

Robots and Programming in Education

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STEM Education

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STEM Education

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STEM Education

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STEM Education

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Mathematics

- ▶ Geometric primitives
- ▶ Counting
- ▶ Multiplication
- ▶ Decimals
- ▶ Fractions and ratios
- ▶ Coordinate systems
- ▶ Graphs
- ▶ Angles

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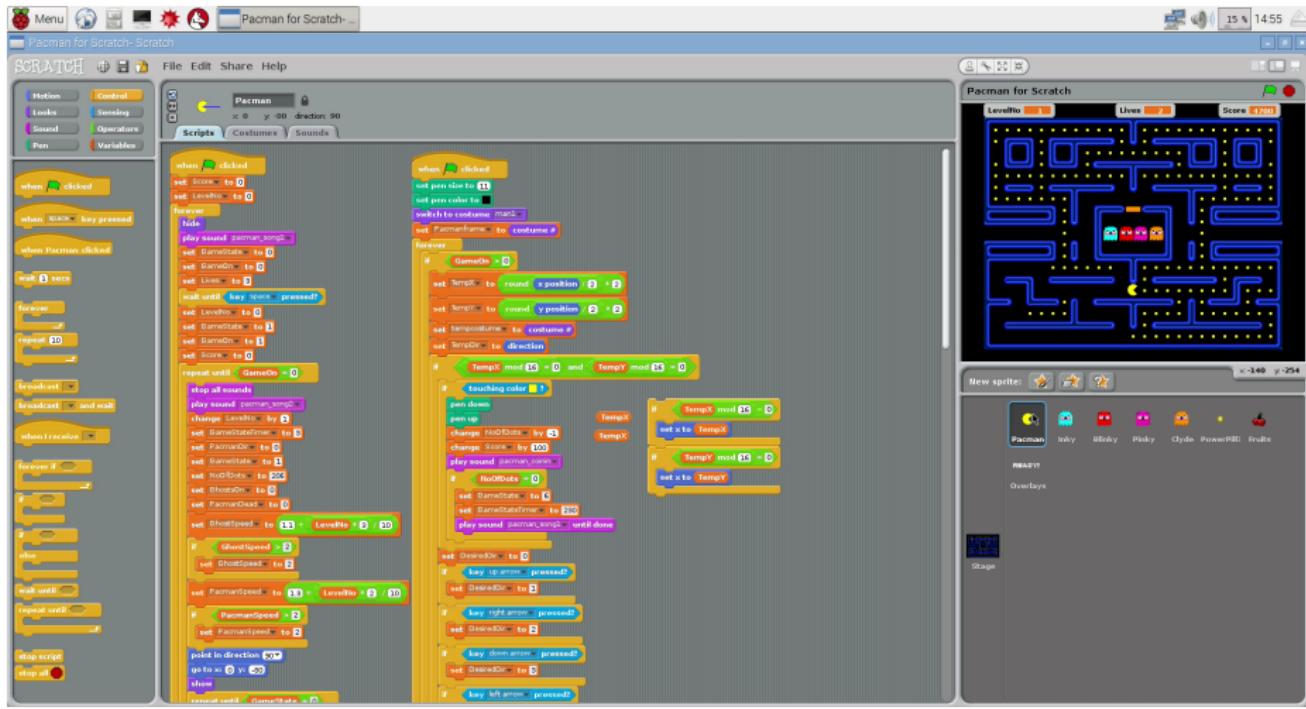
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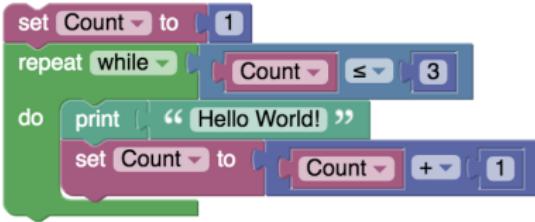
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Scratch



Blockly

- Logic
- Loops
- Math
- Text
- Lists
- Color
- Variables
- Functions



Language: JavaScript ▾

```
var Count;
```

```
Count = 1;
while (Count <= 3) {
    window.alert('Hello World!');
    Count = Count + 1;
}
```

