EV3 LESSONS

Moving Straight

By Sanjay and Arvind Seshan

BEGINNER PROGRAMMING LESSON

LESSON OBJECTIVES

1. Learn how to make your robot go forward and backwards

2. Learn how to use the Move Steering block

3. Learn how to read sensor values using Port View
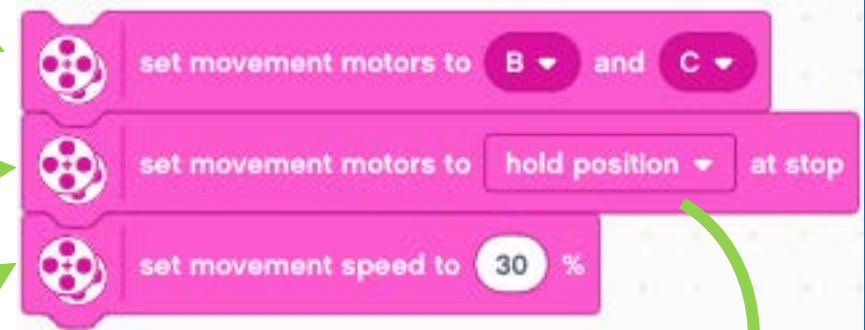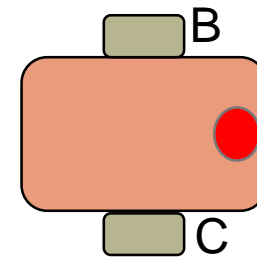
CONFIGURING MOVEMENT BLOCKS

Before using movement blocks, you must configure the robot first.
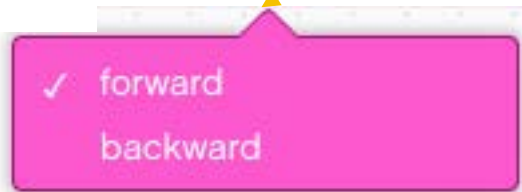
There are three blocks for this purpose:

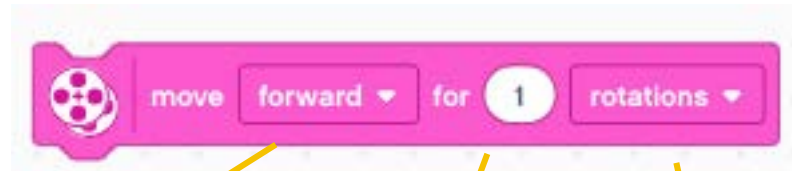This one determines which motors are connected to the left & right wheels

This determines what the robot doesat the end of a move block (brake/hold or float/coast)
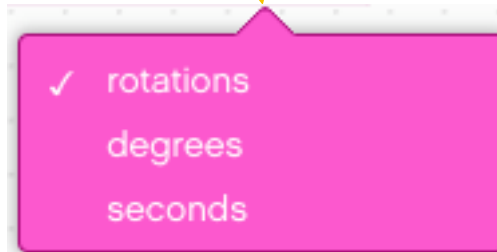
This sets the "default" speed for later move blocks

MOVE STRAIGHT BLOCK
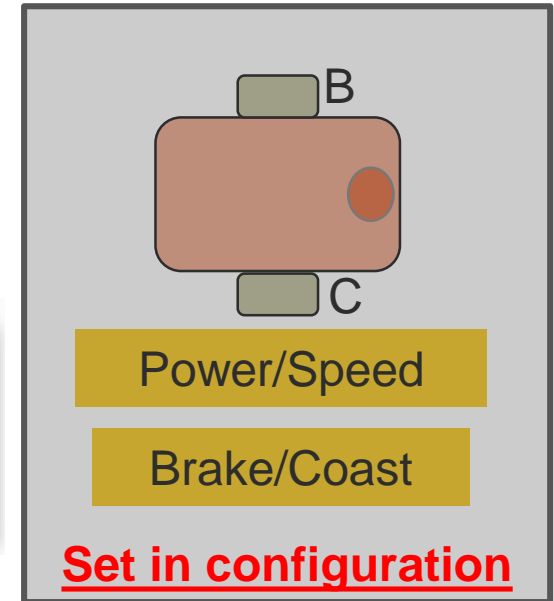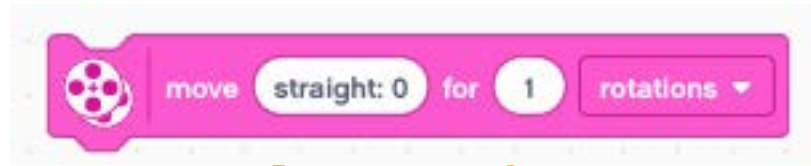

