



# Discover Robotics & Programming

5 POINTS

## Card 1 Overview

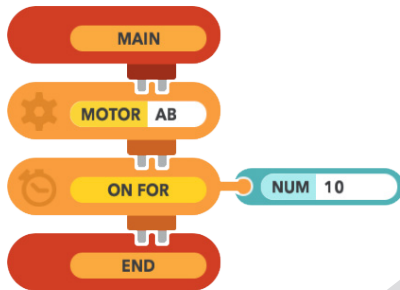
### Meet RiQ

A robot must be mechanical, electrical and programmable to be autonomous, meaning it can complete complex tasks on its own. Learn about these three systems by constructing RiQ with The Brain and DC motors from the motor testing station. Being able to turn on the motors is different than being able to direct and control RiQ. After building RiQ, take control of the settings of his DC motors.

## P1 Build RiQ

Learn the mechanical components of RiQ the robot using fischertechnik™ building manipulatives. Grab the step-by-step build plans to get started.

You've used the **ON FOR** before with the motor testing station, now put it into action with a real robot. Build this program in Cortex:



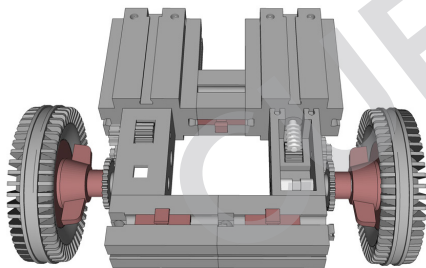
This program tells motors A and B to run for one second.

As before, compile and run the program. Check the progress on the status bar!

The motors should run for 1 second! If not, check: are the motors connected to Ports A and B?

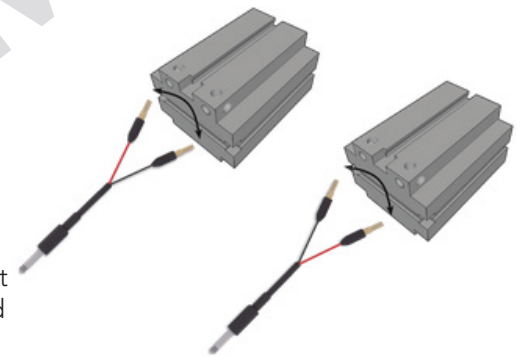
If set up on the floor, RiQ should either roll forward, backward or spin for 1 second. It all depends on the polarity of the motors.

Pick up RiQ to view the underside of the motors. Each one controls a separate wheel.

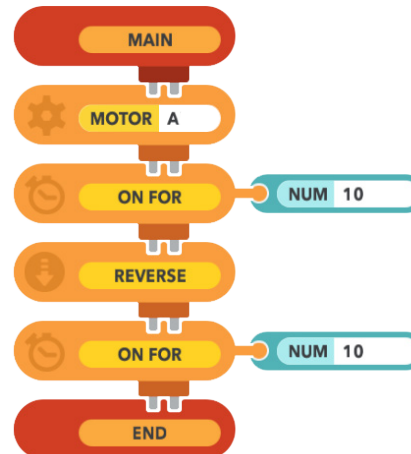


Switch the red and black cables on a single motor, and run the program again. RiQ should switch between spinning and moving straight.

Change the cables of both motors. Reversing the polarity makes RiQ reverse direction. Set the cables so RiQ drives forward when the program runs.



Cortex can do the same thing with the **REVERSE** command. Add a reverse command to RiQ's program:



This program tells RiQ to go forward for one second, then reverse for another second.

When ready, compile and run the program. Save it for P2.

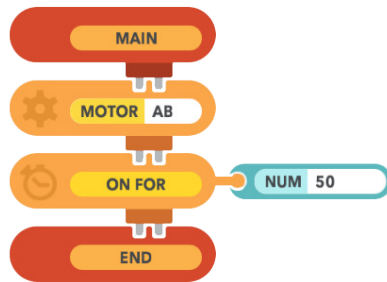
Look closely at The Brain when this program runs. Watch the LED lights next to each motor port. Remember, green is positive polarity and red is negative polarity.

# Discover Robotics & Programming

## P2 Motor Speed with SET PWR

Not all motors are created equal. Some are stronger, some are weaker and each is at a unique stage of its mechanical life. For RiQ, this makes driving forward a bit of a challenge. Bring in **SET PWR** commands to help him out.

Open the program from P1 and change the duration to 5 seconds.



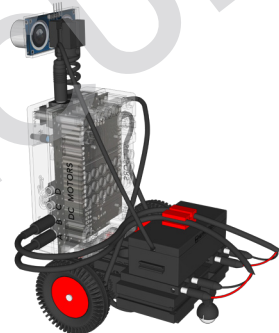
Run the program and watch closely to see which way RiQ turns.

If the right motor is stronger, RiQ turns left. If it's the left that's strong, RiQ goes right.

Check to see which ports your motors are pulled

into. (This image shows the left motor in A and the right in B.) Which port is your strongest motor connected to: A or B? Remember this port for the next program.

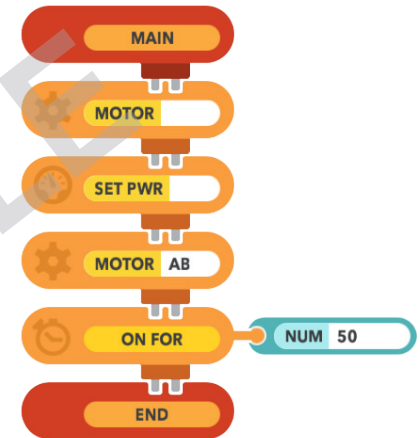
All motors default to 100% power, but 100% power on a weak motor isn't the same as 100% on a strong motor. To make RiQ drive straight, dial down the power on the stronger motor.



Modify your program to set the power of the stronger motor:

Set the power of the stronger motor.

Experiment with the **SET PWR** command until RiQ drives straight. Save the program for C1.



## C1 Straight Line

Program RiQ to drive 60 cm in a straight line. Adjust the power on 1 motor and (if needed) the polarity of 1 or both motors to allow RiQ to move as straight as possible.

## C2 Circle RiQ

Program RiQ to drive in 1 complete circle with a radius between 15 and 30 cm. RiQ should start and end in the same place.

*Hint: Adjust the speed on at least 1 motor.*

## DP Make RiQ's First Polygon

Now that RiQ can drive perfectly straight and curve, program him to draw (using the pen and holder) a recognizable shape.

### Key Terms

- **Polarity** - The direction of current flow. Changing polarity changes the direction of the motors.
- **SET PWR** - Sets power level on selected motors.
- **Radius** - The distance from a center of a circle to the edge.

## Check for Understanding

- What is polarity?
- If RiQ's wheels are running in opposite directions, what could you check to make them go the same way?
- What are two ways to make RiQ reverse directions?