



Armstrong

School Program 2023-2024

Lesson 3



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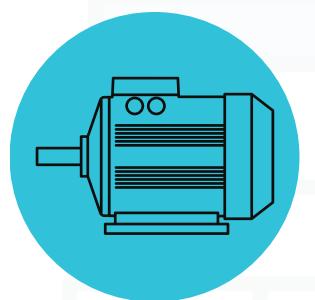
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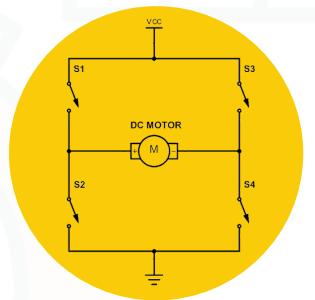
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Lesson Content



Motor



Motor Driver



Moving wheels



Robot Movement

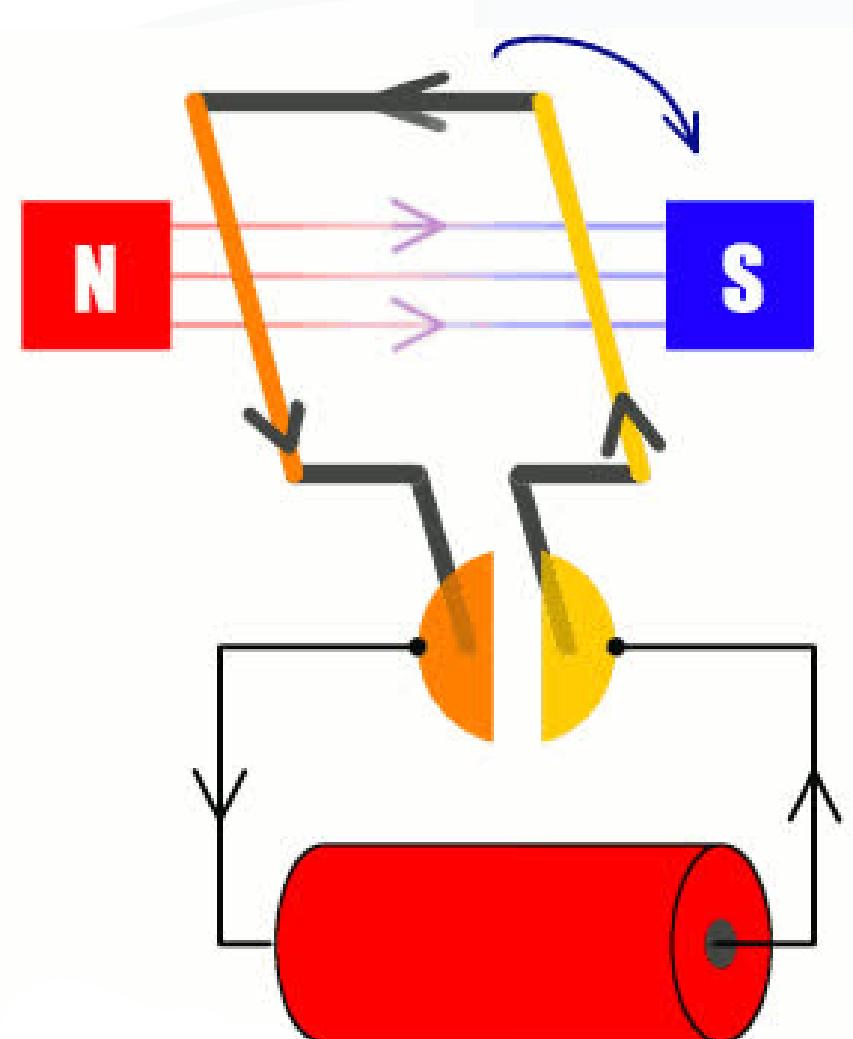
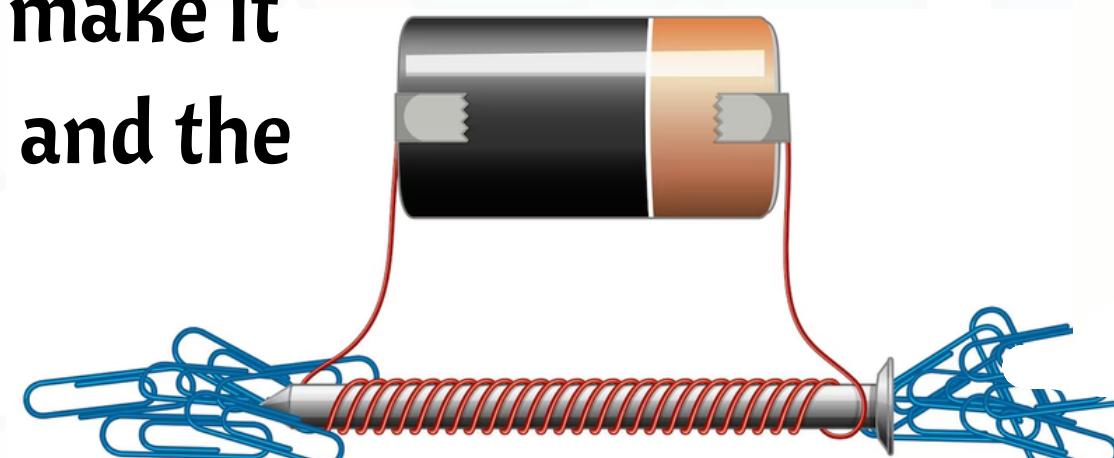
Motor

What is a motor?

It is a device that converts electrical, chemical, or nuclear energy into mechanical energy.

How does an electric motor work?

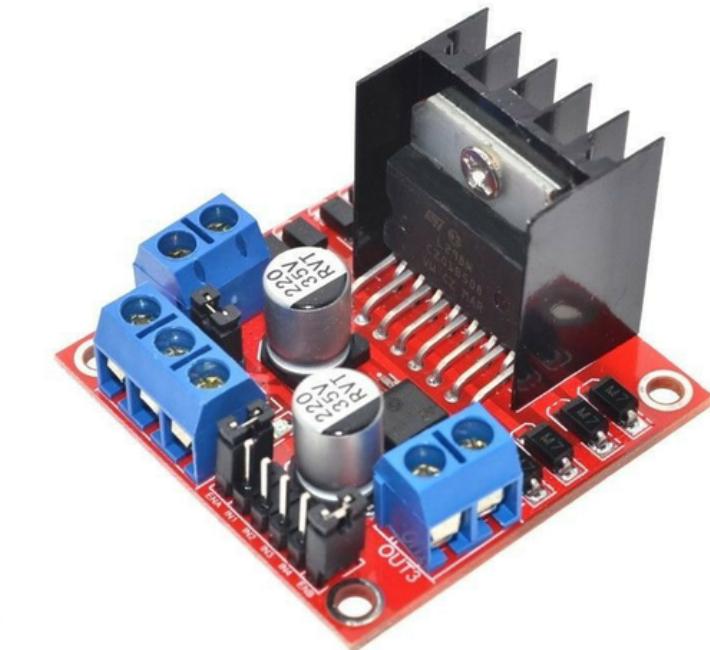
An electric circuit produces a magnetic field. So putting the circuit between 2 magnets will make it rotate due to repulsion between the circuit and the magnets.



Motor Driver

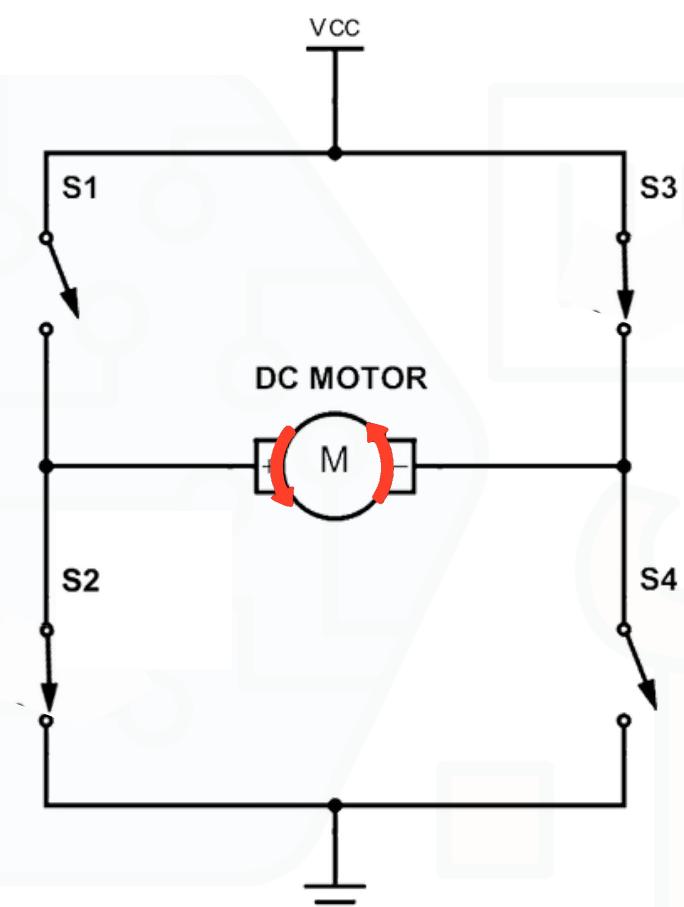
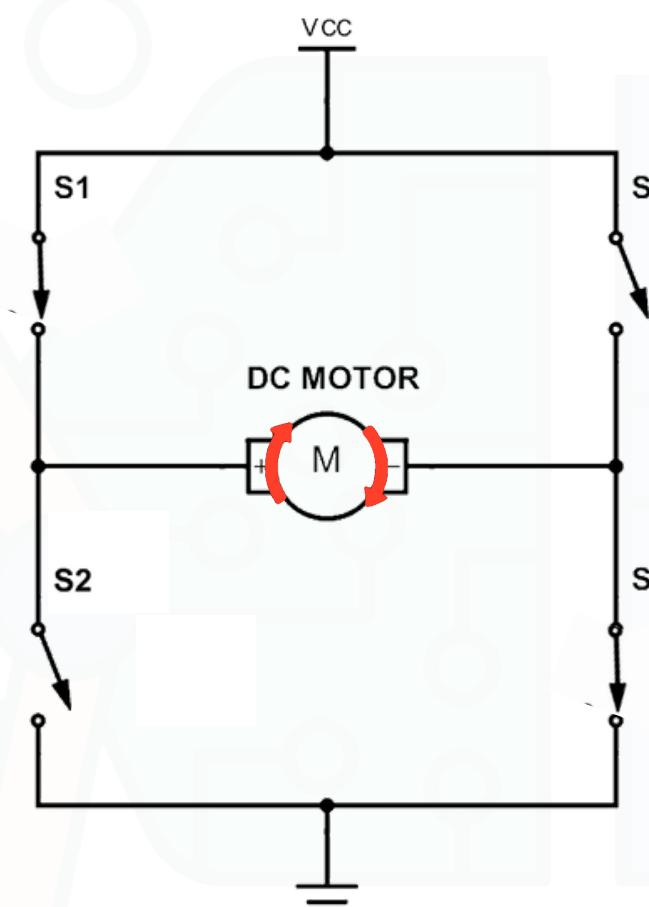
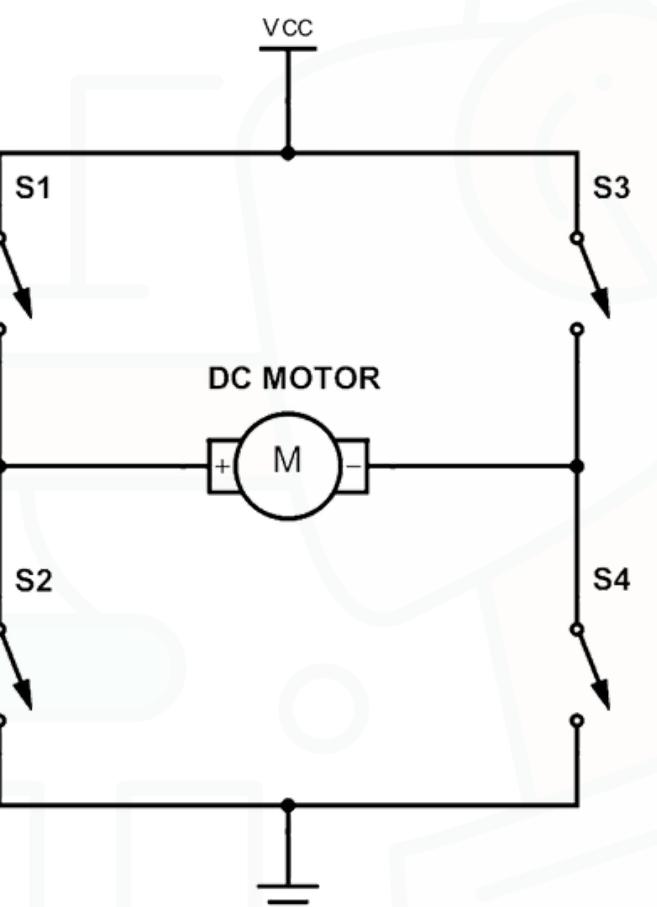
Motor driver

It is a device that controls motor's movement (direction & speed) depending on its inputs (direction of current).

