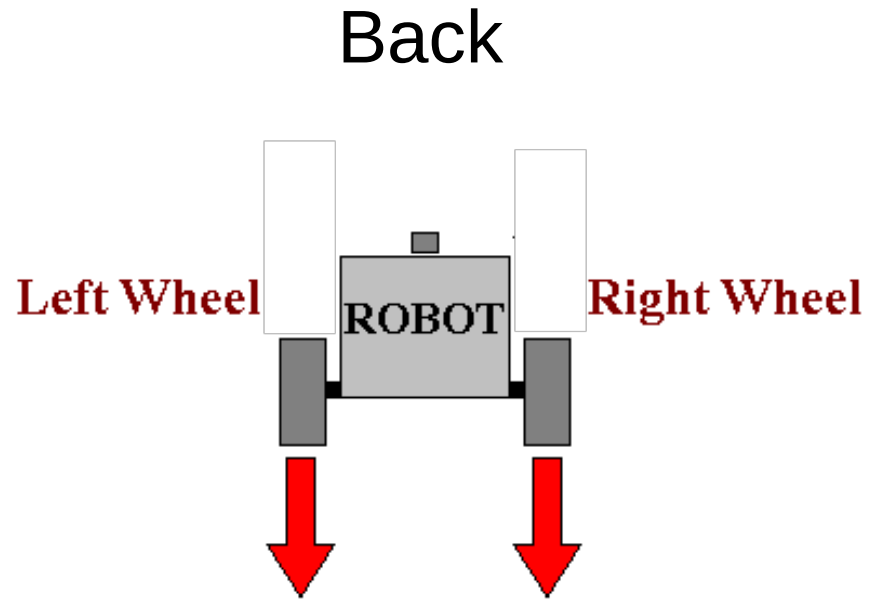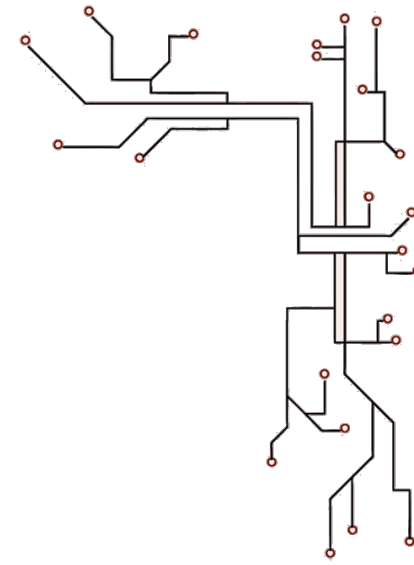# 2-Wheel Differential Drive

Forward

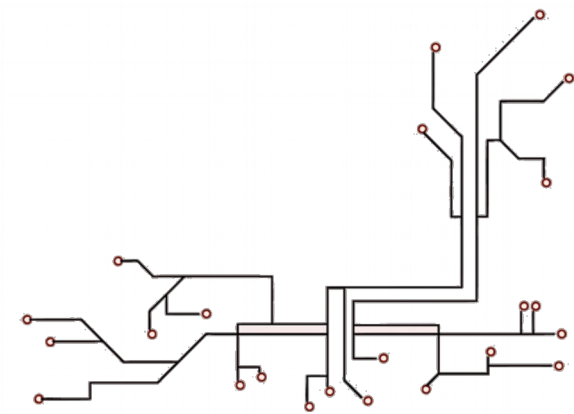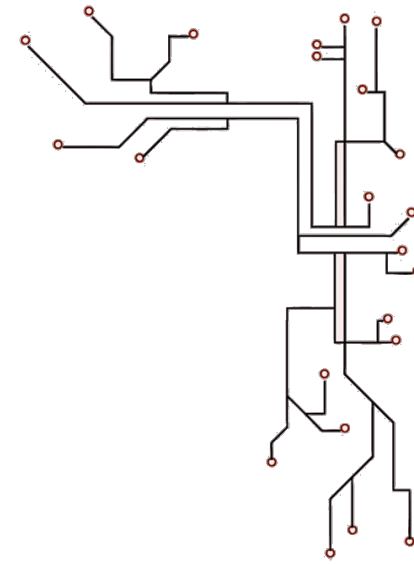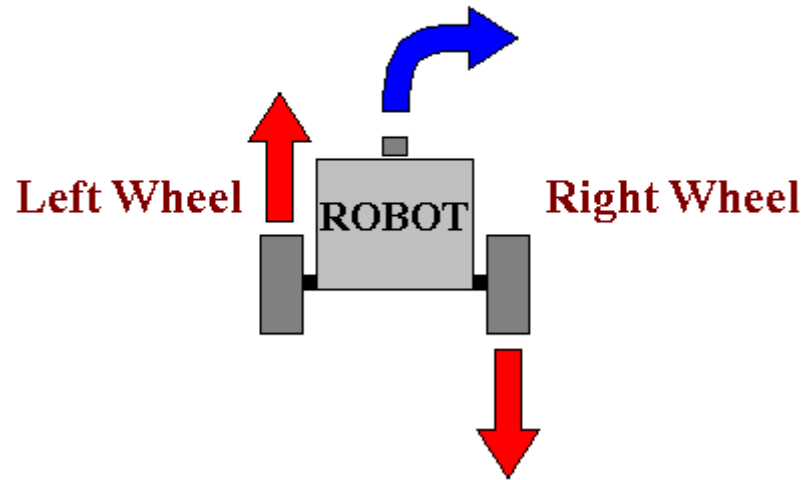Left Wheel ROBOT Right Wheel

A POSTERIORI
Play · Experience · Learn

2-Wheel Differential Drive

Back

Left Wheel   ROBOT   Right Wheel

2-Wheel Differential Drive

Left Turn

Left Wheel Reverse

ROBOT

Right Wheel Forward
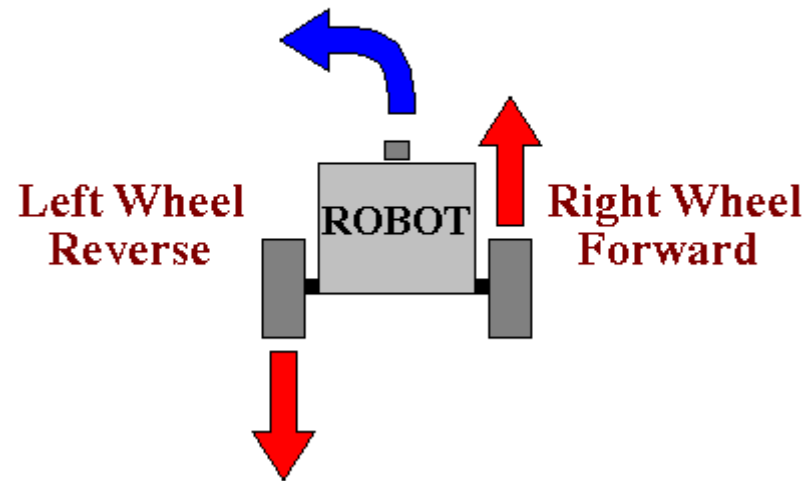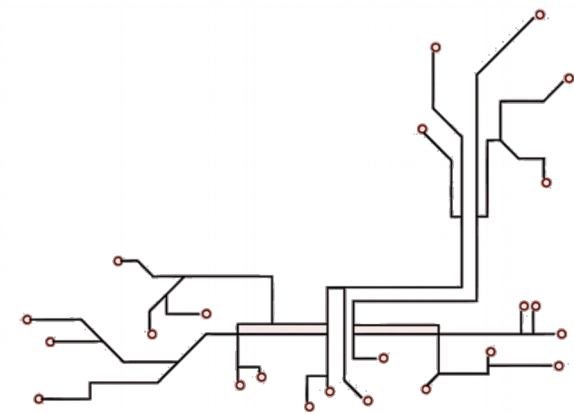
2-Wheel Differential Drive

Right Turn

Left Wheel · ROBOT · Right Wheel

2-Wheel Differential Drive

What is the
expected behavior?

Left Wheel ROBOT Right Wheel

Faster   Slower

A POSTERIORI
Play · Experience · Learn

EV3 Robot Educator

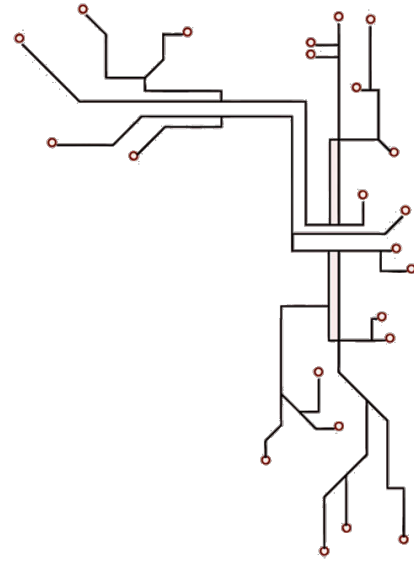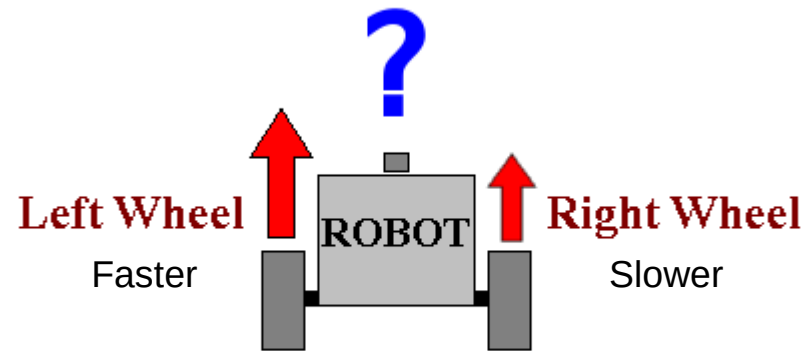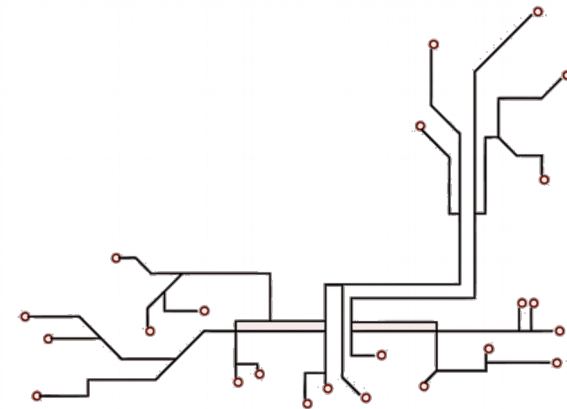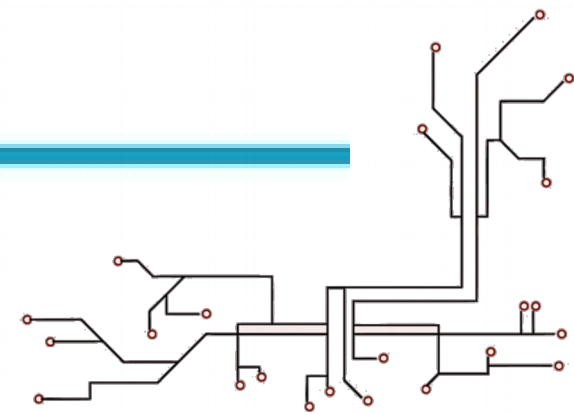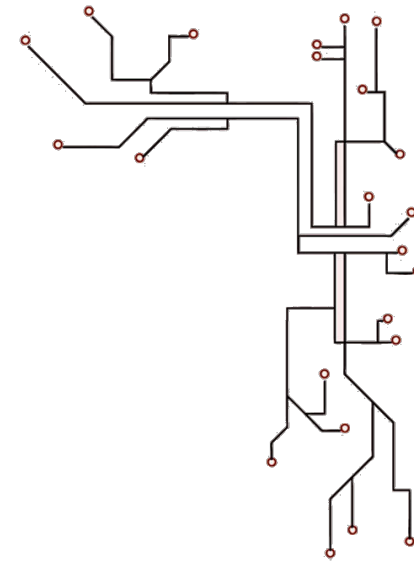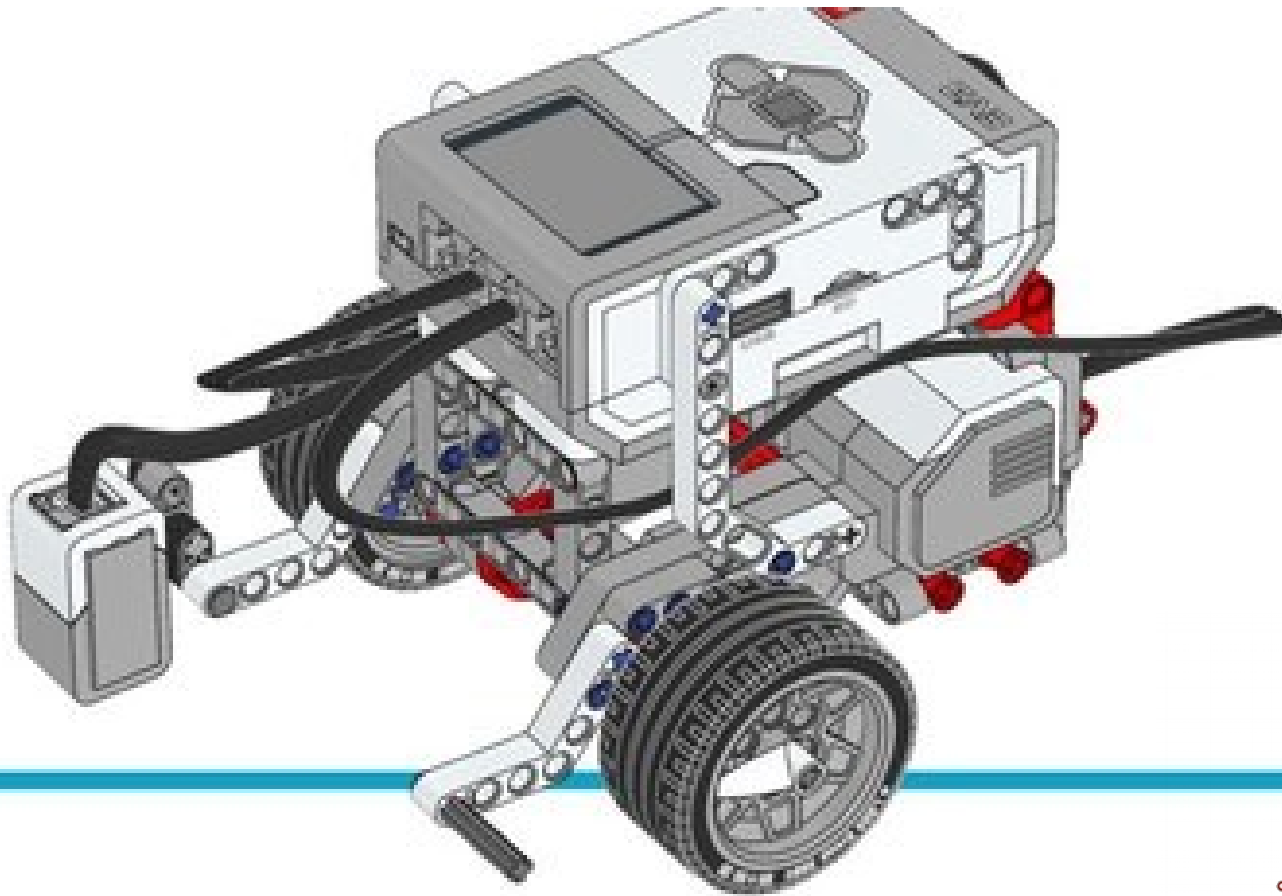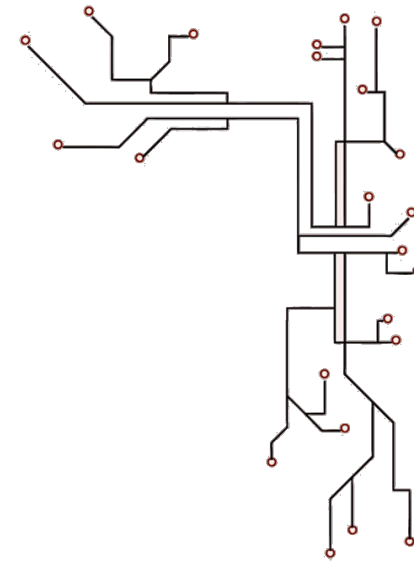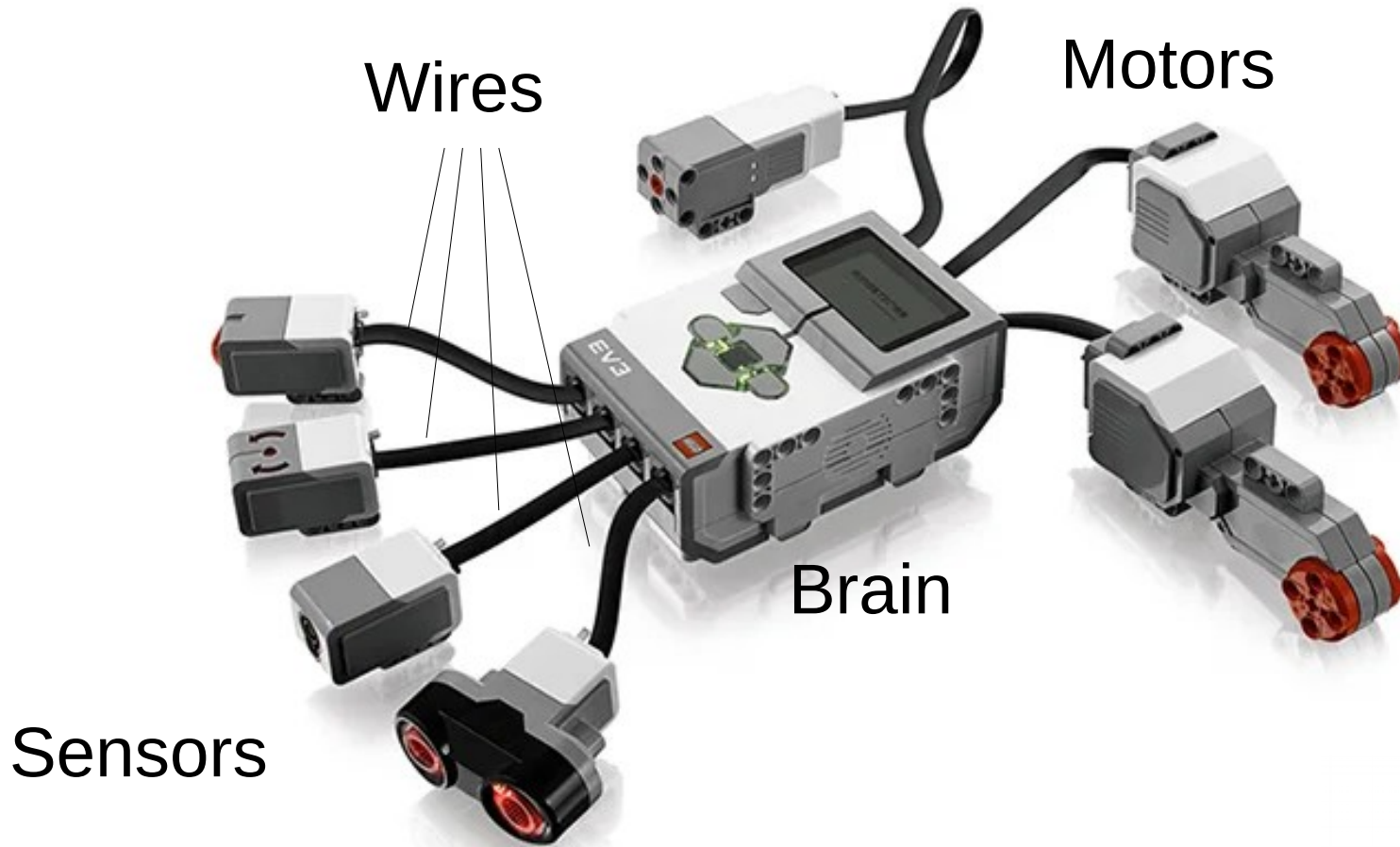Let's Finish the Build!!!
(wires & all)

