# ACCELERATION

BY SANJAY AND ARVIND SESHAN

LESSON OBJECTIVES

- Learn what acceleration means

- Learn how and when to use accelerate

- Learn how to use the Timer Block

WHY RAMP UP

- Acceleration is very helpful when running fast-paced programs
- The speed steadily increases over time in a linear fashion
- Usually, if the robot starts up with high speed, then there would be a small jerk in the beginning. The jerk may change the position of the robot.
- With the acceleration, it would start up slowly and increase speed over time (see video on the right)

Acceleration of Speed
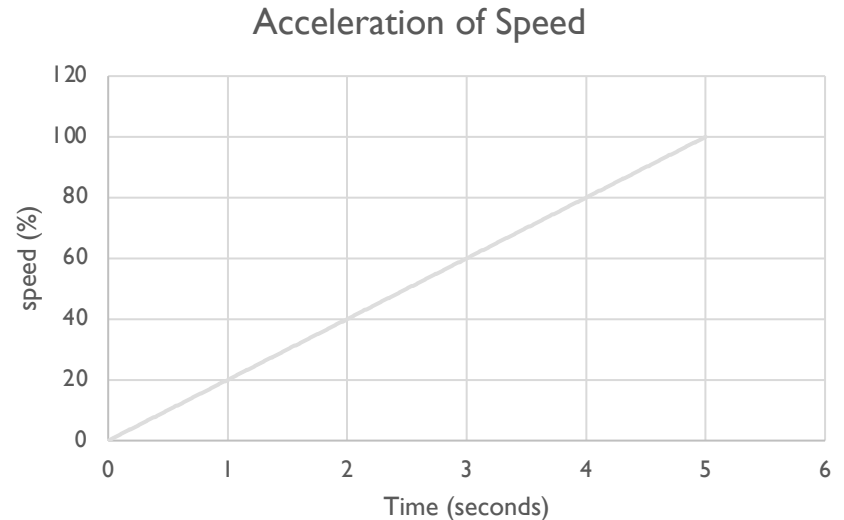
NEW TOOL: TIMER BLOCK

■ The timer block is used to count time

■ It is found in the Blue sensor tab

■ 1 timer is available You can use the reset timer block to reset a the timer back to 0 seconds

■ You can use the block to read the time since reset…

■ If you are a FIRST LEGO League Challenge team, you can use timers to track time or for the acceleration code in this lesson

ACCELERATE IN 4 EASY STEPS

1. Reset timer

2. In a loop, read the number of seconds passed and multiply the speed by 20. The 20 is the rate at which it speeds up and is measured in speed/second