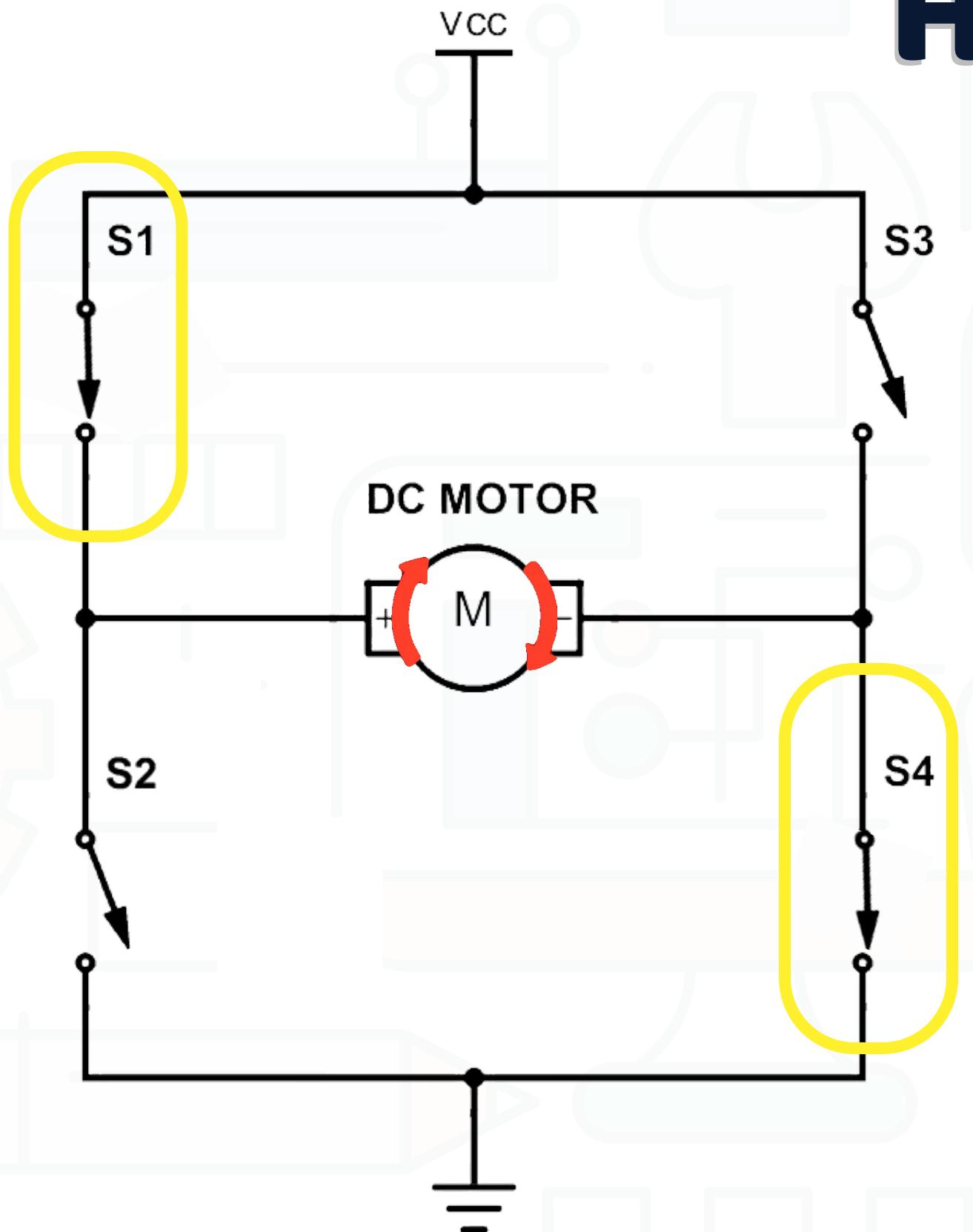


H bridge circuit

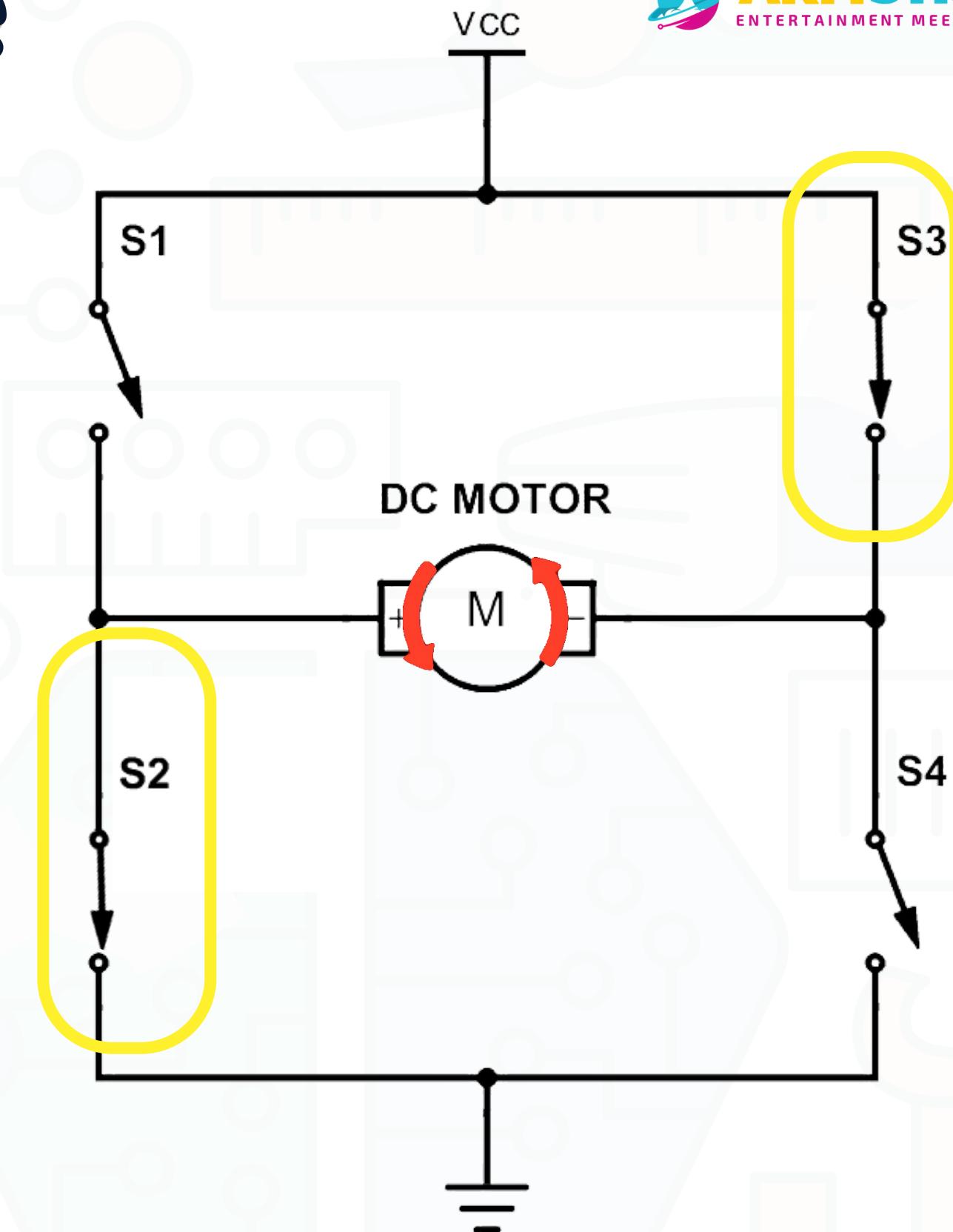
The principle of motor Driver depends on The H bridge circuit.



H bridge



Input 1



Input 2

Move 1st Wheel

Move the front right wheel forward and backward.

First we should know the connection of the driver and its pins.

Pins:

- Enable -> D10
- Input 1 -> A1(D15)
- Input2 -> A2(D16)



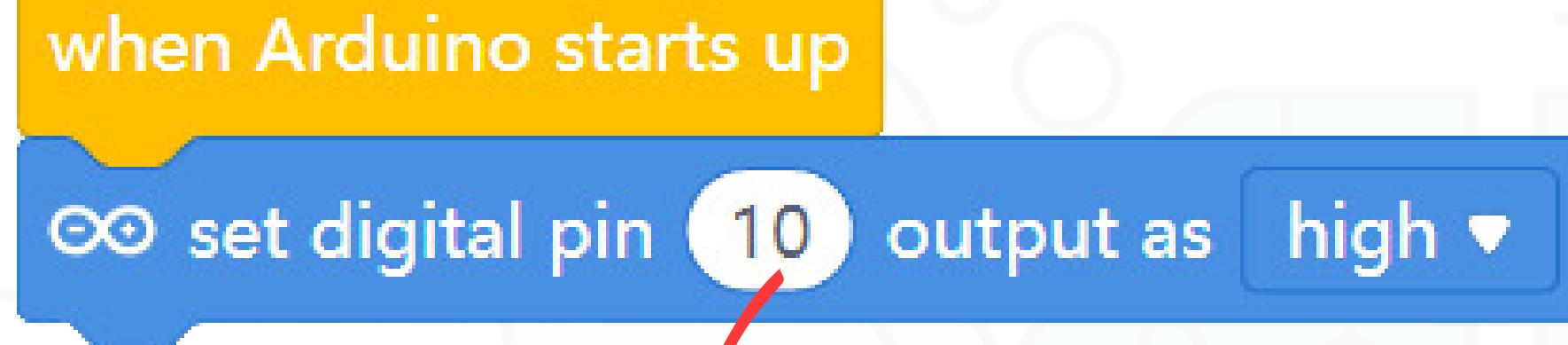
Stop The Robot

To Stop the robot we should set all input1 and input2 pins to "LOW"



Move 1st Wheel

Step 1: Enabling the motor



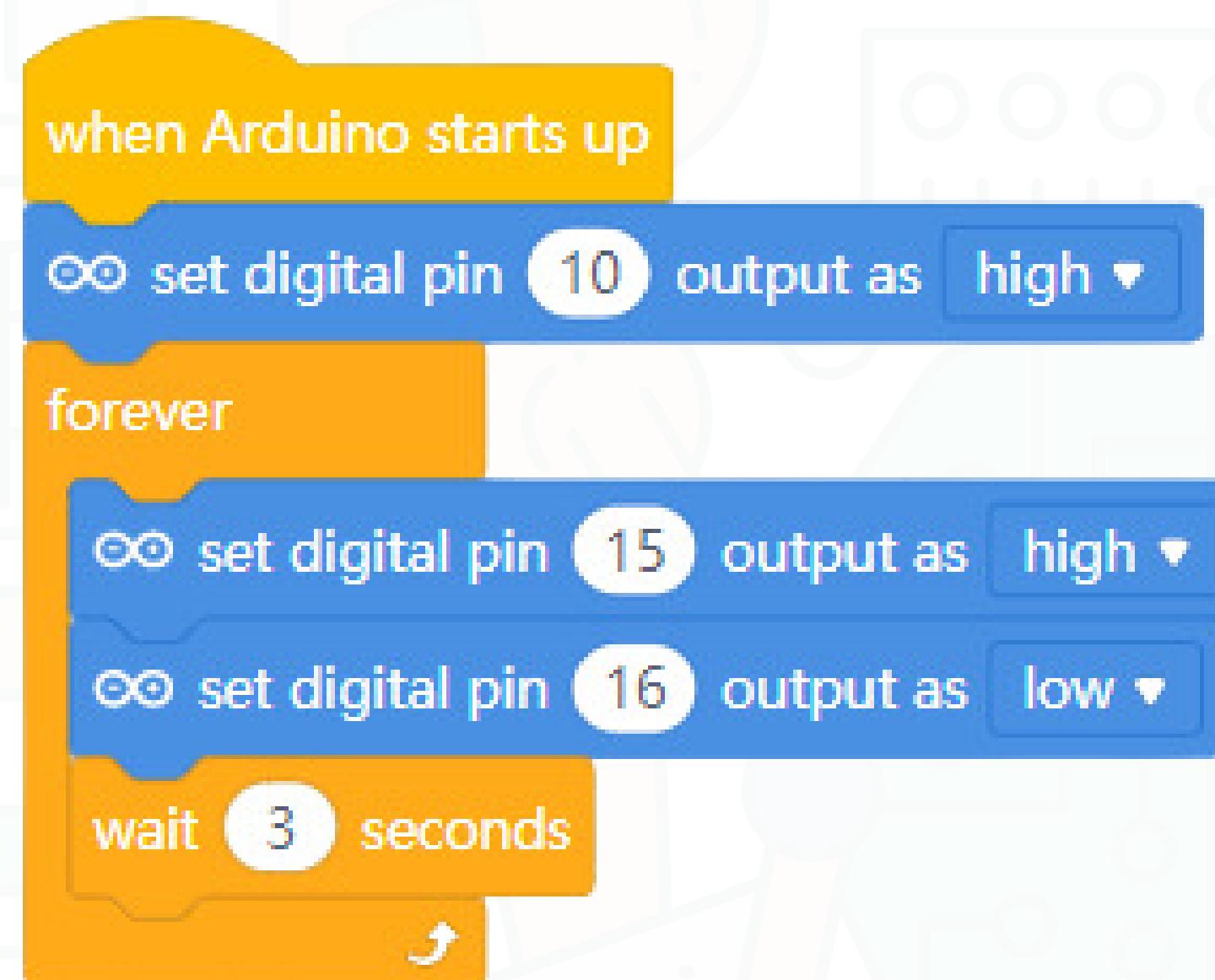
```
when Arduino starts up
  set digital pin [10 v] to [high v]
```



