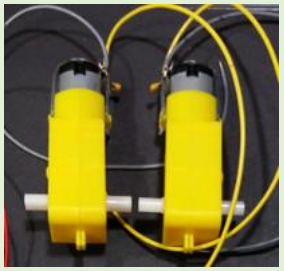
Propulsion Test #2



Objectives:

Program the rover to ??

1. Open the MakeCode Editor. Click “import” o the projects page.
2. Upload the link or the URL of the Speed Test 1 activity. You will modify this code for Speed Test 2.
3. Rename the project: Speed Test 2
4. Follow the **what** and **how** directions.

Did You Know?

In the propulsion Test #1, pressing the Button A changes the speed by ten only in a forward direction. In the Speed Test #2 program, the speed will increase or decrease by ten and will represented by the LEDs and coded in the following manner. Each time Button A is pressed, the speed will initially increase in positive increments of 10 until reaching 100 and produce a forward motion, adding an LED for each unit of 10. The lit LED will show above the blinking LED in the x2 y2 position to represent a positive forward motion. Pressing Button A after 100, will then decrease the speed from 0 into negative integers and produce a backwards motion. Each of these units of 10 will produce a lit LED below the blinking LED in the x2 y2 position. Positive integers represent forward motion and negative represent reverse motion. The Make Code simulator will appear to have the lit LEDs reversed, but when placed in the motor:bit on the rover, it will rotate the micro:bit so that when reading the LEDs from the rear of the rover it will appear correct.

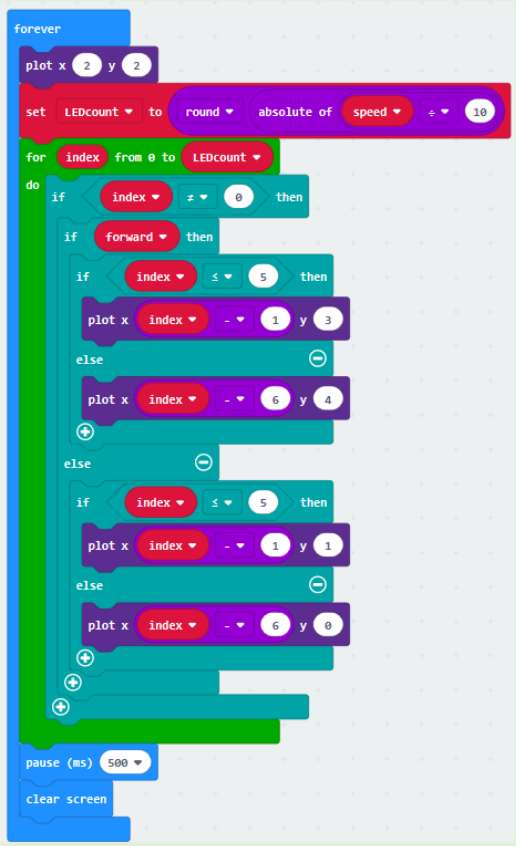
What am I doing?	How will I do it?
Create code to allow the rover to move in a forward and reverse motion. • Modify the on start block from the Speed Test 1 program.	**Modify the ON START block:** 1. Delete all the code in the on start block from the STEM SEALS Drive Wheels block. Now the rover will not move but indicate the selected speed. 2. Create a new variable called “Forward” 3. Add and if/then block a. If “speed” is greater than or equal (≥) to zero (0) b. set “Forward” to true c. else set “Forward” to false 

Modify the forever loop to now show a graphical (LED) representation of the rover's speed (forward and reverse).

- The LEDs on the micro:bit can be programmed to be on or off based on conditions and by using their location on the (x,y) grid.
- Use the LED plot, loop, and logic blocks to create the graphical representation.
- Forward speed is represented using positive integers 0 to 100 and reverse speed is represented using negative integers to -100.

Using the Forever block:

1. Modify the set LEDCount block to round absolute of "speed" divided (÷) by 10.
2. Insert a new if/then block between the first and second if/then blocks (which plots the LEDs as speed indicators).
   a. if "forward" then
   b. leave the original speed indicator
   c. else: add (copy and paste) another if "index" is less than or equal to 5 (≤) then
   d. change the y in the first plot statement to 1
   e. change the y in the second plot statement to zero (0)