Swift Playgrounds



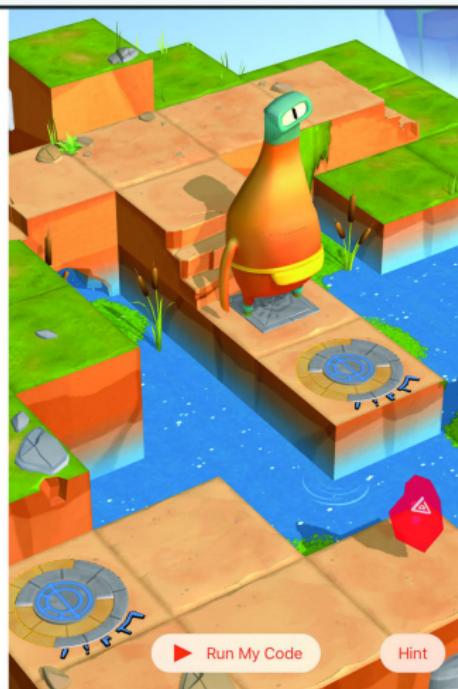
Challenge: Teleport through the portal to collect the gem.

For your first challenge, there's a new element in Byte's world. A **portal** teleports Byte from one place to another, with Byte facing the same direction going in and out.

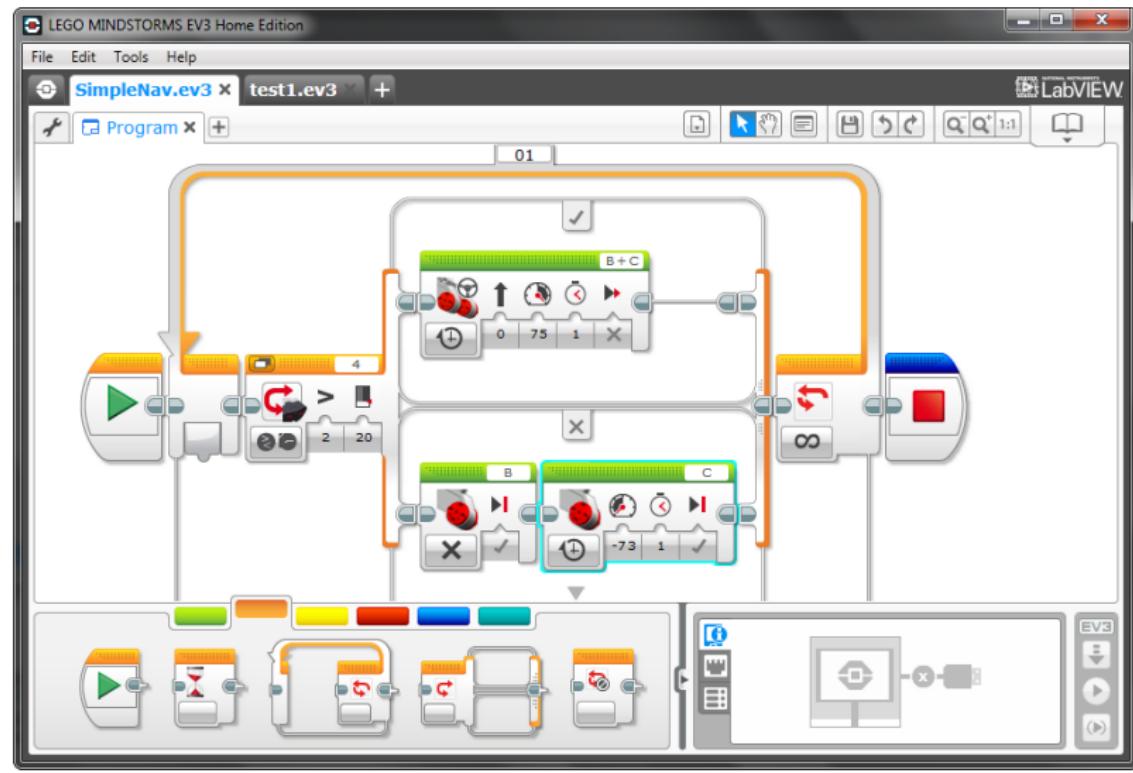
You'll need to use all the **commands** you've learned so far, in the right order, to toggle open the switch, move through the portal, and collect the gem.