Enable pin

Move 1st wheel

Step 2: Moving the wheel forward



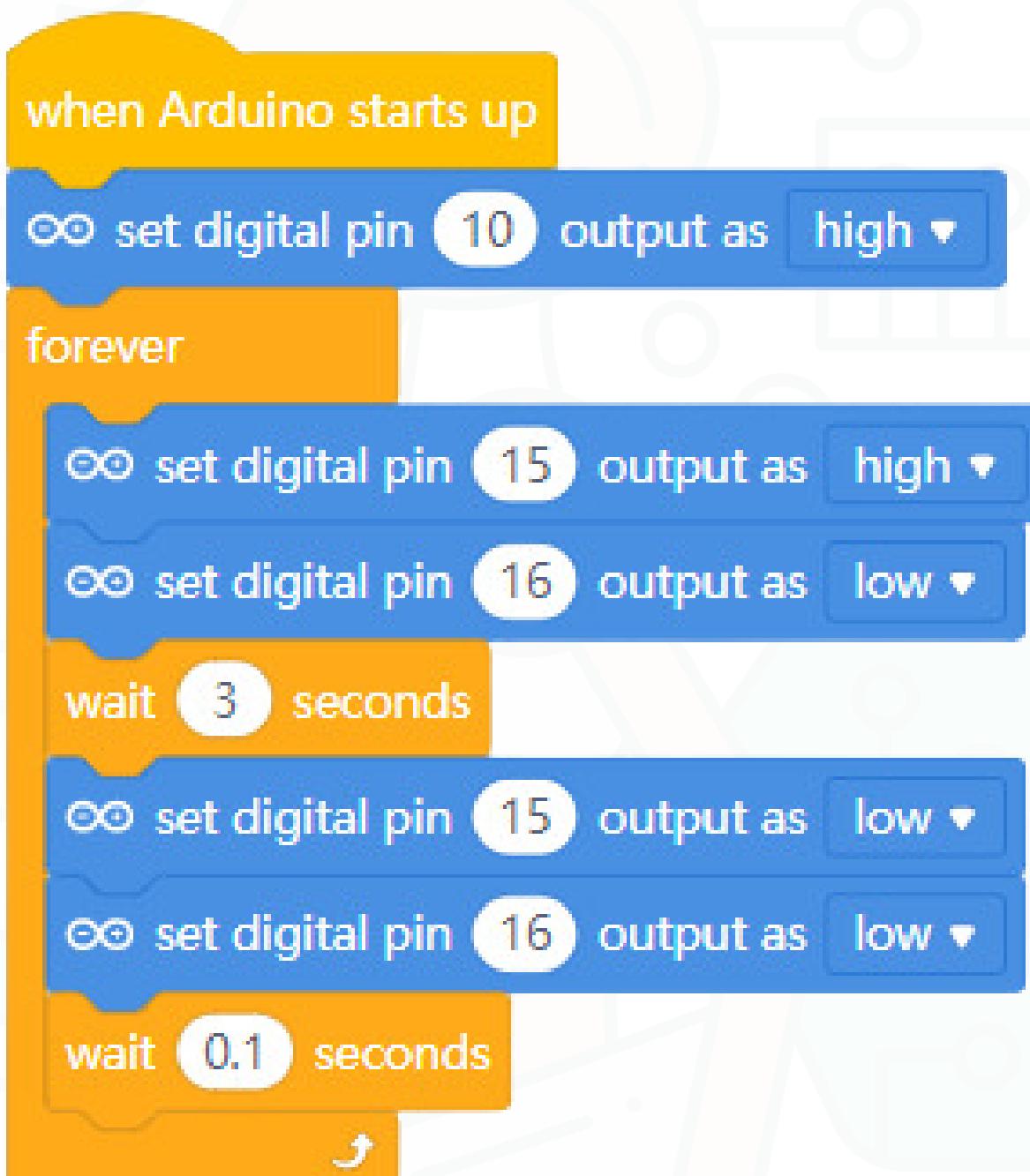
Input1 pin

Input2 pin

Move 1st wheel

Step 3: Stop the wheel

Note: We stop the wheel before motor moving in a different direction so the motor doesn't break



Move 1st Wheel

Step 4: Moving the wheel backward



Move 1st Wheel

Step 4: Stop the wheel

```
when Arduino starts up
  set digital pin 10 output as high
forever
  set digital pin 15 output as high
  set digital pin 16 output as low
  wait 3 seconds
  set digital pin 15 output as low
  set digital pin 16 output as low
  wait 0.1 seconds
  set digital pin 15 output as low
  set digital pin 16 output as high
  wait 3 seconds
  set digital pin 15 output as low
  set digital pin 16 output as low
  wait 0.1 seconds
```

Let's try it on mBlock

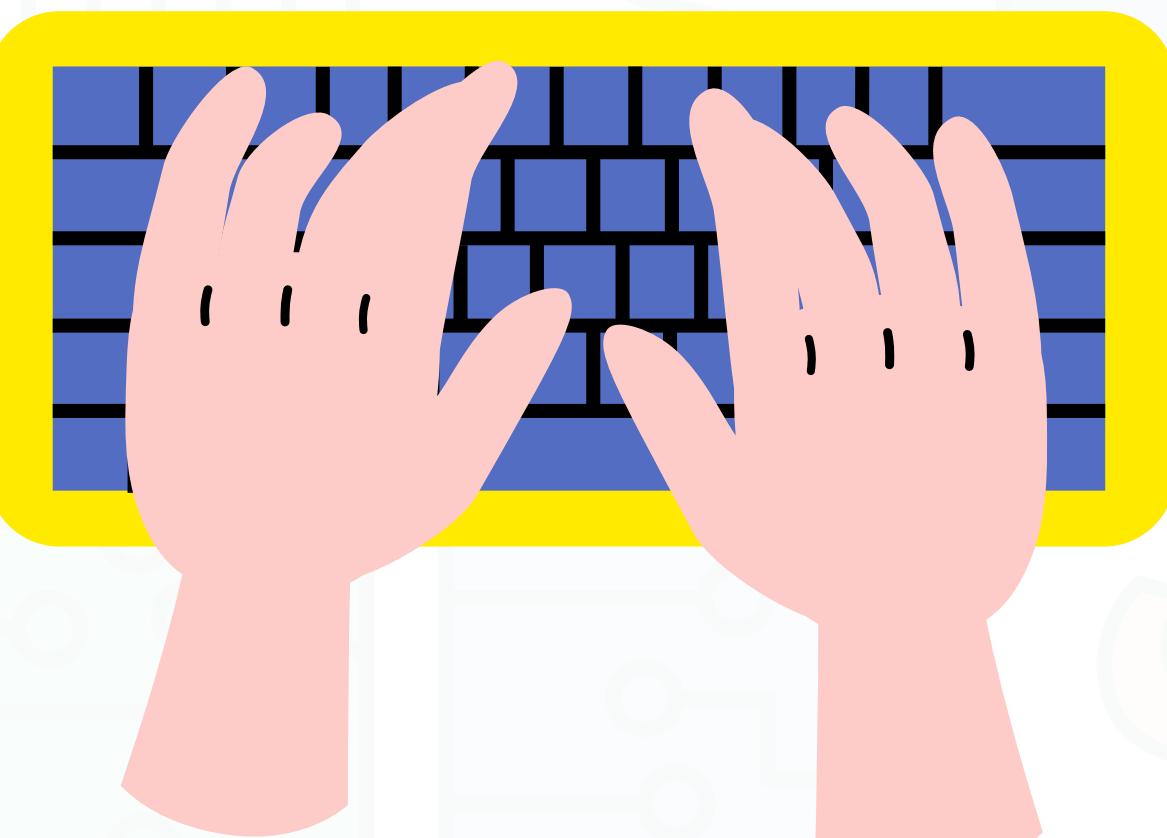


To move the front left wheel

Knowing the pins of the motor are:

- Enable -> D6
- Input 1 -> D11
- Input2 -> D12

Hint: Remember the previous steps to move the front right wheel.



