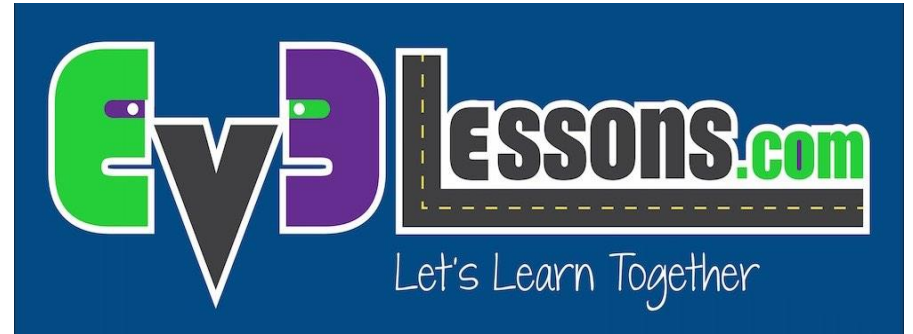
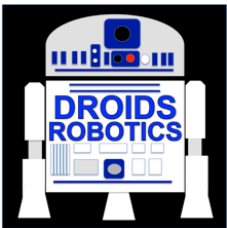


BEGINNER EV3 PROGRAMMING LESSON



Topics Covered:
Turning



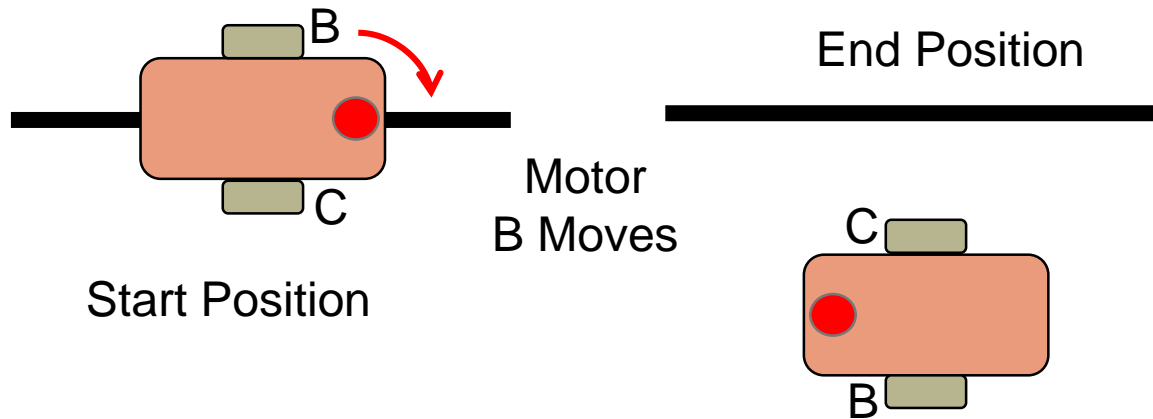
By: Droids Robotics

LESSON OBJECTIVES

1. **Learn to turn the robot a desired number of degrees**
2. **Learn the differences between Spin and Pivot Turns**
3. **Learn how to program two different type of turns**
4. **Learn to write pseudocode**

