

Exploring Logo on a Turtle Robot

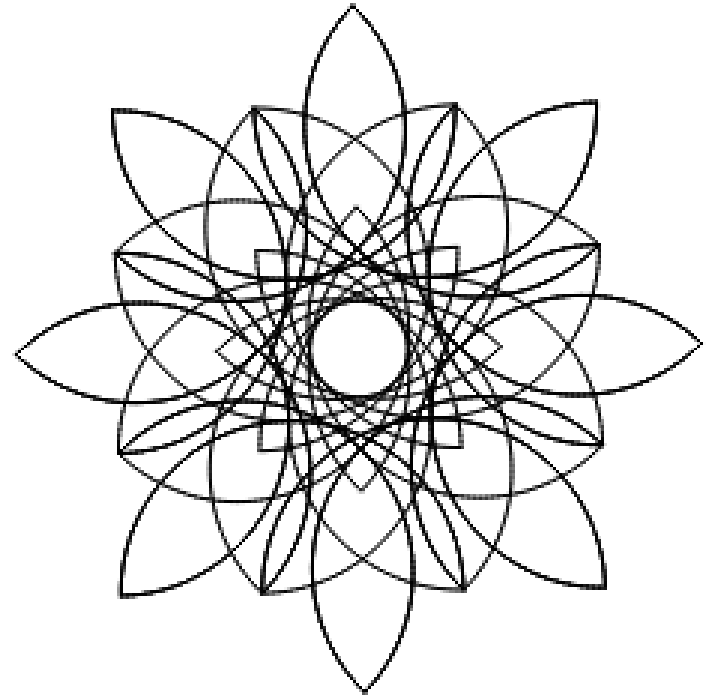
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Logo

- Logo is a computer language designed at MIT
- It is most famous for its “turtle graphics”, pictures produced by a turtle that follows commands



Dahlia, by David Eisenstat

Accessing Logo

- You can get access to Logo here:
 - <https://bit.ly/rocturtle23>
- Use a browser to visit that address, and keep it open, so you can type the commands for the turtle!

Connect the Turtle

- Use the USB cable to connect the Turtle to the computer.
- A “CIRCUITPY” drive should become visible.
- Make sure the Turtle is switched on.

To copy your program to the turtle

- Click “Save to Turtle”
- Move the “turtlecode.py” file to CIRCUITPY
- You’ll hear two beeps. Press the button to start!

Command Reference 1

Command	Short form	Description
FORWARD <i>distance</i>	FD <i>distance</i>	Moves the turtle <i>distance</i> units forward. <i>distance</i> must be a number. Example: FD 100
CLEARSCREEN	CS	Clears the drawing and moves the turtle to the centre (origin).
HIDETURTLE	HT	Hides the turtle, if it is visible. Note the real turtle can't hide!
SHOWTURTLE	ST	Shows the turtle, if it was hidden.
HOME	HOME	Moves the turtle to the origin.

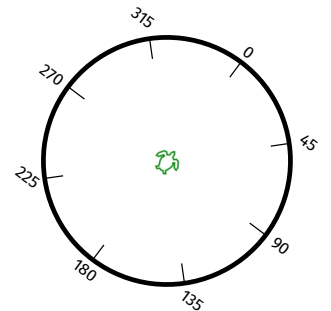
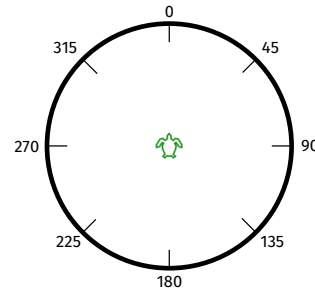
Command Reference 2

Command	Short form	Description
RIGHT <i>degrees</i>	RT <i>degrees</i>	Turns the turtle <i>degrees</i> to its right, where <i>degrees</i> is the angle to turn, a number from 0 to 359.
LEFT <i>degrees</i>	LT <i>degrees</i>	Turns the turtle <i>degrees</i> to its left, where <i>degrees</i> is the angle to turn, a number from 0 to 359.