A POSTERIORI
Play · Experience · Learn

Inputs/Outputs

Wires

Motors

Brain
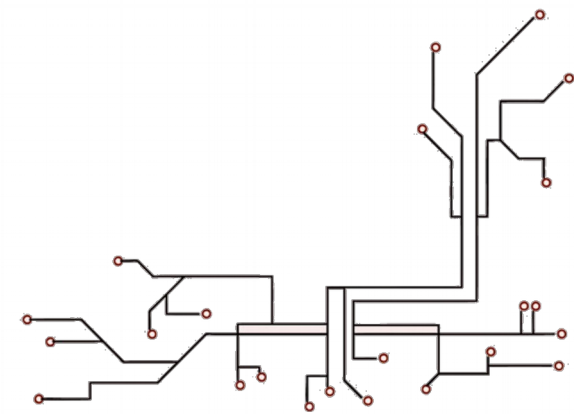
Sensors
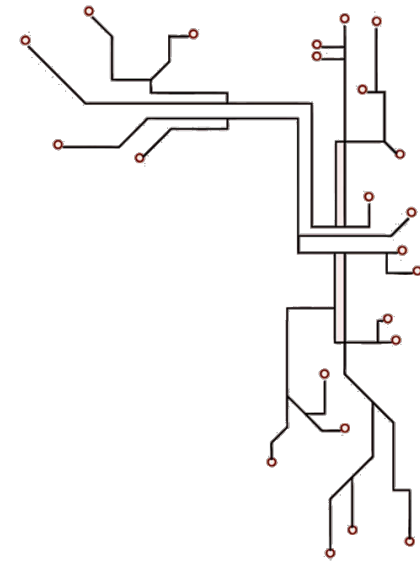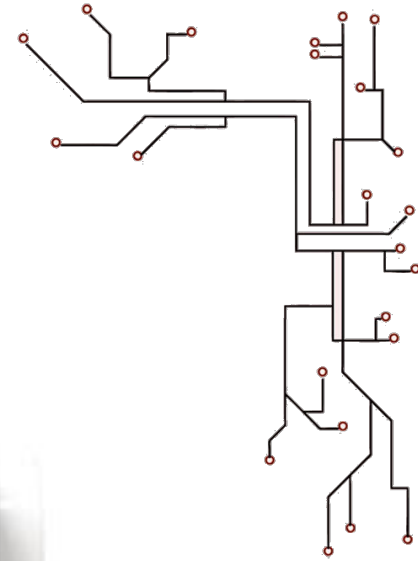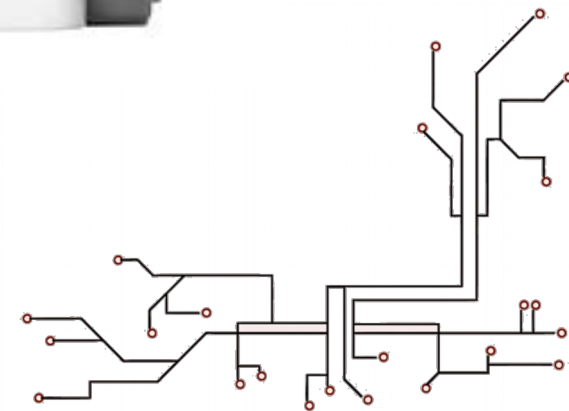
Outputs – Motors

**Letter
Ports
A – D**
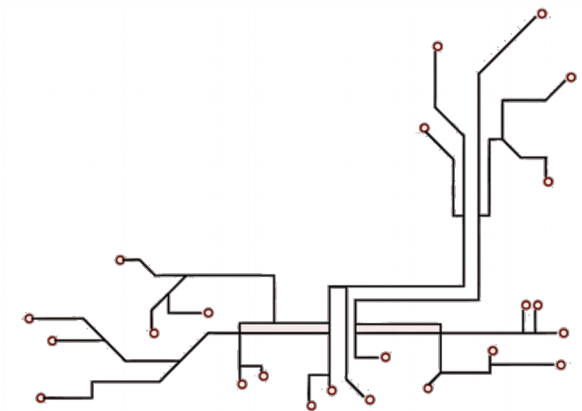
Inputs – Sensors & Buttons

Number Ports 1 – 4

Outputs – Motor Control

Which Motors Ports, A – D,
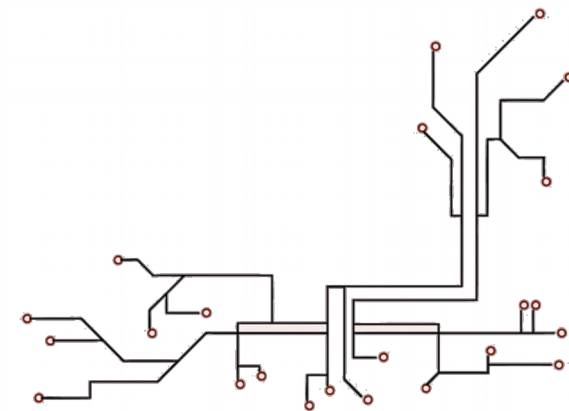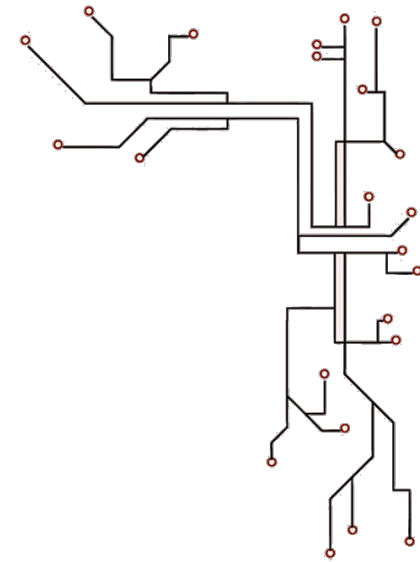Should you Connect for Two-Wheel
Drive?

**Many Possible Combinations…
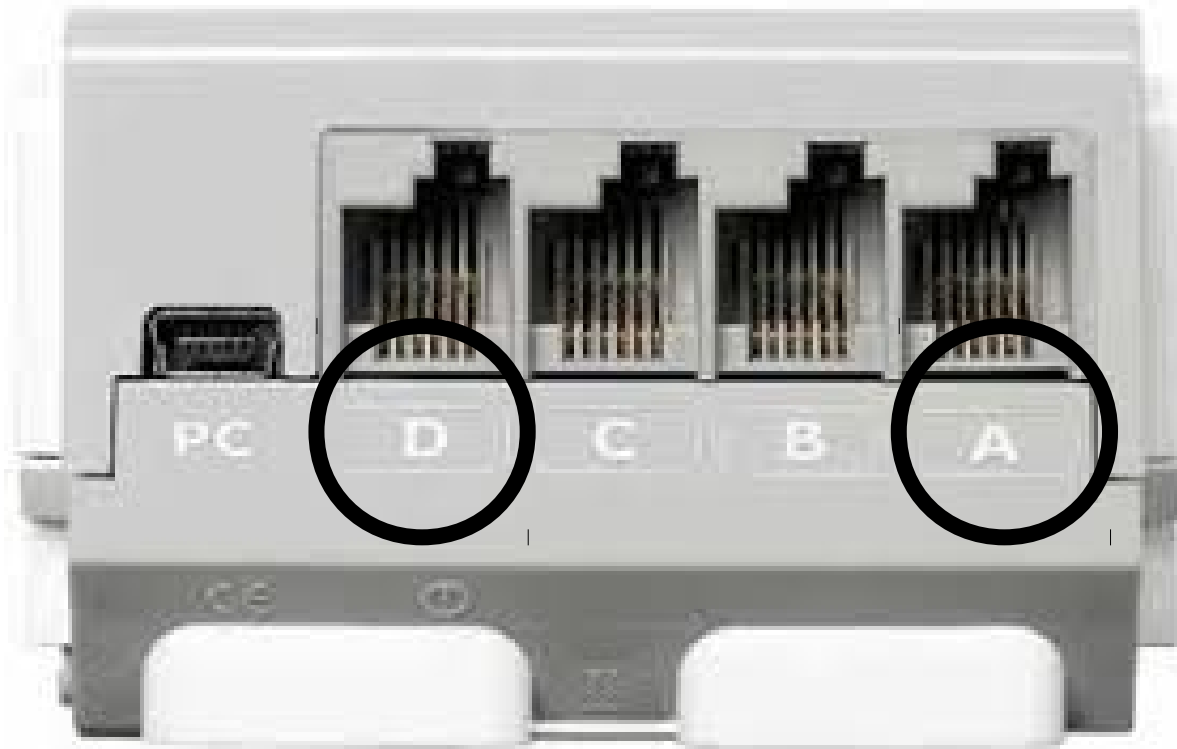No Right Answer...**

Common Usage:
A + D
OR
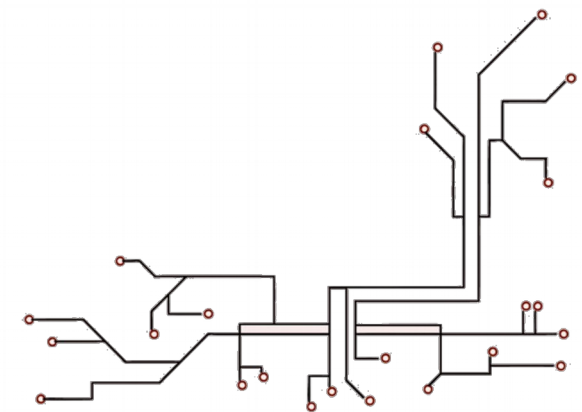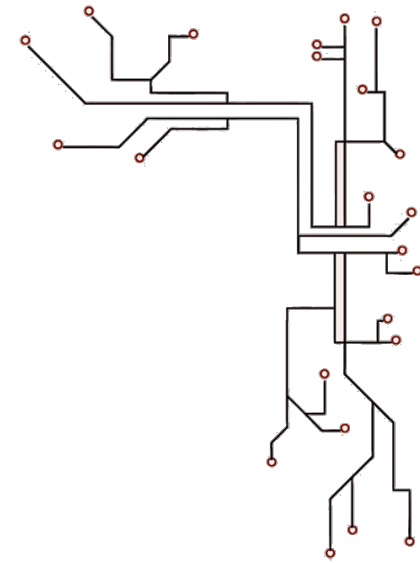**B + C**

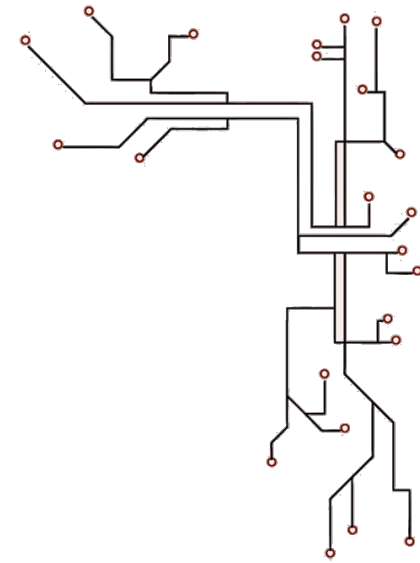# Outputs – Common Combo 1

A & D

Outputs – Common Combo 2

B & C
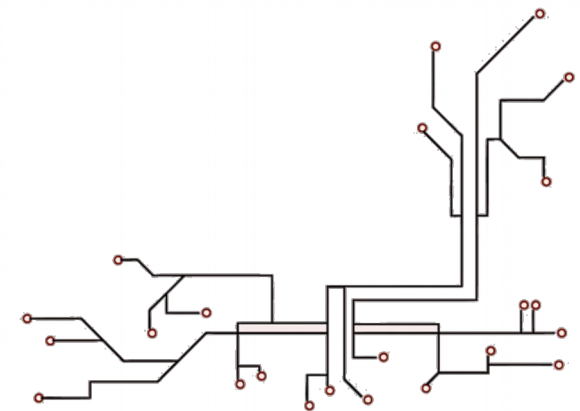
Turn On Your EV3 Brick

Press and hold the **Center Button**.

Make sure you inserted a charged **battery**!

Outputs – Motor Control
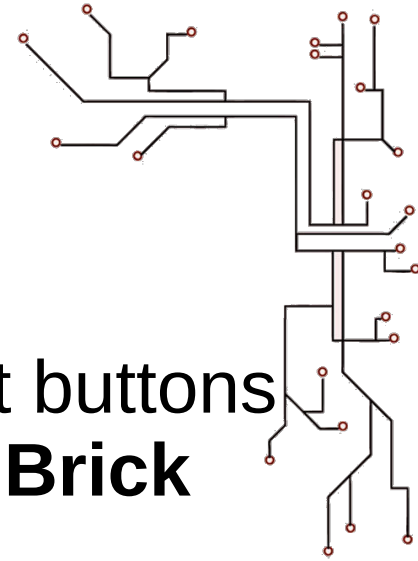
Use left/right buttons to move the **Brick Apps Tab**.

Select **Motor Control App** to test the motors, your build, and differential driving.

Outputs – Motor Control

Press Center
Button to Switch
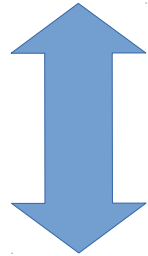
You can switch
between
A&D
and
B&C
Control.

We will use **A&D**
for our examples.

A_POSTERIORI
Play · Experience · Learn

Outputs – Motor Control
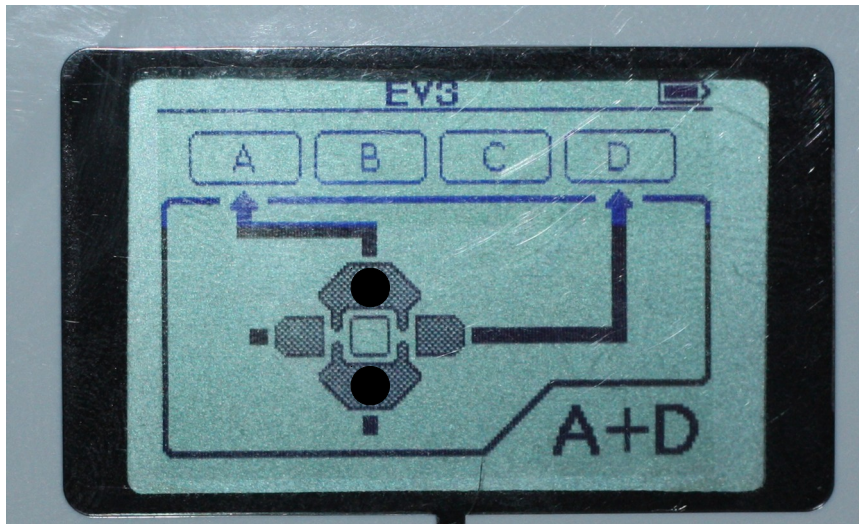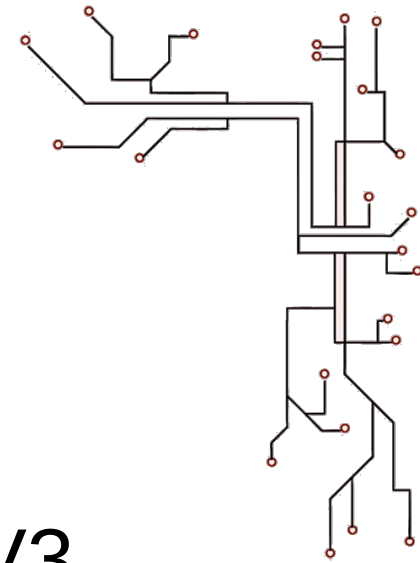
These two EV3 buttons will control the motor plugged into **Port A**
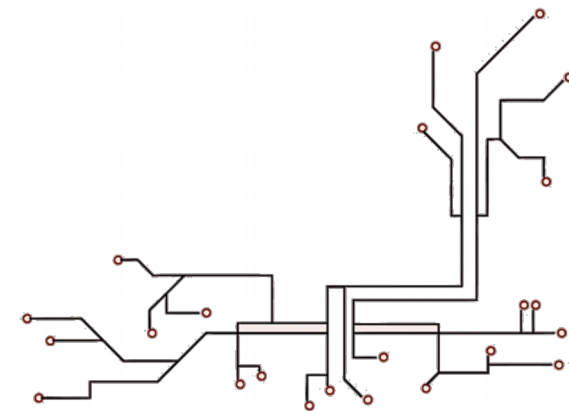
Outputs – Motor Control

These two EV3 buttons will control the motor plugged into **Port D**

Outputs – Motor Control

Test that
Fwd A & Fwd D
run both motors
forward, and the
robot drives
forward.