Move 2nd wheel

Step 1: Enabling the motor

when Arduino starts up

set digital pin 6 output as high

6

output as

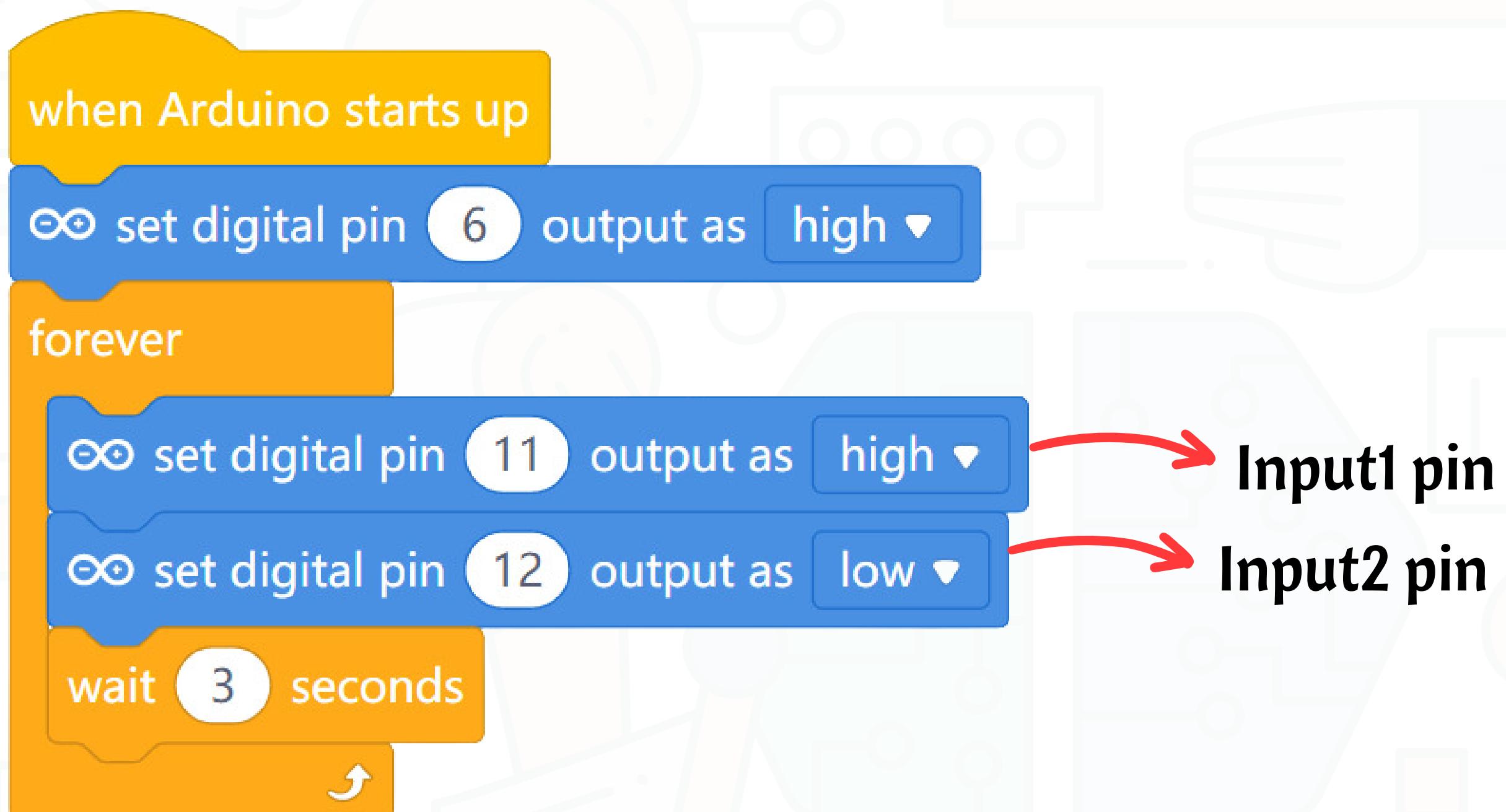
high



Enable pin

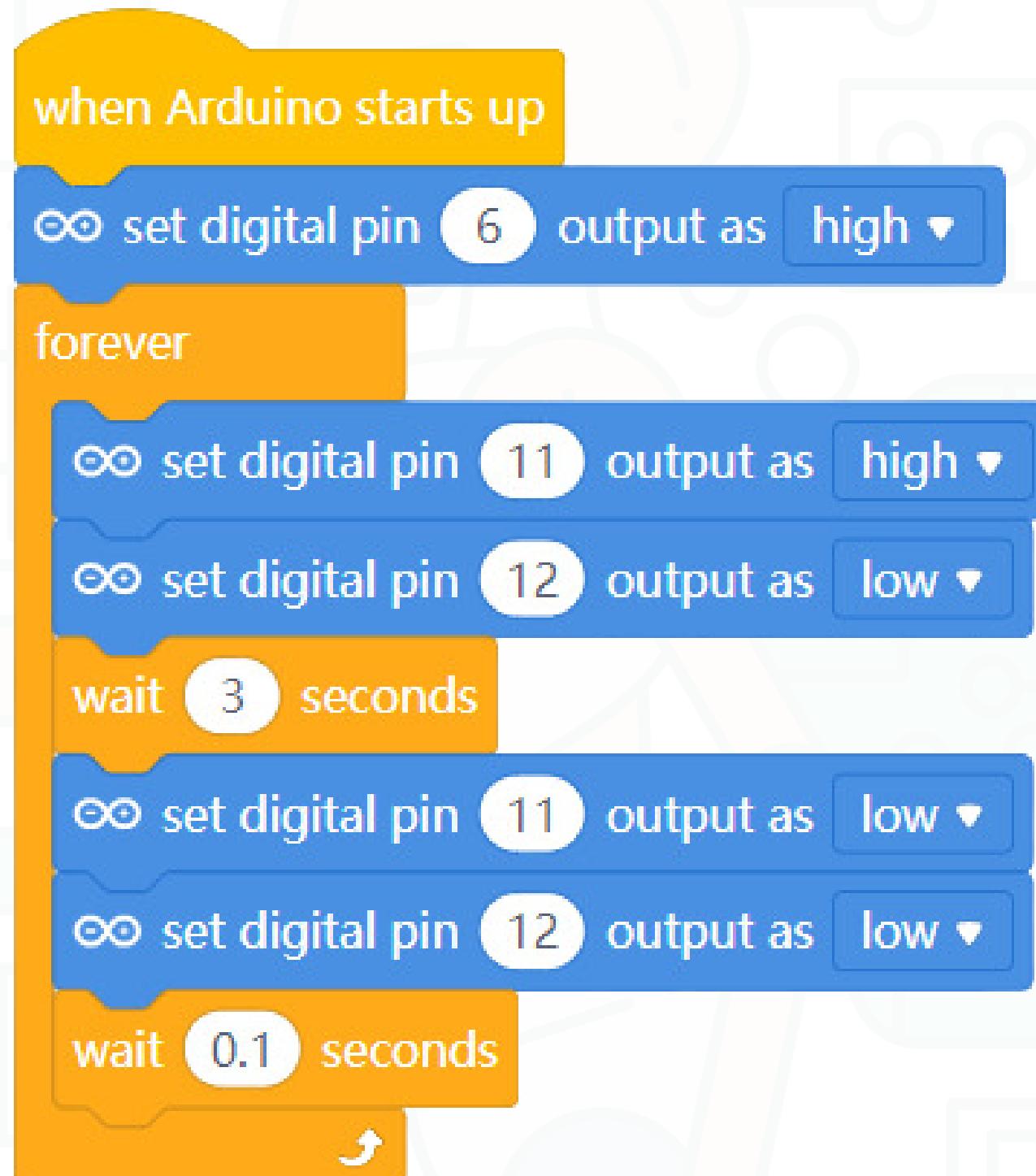
Move 2nd wheel

Step 2: Moving the wheel Forward



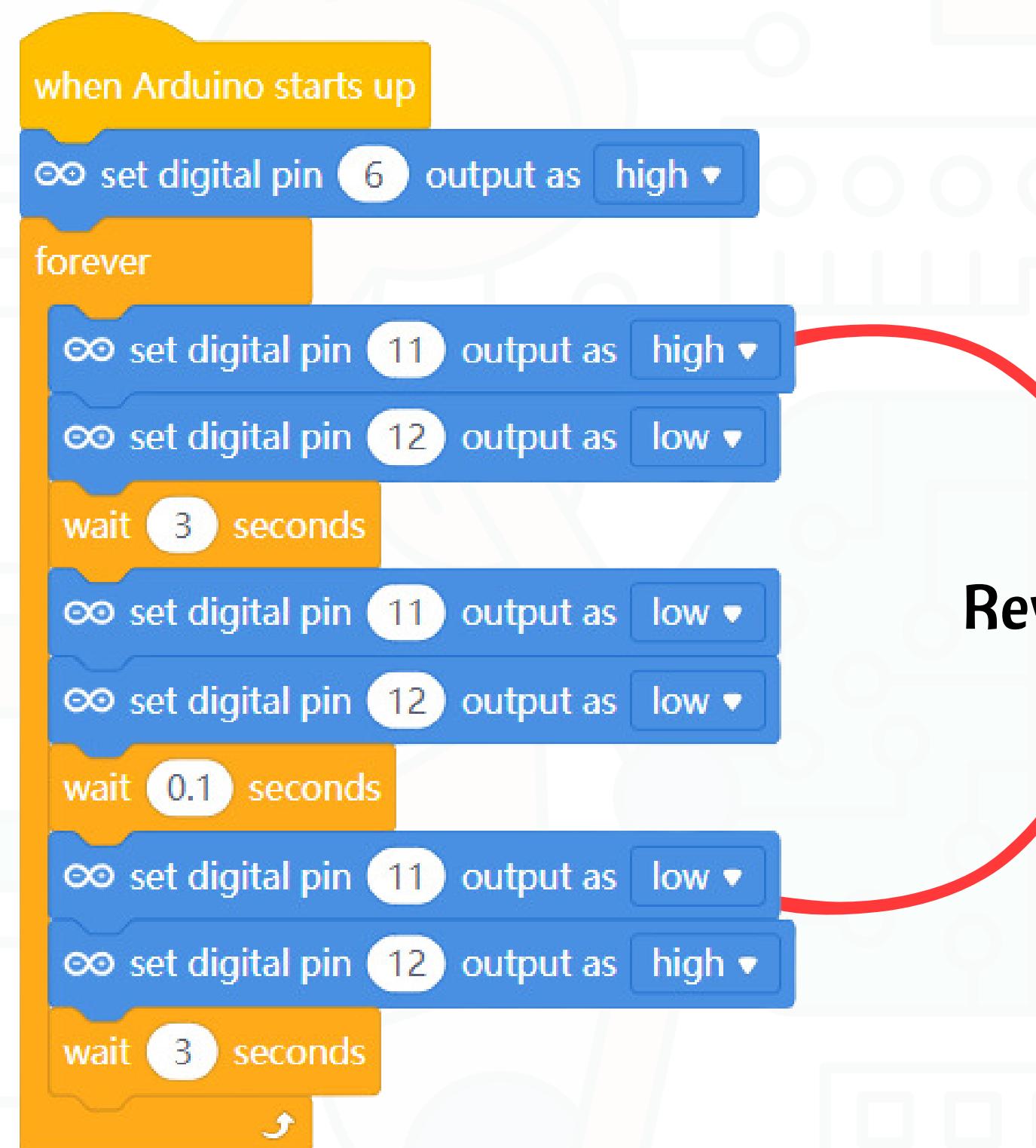
Move 2nd wheel

Step 3: Stop the wheel



Move 2nd wheel

Step 4: Moving the wheel backward



Move 2nd wheel

Step 5: Stop the wheel

```
when Arduino starts up
  set digital pin 6 output as high
forever
  set digital pin 11 output as high
  set digital pin 12 output as low
  wait 3 seconds
  set digital pin 11 output as low
  set digital pin 12 output as low
  wait 0.1 seconds
  set digital pin 11 output as low
  set digital pin 12 output as high
  wait 3 seconds
  set digital pin 11 output as low
  set digital pin 12 output as low
  wait 0.1 seconds
```

Think

How will we move the robot forward?

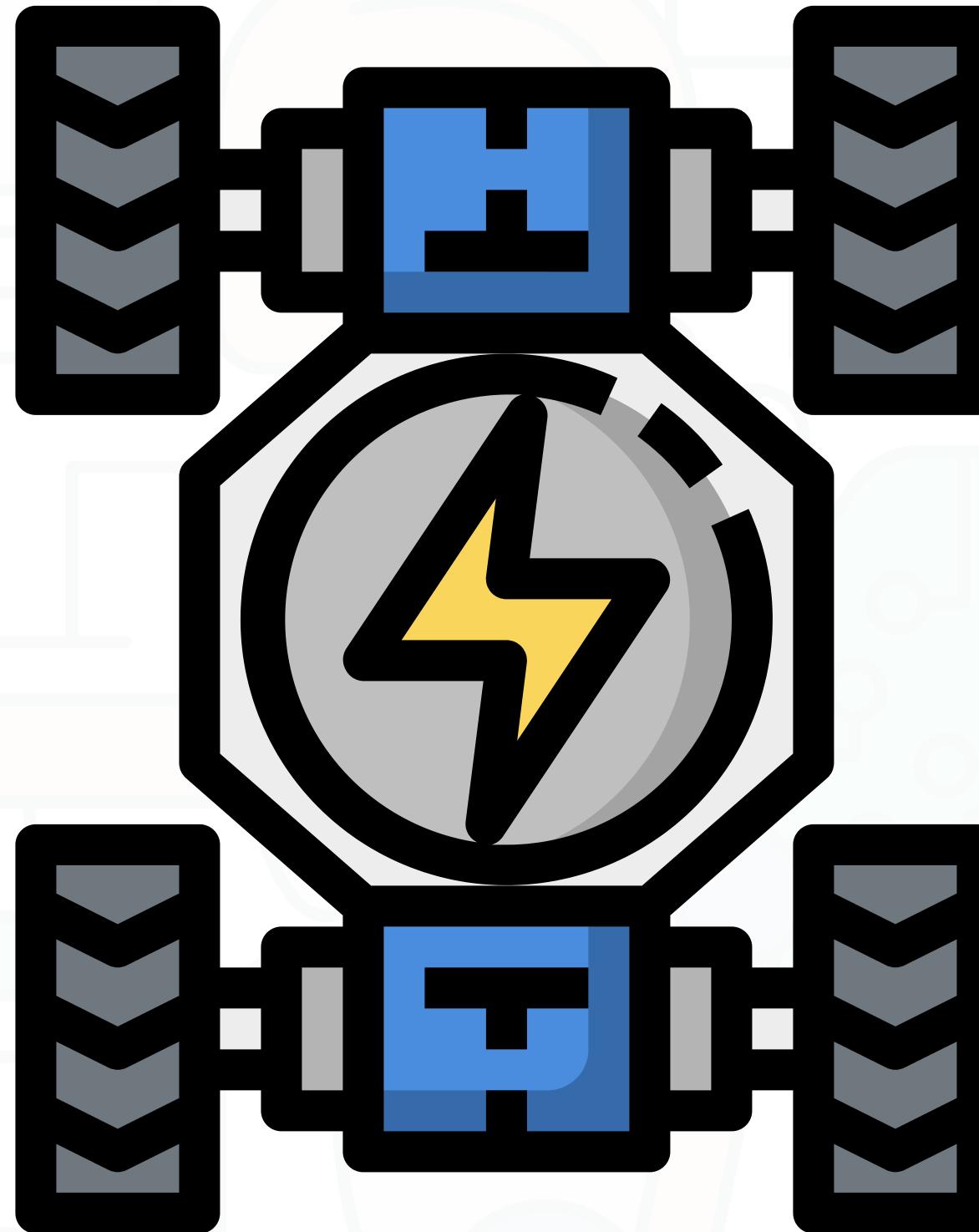


Let's move The Robot

Move Forward

Pins we need:

- Enable -> D6
- Input 1 -> D11
- Input2 -> D12



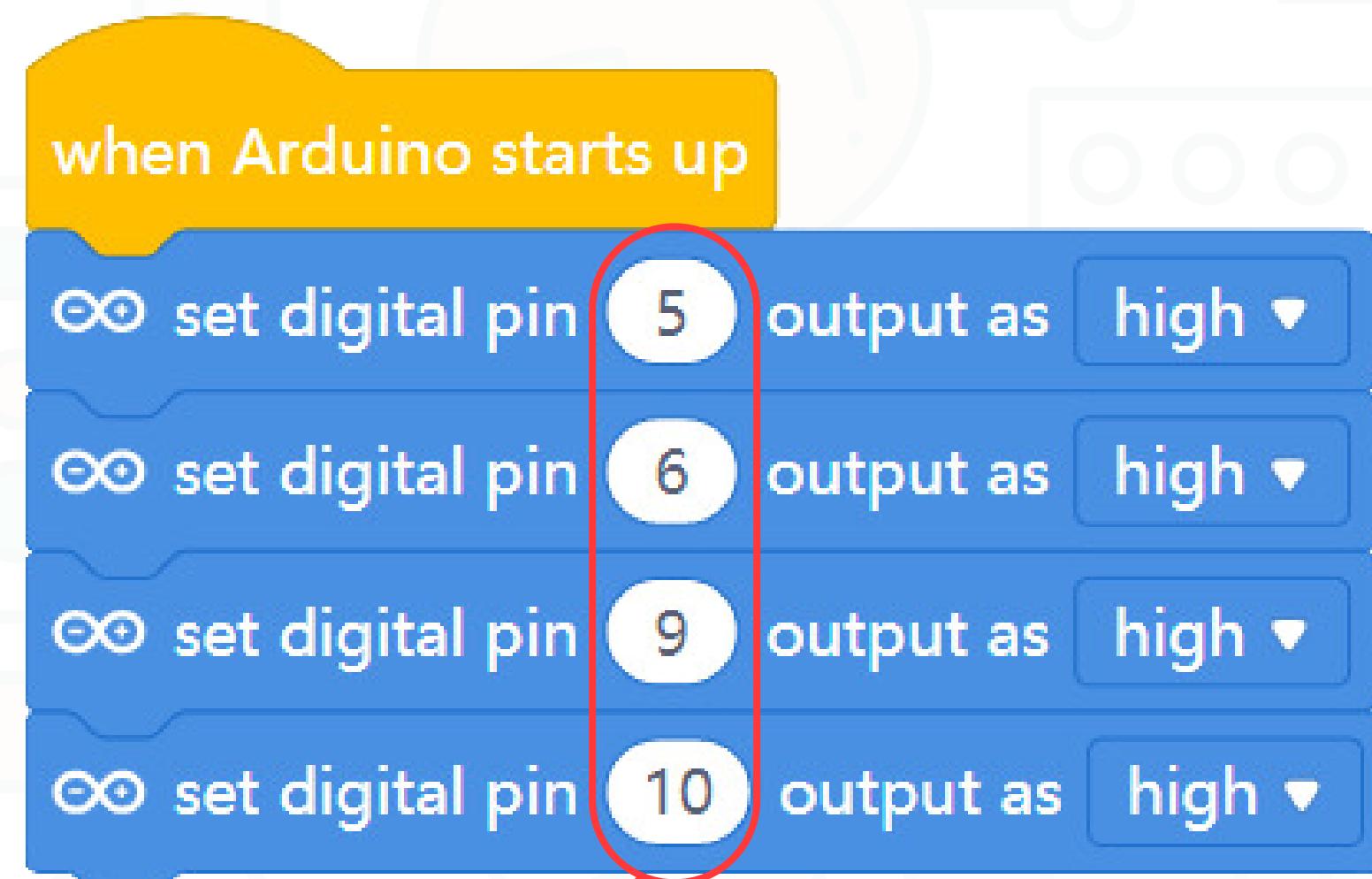
- Enable -> D5
- Input 1 -> D7
- Input2 -> D8

- Enable -> D10
- Input 1 -> A1(D15)
- Input2 -> A2(D16)

- Enable -> D9
- Input 1 -> D13
- Input2 -> A0(D14)

Let's move The Robot

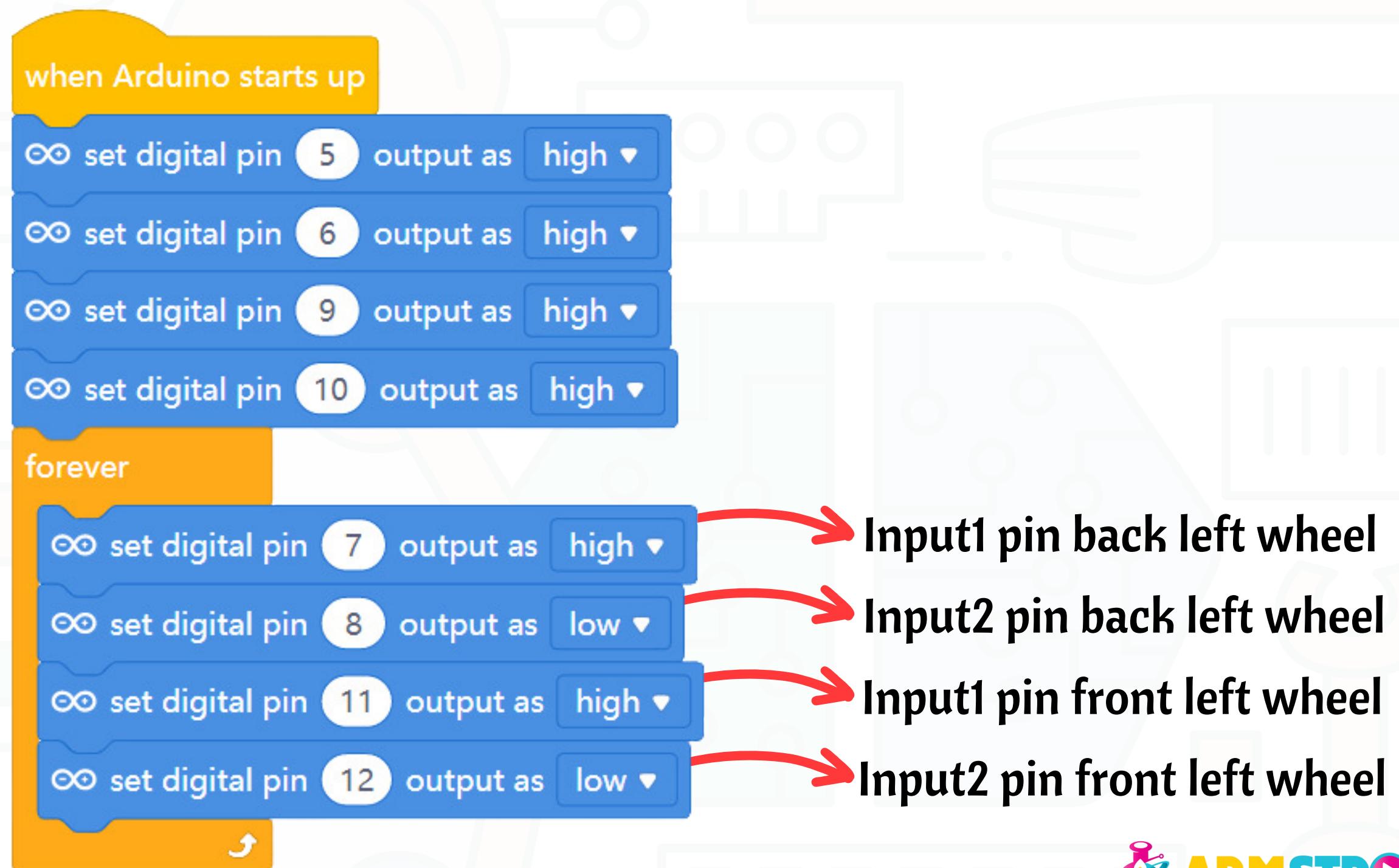
Step 1: Enabling the motors



Enable pins

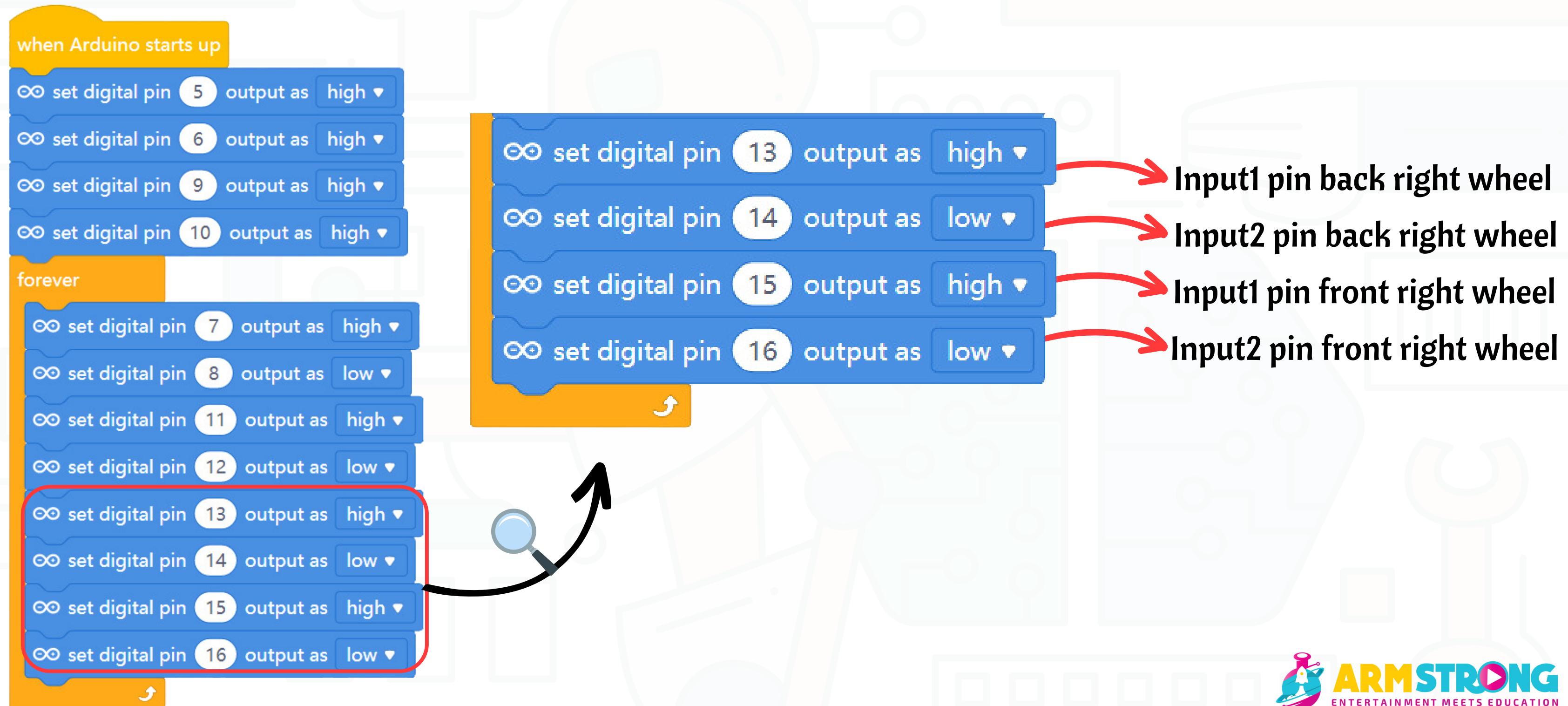
Let's move The Robot

Step 2: Moving the left wheels forward



Let's move The Robot

Step 3: Moving the right wheels forward



Let's try it on mBlock

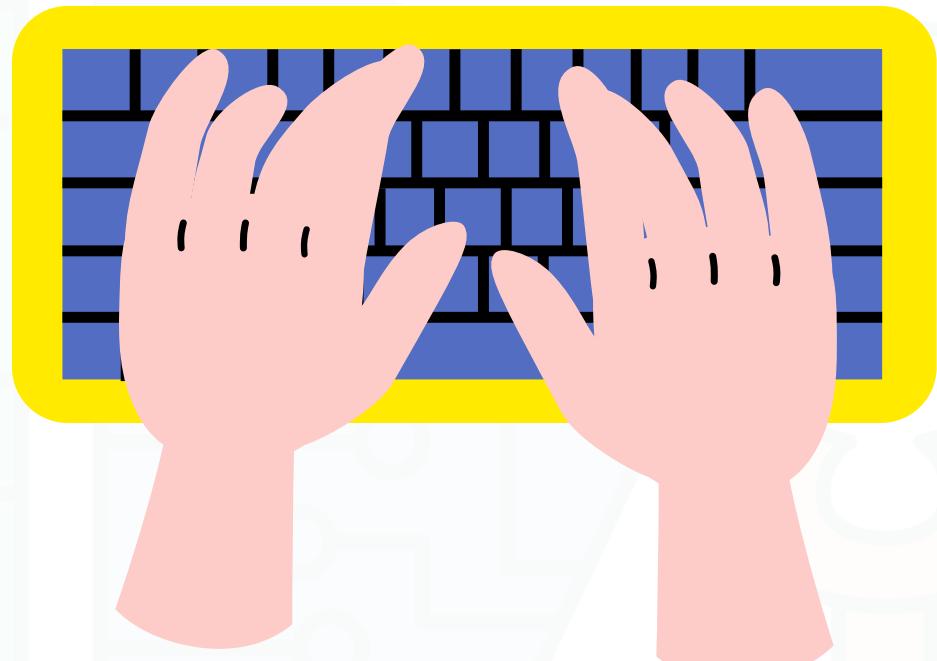


Write a code to move the robot backward.