Direction

Mode of operation

Duration/Distance

Power/Speed

Brake/Coast

Set in configuration

Simplest move block – just gives control over direction and distance

Other move blocks give control over speed and steering

MOVE STEERING BLOCK

move straight: 0 for 1 rotations

Steering

Duration/Distance

✓ rotations
degrees
seconds

Mode of operation

B

C

Power/Speed

Brake/Coast

Set in configuration

This gives control over steering by giving different amounts of power to the left and right wheels. 50 & -50 steering give 0 power to one wheel and full power to the other. 100 and -100 give full power to both wheels but turn them in opposite directions

MOVE STEERING/POWER BLOCK

move straight: 0 for 1 rotations at 50 % speed
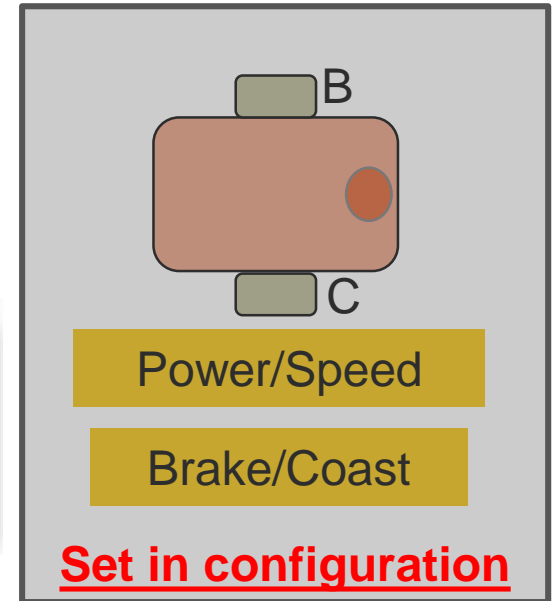
Steering

Duration/Distance

Mode of operation

Move Speed

B

C

Brake/Coast

Set in configuration

This is like the move steering block. However instead of using the configured "default" speed, you specify the speed within the block. This is useful if you have one move that you want to do more slowly or quickly.