Don't worry if you don't get it right the first time. This is your chance to experiment!

```
moveForward()  
moveForward()  
moveForward()  
turnLeft()  
moveForward()  
moveForward()
```



LEGO Mindstorms EV3



KUBO

Thymio

Cubelets

Ozobot Evo

Cozmo

LEGO Mindstorms EV3

Comparison

Robot	KIBO	KUBO	Dash	Thymio	LEGO Boost	Cubelets	Ozobot Evo	Sphero	Cozmo	LEGO EV3	Parrot Jumping
Price	€ 195 - € 425	€ 370	€ 130	€ 130	€ 160	€ 135 - € 425	€ 85	€ 110	€ 165	€ 400	€ 80
Age	4 - 7	4 - 10	5 - 8	6+	7 - 10	8+	8+	8+	8+	10+	10+
Coding	Wood Blocks	TagTile	Blockly Swift Playgrounds	VPL Blockly Scratch	Boost	Cubelets Blockly	OzoCodes Blockly	Sphero MacroLab orbBasic	Code Lab Python	LEGO EV3 LabVIEW RoboC Scratch	Scratch
Building	yes	no	some	no	multiple	yes	no	no	no	multiple	no
Sensors	sound light distance	tile recog.	3 microphones 3 distance	9 IR proximity 5 cap. touch but. 1 accelerometer 1 thermometer 1 microphone	color distance	1 brightness 2 distance 1 temperature 1 knob	IR proximity optical	accelerometer gyroscope	vga camera gyroscope accelerometer	1 color 2 touch 1 ultrasonic 1 gyro	accelerometer gyroscope
Actuators	LEDs wheels	wheels LEDs	wheels 1 speaker 12 white LEDs 3 RGB LEDs 1 red LED	39 LEDs 2 DC motors 1 loud-speaker	move hub motor	1 rotate 2 wheels 1 light 1 speaker 1 bar graph	LEDs speaker wheels	LEDs int. wheels	4 motors OLED display speaker	2 large motors 1 small motor 1 display 1 speaker lights	wheels jumping
Other			2 IR receivers 3 IR transmitters xylophone accessories	hold pencil follows lines pull trailer microSD card 6 behaviours 1 IR receiver 1 wireless		1 bluetooth 2 block 1 minimum 1 maximum 2 inverse	app RC	bluetooth app RC	facial recog. app control	IR RC bluetooth	VGA camera app RC
Pros	preschoolers no screen code	preschoolers no screen code	cheap multilanguage LEGO compat.	cheap multilanguages lots of sensors lots of features powerful	infinite robots LEGO compat.	building is coding no screen code	cheap no screen code	cheap	cute has sdk	infinite robots powerful LEGO compat.	cheap has sdk
Cons	expensive simple code	expensive simple code	few sensors needs comp. or tablet	needs comp. or tablet	specific code few sensors few actuators	full kit expensive small kit lacking	few sensors few actuators few features	needs phone or tablet few sensors few actuators specific code	needs phone or tablet few sensors	expensive expensive extras paid software	needs iOS device few sensors

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Robots can be a great educational tool. Which robot is best?

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- ▶ Want to build at will? Get LEGO Mindstorms EV3! Bit expensive, but you may build infinite robots.

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- ▶ Want to build at will? Get LEGO Mindstorms EV3! Bit expensive, but you may build infinite robots.
- ▶ Want something different? Get Cubelets! Full pack is quite expensive, but you can build and code at the same time.

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- ▶ Affordable and easy to program robots.
- ▶ Robots that can grow in complexity, for example, programmable with different languages.

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