Python Turtle - Lesson 1

Topics

In this lesson we will:

- install and setup your programming environment
- run your first program
- learn how to deal with error messages
- import modules
- create a simple turtle program

Part 1: Thonny Introduction

What is Thonny?

Thonny is a Python integrated development environment (IDE) for beginners.

- Comes packaged with Python
- Download it from **thonny.org**.

Thonny isn't the language we will be programming with, Python is.

- Microsoft Word → write English
- Thonny → write Python.

What is Thonny?

Python is programmed in text files called scripts.

- use any text editor to write Python.
- IDE offer additional features:
    - highlighting syntax by marking it in different colours
    - helping you debug your program

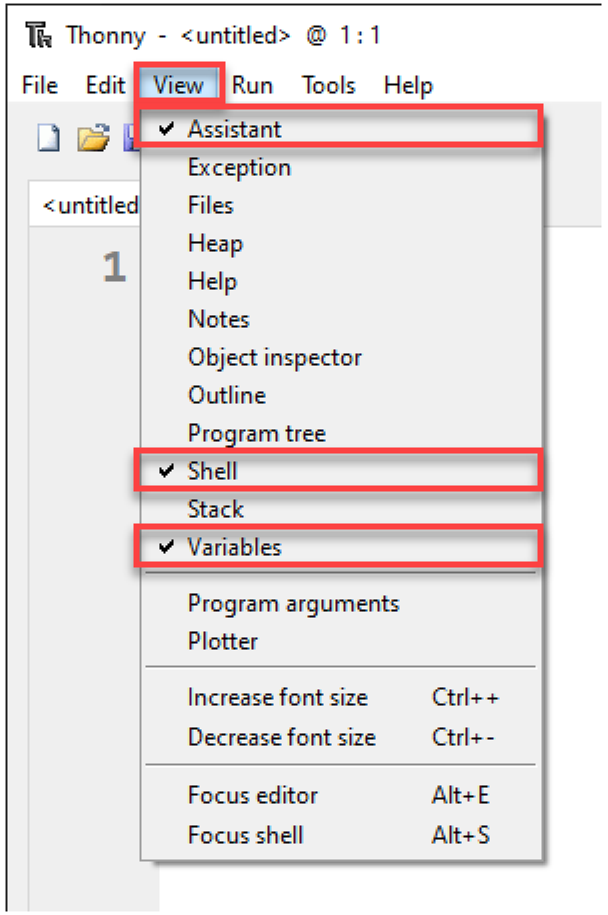
Think of Thonny as a text editor with extra features built in.

Setting up Thonny

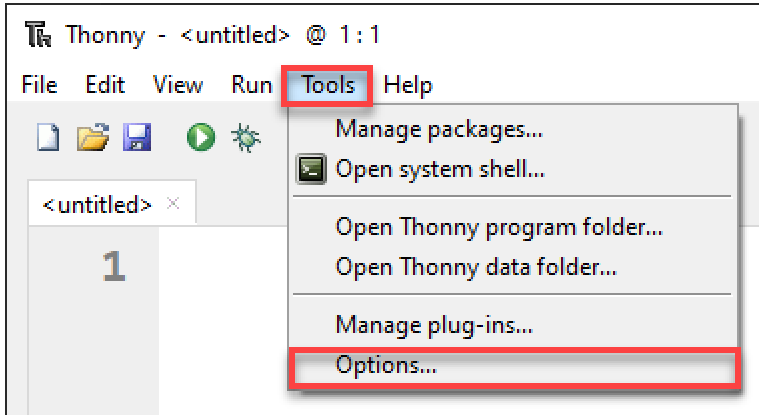
Before we look at Thonny's User Interface (UI), we need to turn on a few features so our IDE looks the same.

> Throughout this course, **bold words** are words that you need to look for on the UI