PIVOT VS. SPIN TURNS

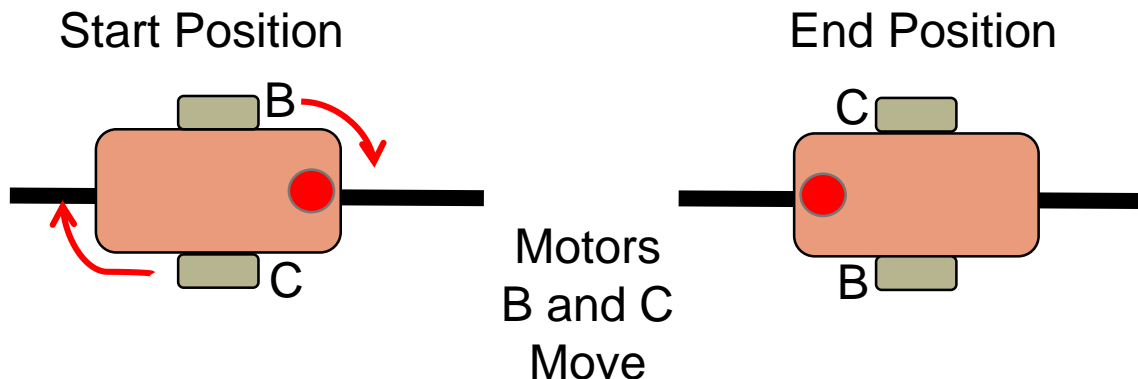
180 Degree Pivot Turn



Notice where the robot ends in both pictures after a 180 degree turn.

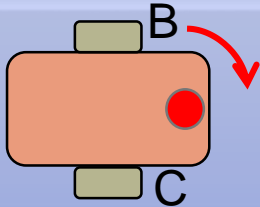
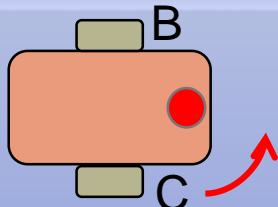
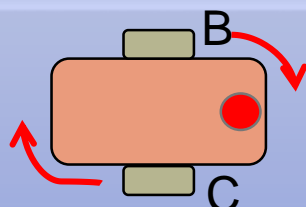
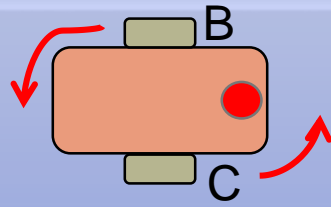
In the Spin Turn, the robot moves a lot less and that makes Spin Turns are great for tight positions. Spin turns tend to be a bit faster but also a little less accurate.

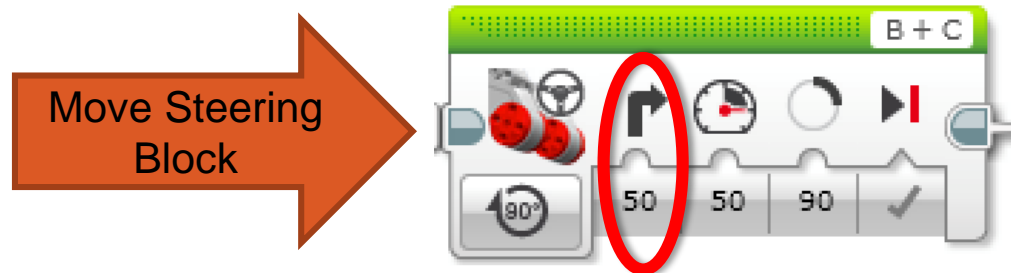
180 Degree Spin Turn



So when you need to make turns, you should decide which turn is best for you!

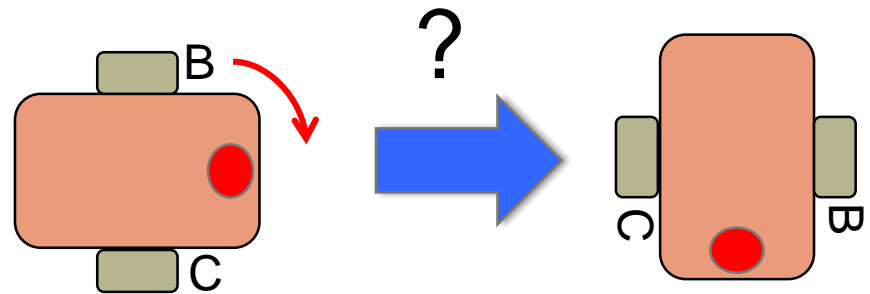
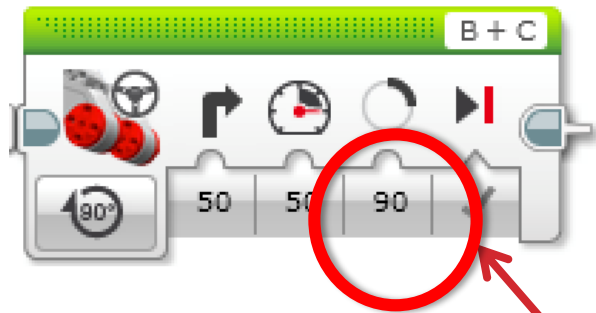
HOW TO MAKE PIVOT AND SPIN TURNS