3. Still in the loop, take the result of the multiplication and apply it to the move block.

4. Repeat the Loop for 5 seconds (duration)

Note that the final speed will be *final speed = duration*rate* which should be less than or equal to 100
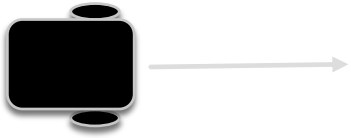
ACCELERATION CODE
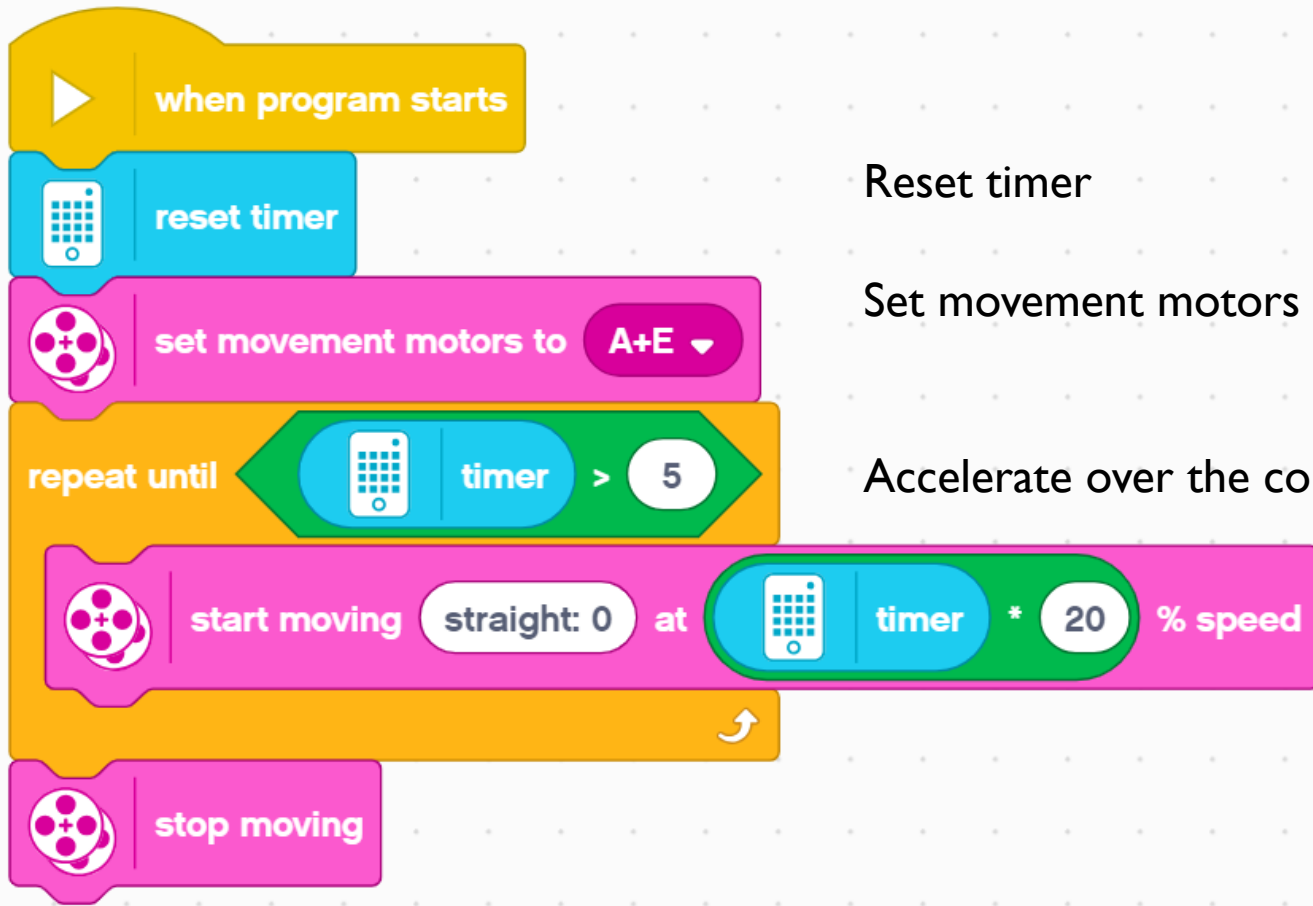
Reset timer

Set movement motors
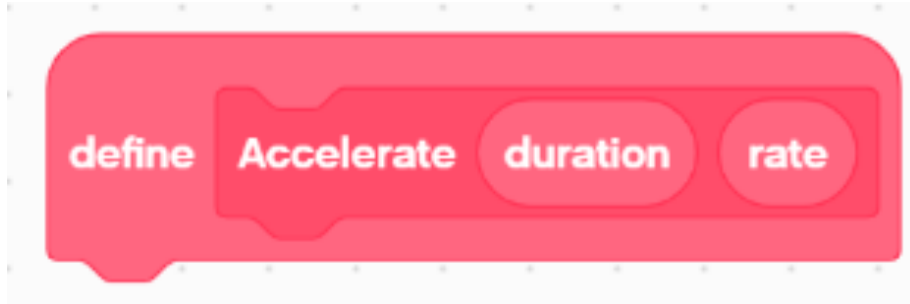
Accelerate over the course of 5 seconds

ACCELERATION CHALLENGE

Step 1: Can you now make an acceleration program that takes 2 inputs (total duration of acceleration and how much speed you want the motor to accelerate per second)? Create a My Block.