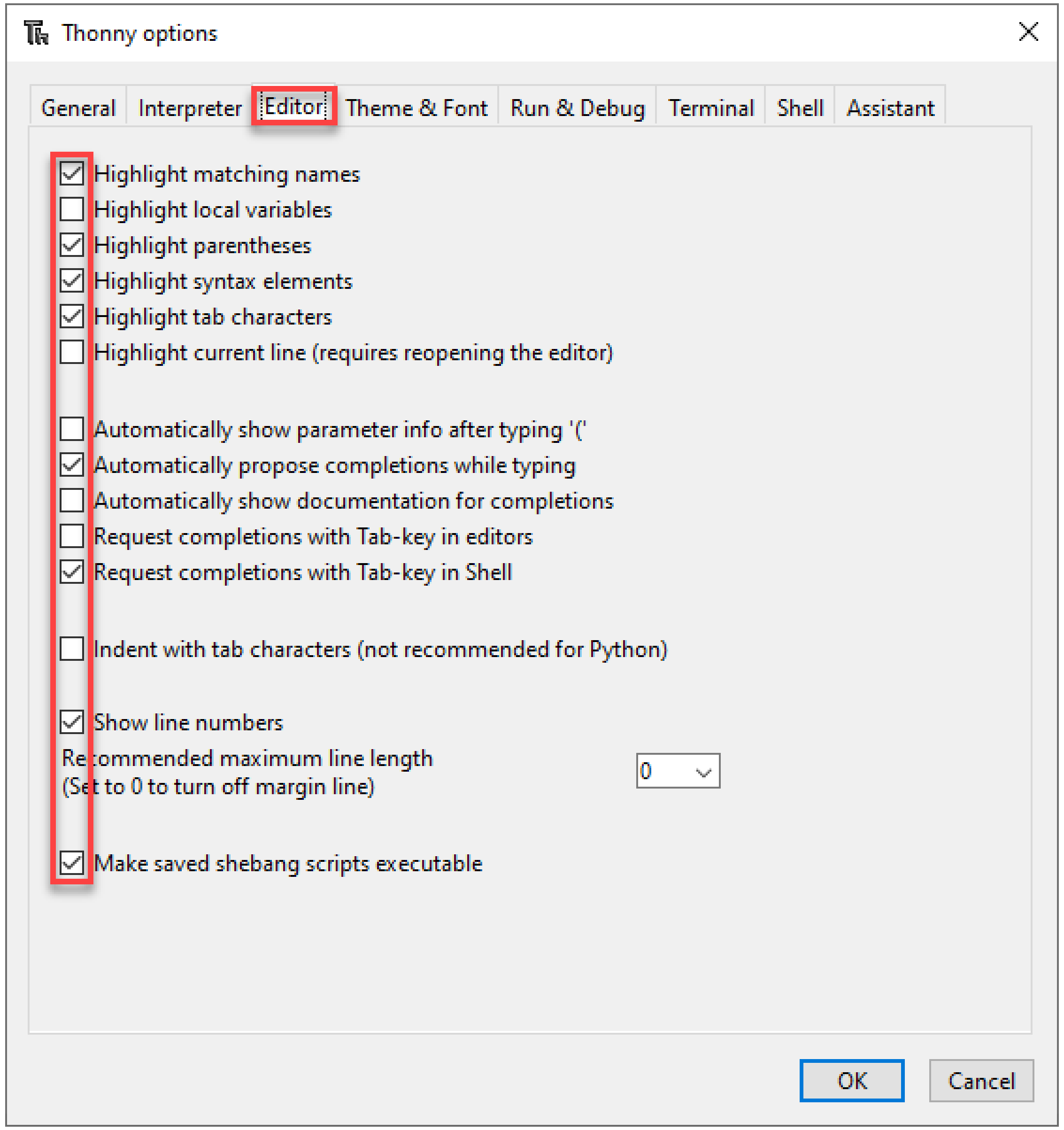
First, go to the **View** menu and make sure there is a tick beside **Assistant**, **Shell** and **Variable**.



Next go to **Tools → Options**



On the **Editor** tab make sure that your check-boxes are the same as the image below.


Thonny options

- [x] Highlight matching names
- [ ] Highlight local variables
- [x] Highlight parentheses
- [x] Highlight syntax elements
- [x] Highlight tab characters
- [ ] Highlight current line (requires reopening the editor)

- [ ] Automatically show parameter info after typing '('
- [x] Automatically propose completions while typing
- [ ] Automatically show documentation for completions
- [ ] Request completions with Tab-key in editors
- [x] Request completions with Tab-key in Shell