MOVE TANK BLOCK

move for 1 rotations ▼ at 50 0 % speed

Duration/Distance

Mode of operation

Left and Right Wheel Speeds

B

C

Brake/Coast

Set in configuration
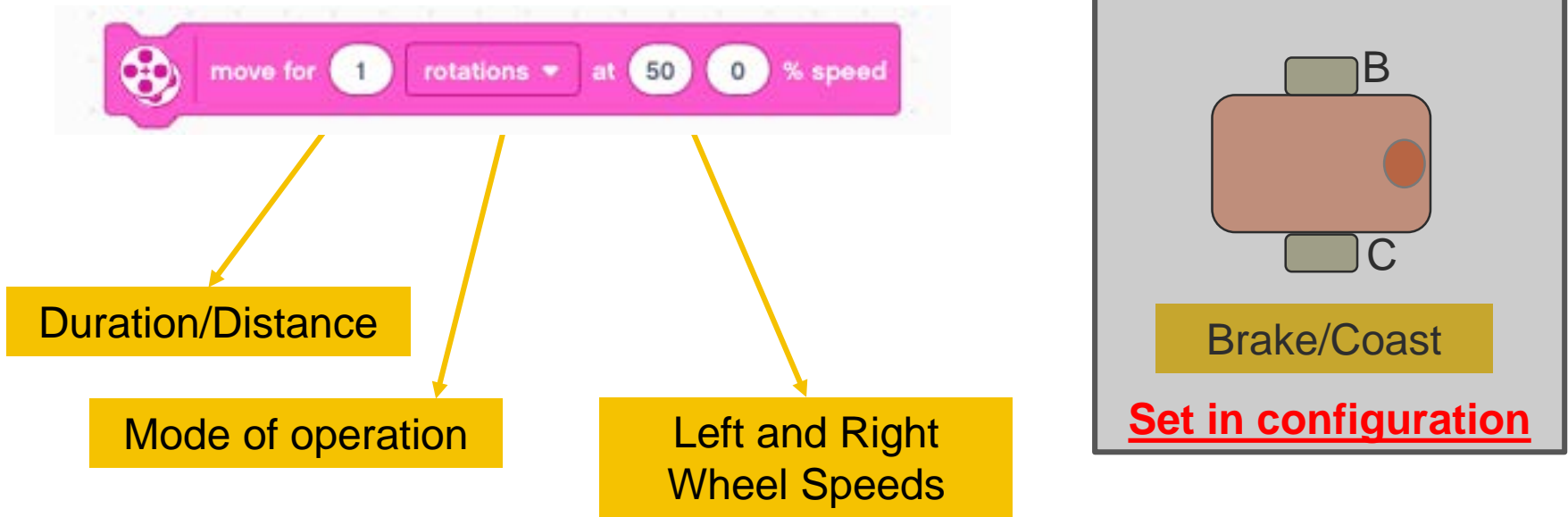
This is like the move steering/speed block. However instead of specifying speed