A POSTERIORI
Play · Experience · Learn
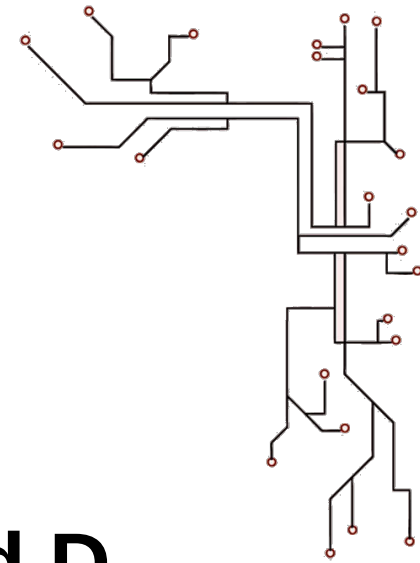
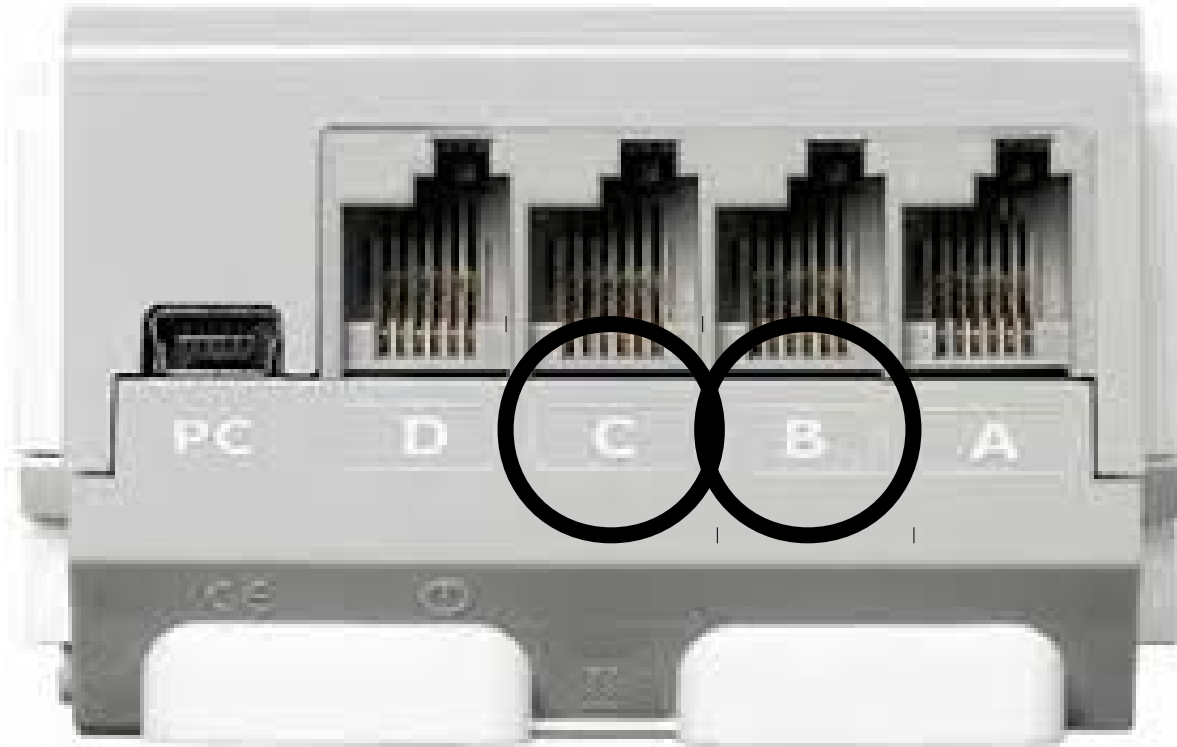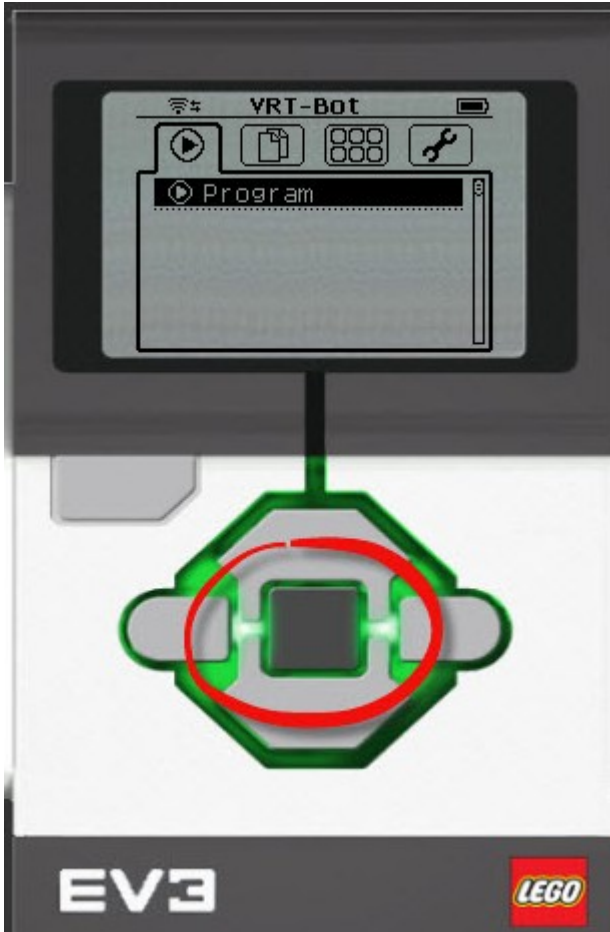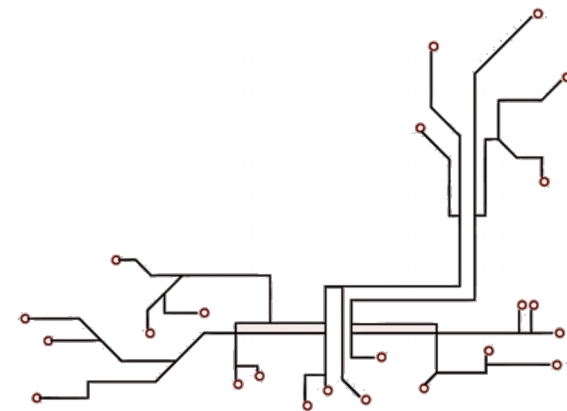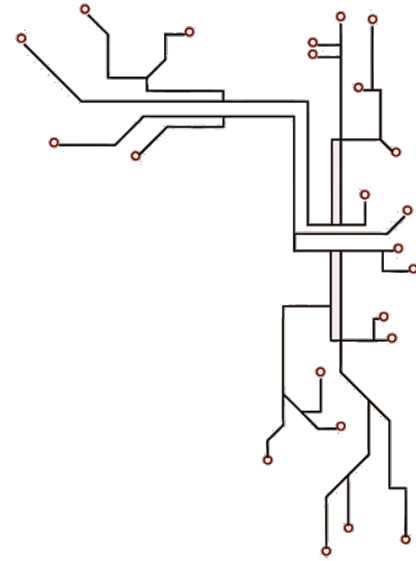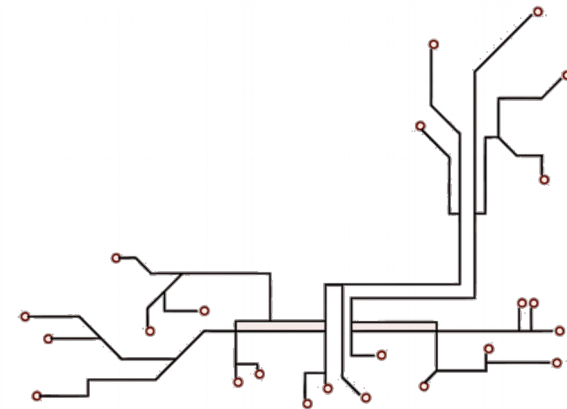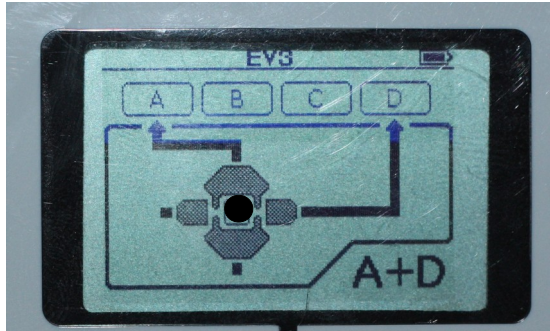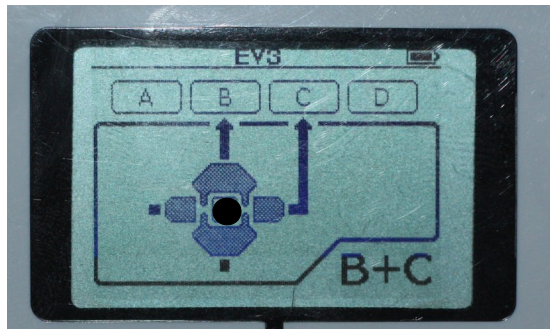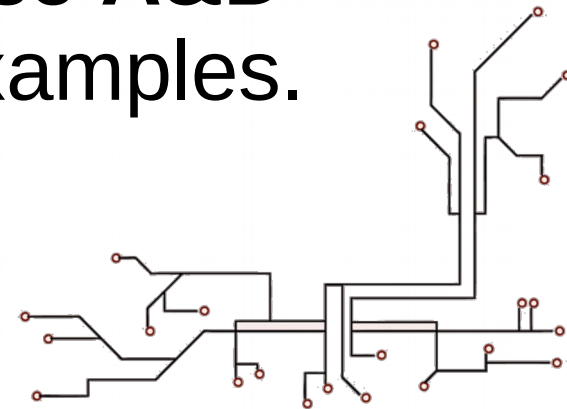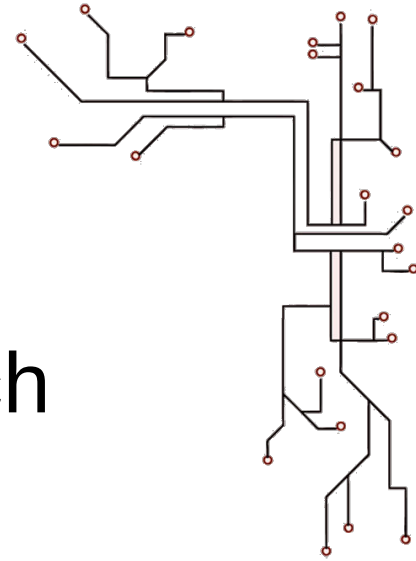# Outputs – Motor Control

Test that
Back A & Back D
run both motors
back, and the
robot drives
backwards.
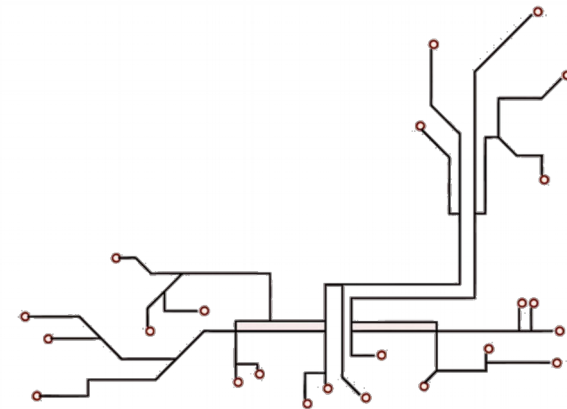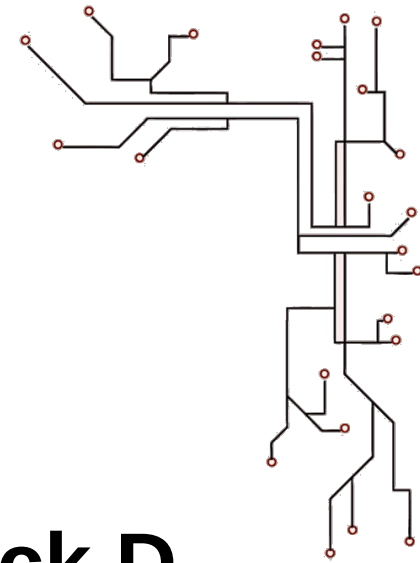
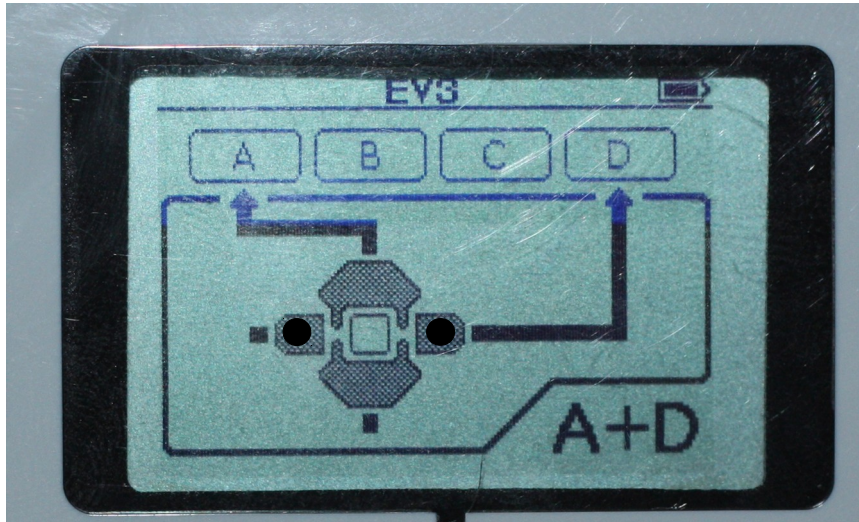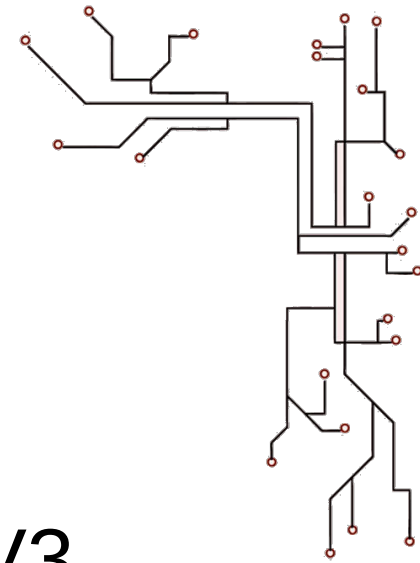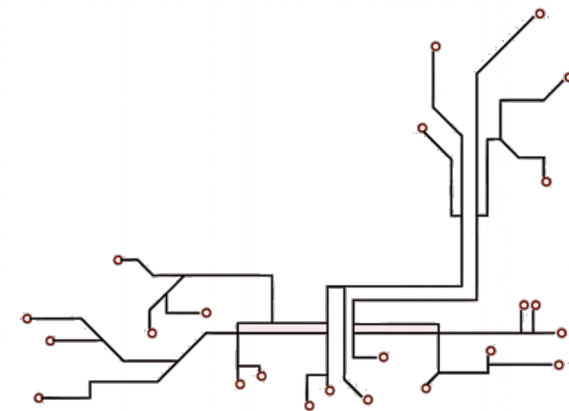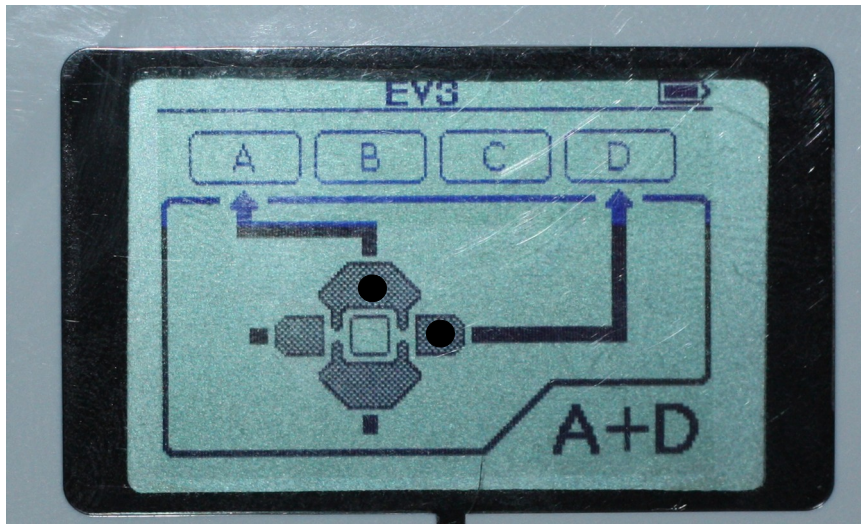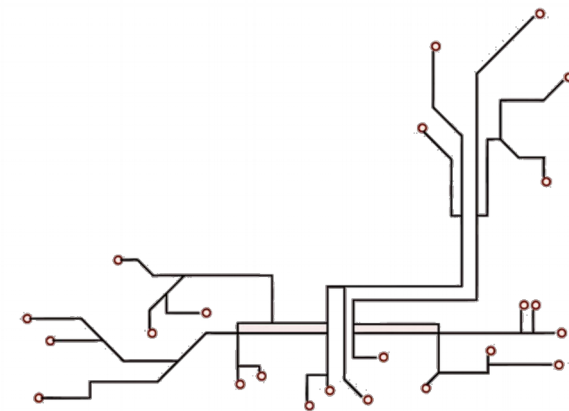# Outputs – Motor Control
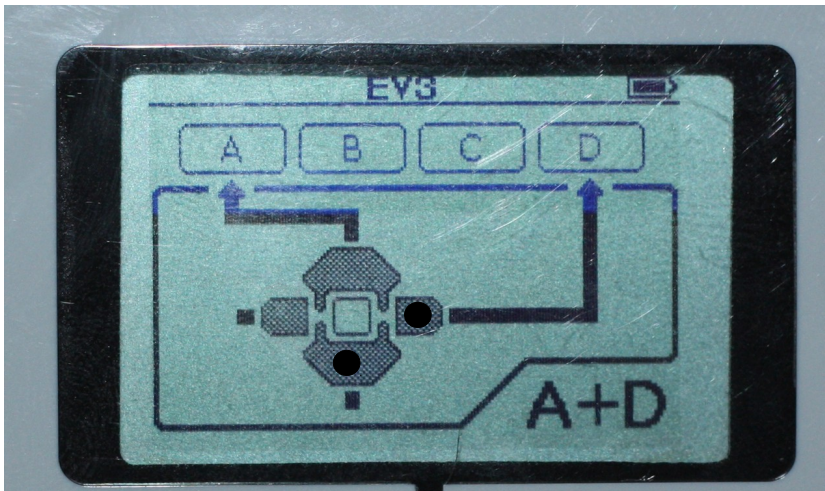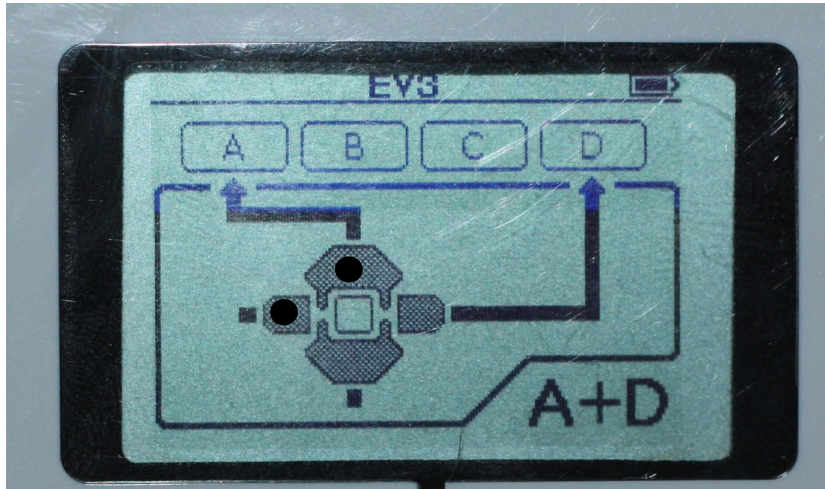
Test that
Fwd A & Back D
run motors in opposite directions, and the **robot turns in place**.

Note which direction the robot turns - should be to the right if A is connected to left motor).

Test that the opposite works as expected.

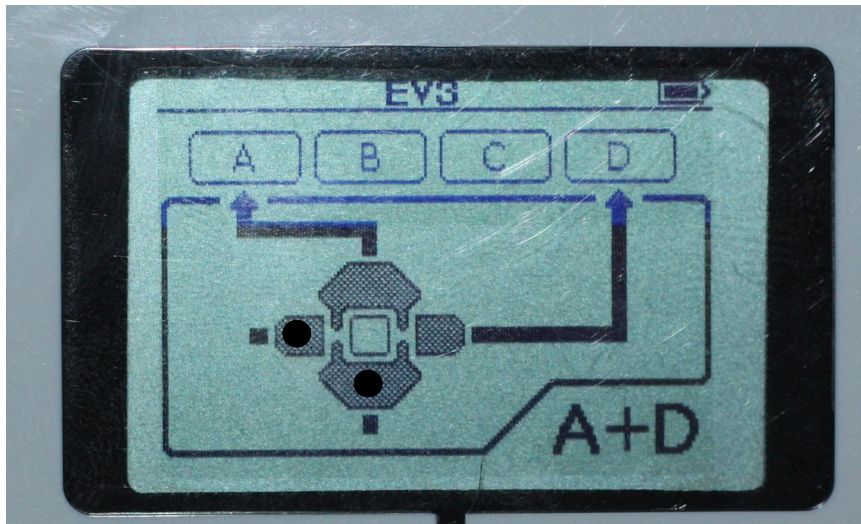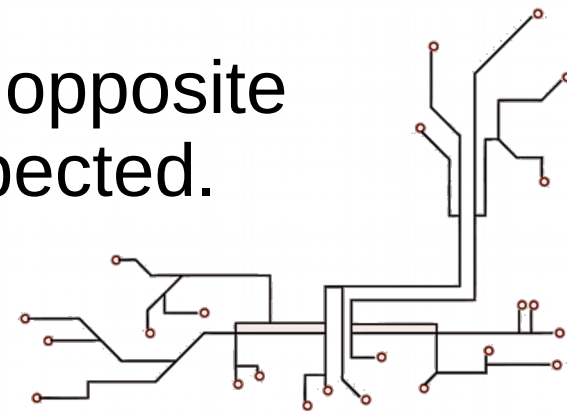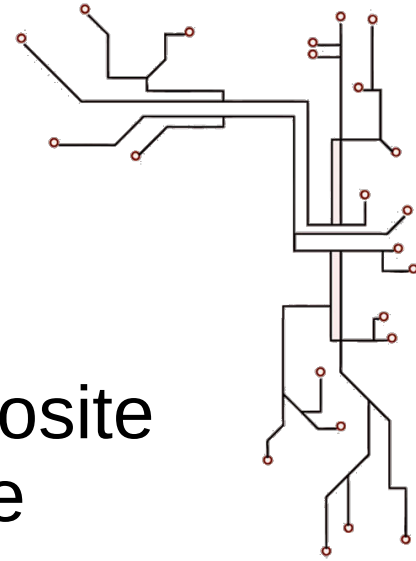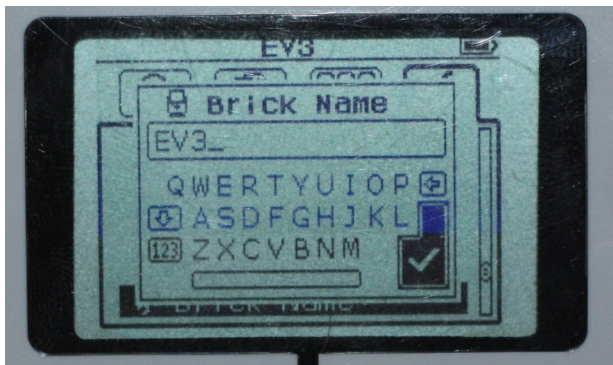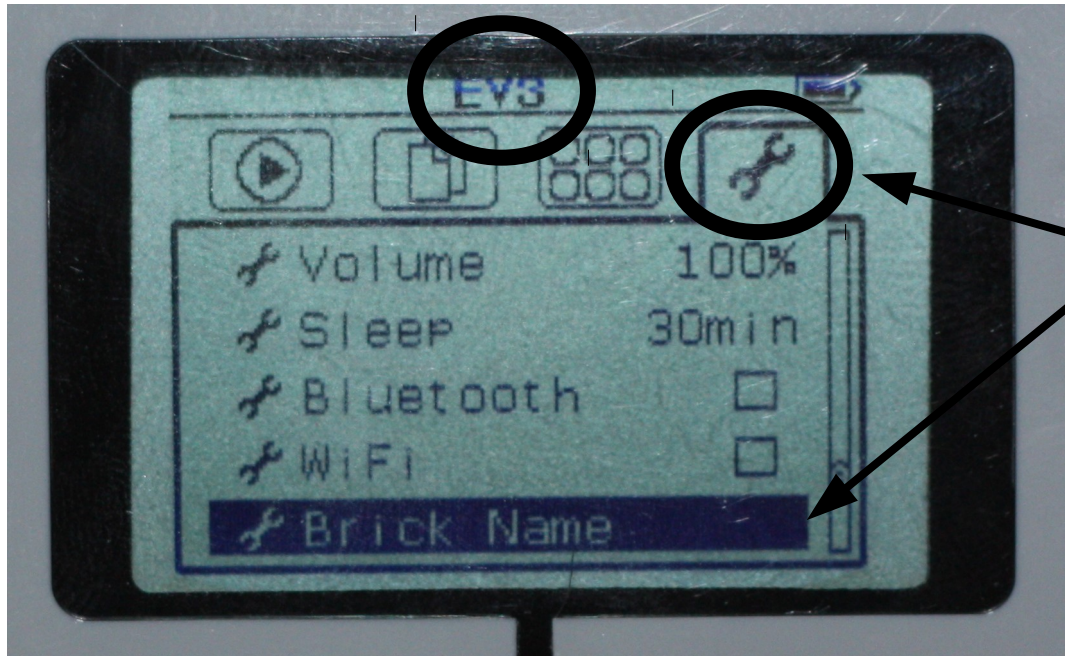# EV3 – Name Your Brick

Before we connect our EV3 to the PC and start coding, let's name our Bricks under Settings.