Try it by yourself

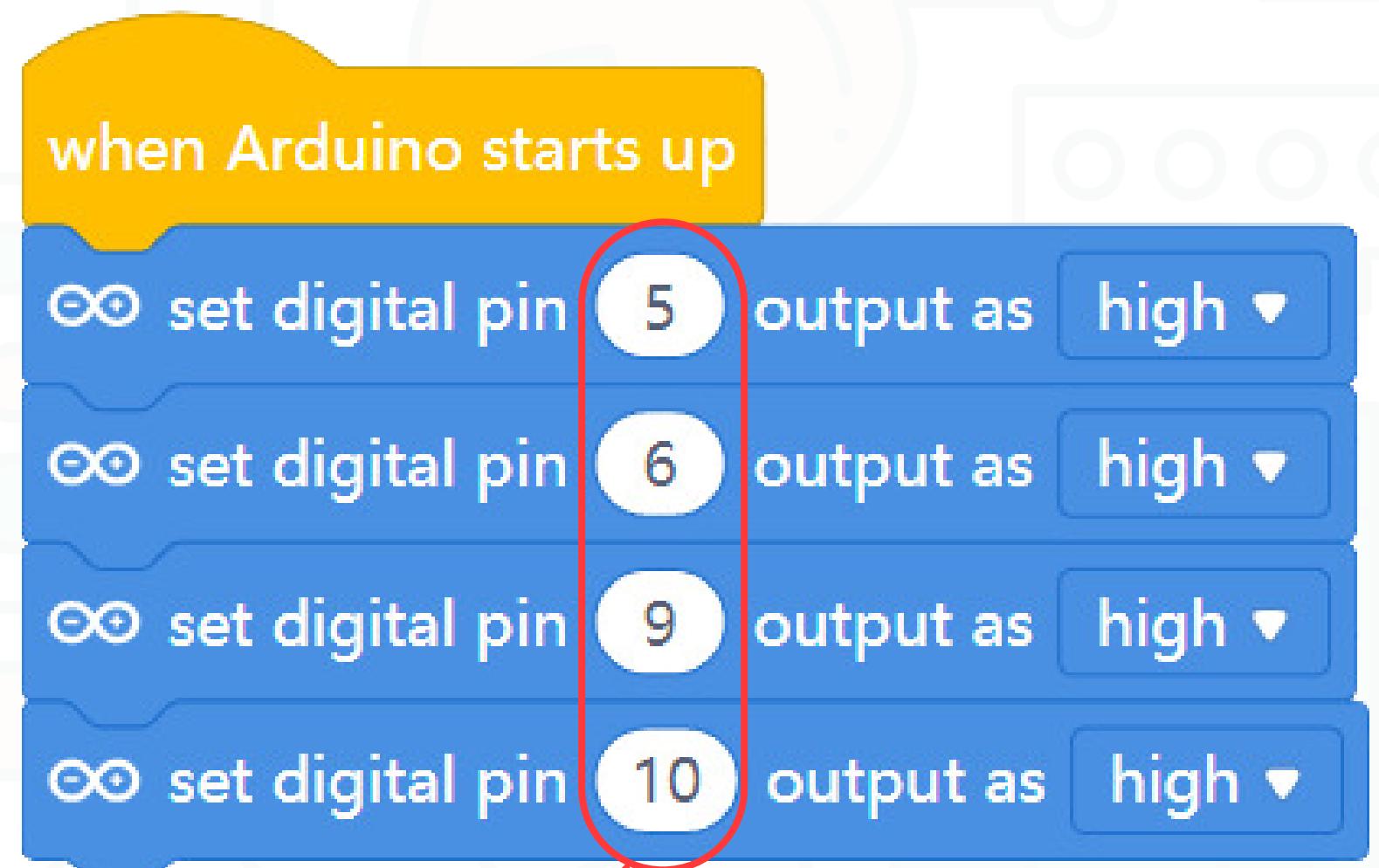


Hint: Reverse the outputs of the previous code.



Let's move The Robot

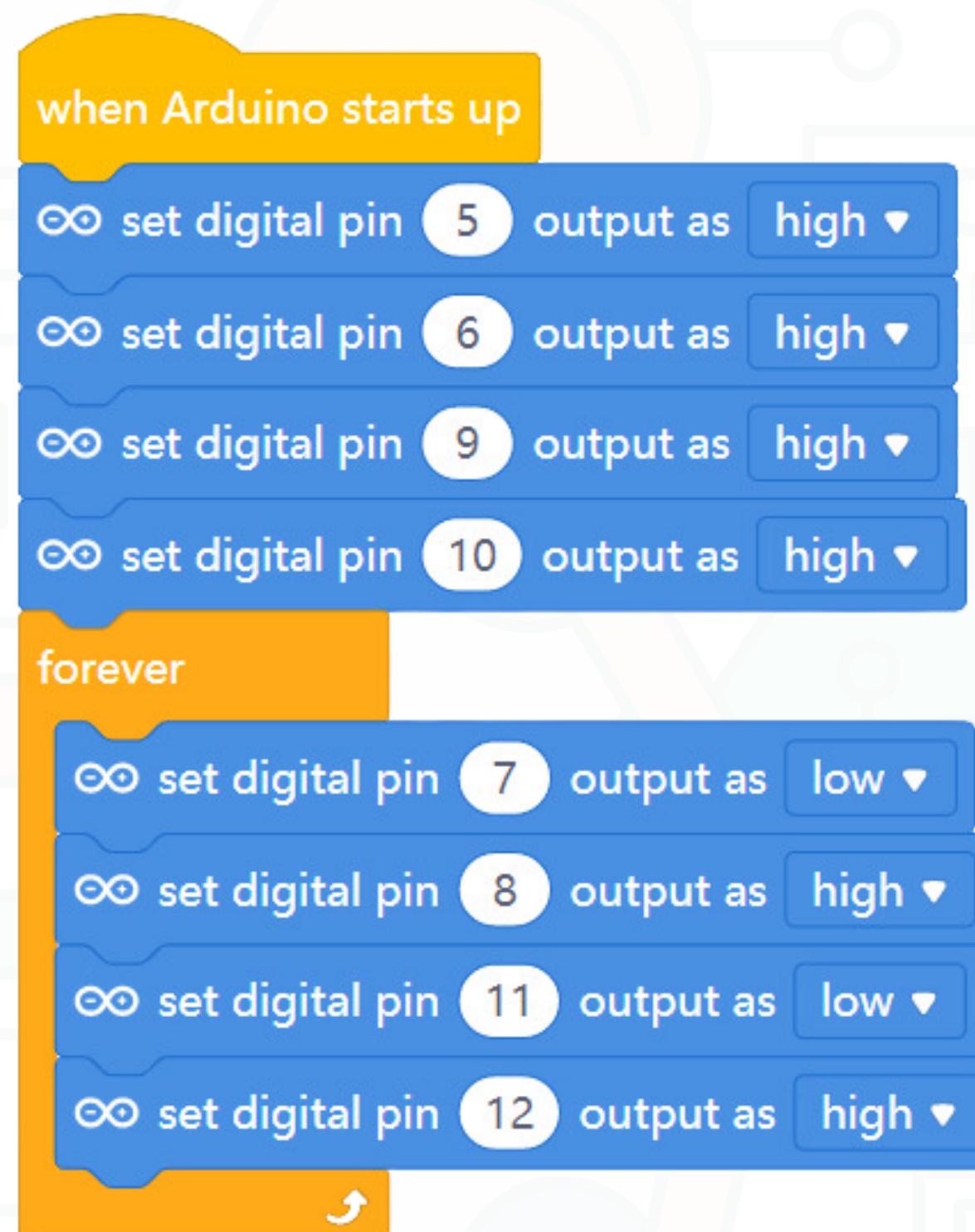
Step 1: Enabling the motors



Enable pins

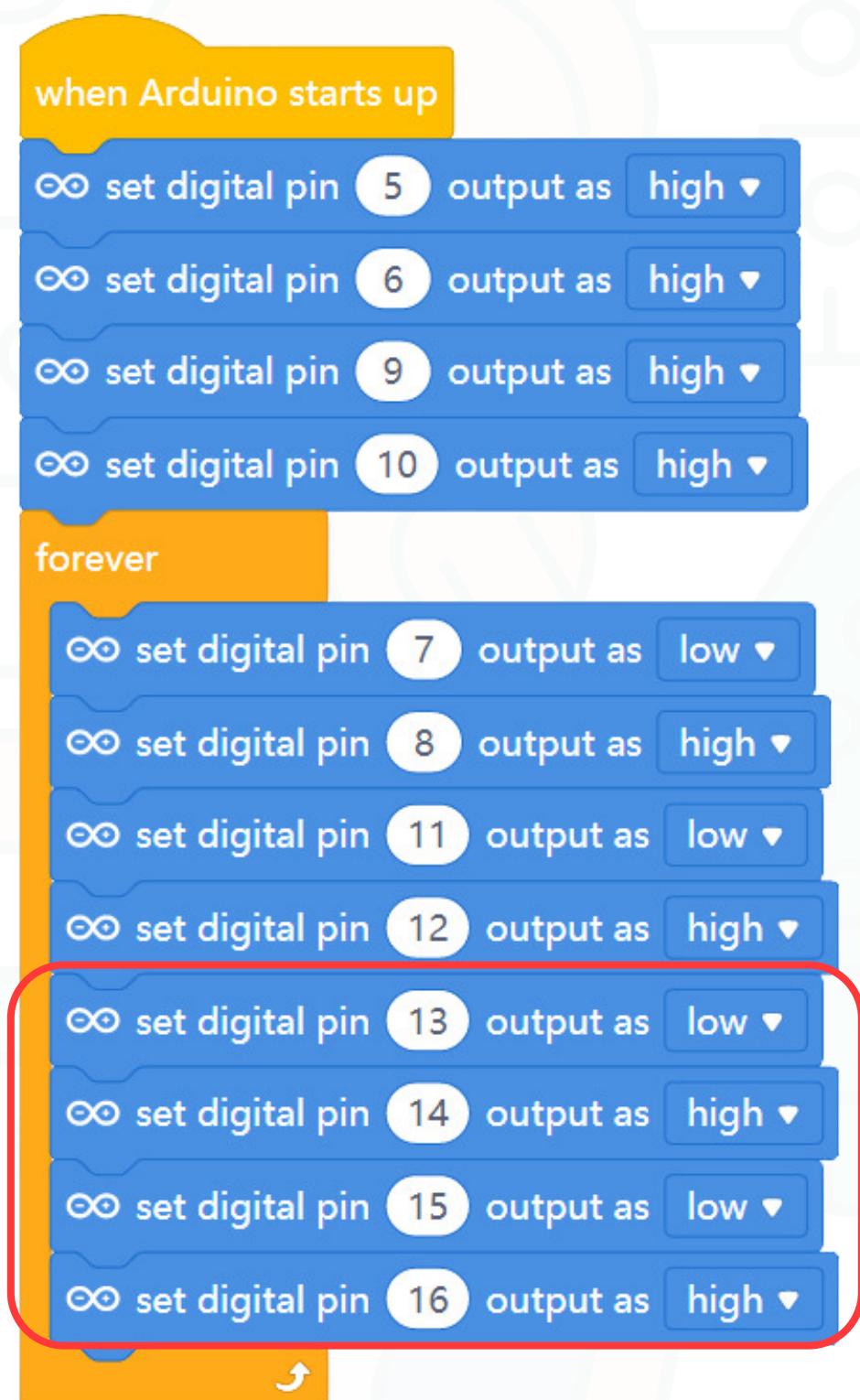
Let's move The Robot

Step 2: Moving the left wheels backward.



