# 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:

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

A complete listing is here: [http://docs.python.org/2/library/turtle.html#turtle-methods](http://docs.python.org/2/library/turtle.html#turtle-methods).

This example draws a backwards L.

```python
>>> 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.

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

```python
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)
```