Step 2: Accelerate your robot, then move until a black line.
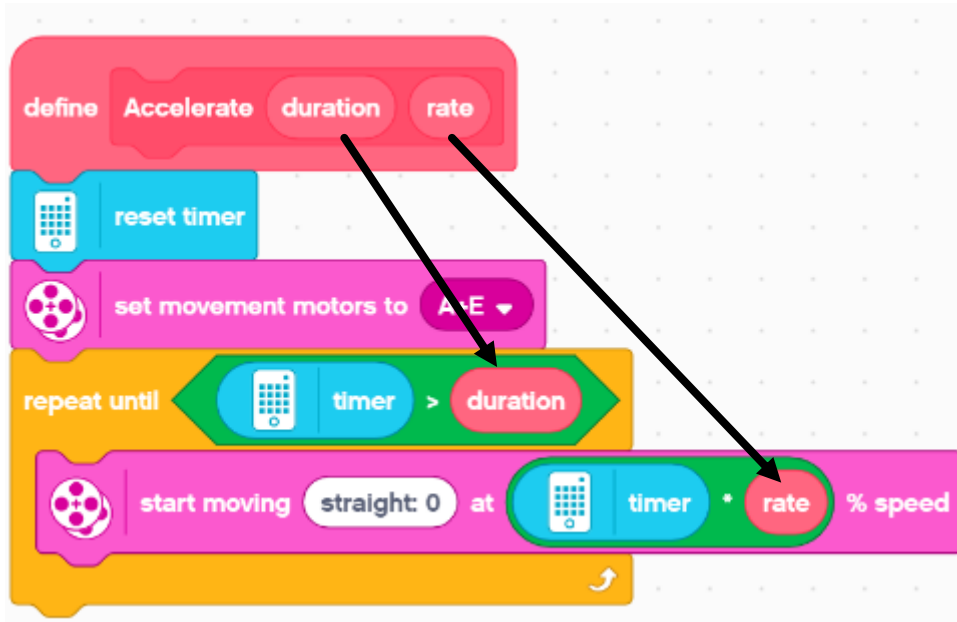
MAKING THE MY BLOCK

define **Accelerate** duration rate

Seconds to ramp up

How quickly you want to ramp up

A. Go to Make a My Block

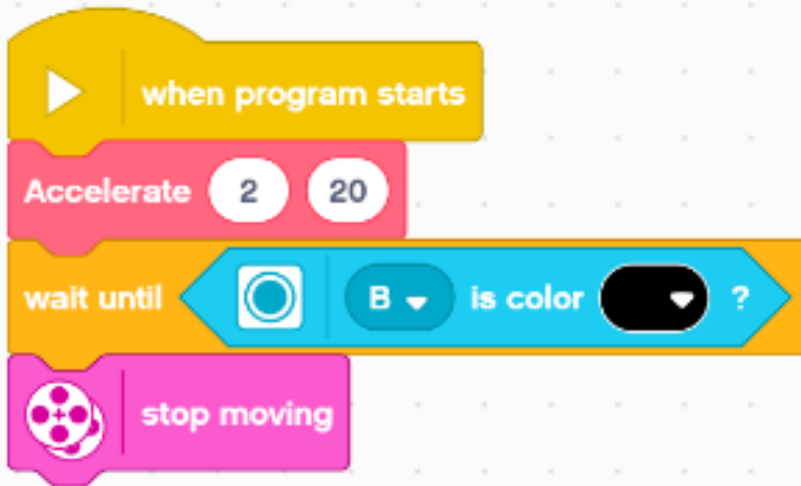B. Add 2 inputs: one for seconds (duration) and one for how quickly you want to accelerate (rate)

DEFINING THE MY BLOCK

Drag the "duration" and "rate" operators into the correct locations

CHALLENGE SOLUTION

This program accelerates for 2 seconds to 40% speed and moves until the color sensor (on port B) sees a black line.

NEXT STEPS

■ Think about what else you might be able to use a timer block for

■ Create a deceleration program now that you know how to create an acceleration program.

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CREDITS

- This lesson was created by Sanjay Seshan and Arvind Seshan for Prime Lessons

- More lessons are available at www.primelessons.org