Let's move The Robot

Step 3: Moving the right wheels backward

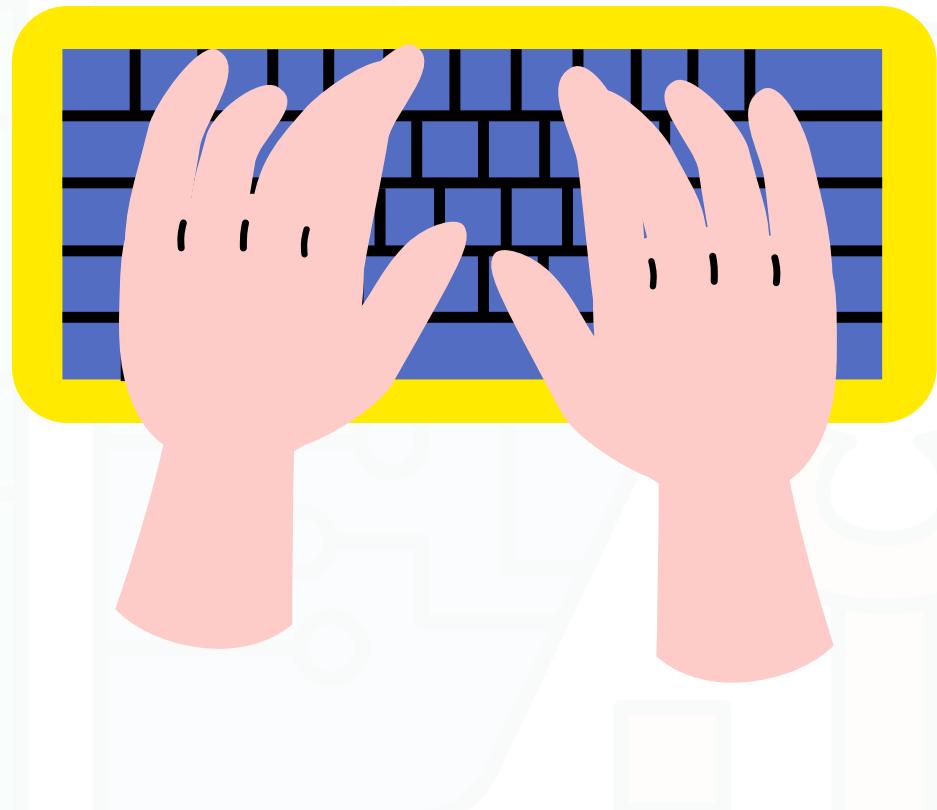


Let's try it on mBlock



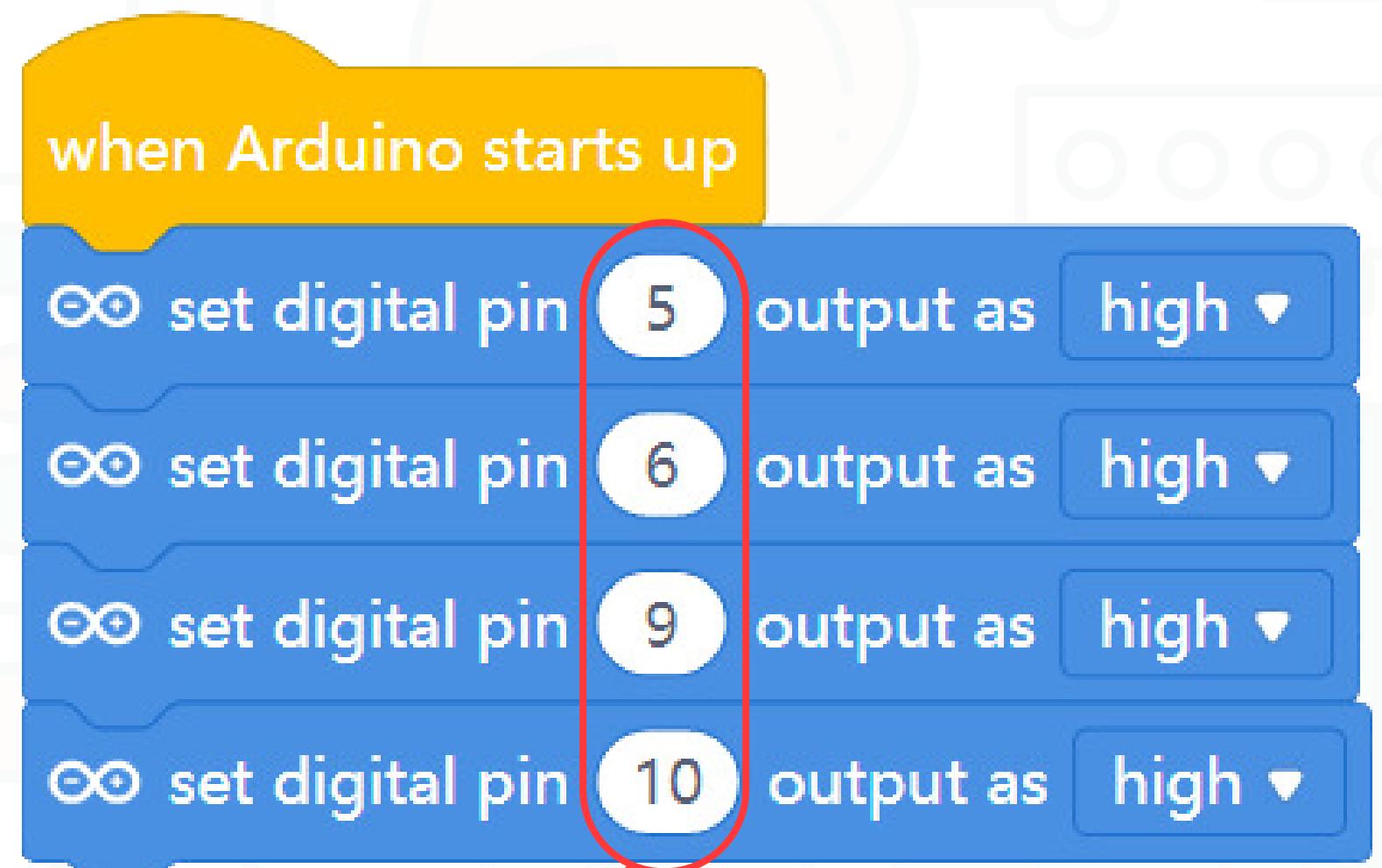
Write a code to move the robot forward and backward with a delay.