Steering Value			
50	-50	100	-100
			
Pivot Turn Right	Pivot Turn Left	Spin Turn Right	Spin Turn Left



Change Steering value here

MAKING A PIVOT TURN FOR 90 DEGREES

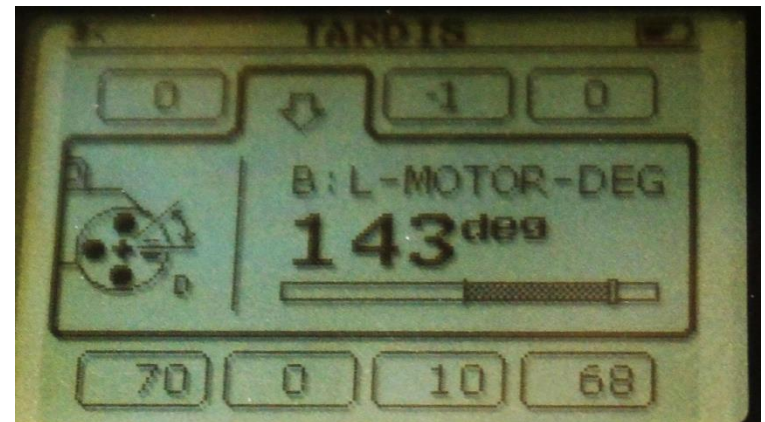
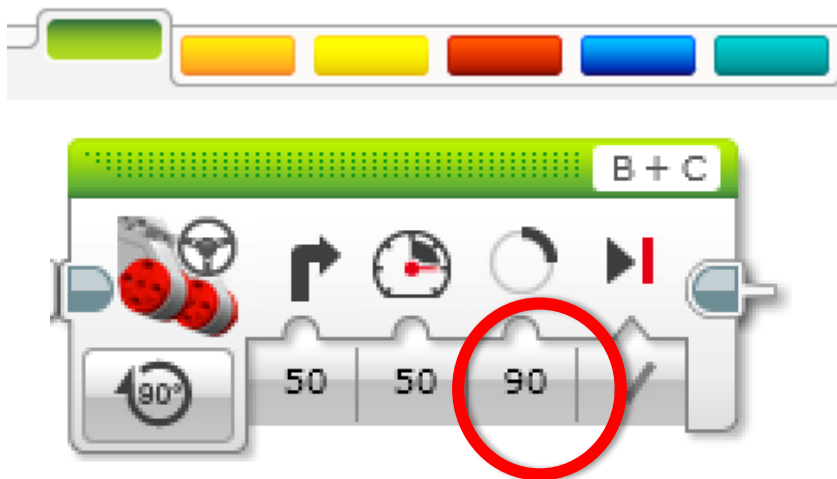


Program your robot to turn 90 degrees....Does the robot actually turn 90 degrees if you just pick 90 degrees for distance?

Ans. NO! Solution on next page

HOW DO YOU MAKE THE ROBOT TURN 90 DEGREES?

Ans. Try using the port view to measure the turn and then input the correct number of degrees.



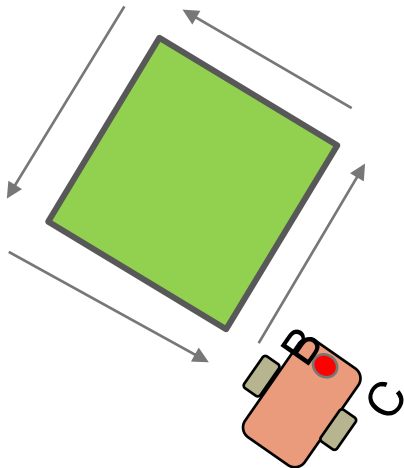
TEACHER INSTRUCTIONS

- Split up class into groups as need.
- Give each team a copy of the Turning Challenge Worksheet.
- Challenge Details are on Slide 8
- Discussion Page Slide 9
- Challenge Solution on Slide 10