and steering, you specify the two motor speeds independently. Its behavior will be identical to the steering/speed block.

NEGATIVE VALUES

Negative Power =
Backwards

Positive Power
= Forward
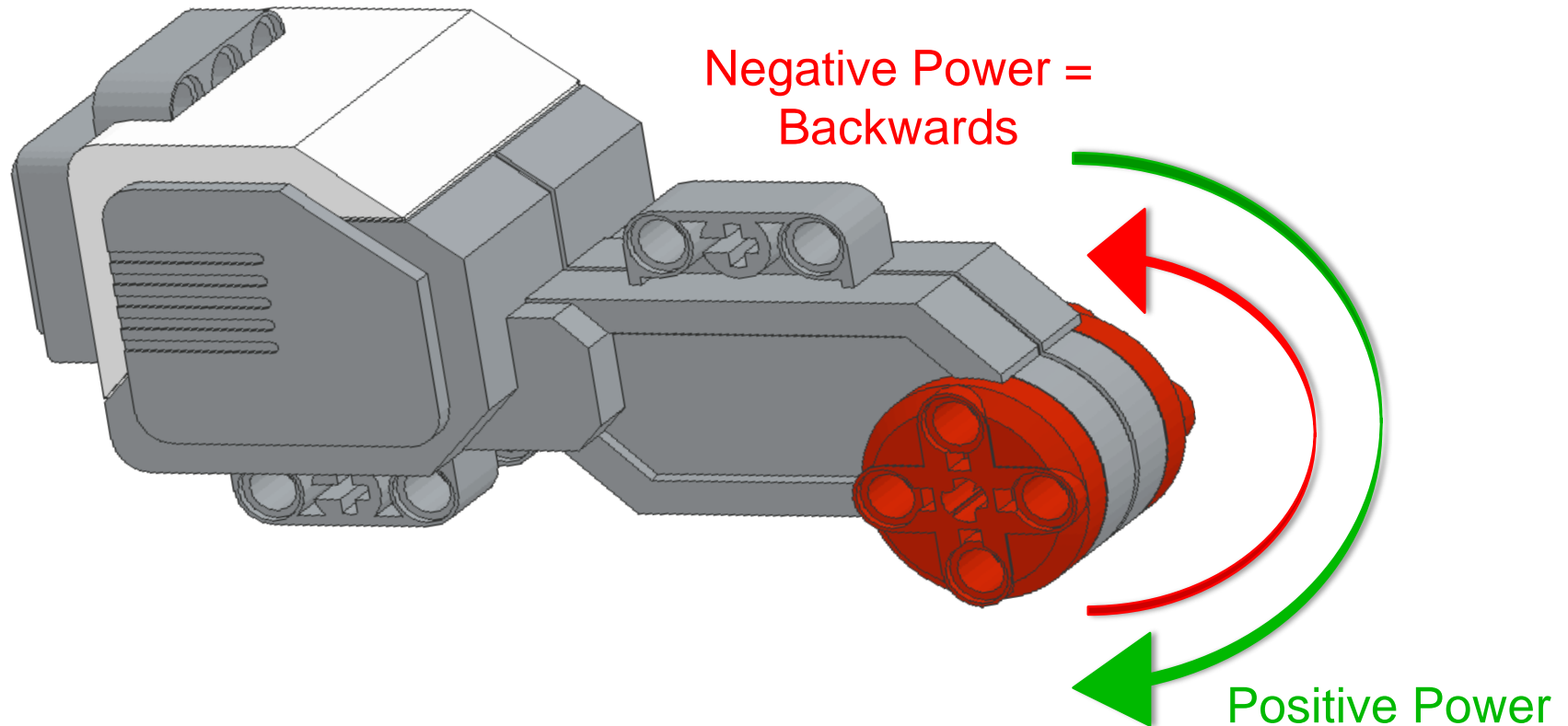
You can enter negative values for power or distance

