

LEGO Robotics Challenges



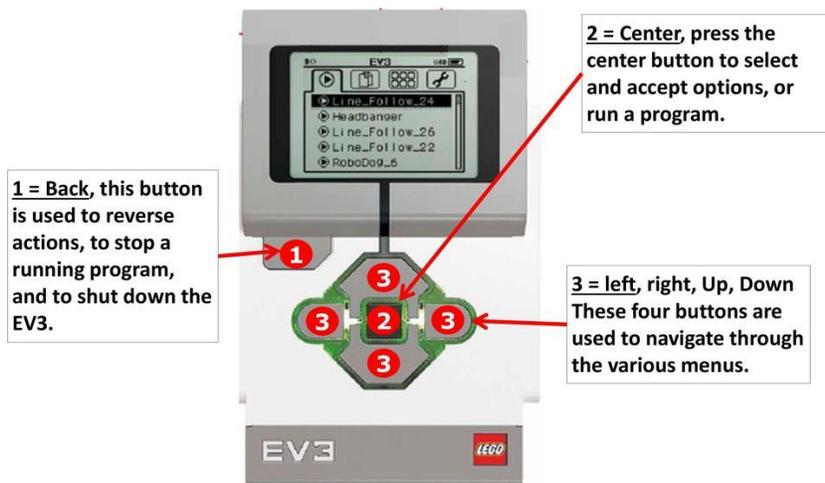
Goal: Learn the importance of accuracy with numbers and using place value to calculate how far robots travel.

Big Questions:

1. How does number accuracy impact real life engineering problems?
2. How can we use patterns in Math to be more efficient problem solvers?
3. What is the relationship of wheel circumference on distance travelled?

1. Turn on your robot by pressing the center button:

EV3 Brick

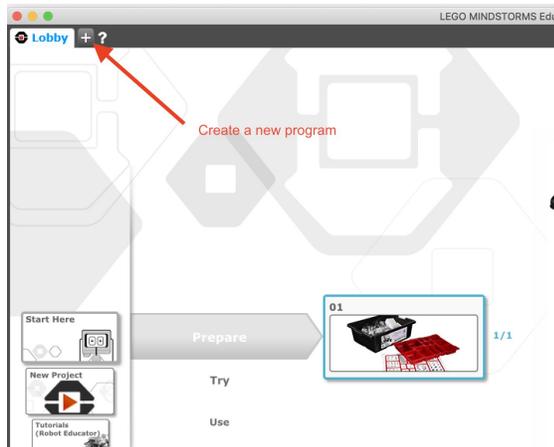


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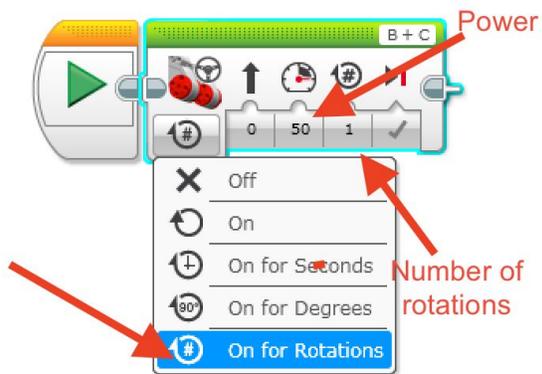
2. Open Lego Mindstorms on your computer.



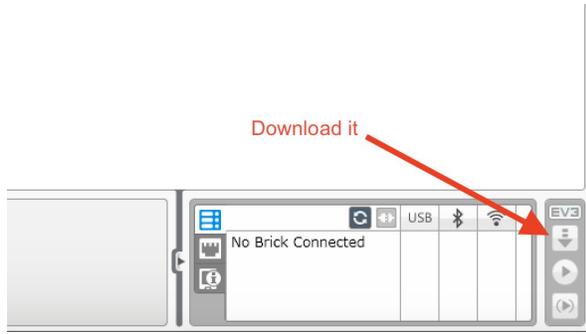
3. Create a new program and save it with something unique



4. Drag a move steering block on to your program and set it for 1 rotation



5. Plug your robot into your computer and download your program and run it



5. Line your robot up and carefully measure how far it travels in 1, 2 and 3 rotations. **Be accurate!**

Rotations	Distance travelled (cm)
1	
2	
3	

Change the wheels. Find the diameter (it will be in mm) and record it here: _____ mm



Large Motorcycle Wheel - 94.2×20



EV3 basic tire - 56×28



Motorcycle tire - 81.6×15



Balloon tire - 56×26



Small tire - 43.2×22

How much would it be in cm? _____ cm

Remeasure the distance travelled:

Rotations	Distance travelled (cm)
1	
2	
3	

How far would your robot go for 10 rotations? (Hint use the answers above to help you!)