Try these commands out and fill in the blanks:

RT -90 is the same as turning _____ 90

RT 405 is the same as turning _____ 45



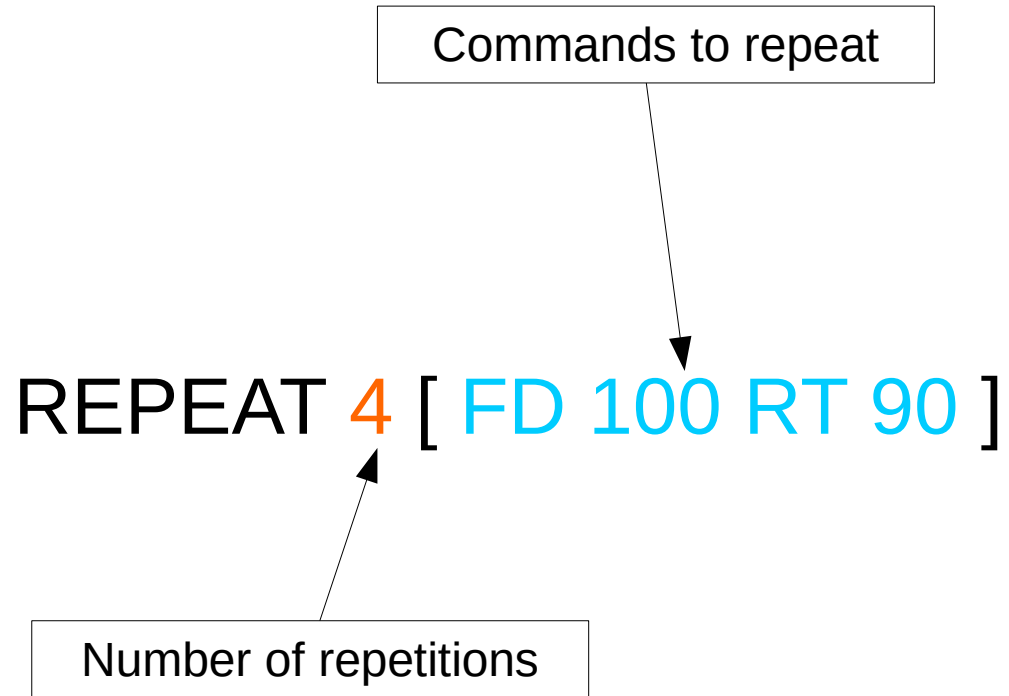
Command Reference 3

Command	Short form	Description
PENUP	PU	Lifts the pen, and the turtle does not draw as it moves
PENDOWN	PD	Lowers the pen, and the turtle draws as it moves
SETPENCOLOR	-	Changes the color of the pen that the turtle is carrying. E.g. SETPENCOLOR 'blue The full list of colors is available in the "Reference" link. On the real turtle, manually change the pen and press the button to continue.

Command Reference 4

Command		Description
MAKE 'led1 TRUE		Switches the left LED on
MAKE 'led1 FALSE		Switches the left LED off
MAKE 'led2 TRUE		Switches the right LED on
MAKE 'led2 FALSE		Switches the right LED off
WAIT <i>time</i>		Pause for <i>time</i> , where 60 is 1 second. E.g. to pause half a second: WAIT 30
BEEP		Plays a short tone on the speaker

The REPEAT Command



Triangles and Hexagons

```
REPEAT 3 [ RT 120 FD 50]
```

```
REPEAT 6 [ RT 60 FD 50]
```

“Blinkenlights”

```
REPEAT 10 [  
  MAKE 'LED1 TRUE  
  WAIT 30  
  MAKE 'LED1 FALSE  
  MAKE 'LED2 TRUE  
  WAIT 30  
  MAKE 'LED2 FALSE  
]
```

REPCOUNT

```
REPEAT 16 [ FD 10*REPCOUNT RT 90]
```

REPCOUNT tracks which repetition is running

In the first repetition, it is 1, and it is 16 in the last repetition in this example.

So, the turtle moves forward 10×1 in the first iteration, but 10×16 in the last!