Use a **<u>unique</u> name you will remember**.

NOT "EV3".
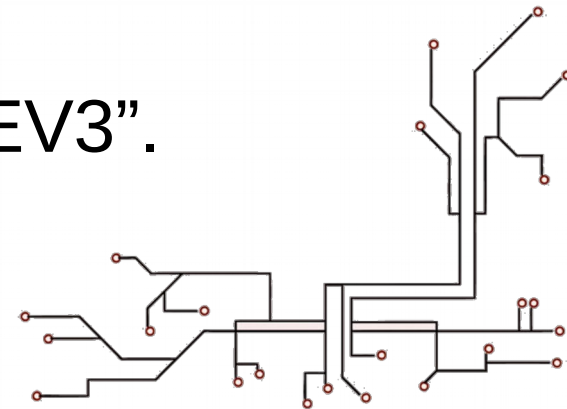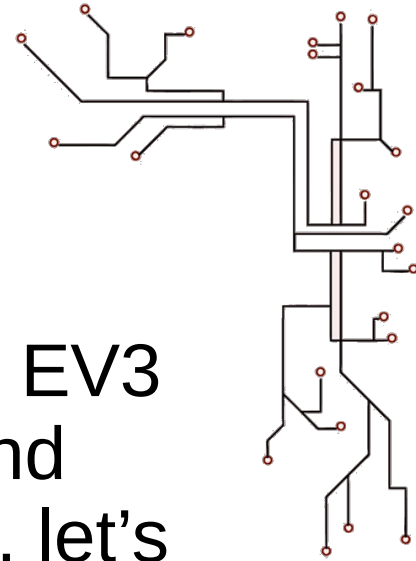
EV3 – Name Your Brick

New Name
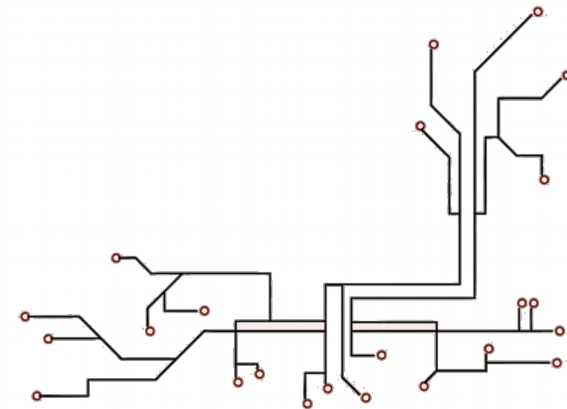
EV3 – Turn on Bluetooth

Now let's make sure Bluetooth is turned on.

This box should be checked.
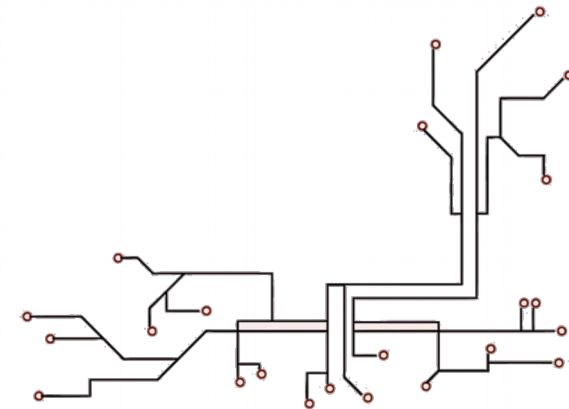
A POSTERIORI

Play · Experience · Learn

EV3 – Turn on Bluetooth
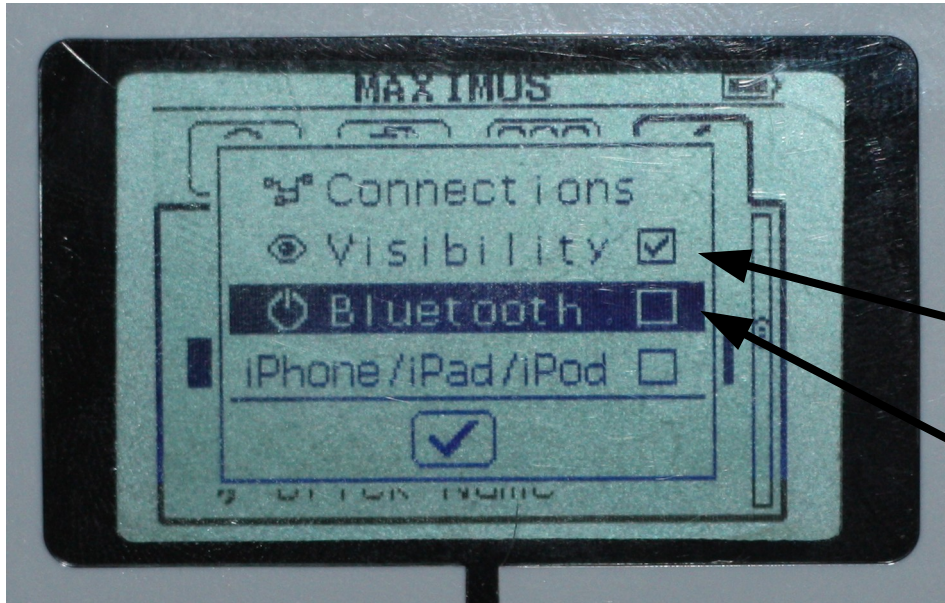
If not, click into Bluetooth, and turn on:

Visibility [x]
and
Bluetooth [x]

Only.
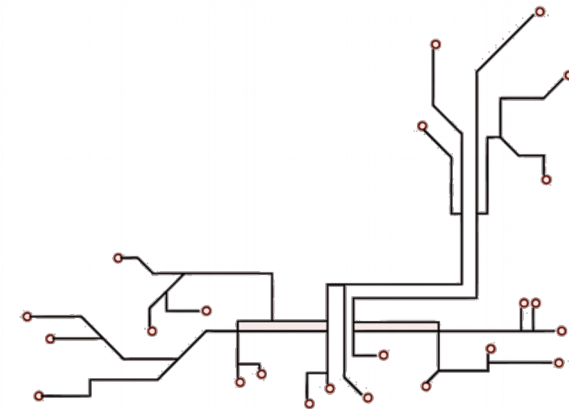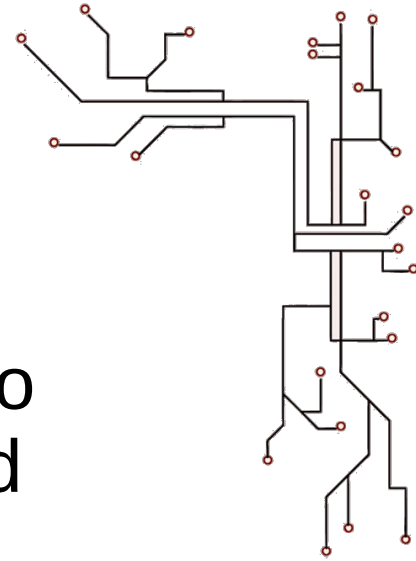
EV3 – Turn on Bluetooth
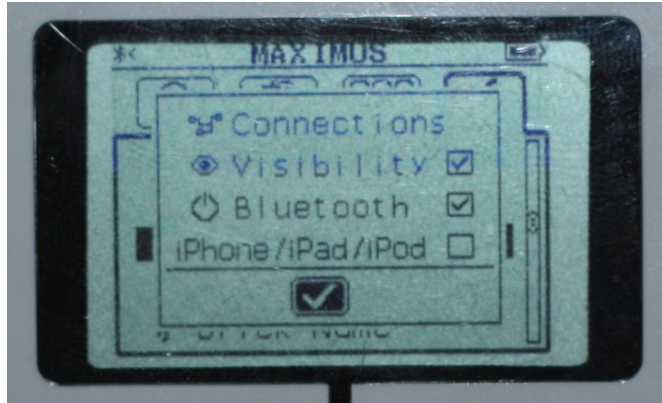
Click [check] to save.
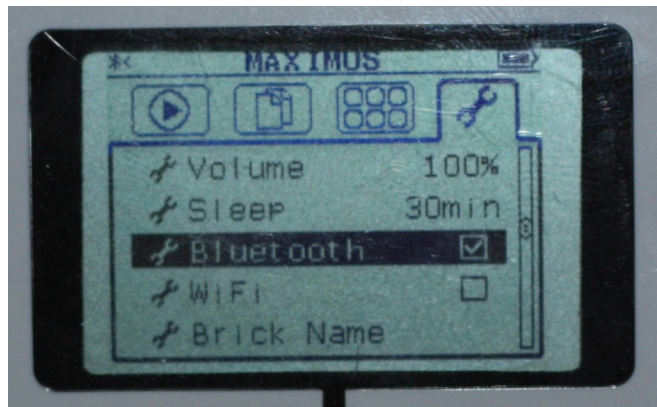
And see that now Bluetooth is [checked] in the Settings tab.
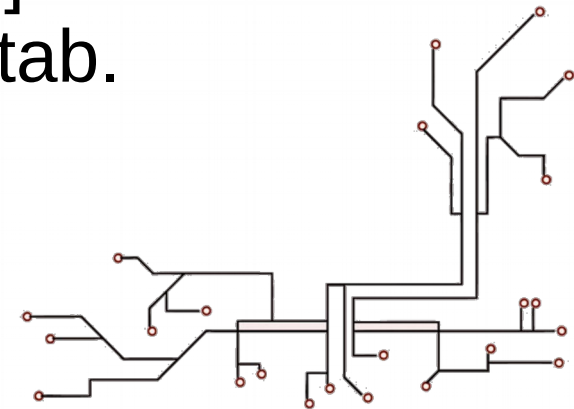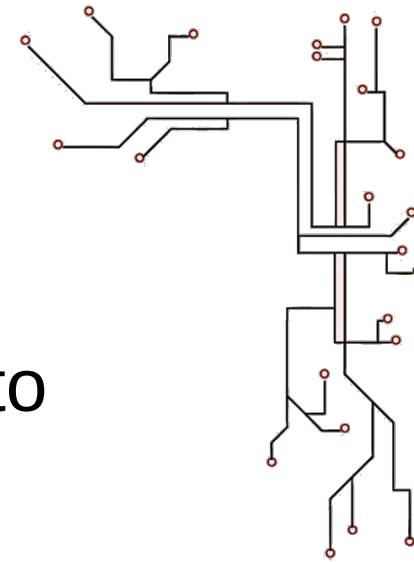
EV3 – Run EV3 Software
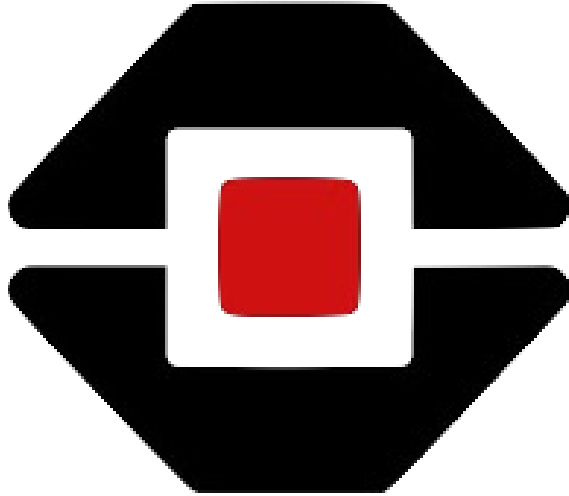
Find this
icon on
your PC
and **run it**!

EV3 – Start New Project

LEGO MINDSTORMS Education EV3 Teacher Edition

File   Edit   Tools   Help

+
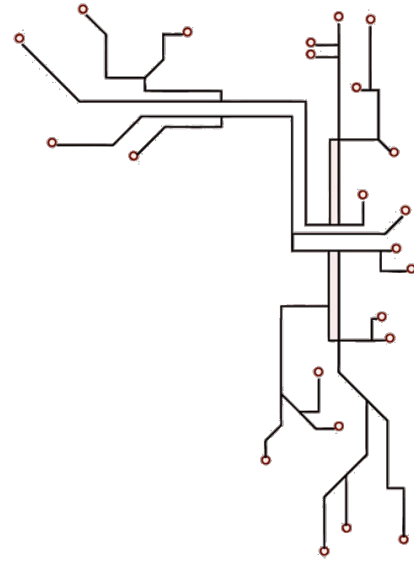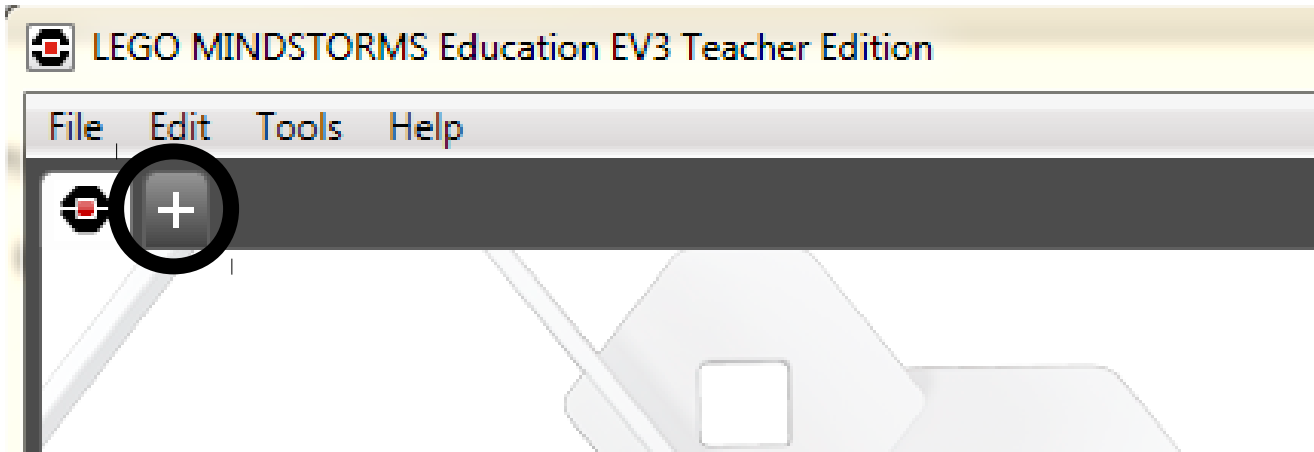
Click the
[+] sign on
top of the
welcome
screen
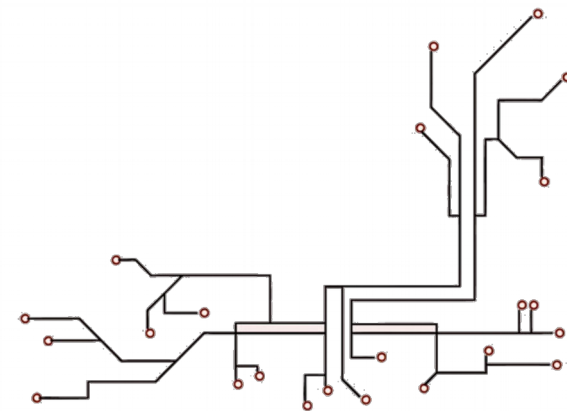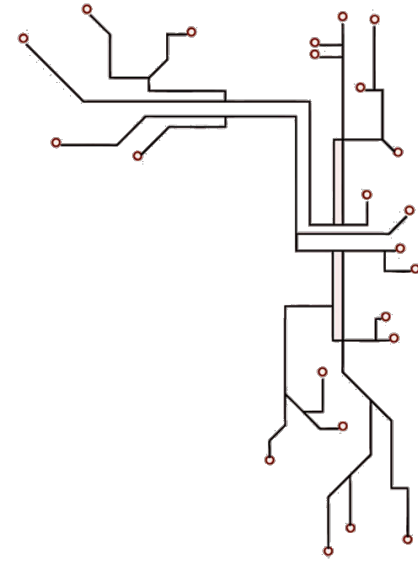
EV3 – Close Content Editor
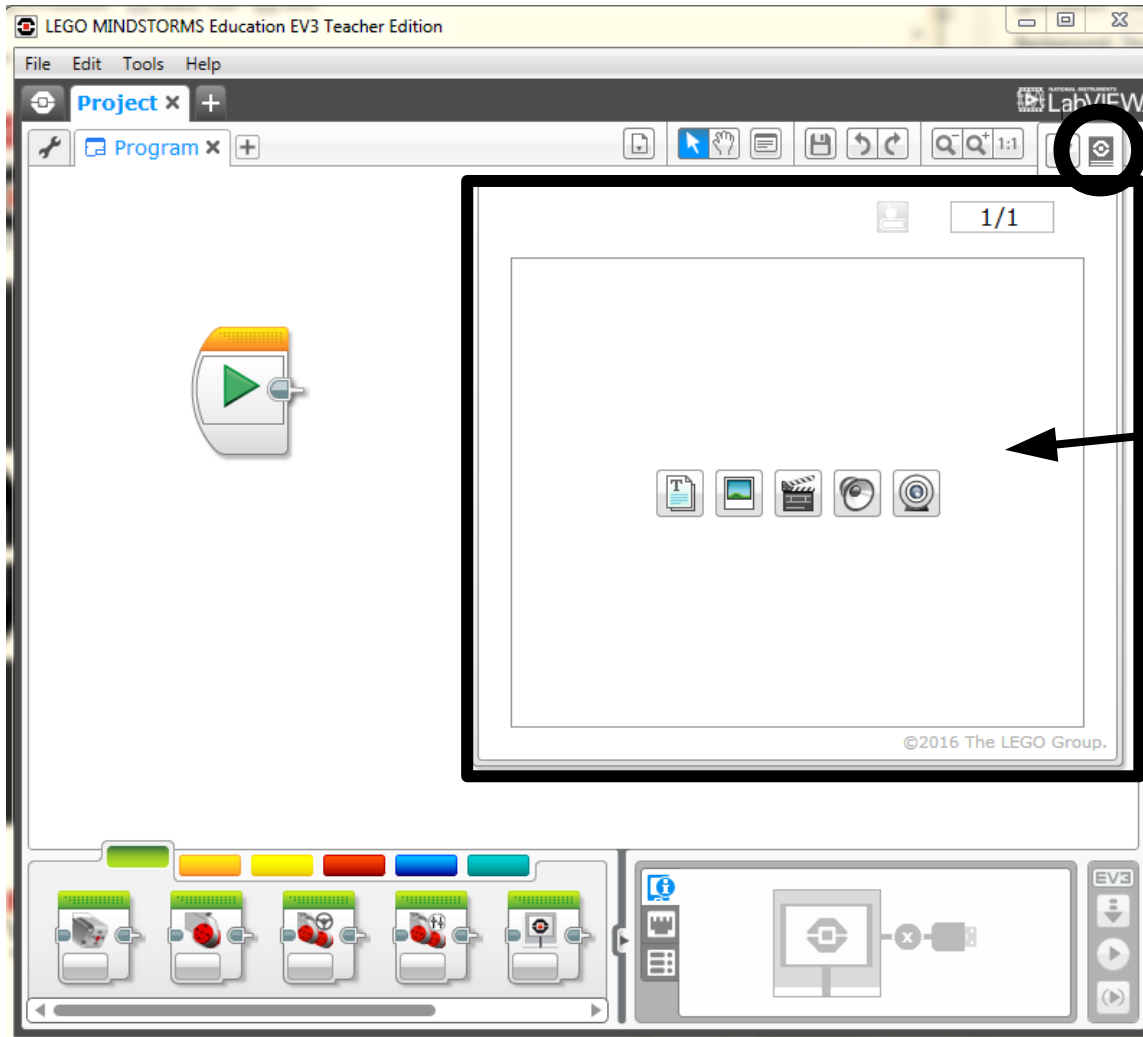
Click this to get rid of the **Content Editor.**