This will make the robot move backwards

If you negate two values (e.g. power and distance or distance and backwards direction), the robot will move forward.

HOW TO MAKE A PROGRAM

Movement

when program starts

set movement speed to 50 %

move forward ▾ for 1 rotatio

move straight: 0 for 1 rotatio

start moving straight: 0

stop moving
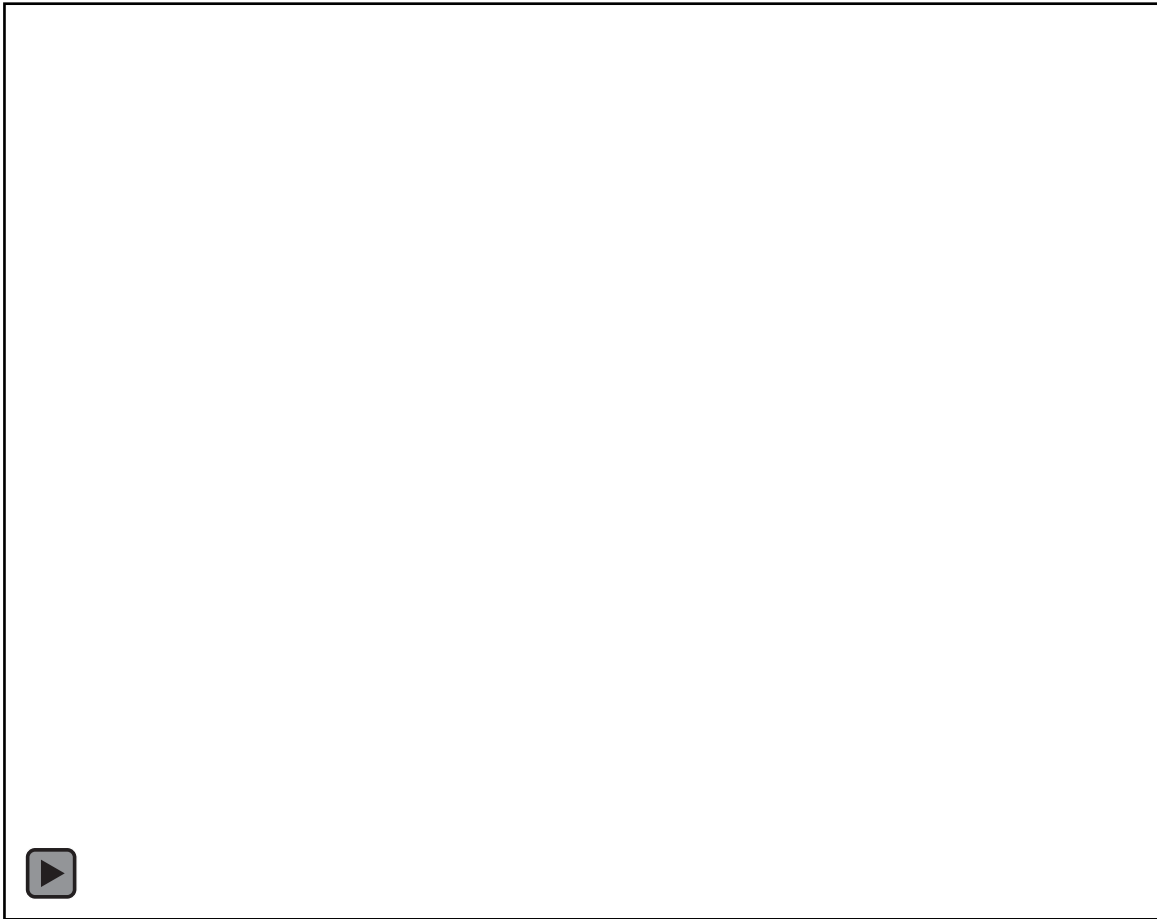
set movement speed to 50 %

set movement motors to B ▾ and

STEP 1: Click and hold Set Speed block and drag to programming area

STEP 2: Drop next to the Start Block (green arrow) (See animation)

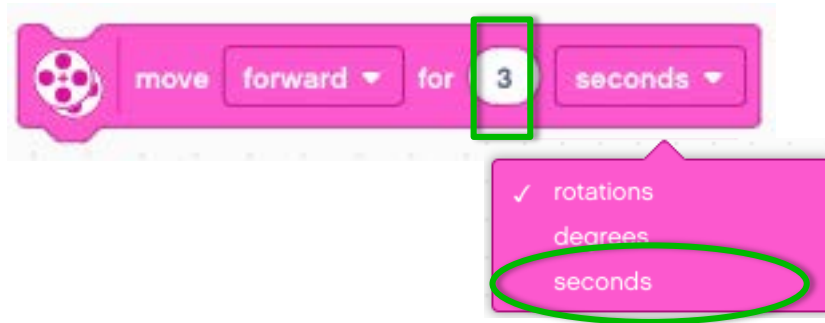# MAKING A MOVE STRAIGHT PROGRAM

STEP 3: Drag the remaining "configure movement" blocks to the program

STEP 4: Drag the Move Straight block onto the program (see animation)

▶

CHALLENGE 1: MOVE STRAIGHT (3 SECONDS)

Step 2:

Step 3

Step 4

STEP 1: Create a Move Straight program

STEP 2: Change mode and duration. Move "3 Seconds"

STEP 3: Connect USB cable to EV3 and Laptop.