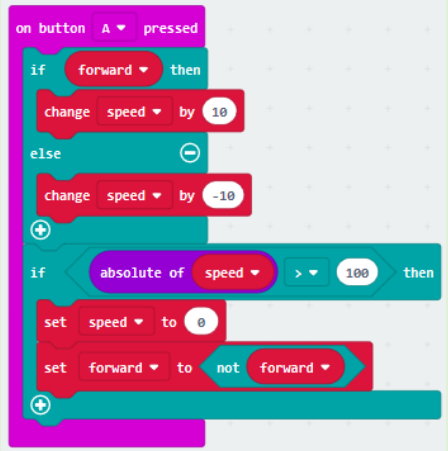


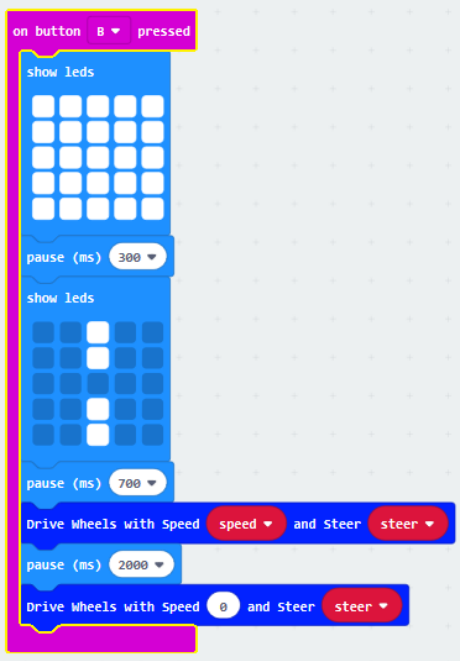
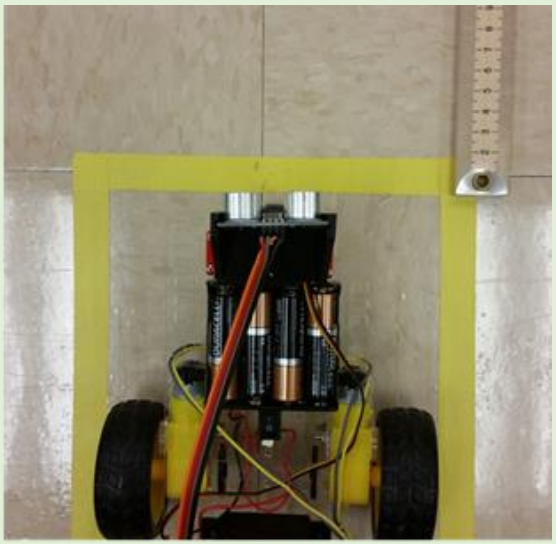
Redo the on button pressed (A) to control the speed of the rover both forward and reverse.

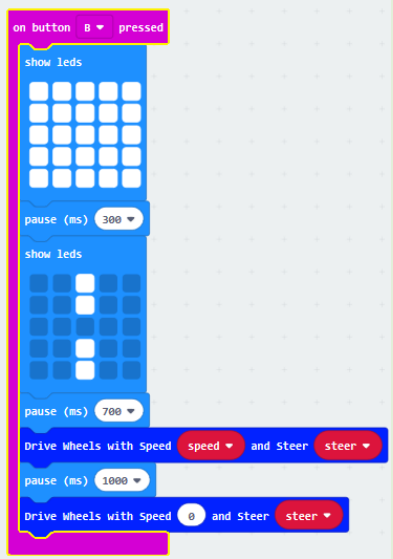
- Each time the button A is pressed the speed of the rover will increase in increments of 10 until reaching 100.
- Once the value is greater than (>) 100, the speed is set back to zero (0) and not forward.

On button A pressed block:

1. Add and if/then block:
   a. if "forward" then
   b. change "speed" by 10
   c. else change "speed" by -10
2. Add another if/then block:
   a. if absolute of "speed" is greater than (>) 100 then
   b. set "speed" to zero (0)
   c. set "forward" to not "forward"



Control when the rover moves. • Use the on-button B pressed block to start the rover in motion.	**Modify the on button B pressed block:** 1. Add a show leds block to the beginning to show all LEDs on to confirm the rover will move. 2. Add a puase of 300 ms. 3. Add another show leds block to show four of the middle LEDs on. 4. Change the pause 1000 ms to 700 ms before the first Drive Wheels block. 5. Change the last pause from 1000 ms to 2000 ms 
Download to the micro:bit, insert into the rover, turn on the rover and test. **Note:** After testing the program and troubleshooting any errors, share and publish the link or save the hex file to a USB for later use.	1. Createa starting position for the rover using masking tape on the floor. 2. Use a meter stick or measuring tape to measure the distance the rover travels. 

Propulsion Test 1:	1. Set the rover behind the masking tape. (see photo) 2. Turn the rover on. 3. Press Button B and observe. Does the rover move? 4. Record in Table 1 (1 second) how far the rover moved under Run number 1. Record the distance and speed LEDs and interpret the speed. (See resource page for Table) 5. Place rover back at starting position behind tape. 6. Press Button A one time. (This sets the speed to 10 in a forward motion.) 7. Then press Button B to set the rover in motion, observe and measure. 8. Record the data again. (Table 1) 9. Continue this process of pressing button B then A and recording results. Note: The larger the "speed" variable, the more power the motors have and the faster the rover will move, and therefore the futher it should travel.
Propulsion Test 2: • In Propulsion Test 1 we set a pause of 1000 ms (1 second) after the Drive Wheels block. This allows that action to happen for one second. • If we set the pause for 2 seconds (2000 ms), what do you expect to happen? • Let's test it out.	**Modify the on button B block:** Change the last pause block from 1000 ms to 2000 ms. Retest for the new time frame. 1. Set the rover behind the masking tape. 2. Turn the rover on. 3. Press Button B and observe. Does the rover move? 4. Record in Table 2 (2 seconds) how far the rover moved under Run number 1. Record the distance and speed LEDs and interpret the speed. (See resource page for Table) 5. Place rover back at starting position behind tape. 6. Press Button A one time. (This sets the speed to 10 in a forward motion.) 7. Then press Button B to set the rover in motion, observe and measure. 8. Record the data again. (Table 2) 9. Continue this process of pressing button B then A and recording results. 
Analyze the data tables and graph. (Tables and Graph Grid found in STEM SEALs Resources)	1. Analyze and compare the data from both Table 1 and 2: do the numbers make sense? 2. Why do yo think the rover would not move when the power was at 10% or 20%? 3. Using the power % and the distance covered from data Tables 1 and 2, create a graph. a. Plot two separate lines, one for the 1 second test and one for the 2 send test. b. Use the prepared diagrams to plot the data. 4. Do the graphs resemble straight lines? 5. Compare and contrast the two graphs?