We won't need it for most of our projects.
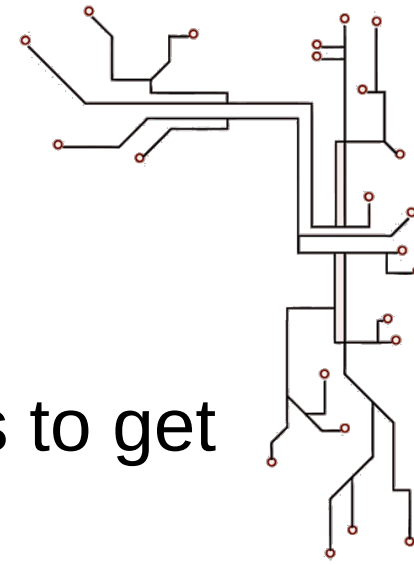
EV3 – Starting Point
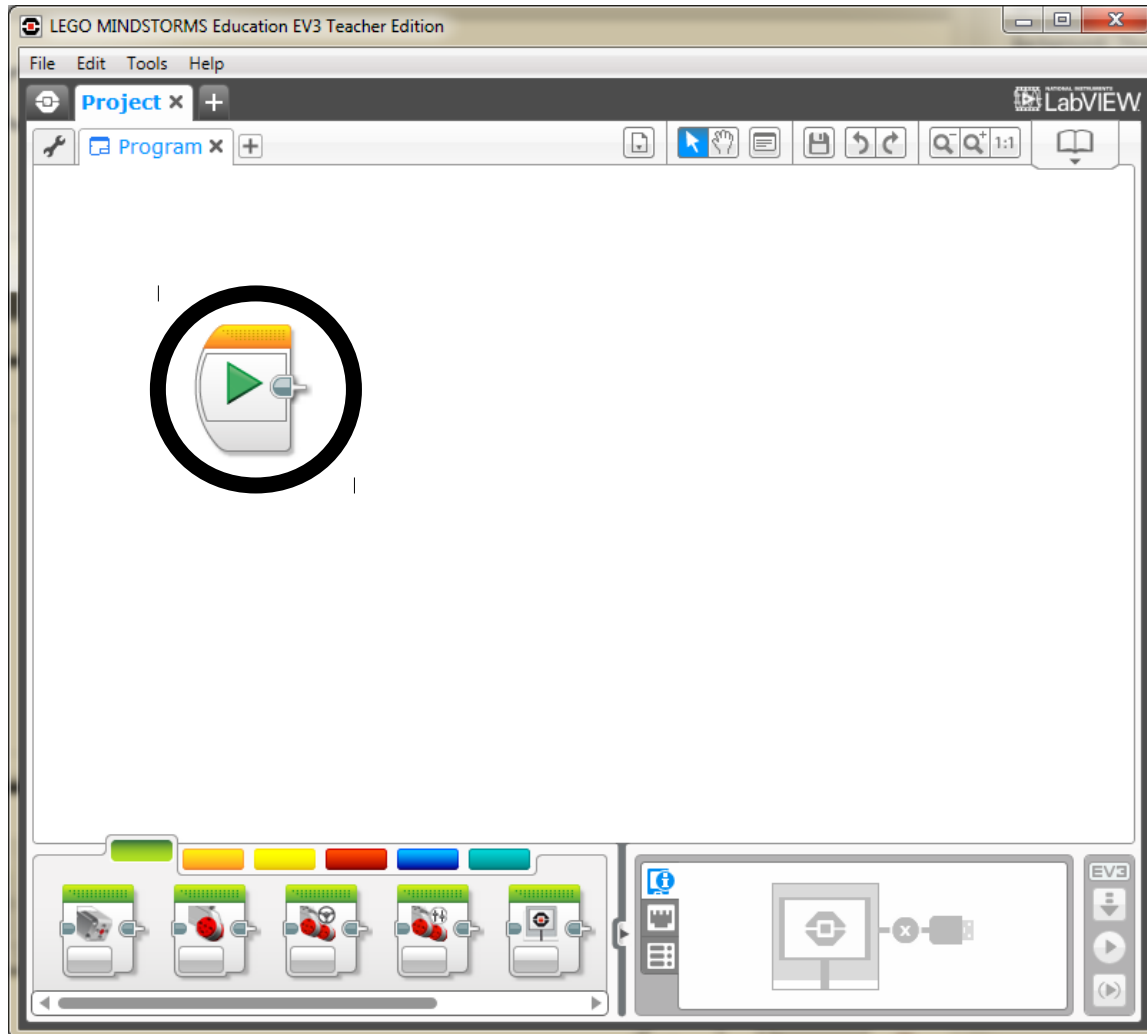
This is our basic starting point for any Program.

But, first, we need to connect a brick.

We prefer Bluetooth.

A POSTERIORI
Play · Experience · Learn
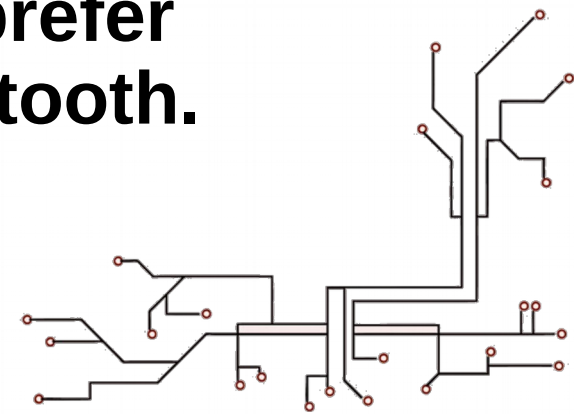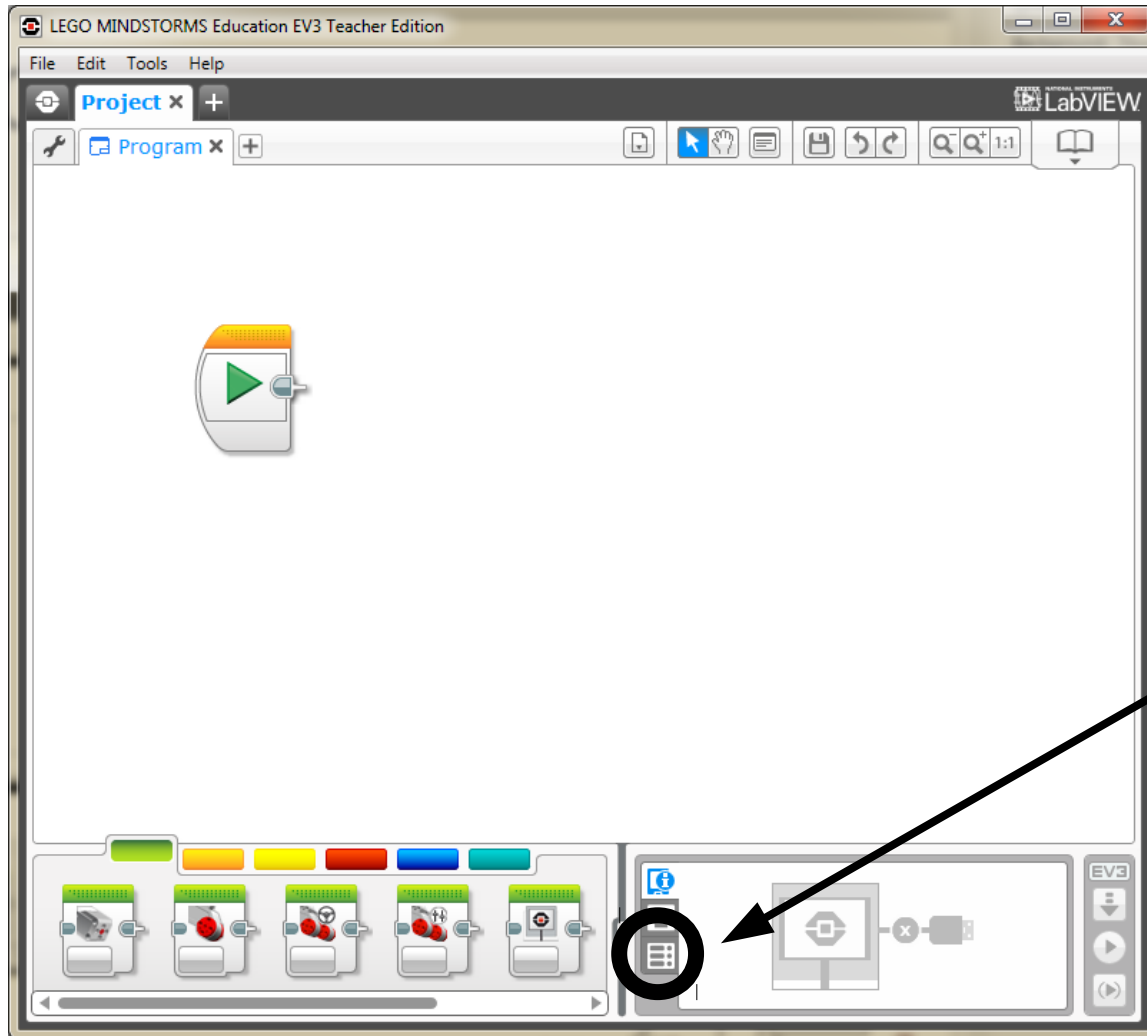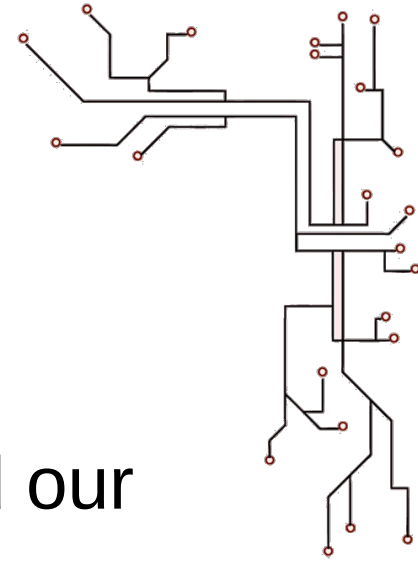
EV3 – Find your Brick

Let's find our Brick.

Click on the **Available Bricks Tab** in the lower right corner.

A POSTERIORI
Play · Experience · Learn
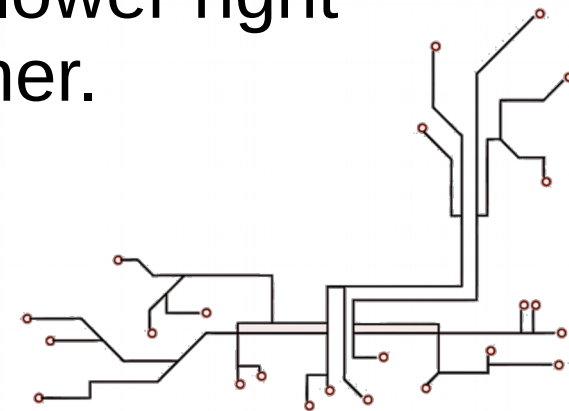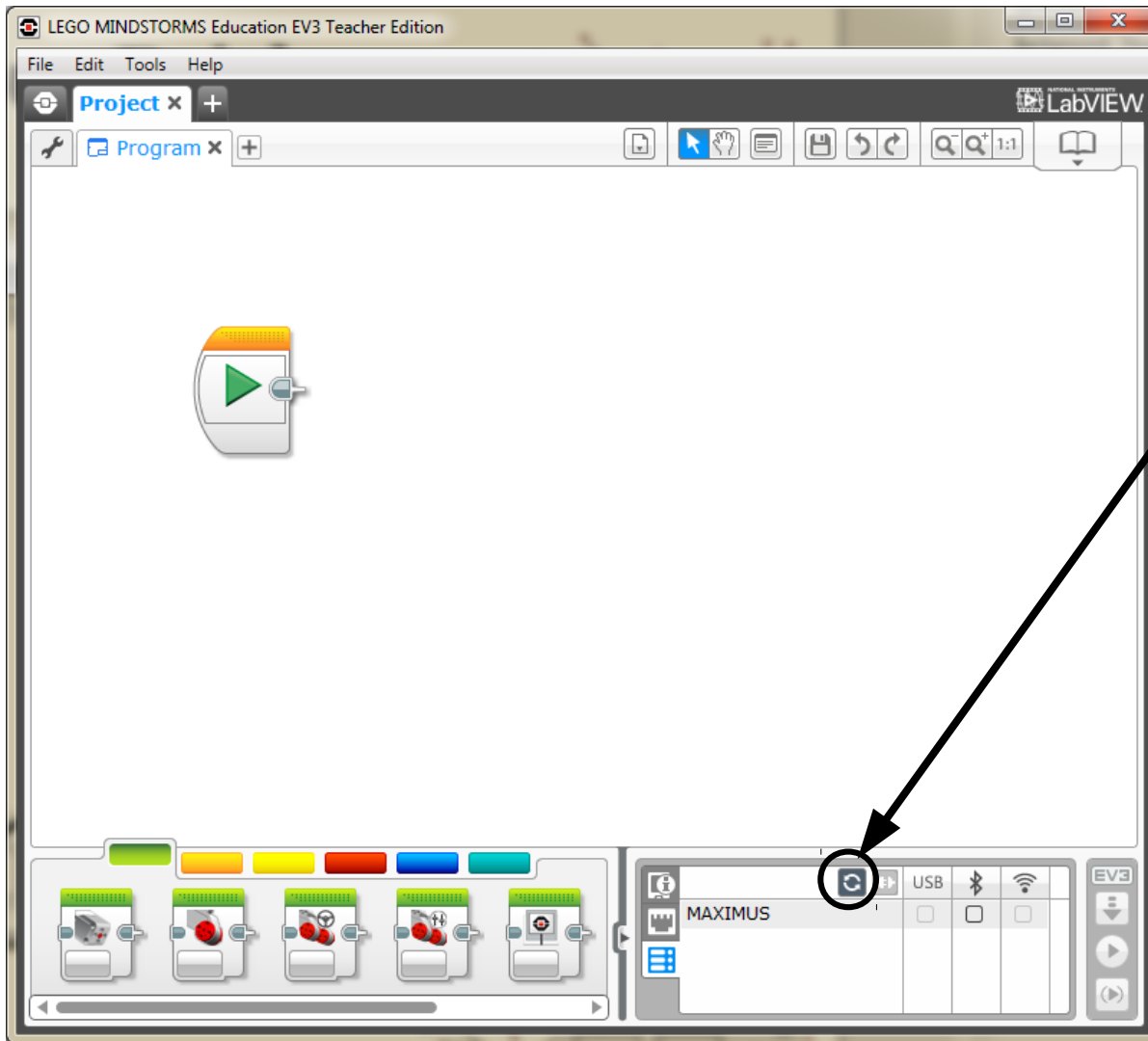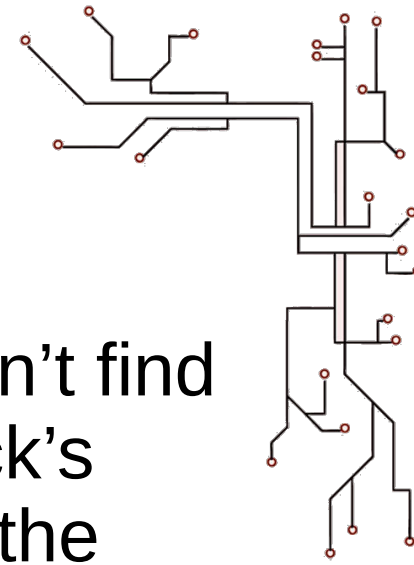
EV3 – Find your Brick

If you don't find your Brick's name in the list, click search.

When you find your brick, click the name.