STEP 4: Download to EV3

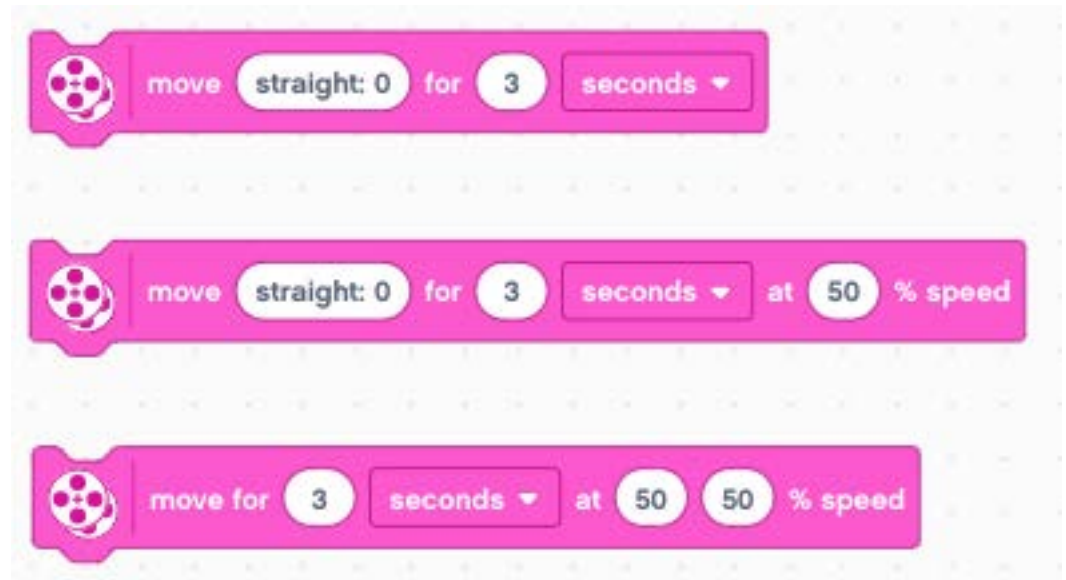# OTHER WAYS TO MOVE 3 SECONDS

Scratch gives you different ways to move 3 seconds.

Here are 3 other blocks that will move you 3 seconds

TEACHER INSTRUCTIONS

- **Split up class into groups as need**
- **Give each team a copy of the Move Straight Challenge Worksheet**
- **Challenge Details are on Slide 8**
- **Discussion Page Slide 9**
- **Challenge Solution on Slide 10**
- **A Better Way on Slide 11**

MOVE STRAIGHT: SECONDS VS. DEGREES VS. ROTATIONS

CHALLENGE: Move your robot forward from the start line to the finish line (1) and back to the start (2).

Try mode SECONDS, DEGREES or ROTATIONS and adjust duration/distance

Try different speeds

FINISH

1

2

B   C

START
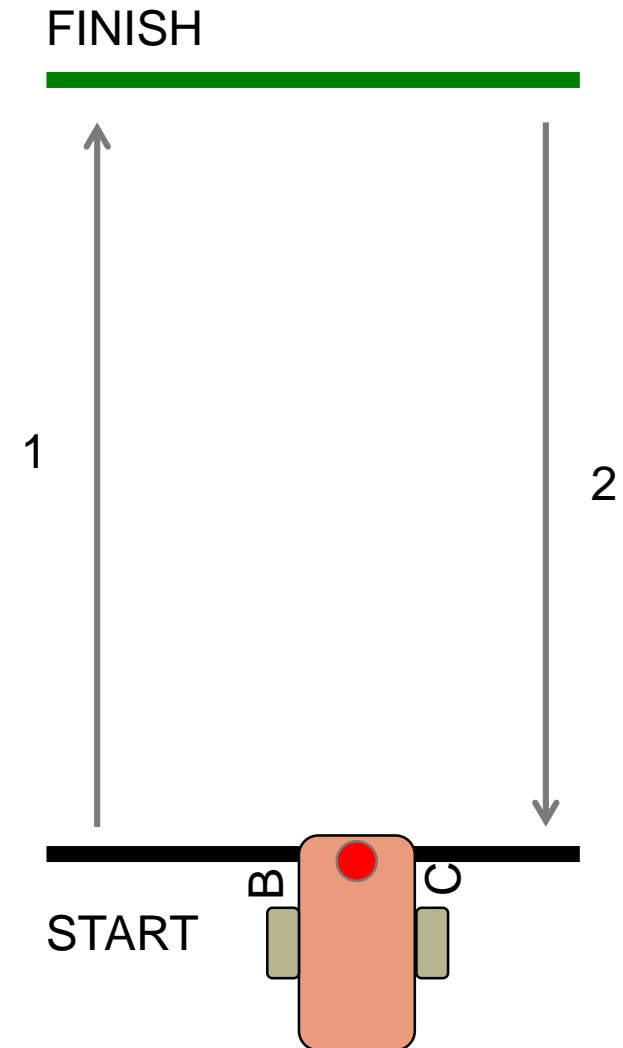
MOVE STRAIGHT DISCUSSION

Did you guess and check a lot?
Yes. Programming with seconds, rotations and degrees using guess and check takes a lot of time and effort.