Try it by yourself



Let's move The Robot

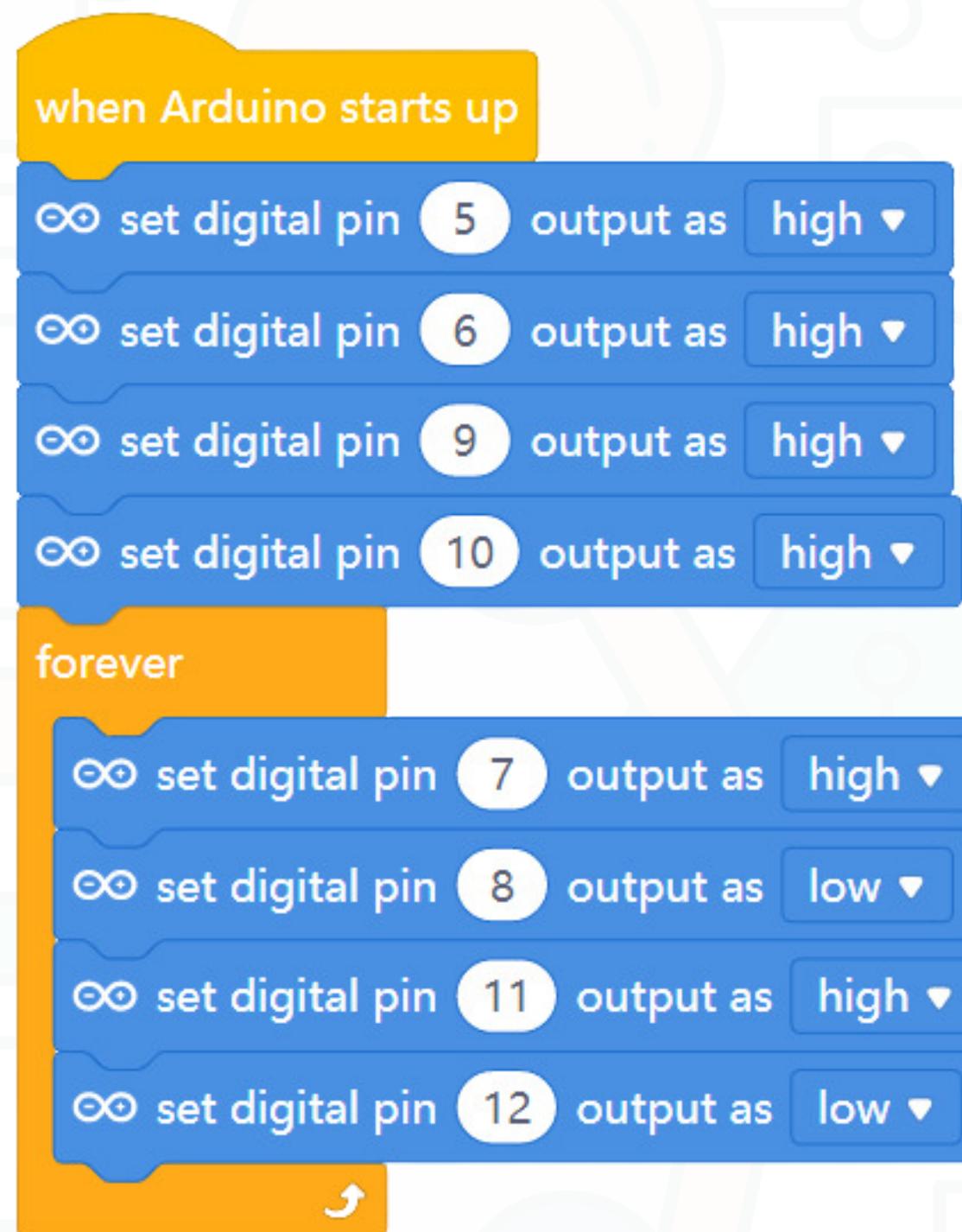
Step 1: Enabling the motors



Enable pins

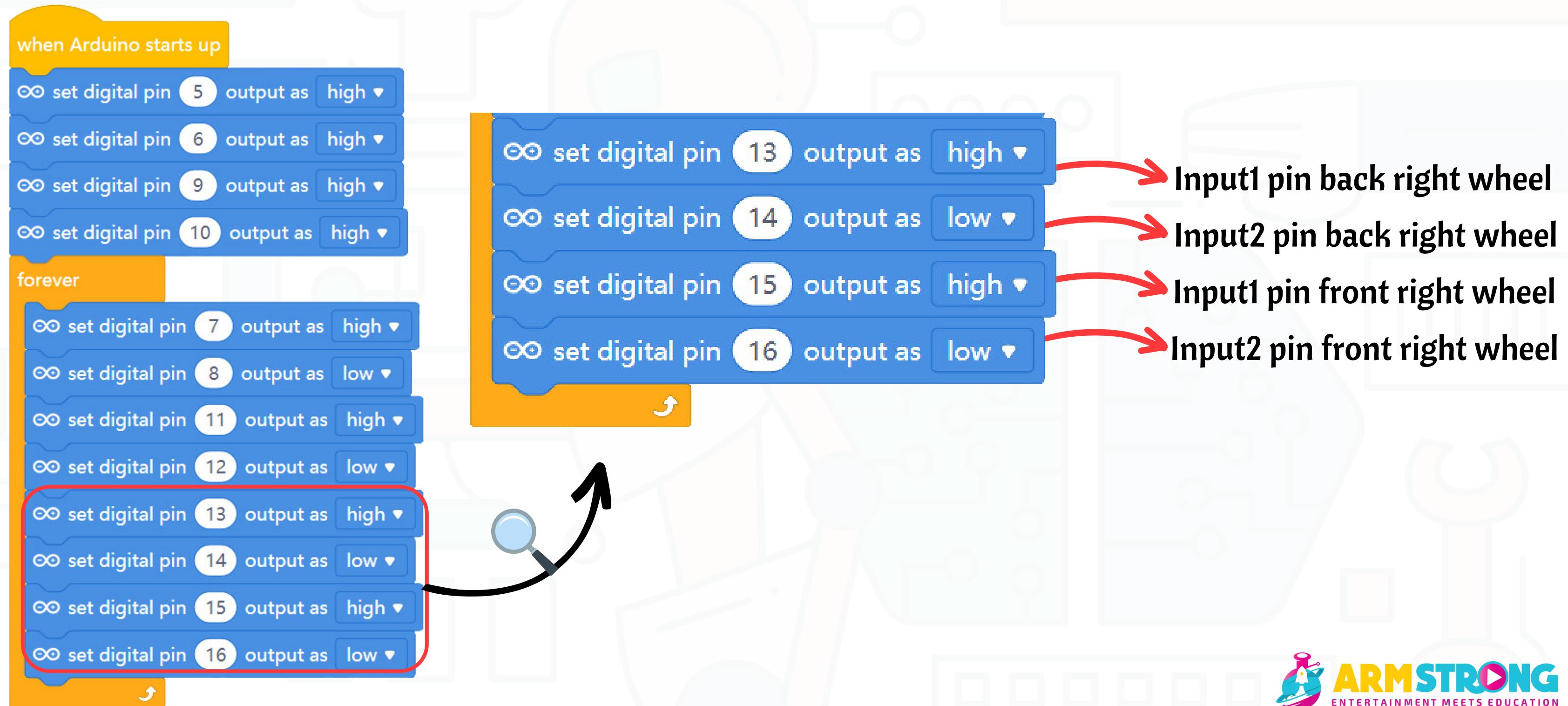
Let's move The Robot

Step 2: Moving the left wheels forward



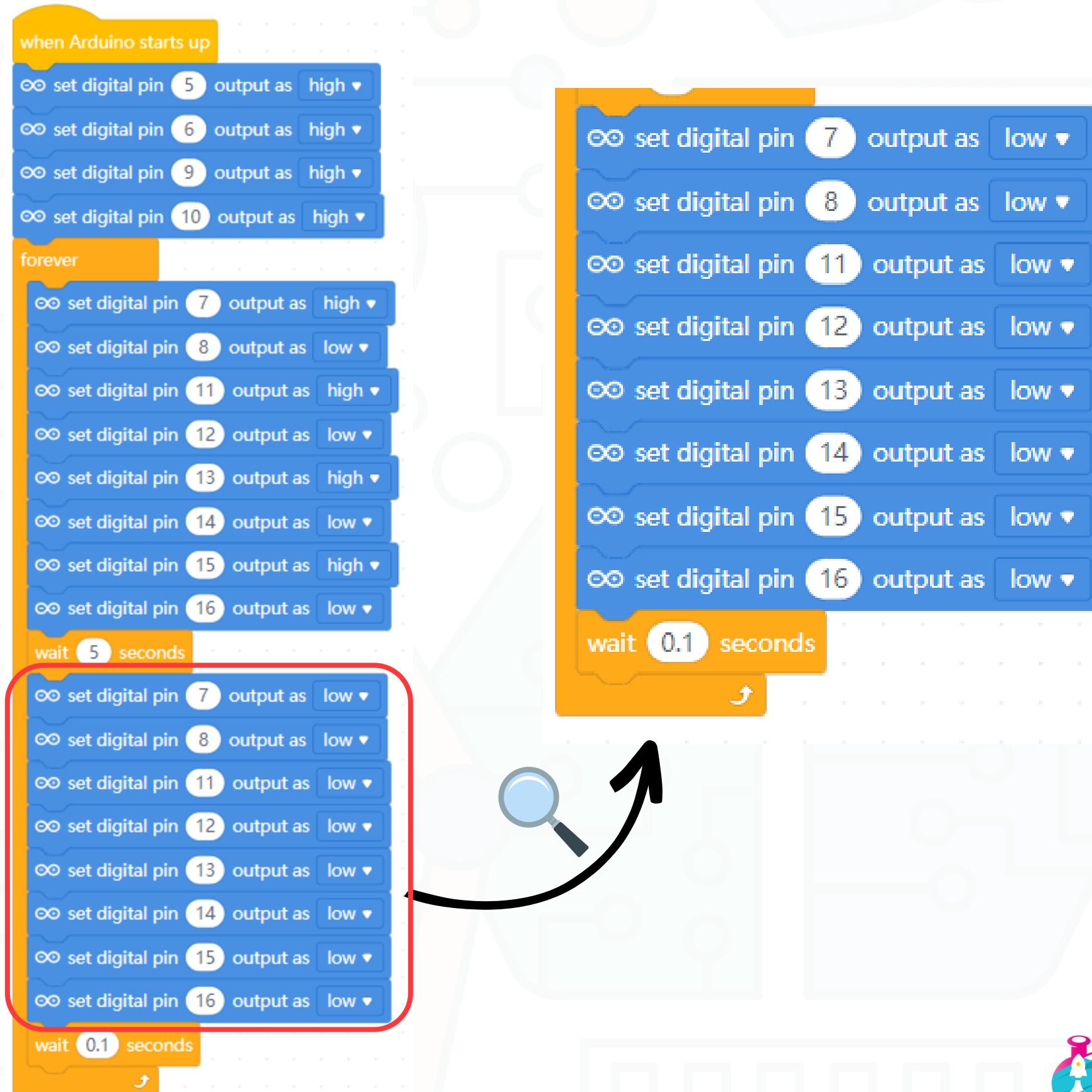
Let's move The Robot

Step 3: Moving the right wheels forward



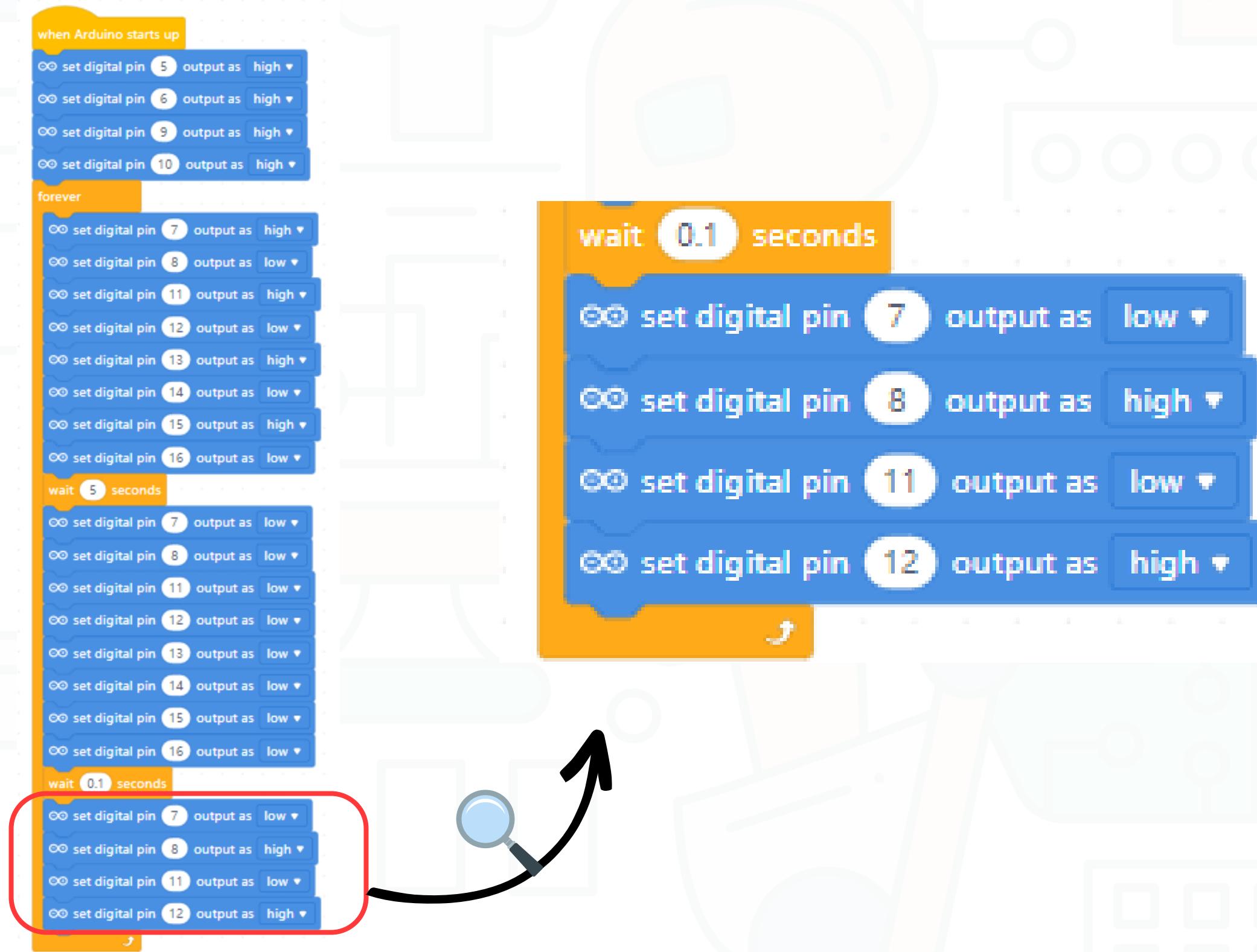
Let's move The Robot

Step 4: Stop the robot



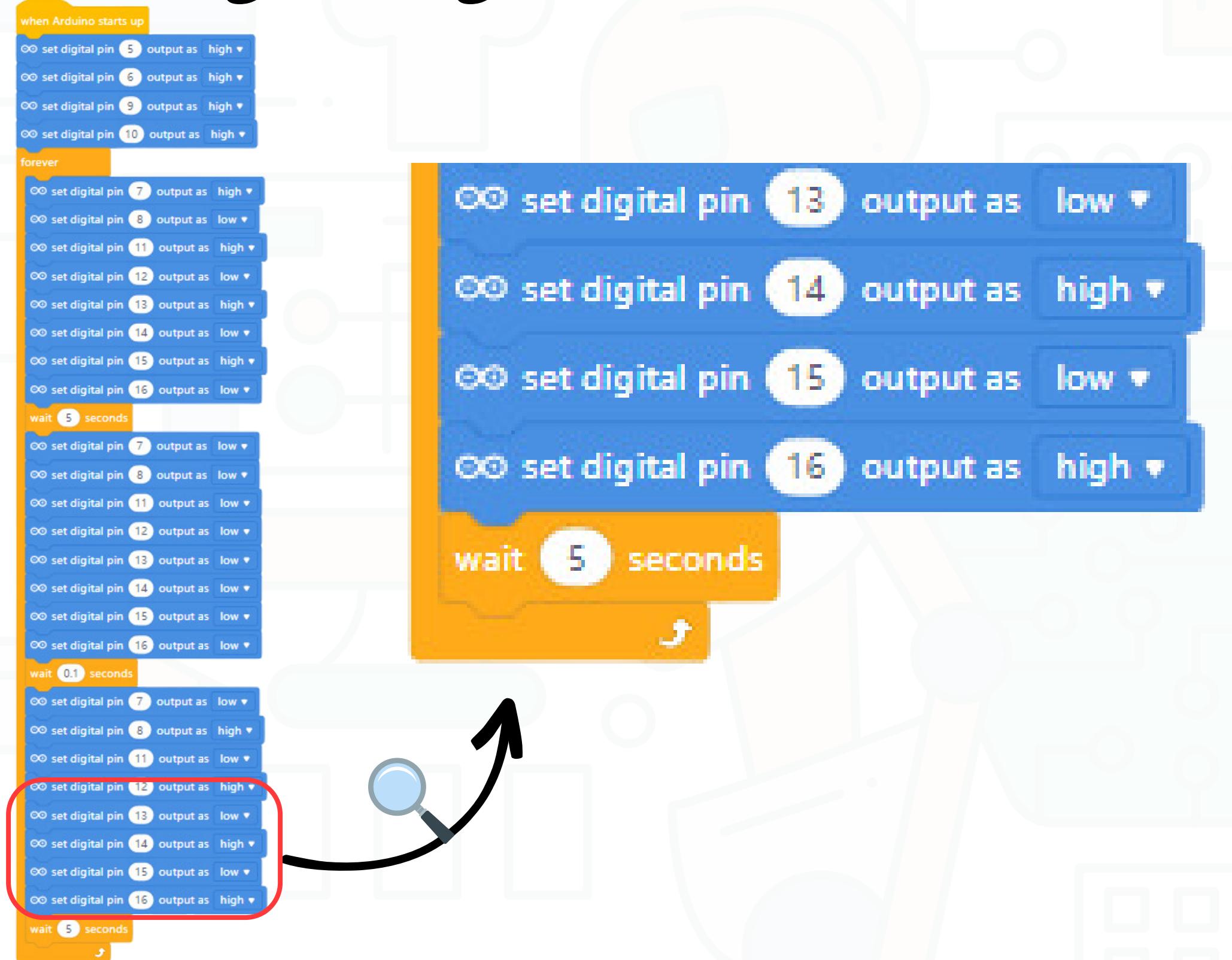
Let's move The Robot

Step 5: Moving the left wheels backward.



Let's move The Robot

Step 5: Moving the right wheels backward



Let's move The Robot

Step 6: Stop the robot