A POSTERIORI
Play · Experience · Learn
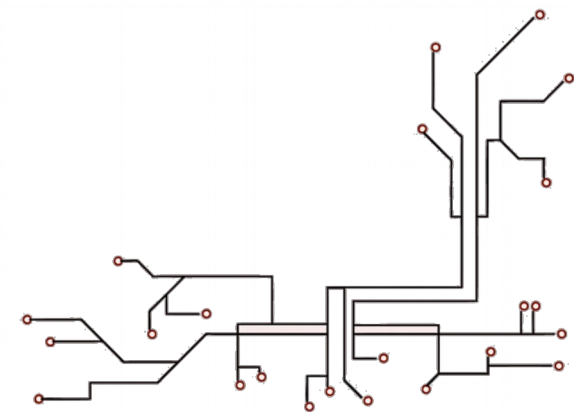
EV3 – Connect your Brick
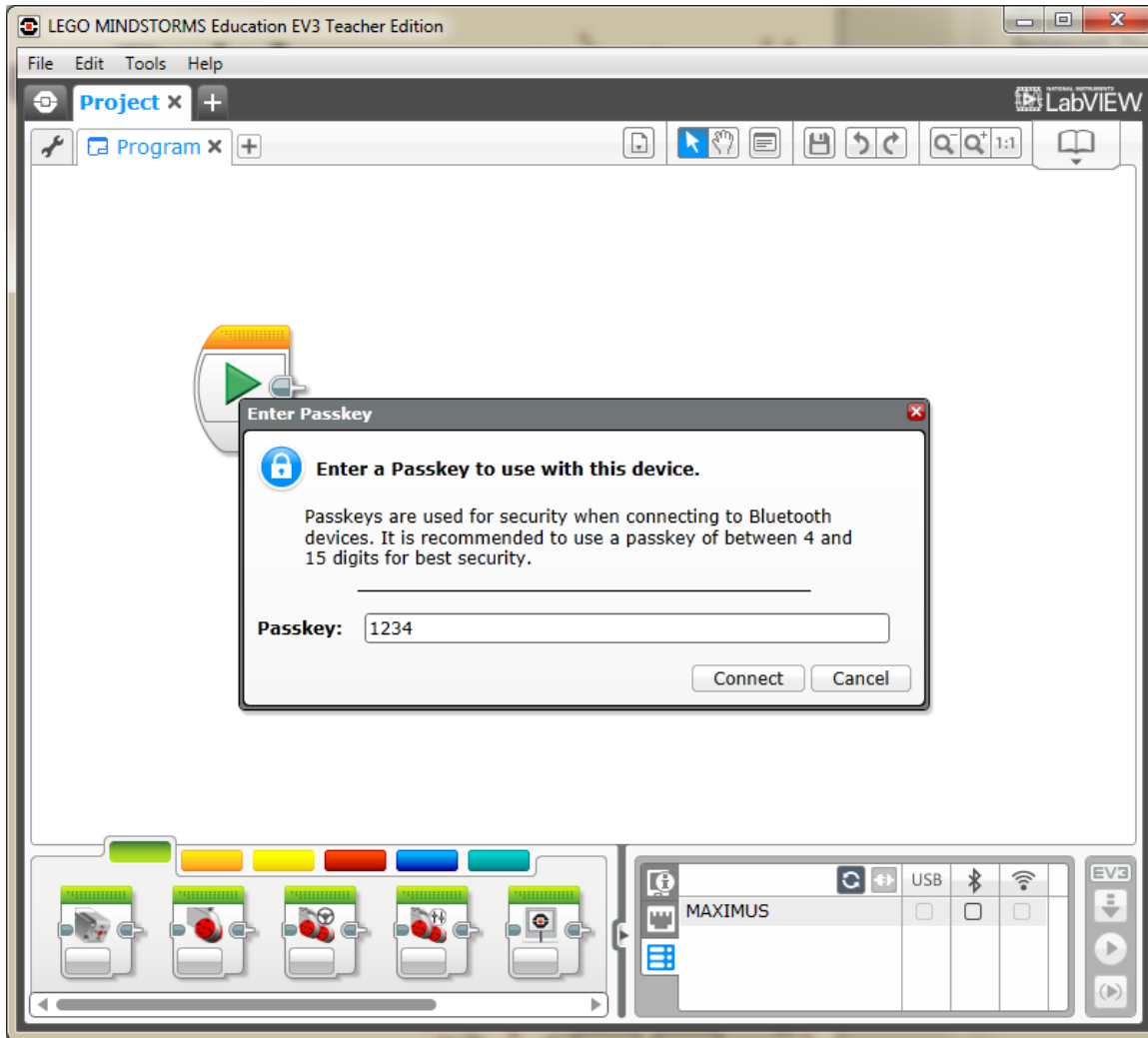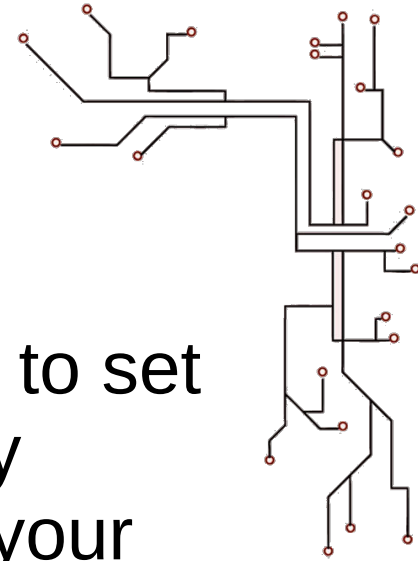
You need to set a passkey between your Brick and PC.

You can choose a code, or leave it as **"1234".**

EV3 – Connect your Brick
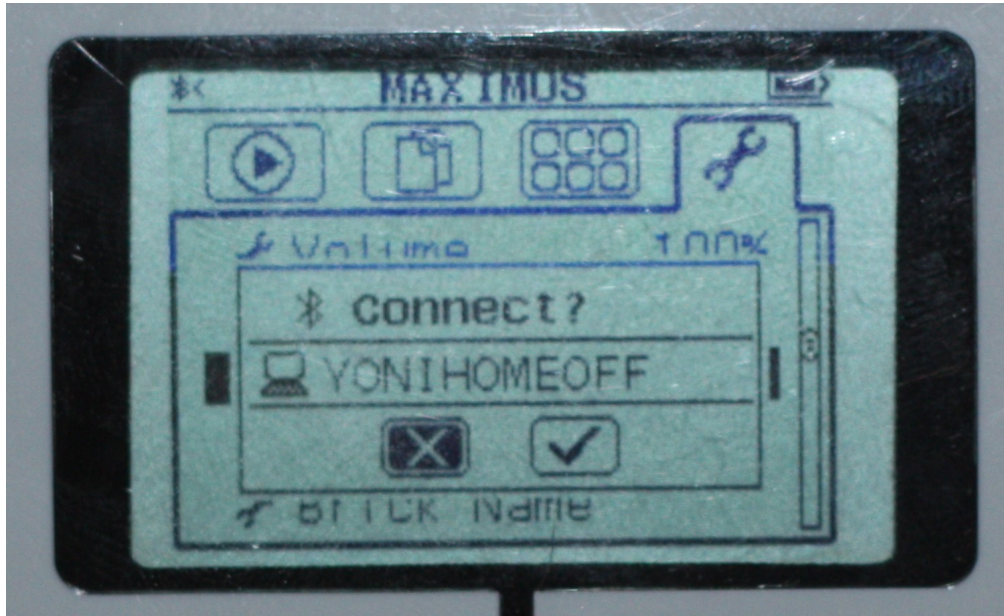
On the EV3, click [check].

Enter the same **Passkey** you chose on the PC's EV3.

EV3 – Connected!
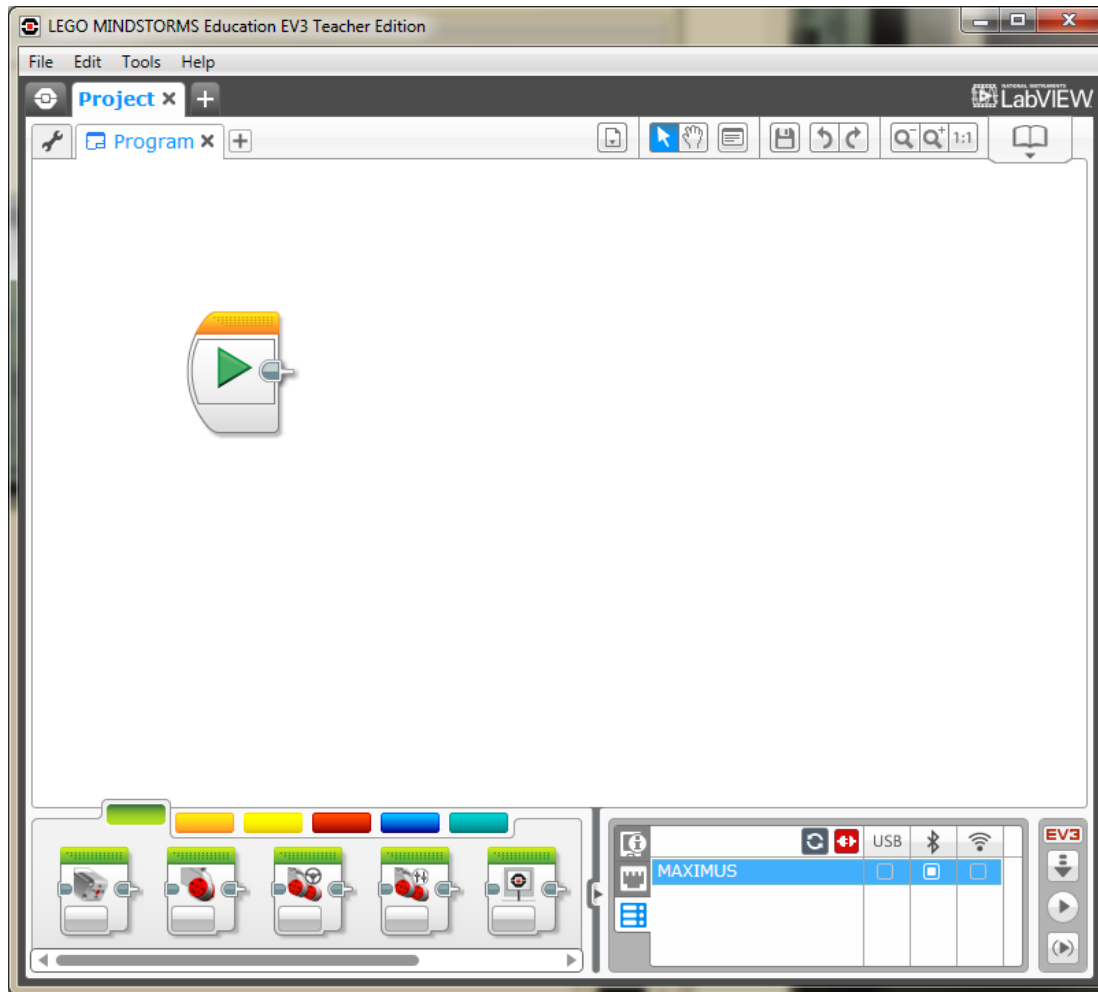
Once you manage to connect, you will see the **brick name highlighted** and the **Bluetooth box checked**.

If you give up on Bluetooth just use a **USB cable**.

A POSTERIORI
Play · Experience · Learn
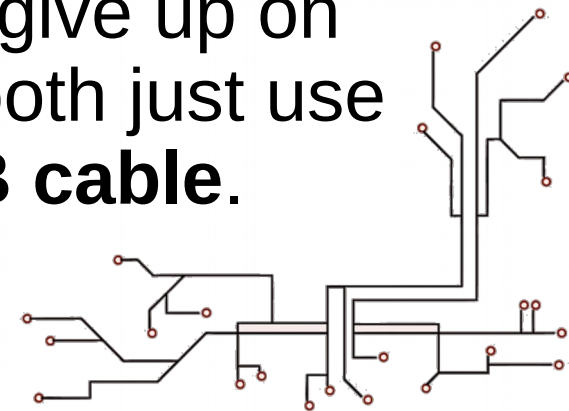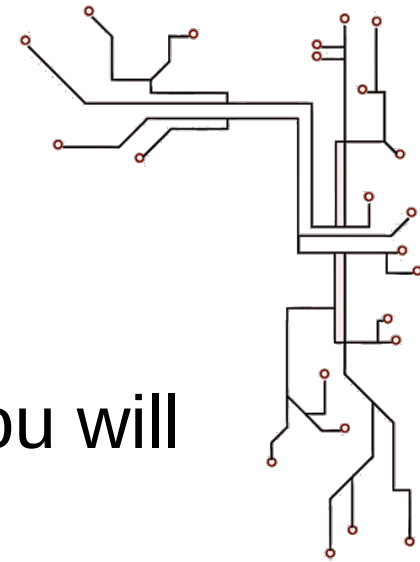
EV3 – Play Program
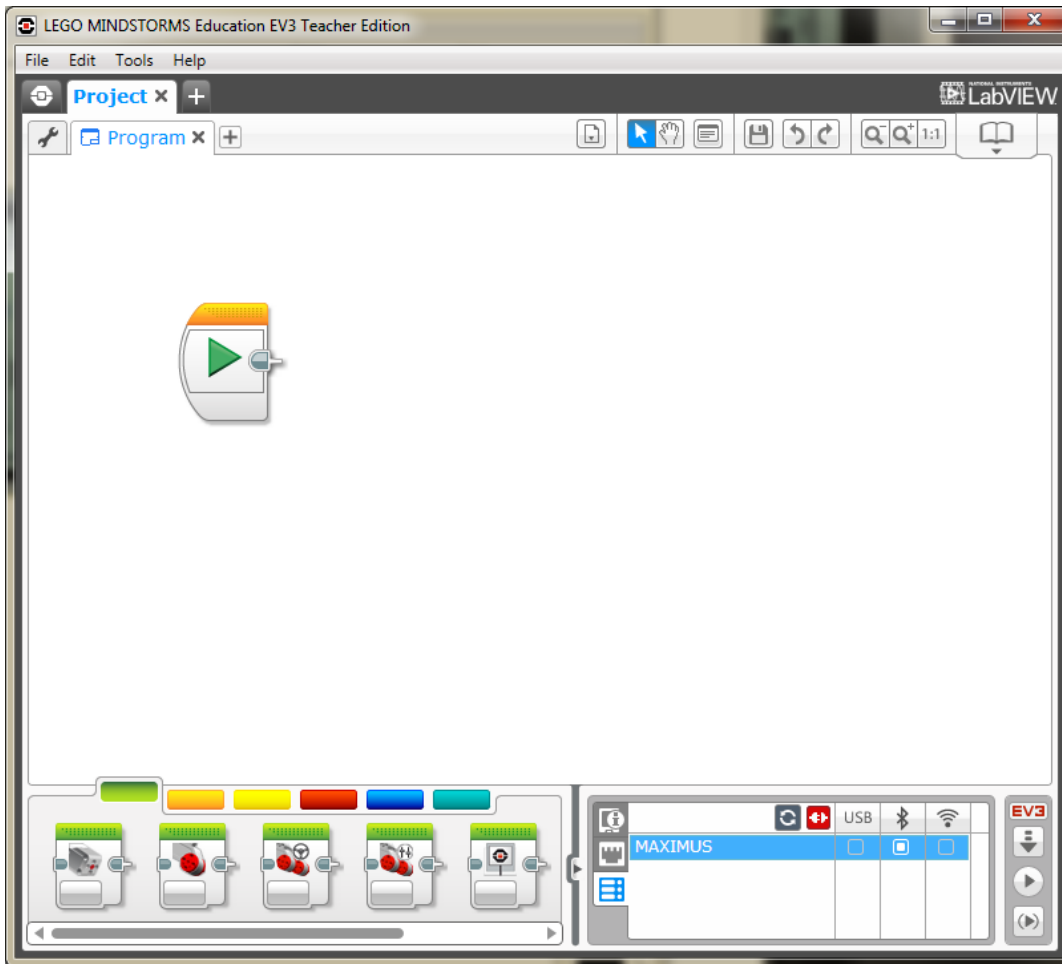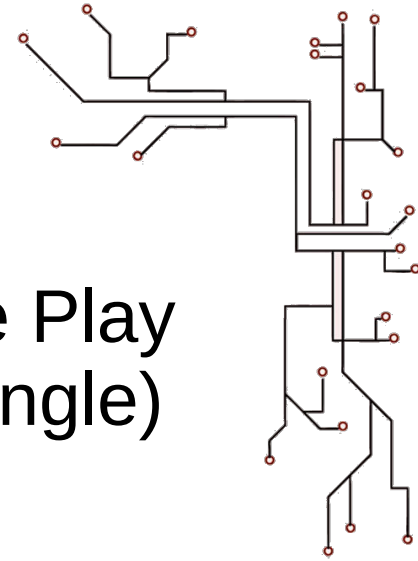
Click on the Play (Green Triangle) button.

You should hear your EV3 make a sound.

That indicates a new program is activated.

A POSTERIORI
Play · Experience · Learn
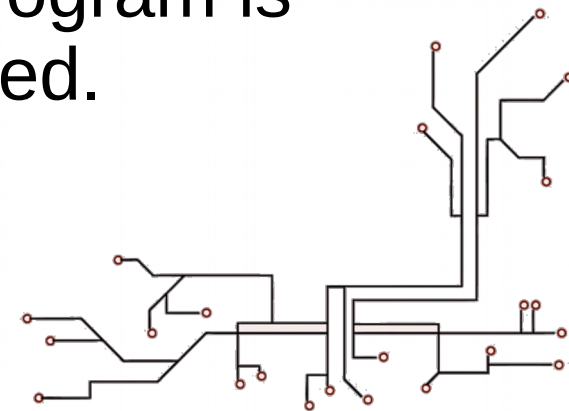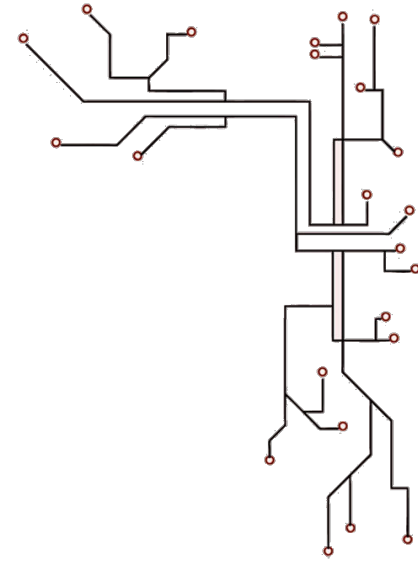
EV3 – Motor Blocks

There are 4 motor blocks
under the Actuator (green tab)
in the Blocks window.

We will use some of these to
get our robot to move.
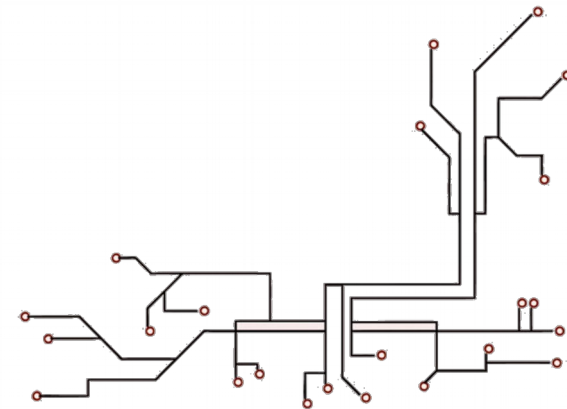
EV3 – Medium Motor
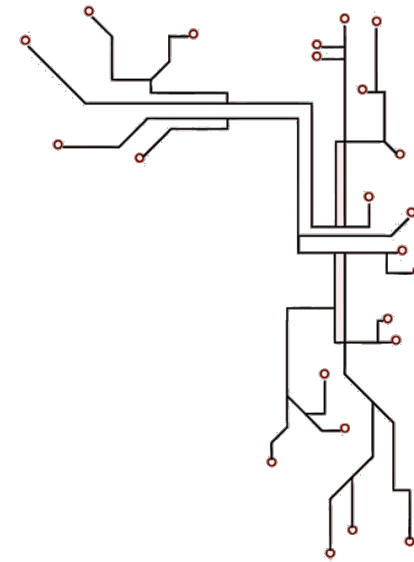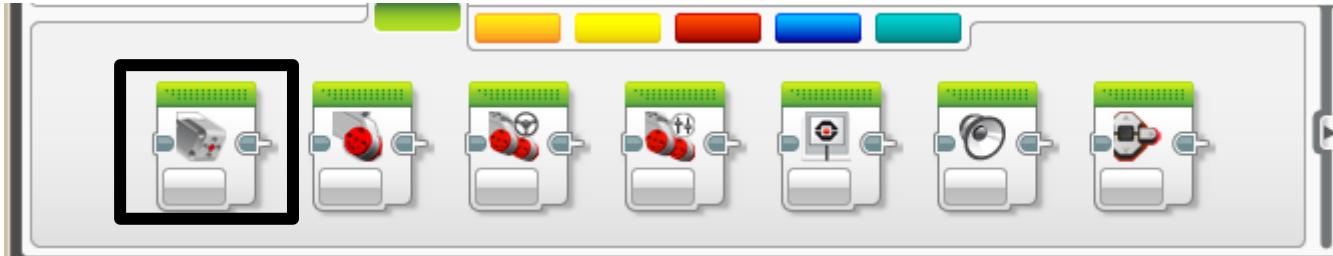
We won't be using that today… But each core set comes with one of those.

We can use it as a grabber later on...
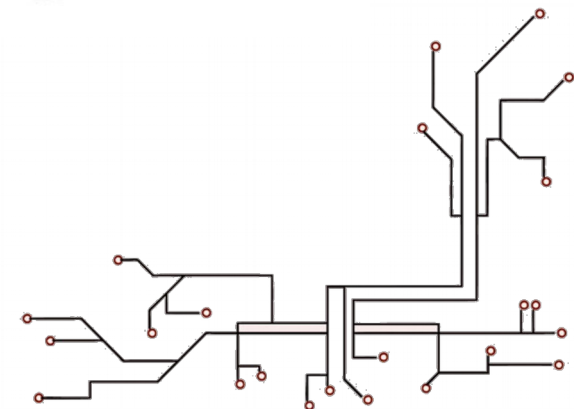
EV3 – Large Motor

We can use this to control one of our motors, but we wish to control both wheels.