Rotations	Calculation	Measurement
10		
20		
100		

Pi Fun! What is π ? [Watch this video](#)

$\pi=3.14159...$ (goes on forever)

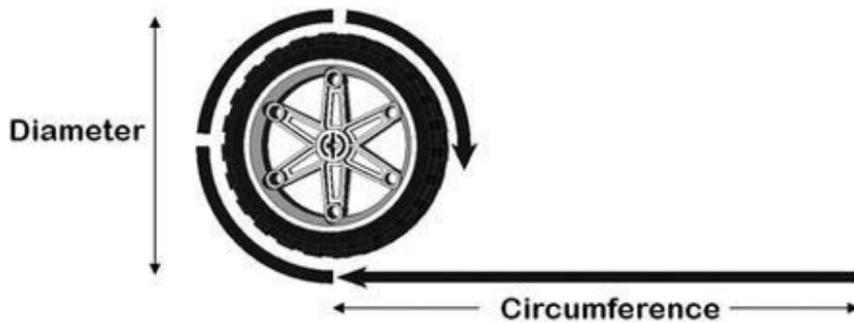
Circumference of a circle=diameter x π

- 1. Figure out your circumference of your wheels.**

Multiply your diameter of your wheel (cm) _____ x 3.14159

= _____

- 2. So if you wheel spins 1 rotation (360 degrees), it should equal the circumference!**



Test this. Is it true?

Distance travelled=Circumference

3. Finally, we can use this idea to calculate the number of rotations needed to travel ANY distance.

Super challenge (try if you dare...)

So if we wanted the robot to travel 40 cm, we would divide this by the circumference to give number of rotations!

Number of rotations= Total distance needed to travel / circumference
Figure this out with a calculator and check if it's correct:

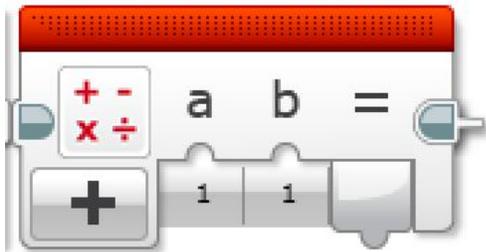
Distance needed to travel	Circumference	Number of rotations
17.5 cm	17.5cm	1
25 cm		
40 cm		
60 cm		

Super, super challenge!

Now, let's use an exciting block to help us do all these calculations for us...(drum roll please)

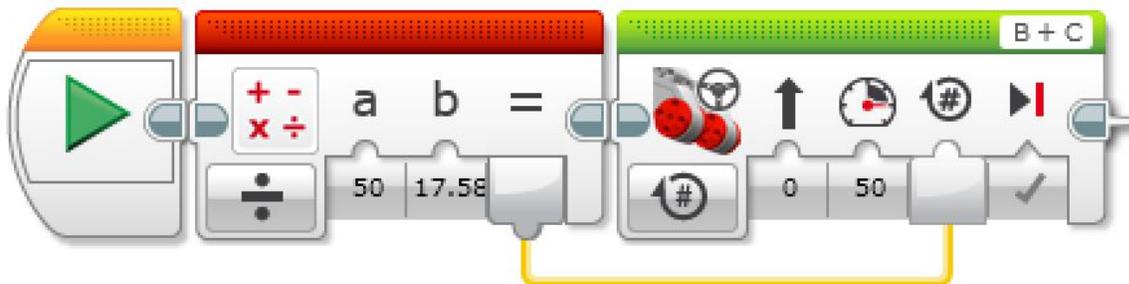
The MATH block (don't be scared)

It looks like this:



It is like a giant calculator to make our programs more efficient.

Try putting these blocks together and see what happens:



Measure how far it went. What do the numbers and the math block parts mean?