Did changing the speed matter?
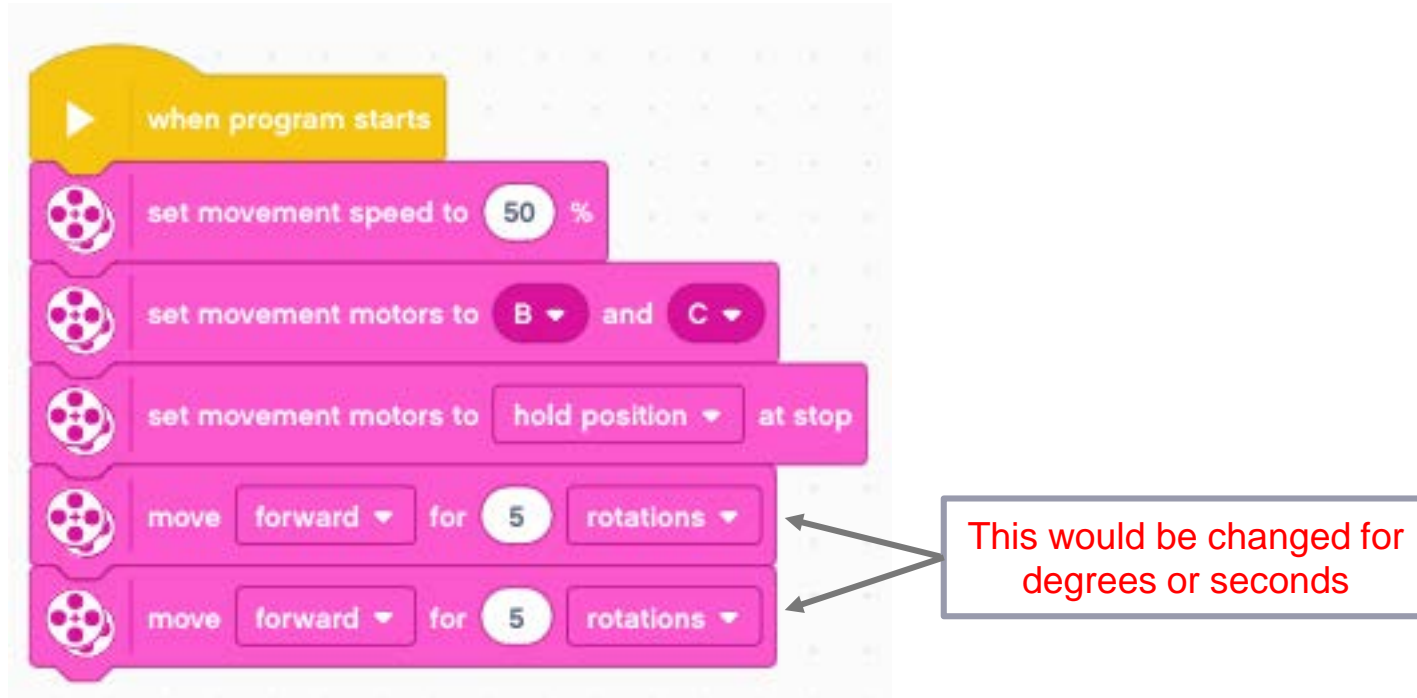Yes. When you move in seconds your speed will matter.

Do you think the wheel size will matter? Why?
Wheel size affects degrees/rotations.

Do you this the battery level will matter? Why?
When you move in seconds, battery levels change the power.

CHALLENGE SOLUTION

when program starts

set movement speed to 50 %

set movement motors to B and C

set movement motors to hold position at stop

move forward for 5 rotations

move forward for 5 rotations

This would be changed for degrees or seconds

- **There is a better way (go to slide 11) to solve this challenge**

SOLUTION: USE PORT VIEW

**CHALLENGE: Move your robot forward from the start line to the finish line (1) and back to the start (2).**

In this lesson, you had to use a lot of guess and check to stop exactly on the second line.