This is useful only when the Large Motors are used independently, not in a 2-Wheel Drivetrain.
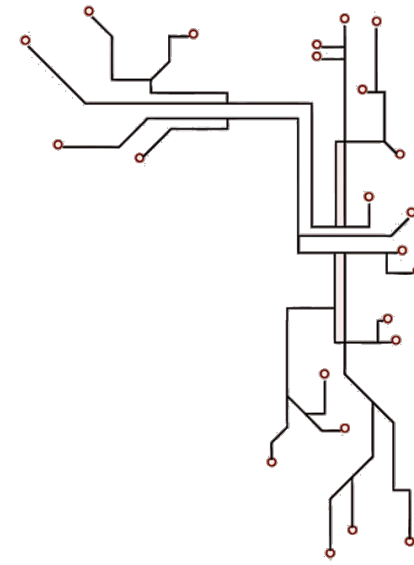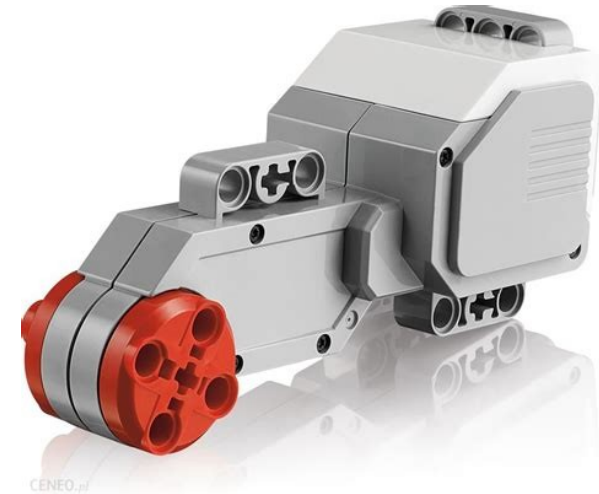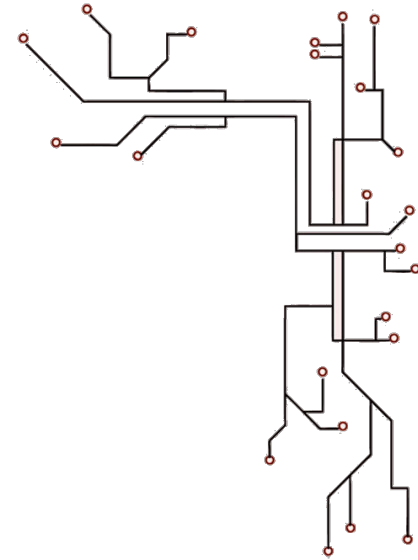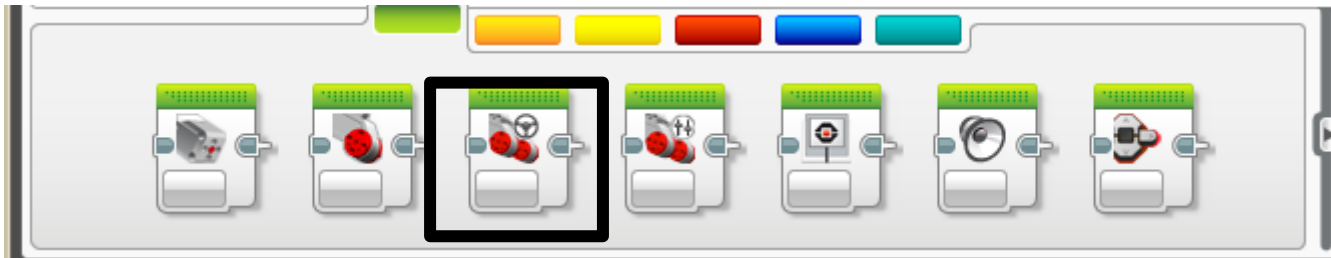
EV3 – Move Steering

Move Steering

This could be used to move our 2-Wheel Robot.

It's the easiest way to control our Robot.

A POSTERIORI
Play · Experience · Learn
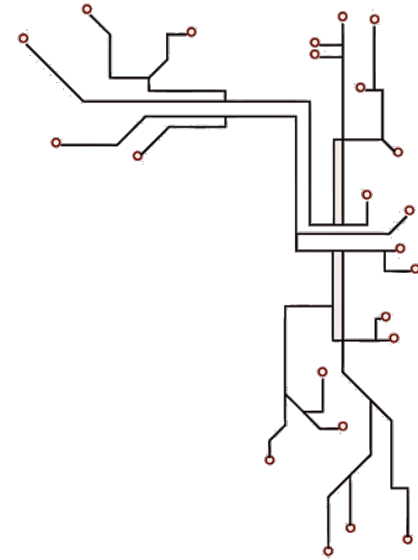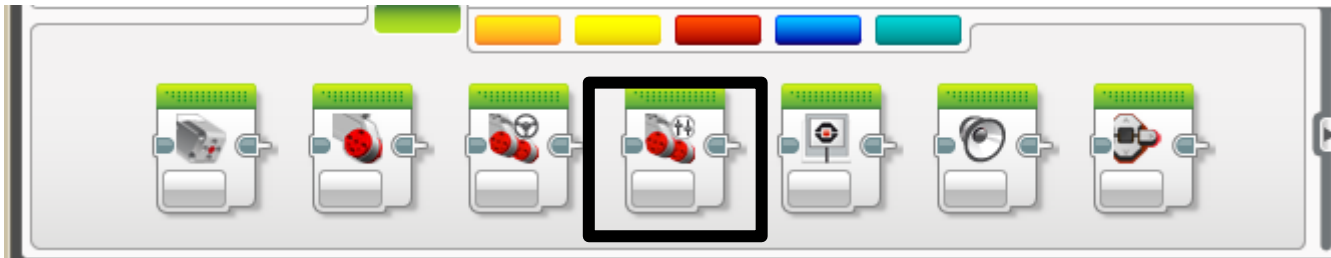
EV3 – Move Tank

Move Tank

This could also be used to move our 2-Wheel Robot.
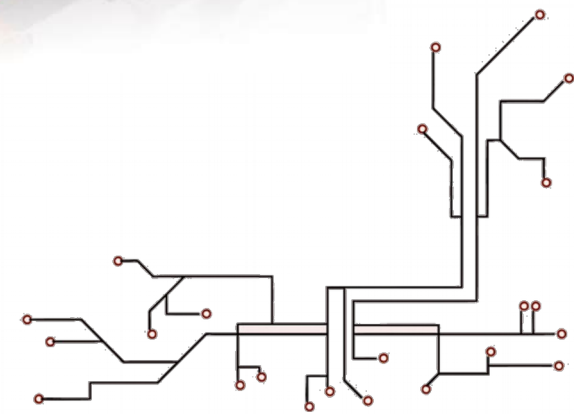
In this one each motor is independently controlled, but their behavior changes together.
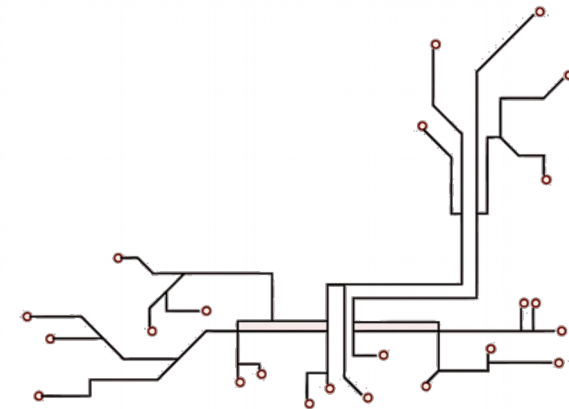
EV3 – Move Steering
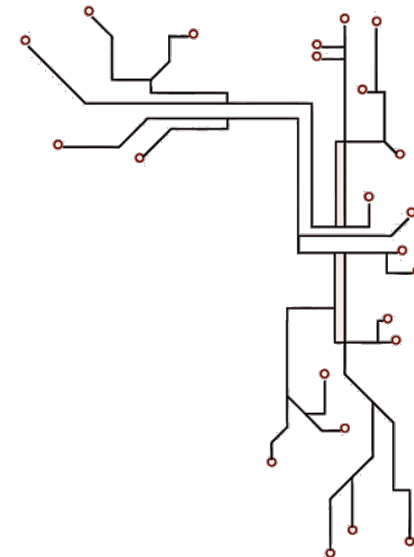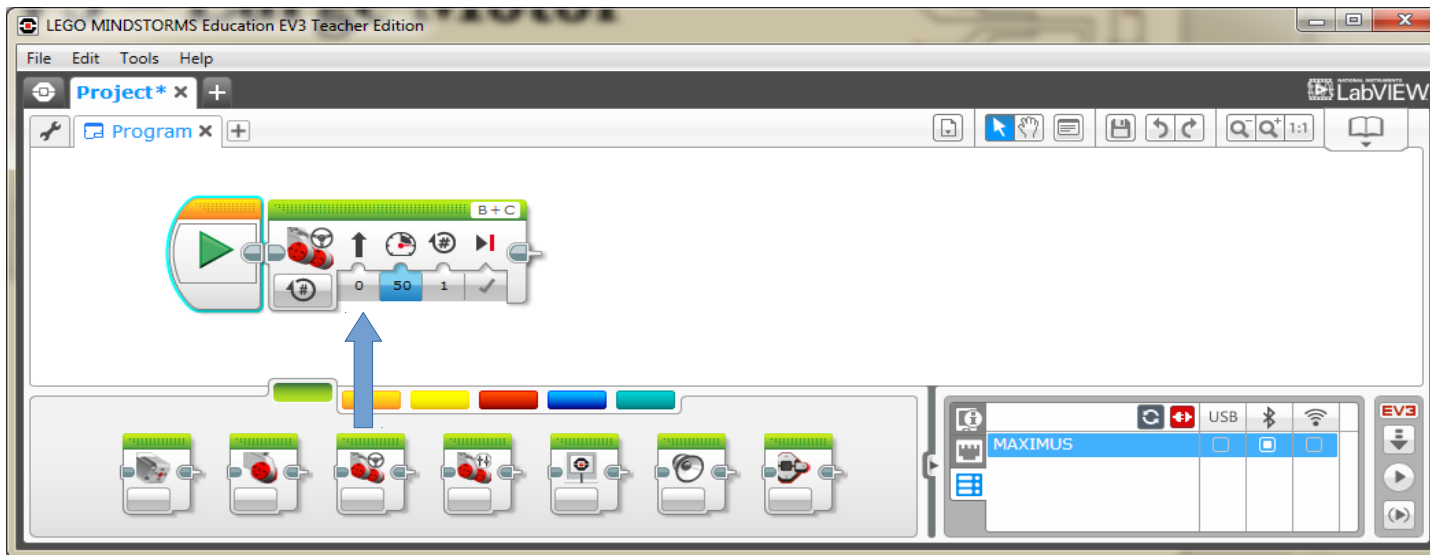
Drag a Move Steering block next to the Play button.

Press Play and see what your robot does.

DON'T LET IT FALL OFF THE TABLE!

A POSTERIORI
Play · Experience · Learn

EV3 – Move Steering

Motor Ports: Choose A & D

These will be the Motor Ports controlled by the Move Steering block.

A POSTERIORI
Play · Experience · Learn

EV3 – Move Steering

Direction:

If FWD – it will drive A & D motors equally
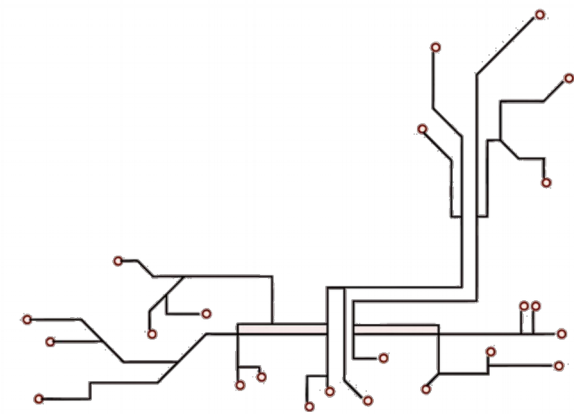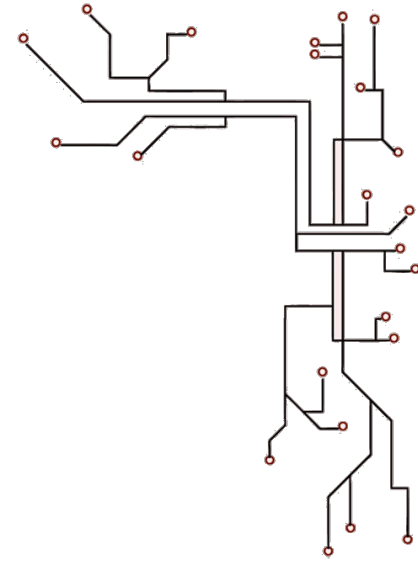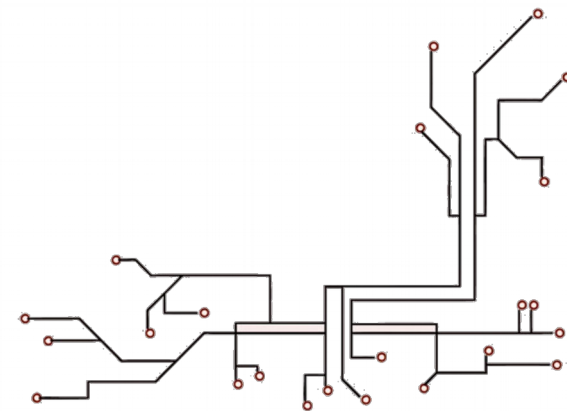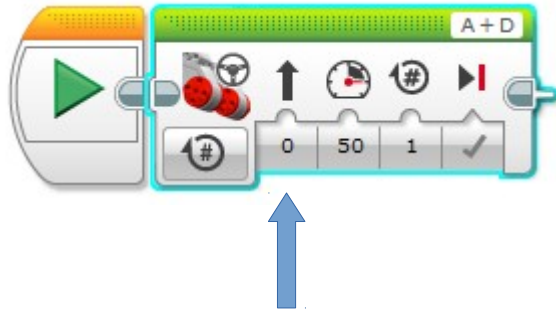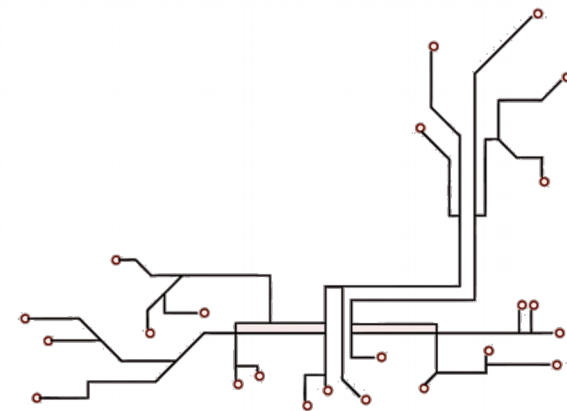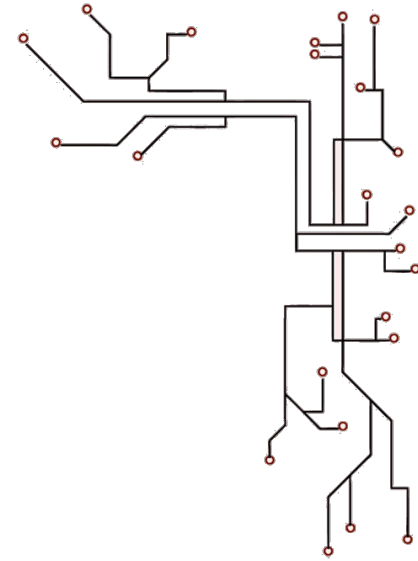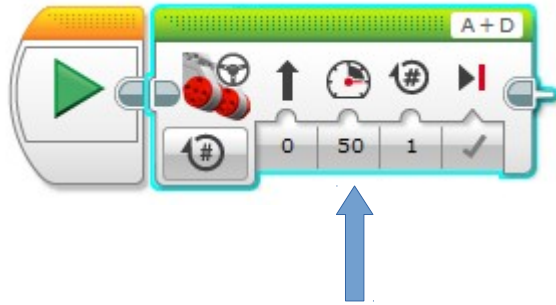
If BACK – it will drive A&D equally in reverse

If LEFT/RIGHT – it will decide based on **differential drive algorithm**

EV3 – Move Steering

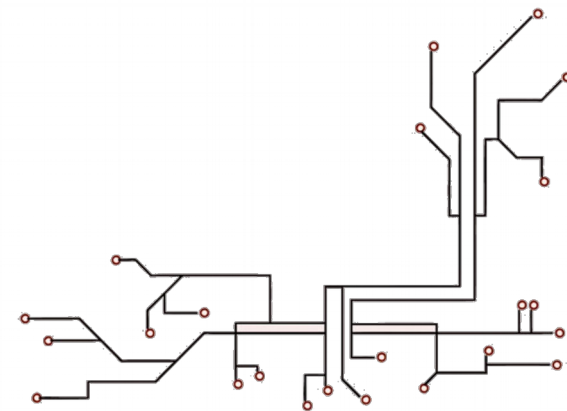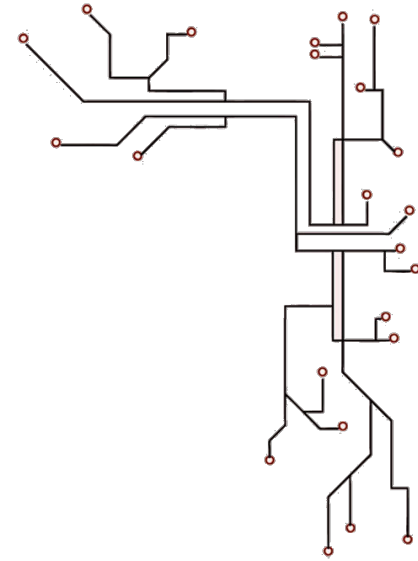**Power**: **How fast the motor turns**
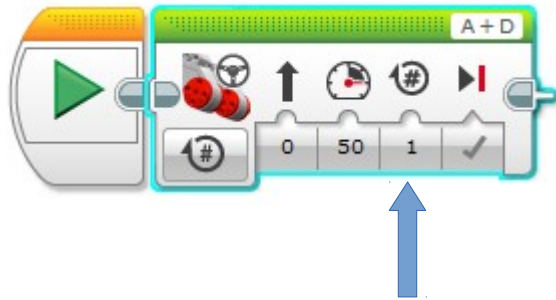
50 - medium speed
100 – full speed

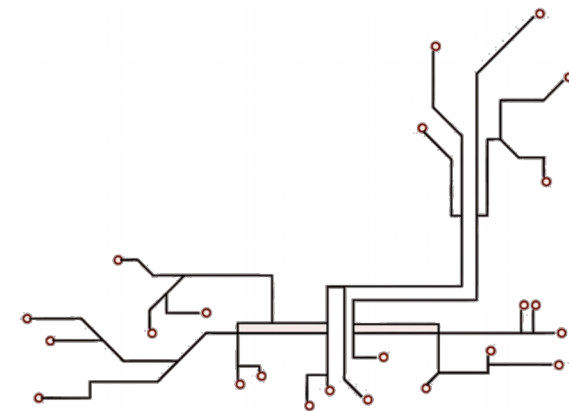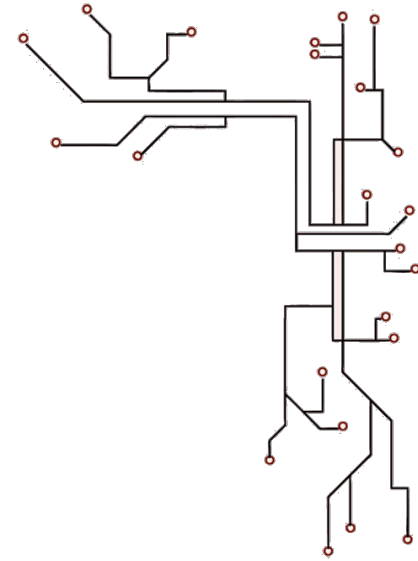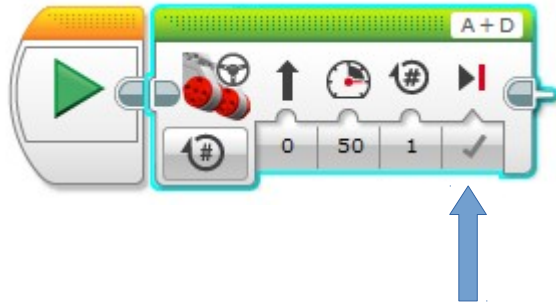See what happens if you try a very low power...