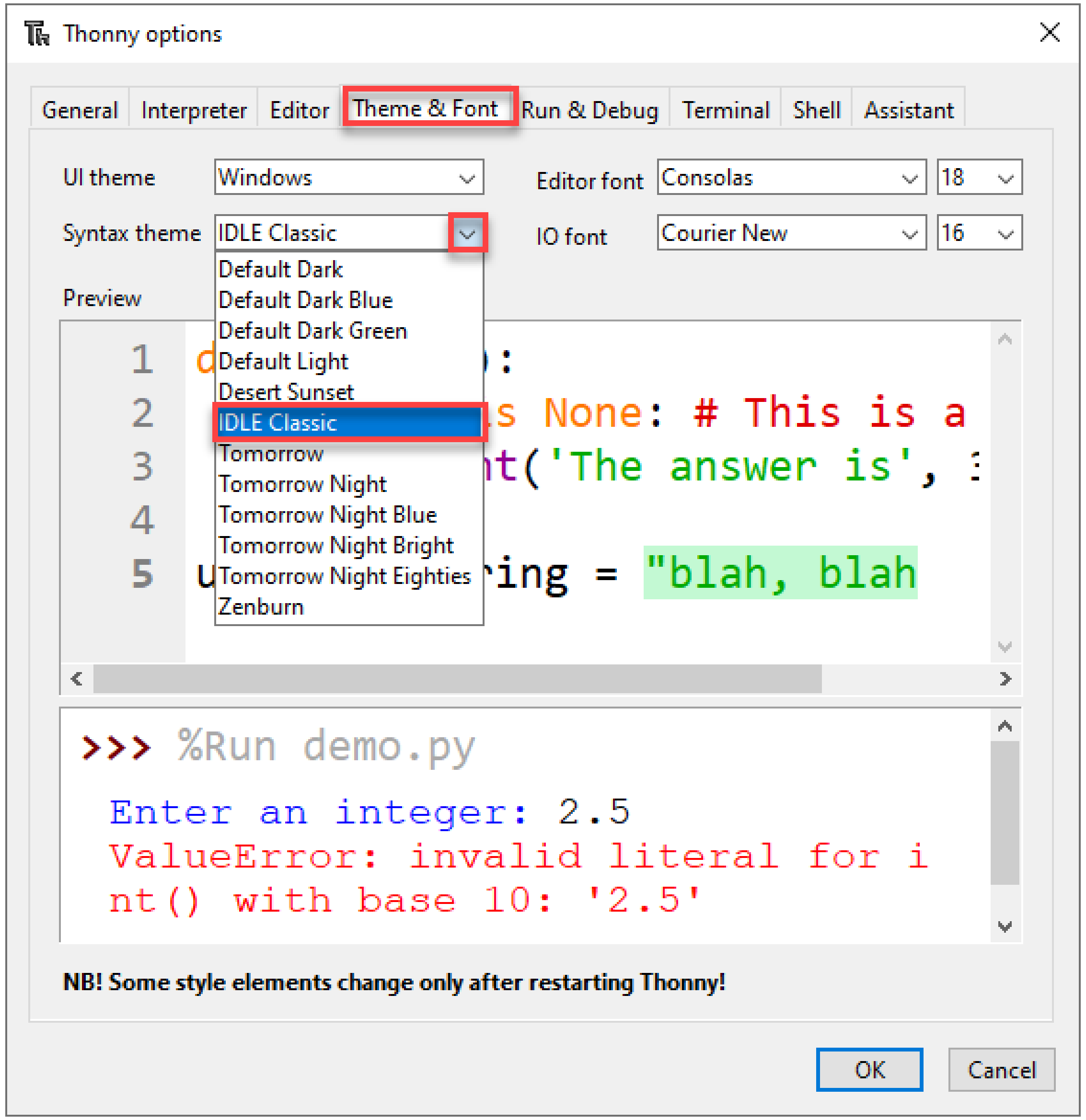
- [ ] Indent with tab characters (not recommended for Python)

- [x] Show line numbers

Recommended maximum line length
(Set to 0 to turn off margin line) 0

- [x] Make saved shebang scripts executable

On the **Theme and Font** tab make sure that the **Syntax theme** is set to **IDLE Classic**.



UI theme: Windows
Editor font: Consolas 18
Syntax theme: IDLE Classic
IO font: Courier New 16

Default Dark
Default Dark Blue
Default Dark Green
Default Light
Desert Sunset
IDLE Classic
Tomorrow
Tomorrow Night
Tomorrow Night Blue
Tomorrow Night Bright
Tomorrow Night Eighties
Zenburn