TURNING CHALLENGES

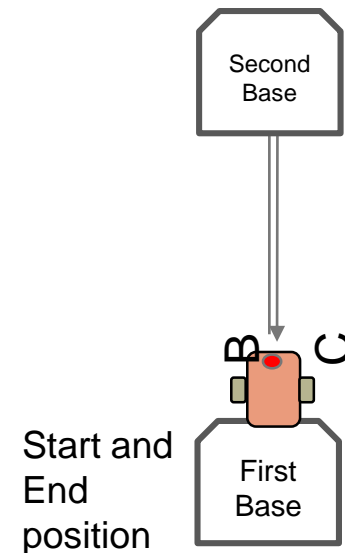
Challenge 1

- Your robot is a baseball player who has to run to all the bases and go back to home plate.
- Can you program your robot to move forward and then turn left?
- Use a square box or tape



Challenge 2

- Your robot baseball player must run to second base, turn around and come back to first.
- Go straight. Turn 180 degrees and return to the same spot.



CLASS DISCUSSION GUIDE

Did you try PIVOT and SPIN turns? What did you discover?

Pivot turns were fine for Challenge 1, but for Challenge 2, if we used Pivot turns, we were farther away from the base.

What situations would one work better than the other?

Spin turns are better for tight turns (places where there is not enough space) and you stay closer to your original position.

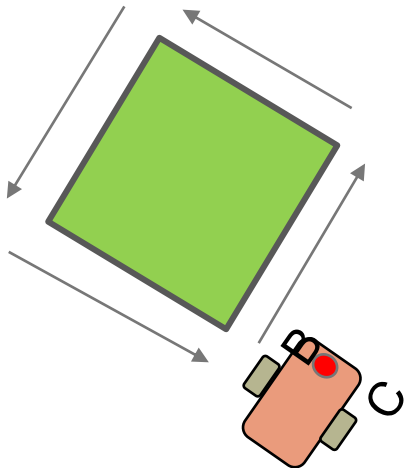
What is PSEUDOCODE? Why do you think programmers find it useful? (pseudocode is from the worksheet)

Pseudocode allows programmers to write out their code in plain English before you code in a programming language. It lets you plan and think before you sit down to code. It lets you share your ideas with others you are working with in a common language.

CHALLENGE SOLUTIONS

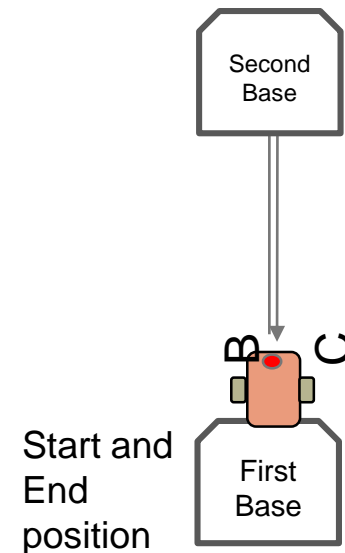
Challenge 1

You probably used a combination of move steering to go straight and do **pivot turns** to go around the box.



Challenge 2

You probably used a **spin turn** because it is better for tighter turns and gets you closer to the starting point!



TURNING AN ATTACHMENT ARM, NOT JUST THE WHEELS

- **Attach a medium motor to Port A or a large motor to Port D as needed.**
- **Move Steering vs. Motor Block**
 - For moving your wheels you should use a Move Steering Block that syncs both wheel motors (see intermediate lesson called Move Blocks to learn about sync)
 - For moving your attachment your arm, you use either a Medium Motor Block or a Large Motor Block because you don't need to sync your motors.

Medium Motor Block



Large Motor Block



CREDITS

- This tutorial was created by Sanjay Seshan and Arvind Seshan from Droids Robotics.
- More lessons are available at www.ev3lessons.com
- Author's Email: team@droidsrobotics.org



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