EV3 – Move Steering

Rotations:

How many times to rotate the wheel.
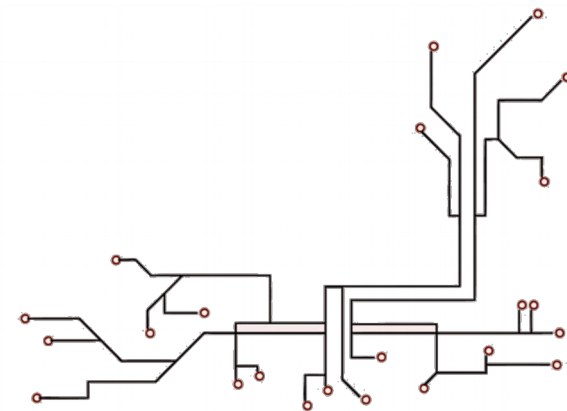
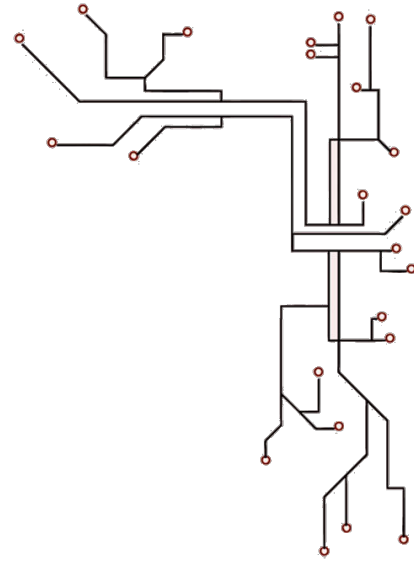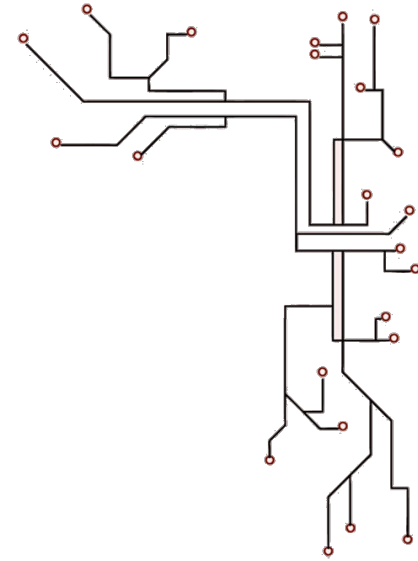This is a sort of distance. How far to go...

EV3 – Move Steering

Break:

When finished to move, apply hard break, or leave wheels to move and come to a stop on their own…

Test behavior with break and no break.

A POSTERIORI
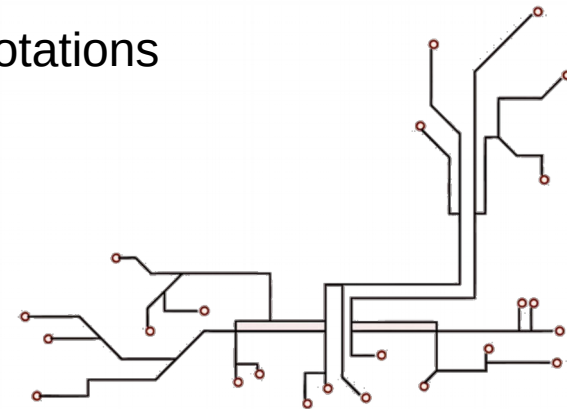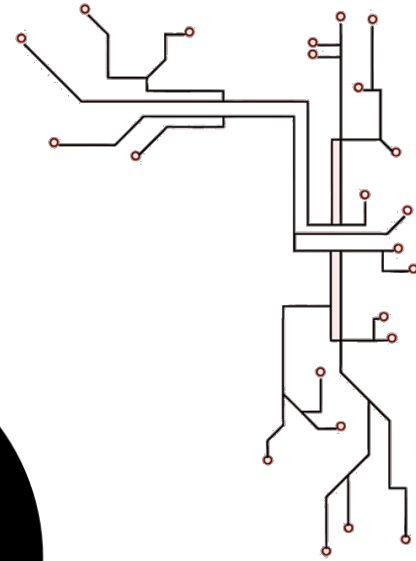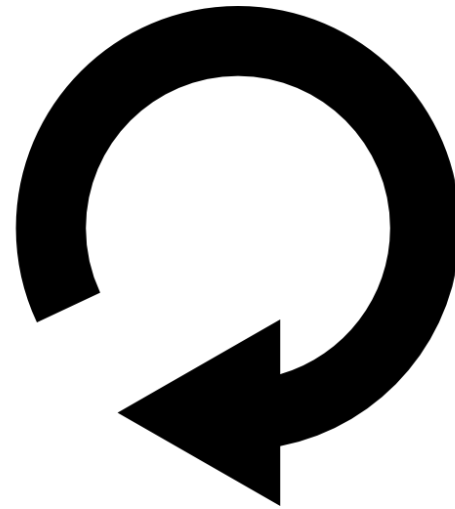Play · Experience · Learn
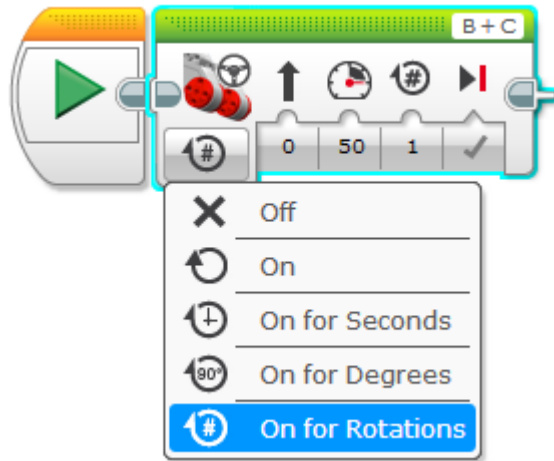
EV3 – Move Steering

On for Seconds – do the movement for some time

On for Degrees – do the movement for a fraction of a rotation

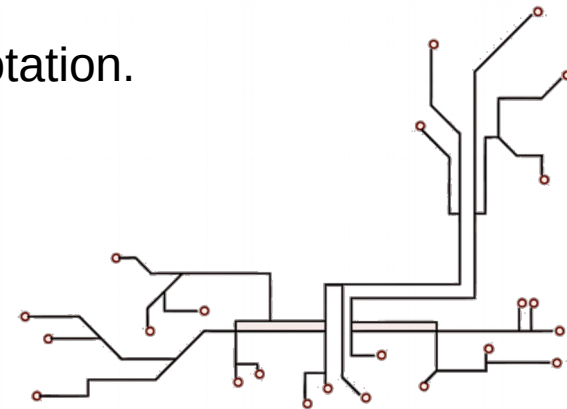On for Rotations – do the movement for a number of full wheel rotations

A POSTERIORI
Play · Experience · Learn
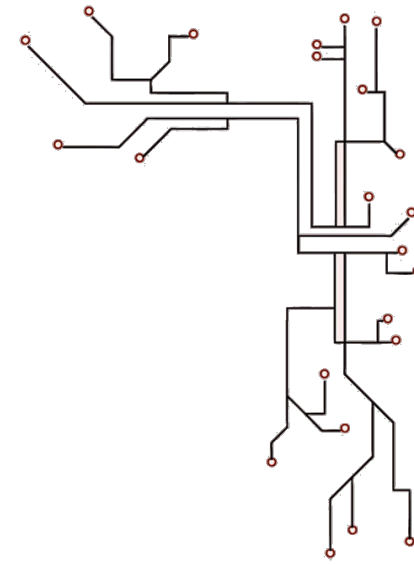
EV3 – Move Steering

On for Rotations –

Each time the wheel spins around completely it turns **_ONE_** full rotation.

EV3 – Move Steering

360 degrees

180 degrees

90 degrees
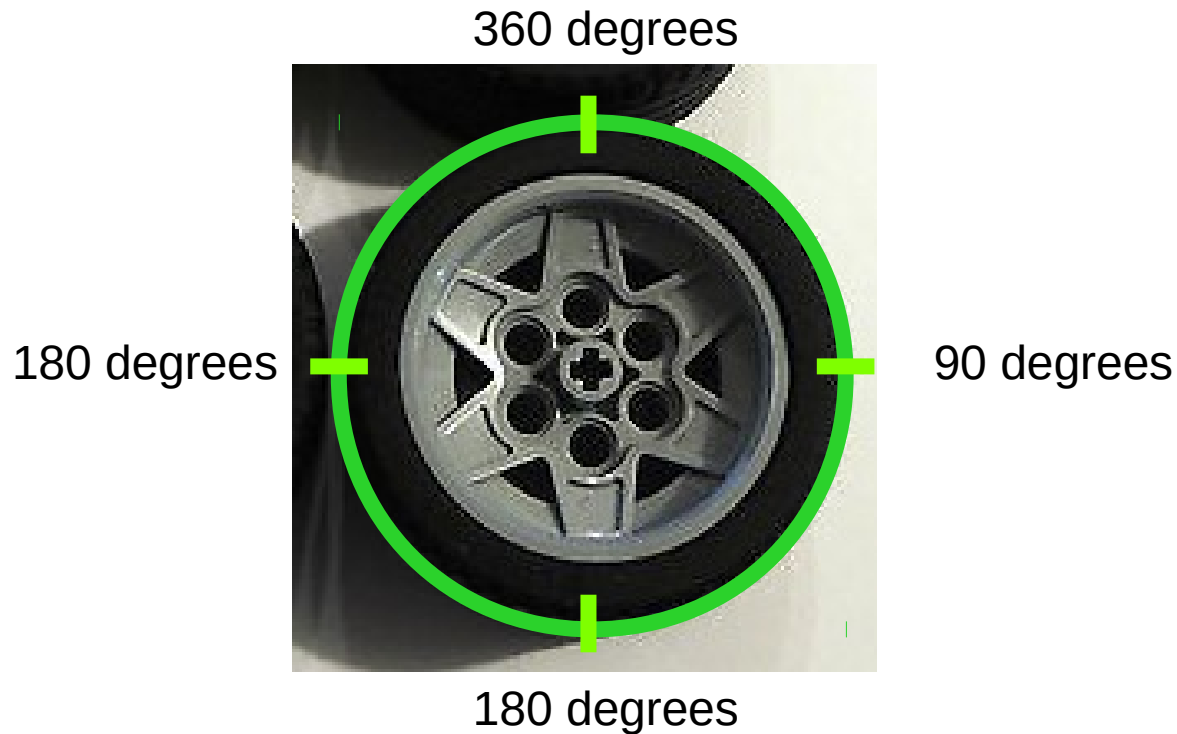
180 degrees

On for Degrees –

Each time the wheel spins around completely it turns **_360_** degrees.
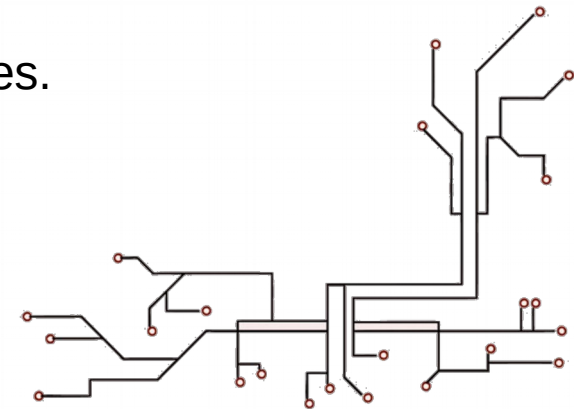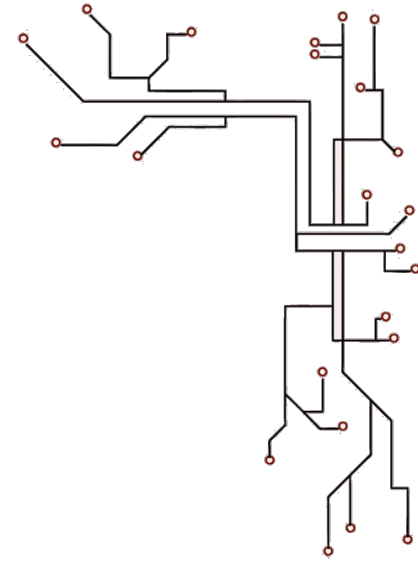
EV3 – Move Steering

Challenge 1

How far will the robot go in 1 rotation?

HINT
Use string to measure wheel circumference...
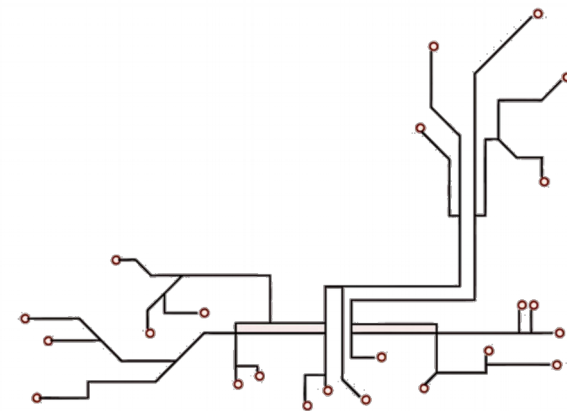
EV3 – Move Steering
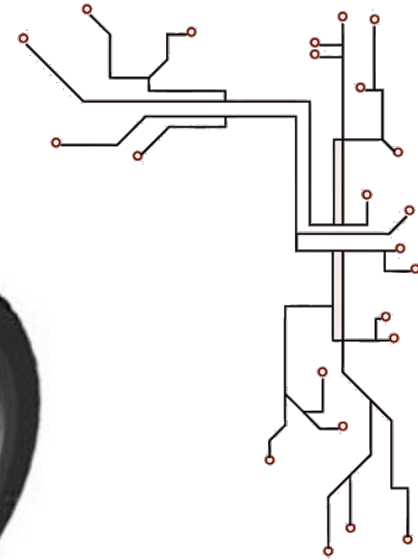
Challenge 2

Make your robot start directly over starting line, and come to a stop directly over finish line…

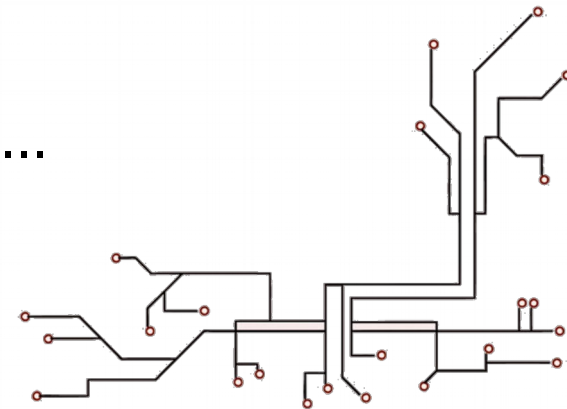No Trial & Error.
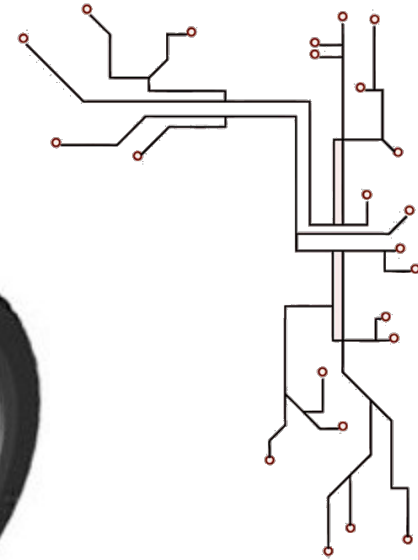You're only allowed to use rulers, string, and measuring tape.

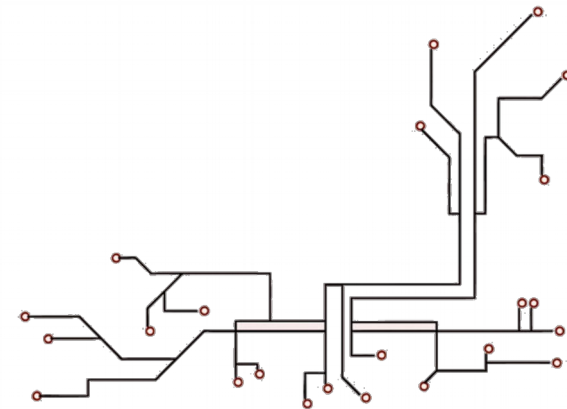**HINT -** Use some math… Answer can be decimal...

EV3 – Move Steering

Challenge 3

Make your robot move forward 1 meter,
then turn left at a 90 degree angle

(***NOT** On for 90 degrees...*)
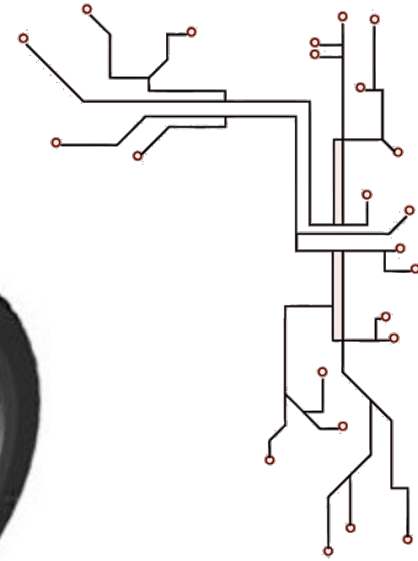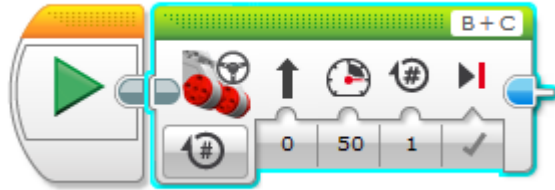
EV3 – Move Steering

Challenge 4

Make your robot move around in a *Square Pattern*
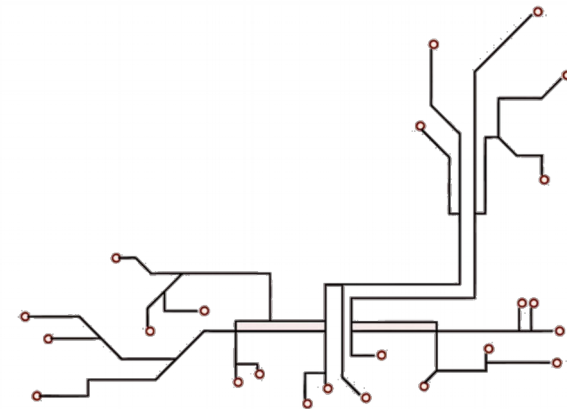
EV3 – Move Steering
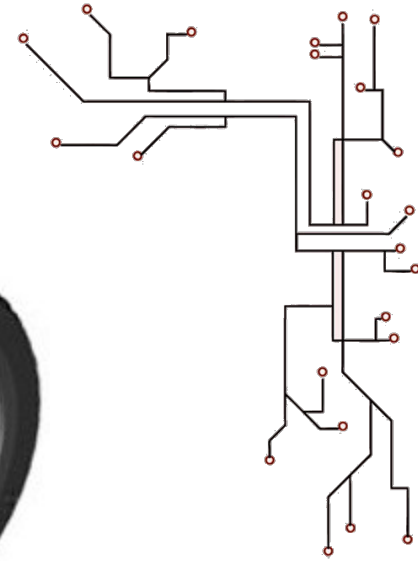
Challenge 4

Make your robot move around in a *Triangle Pattern*