

# 1 Turtle

The `turtle` module provides some simple graphics functionality. The `Turtle` function takes no arguments and returns a new turtle object.

A turtle object has several attributes:

- position: the x,y location on the screen
- heading: the direction the turtle is facing
- color, fillcolor: the color the turtle will draw and use to fill in drawn shapes
- pen position: the pen can be up or down

Here are some of the methods available on turtle objects:

Name	Arguments	Description
<code>forward</code>	distance	Moves the turtle forward
<code>backward</code>	distance	Moves the turtle backward
<code>left</code>	angle	Turns the turtle counterclockwise
<code>right</code>	angle	Turns the turtle clockwise
<code>up</code>	none	Lifts up the pen
<code>down</code>	none	Puts the pen down
<code>color</code>	color name (string)	Changes the pen color
<code>fillcolor</code>	color name (string)	Changes the color used to fill a polygon
<code>heading</code>	none	Returns the current heading
<code>xcor</code>	none	Returns the current x position
<code>ycor</code>	none	Returns the current y position
<code>goto</code>	x, y	Moves the turtle to position x, y
<code>begin_fill</code>	none	Marks the start of a polygon
<code>end_fill</code>	none	Closes the polygon and fills it with fillcolor
<code>setheading</code>	angle	Sets the orientation of the turtle to given angle

A complete listing is here: <http://docs.python.org/2/library/turtle.html#turtle-methods>.

This example draws a backwards L.

```
>>> import turtle
>>> franklin = turtle.Turtle()
>>> franklin.forward(100)
>>> franklin.left(90)
>>> franklin.forward(300)
>>> franklin.ycor()
300.0
>>> franklin.heading()
90.0
```

## 2 Turtle

Examples done in class.

- Drawing a triangle based on user input.

```
import turtle, math
height = int(raw_input("What is your triangle's height? "))
base = int(raw_input("What is your triangle's base? "))

franklin = turtle.Turtle()
franklin.color('red')

franklin.begin_fill()

franklin.forward(base)
radians = math.atan(float(height)/base)
degrees = math.degrees(radians)
turn_angle = 180 - degrees
franklin.left(turn_angle)
hypo_length = math.sqrt(base**2 + height**2)
franklin.forward(hypo_length)
franklin.left(180 - (180 - (90 + degrees)))
franklin.forward(height)

franklin.end_fill()

turtle.done() # IMPORTANT: gotta remember to do this at the end
```

- What is the output of this program?

```
import turtle
t1 = turtle.Turtle()
t2 = turtle.Turtle()
t2.color('red')
t1.up()
t1.forward(100)
t1.right(90)
t1.down()
t2.left(90)
t1.forward(25)
t2.forward(t1.xcor())
turtle.done() # IMPORTANT: keep window open until you close it
               #(or click anywhere on it)
```