Name: _____ Date: _____

Introduction to NXT/EV3 Robotics

GEARBOTS Educational Resources Promoting Science, Technology, Engineering, Arts and Math (STEAM Education)

A. Introduction to Move Blocks: - Use TM001 Introductory Training Mat

First, you will need to build the basic TestBot. Simply put… if you want your robot to move, you will have to build and program your robot using the motors provided in your kit. Programming motors will allow you to move your robot in the following ways:

1. Move forward or backwards for a specific duration
2. Efficiently and effectively complete turns (any specified degree or angle, pivot turn, point turn)
3. Change the speed (power output) and distance traveled (modifiers) of your motors
4. Complete a square (using loops)

Key concepts taught in the lesson:

▪ Graphic coding language, program blocks, move blocks, pivot and point turns, duration, ports, variables, iterative design, engineering method, programming - FLOW v1.0

1. Basic Movement: Must successfully complete each task before moving to the next one

☐ **TASK ONE:** Write, test and debug a program that allows your robot to <u>travel forward for 2 seconds at 85% power</u> and then <u>coast to a stop</u>. **Partner:** Change the amount of time.

☐ **TASK TWO:** Write, test and debug a program that allows your robot to <u>travel forward for 3 rotations at 50% power</u>, <u>travel backwards for 400 degrees at 60% power</u>, <u>spin around once</u> and then <u>break to a stop</u>. **Partner:** Change the speed (power level), direction, and the amount of time (fraction of a second - i.e. 1.5 seconds) and then stop.

CHECK-IN ➔ ☐ **TASK THREE:** Write, test and debug a program that allows your robot to <u>travel forward for 4 rotations at 35% power</u>, <u>make an approximate 90^0 turn</u>, <u>travel forward for 2.5 seconds</u> and then <u>coast to a stop</u>. **Partner:** Change the duration of the move block to 1.4 rotations and make an approximate 180^0 turn.

☐ **TASK FOUR:** Write, test and debug a program that allows your robot to travel an unlimited amount of time forward.
Questions: What did you observe? Did the program work?

2. Introduction to Loops:

☐ **TASK FIVE:** Write, test and debug a program that <u>loops</u> a <u>4-block program</u> <u>five times</u> and then <u>coast to a stop</u>.
Partner: Change the block order to change the robot's behaviour.

CHECK-IN ➔ ☐ **TASK SIX:** Write, test and debug a program that <u>loops</u> a <u>2-block program</u> <u>two times</u> then goes <u>forward at 50% for 2.4 rotations</u> and then <u>break to a stop</u>.
Partner: Change the duration and power of the move blocks in the loop to change the robot's behaviour.
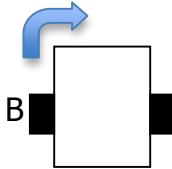
3. Introduction to Turning (Pivot and Points Turns):

1. Pivot = One wheel turns:
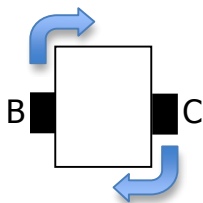[example: Select a large motor block with a B port configuration]
- ACTION: The robot will complete a <u>pivot turn</u> to the right

2. Point = Two wheel turns:
[example: Select a steering move block and move the steering bar all the way to the left]
- ACTION: The robot will complete a <u>point turn</u> to the left

☐ **TASK SEVEN:** Write, test and debug a program that that allows your robot to complete a one wheel turn (pivot turn) to the right for 2 rotations at 40% power. **Partner:** Change rotations and power to change the robot's behaviour.

☐ **TASK EIGHT:** Write, test and debug a program that allows your robot to complete a two wheel turn (point turn) to the left for 3 seconds at 83% power. **Partner:** Change amount of time and power to change the robot's behaviour.

CHECK-IN ➔ ☐ **TASK NINE:** Write, test and debug a program that allows your robot to travel at 50% power for 2.9 rotations forward, complete a right pivot turn for 1 second, travel backwards for 180 degrees, complete a two wheel turn (point turn) to the left for 1.5 rotations, and forward at 25% power for 1 rotation. **Partner:** Change the turning blocks in the task to change the robot's behaviour.

DISCUSSION QUESTION:
▪ Think about the characteristics/behaviours of both turns. Why and when would you use a point turn over a pivot turn?

4. ENGINEERING TEAM CHALLENGE: Use as a Summative Assessment

- Introduction to "Iterative Design" and the "Engineering Process" in the Engineering Methodology Booklet**.**
   ▪ Now it is time to put your engineering skills and talents all together. Complete the assigned challenges below. Once done, check-in with your instructor.

☐ **Square / Intersection Challenge:** - Use Introductory Training Mat – TM001
Write, test and debug a program that completes the assigned challenge on the GEARBOTS Training Mat. You must alternate between pivot and point turns.
Partners: Each partner should take turns programming the solution to this challenge.