Now try Port View:

- Go to one of the rotation sensors (Motor B or C for our robot on the right)
- Make sure it is on degrees as the mode and that it starts at 0 degrees.
- Move your robot with your hand from the start line to the end line. Make sure that your wheel turns smoothly and doesn't slip as the robot moves.
- Read how many degrees your robot moved
- Use this number in the Move Steering Block to move the correct distance.
- Read the lesson on Port View for more information
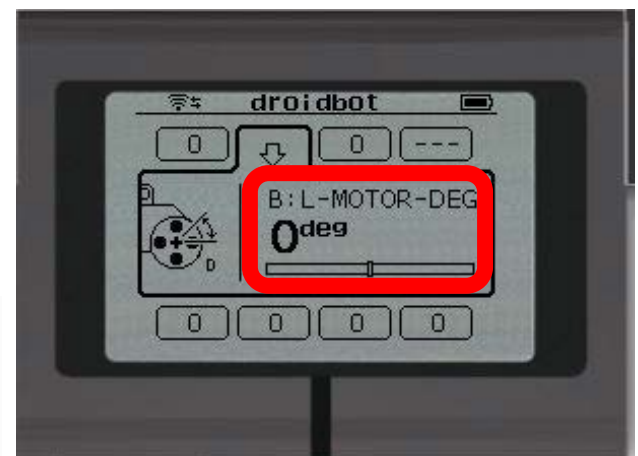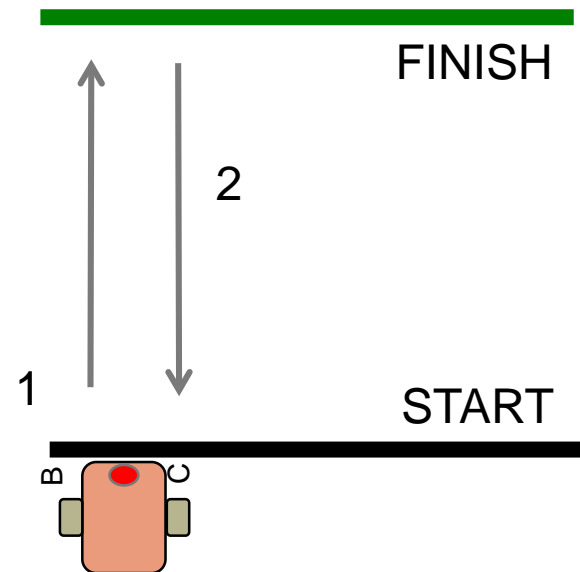
START MOVING AND STOP MOVING BLOCKS
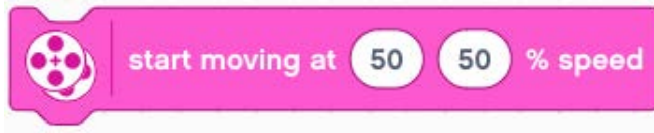
- **There are 4 more move blocks in the Movement palette.**

- **The Start moving blocks will turn on your drive motors at the given speed (and steering if given).**

- **These blocks have no duration/distance. After turning the motor on, the program instantly moves to the next block**

- **The motor will continue running until stopped or controlled by another block**

- **Stop moving will halt your drive motors no matter what action they are running.**

START AND STOP MOVING

What would happen if you placed a Start Moving block?

Would the robot…

      1) Move?

      2) Move for a little while?

      3) Not move at all?

start moving straight: 0 at 50 % speed

ANS. Move until stopped or the program ends. Note that the program will not end unless you have a Stop Program block.

Note that this is a different behavior than EV3-G users might be familiar with.

What does Motor Off do?

ANS. Turn off the motors.

WAIT BLOCK

Start and Stop Moving blocks are typically used along with wait blocks. Wait blocks hold up the program execution until some event occurs. The lessons on sensors cover wait blocks in more detail.

For now, we will use the Wait for Seconds block

This block takes the entered number of seconds to run

Can you solve Challenge 1 (Move 3 Seconds) using Start Move and Wait blocks?

OTHER WAYS TO MOVE 3 SECONDS

The Start Moving block starts the robot moving

After turning on the motors, the program begins running the Wait block. This takes 3 seconds to run.

The Stop Moving block makes the robot stop

CREDITS

- **This tutorial was created by Sanjay Seshan and Arvind Seshan**

- **More lessons are available at www.ev3lessons.com**