Nested REPEATs

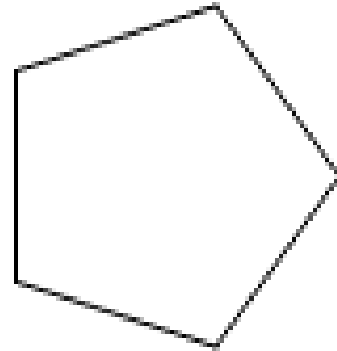
```
REPEAT 12 [ REPEAT 4 [ FD 50 RT 90 ] RT 30]
```

Repeat FOREVER

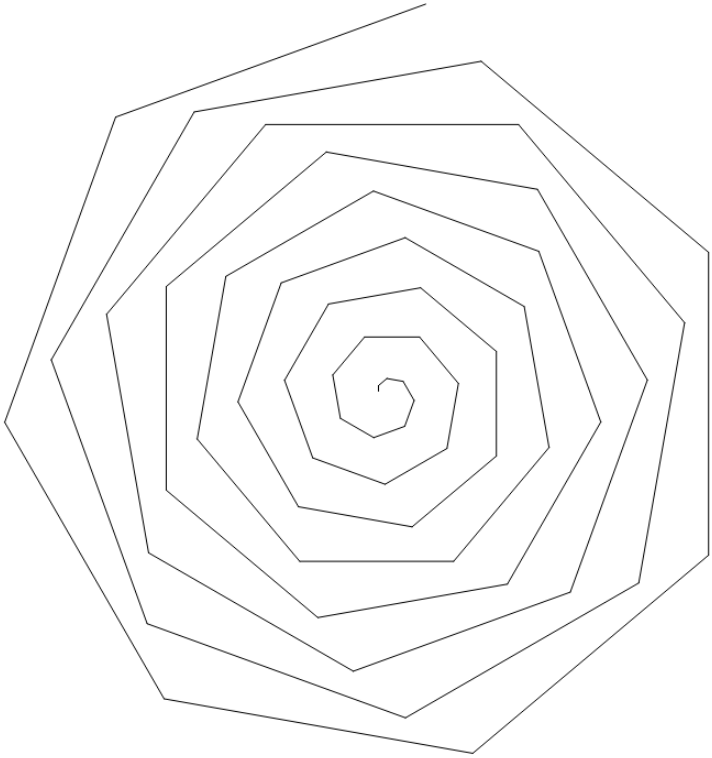
```
FOREVER [  
  MAKE 'LED1 TRUE  
  WAIT 30  
  MAKE 'LED1 FALSE  
  MAKE 'LED2 TRUE  
  WAIT 30  
  MAKE 'LED2 FALSE  
]
```

Challenge 1: Pentagon

```
REPEAT 5 [ RT __ FD 50]
```



Challenge 2: “Rose”



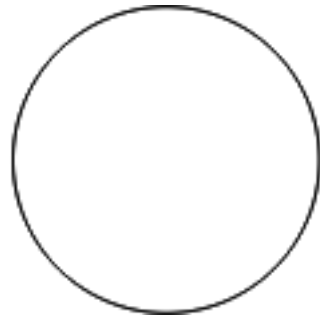
```
REPEAT __ [FD __*REPCOUNT RT __]
```

Challenge 3: Light Counter

```
REPEAT 10 [  
  REPEAT ____  
  [MAKE 'LED1 TRUE  
  WAIT 30  
  MAKE 'LED1 FALSE  
  WAIT 30]  
BEEP  
WAIT 60]
```

Bonus: How would you make the lights count down?

Challenge 4: Circle



Advanced Stuff - 1

- You can learn more about Logo through some books:
- Computer Science Logo Style
 - <http://people.eecs.berkeley.edu/~bh/v1-toc2.html>
- The Great Logo Adventure
 - <https://www.softronix.com/download/tgla.zip>

Advanced Stuff - 2

- The turtle also supports the CircuitPython language!
- You can learn more here:
 - Visit <https://www.circuitpython.org/> and click “Get Started”
- You can write CircuitPython code by modifying `turtlecode.py`

Credits

- Open Source Turtle Robot by Ken Olsen
 - <https://www.instructables.com/OSTR/>
- Workshop Organization
 - Danielle Daniels, Director of Diversity in STEM
 - Jingyu Qiu, PhD student in Computer Science
 - Roncui Dong, PhD student in Computer Science
 - Sreepathi Pai, Associate Professor of Computer Science