Preview

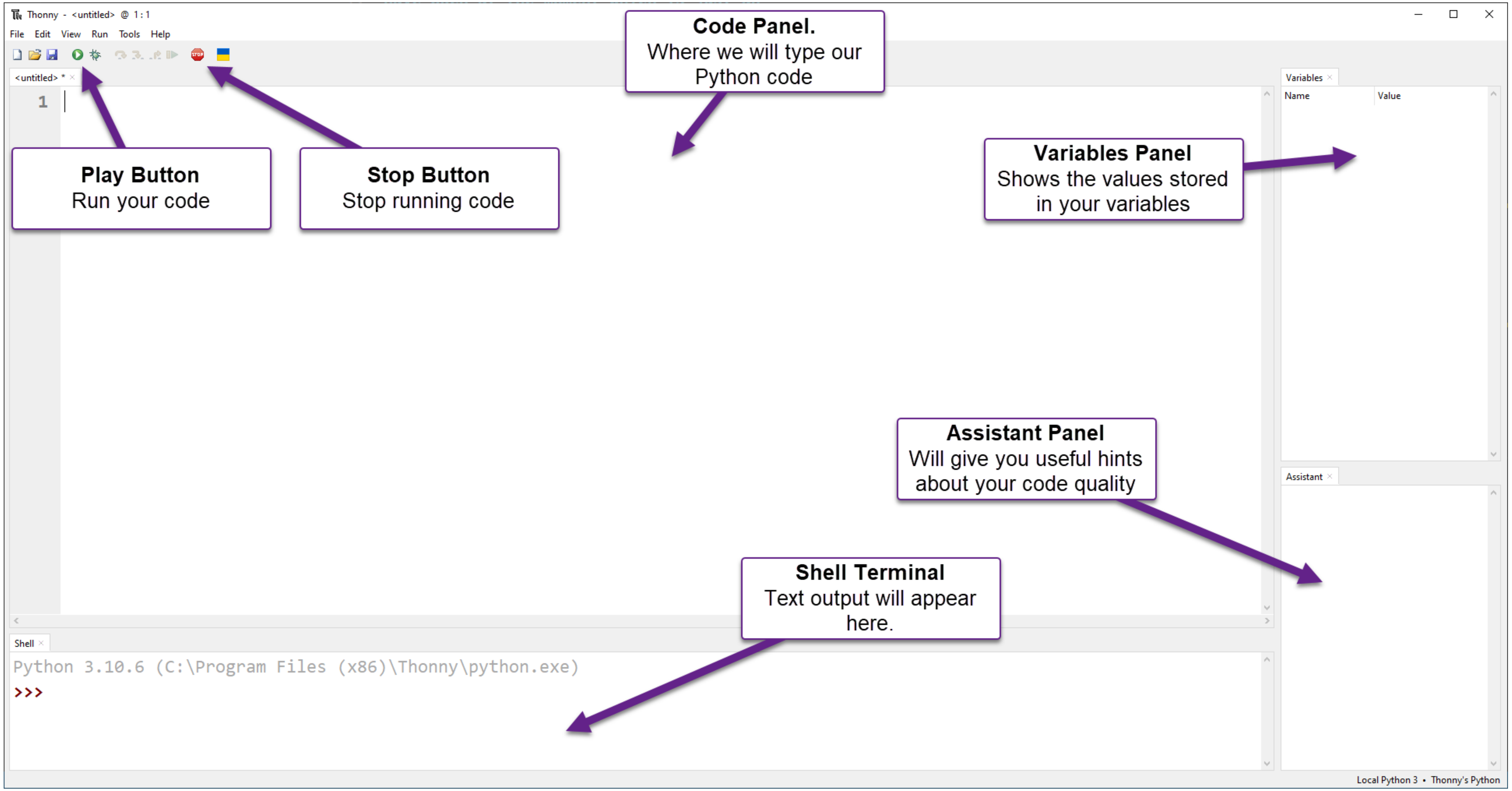
```
d                ):
                 s None: # This is a
                 nt('The answer is', :

U                ring = "blah, blah
```

```
>>> %Run demo.py
 Enter an integer: 2.5
 ValueError: invalid literal for i
 nt() with base 10: '2.5'
```

NB! Some style elements change only after restarting Thonny!

The User Interface



Thonny - <untitled> @ 1 : 1
File Edit View Run Tools Help
<untitled> *
Variables
Name
Value
Assistant
Shell
Local Python 3 • Thonny's Python

Code Panel.
Where we will type our Python code

Play Button
Run your code

Stop Button
Stop running code

Variables Panel
Shows the values stored in your variables

Assistant Panel
Will give you useful hints about your code quality

Shell Terminal
Text output will appear here.

```
Python 3.10.6 (C:\Program Files (x86)\Thonny\python.exe)
>>>
```

First Program

For our first program we are going to make a really simple little program called *hello world*, because this is the traditional first program to write.

Type the following code into the Code panel:

```
# Our First Program

print("Hello World")
```

Predict

Remember the PRIMM process (*Predict*, *Run*, *Investigate*, *Modify*, *Make*).

- *predict* what you think will happen when you run the code.

Run

Run the code by clicking on the **Play button** (or you can press F5 on your keyboard).

- **Shell** should now show `Hello World`
- Is that what you predicted would happen?

Investigate

Let's *investigate* what happened.

Only `Hello World` appears in the terminal

- misses the first line: `# Our First Program`. Why is that? Well.
- the `#` character → comment (meant to be read by humans)
- Python will ignore it
- make notes throughout your code

Line `3`

- `print` is in purple
- means `print` → a keyword in Python

Try removing the `n` from `print` so the line now reads:

```
prit("Hello World").
```

Try running the code now and see what happens.

Error message in **Shell**:

```
Traceback (most recent call last):
  File "<string>", line 3, in <module>
NameError: name 'prnt' is not defined
```

Unpack the error message:

- `Traceback (most recent call last):` → "this is where I got up to".
- `File "<string>", line 3, in <module>` → the file and the line of the error.
- `NameError: name 'prnt' is not defined` → the type of error
    - `NameError` → found a word that it doesn't understand
    - `prnt` → the word it doesn't understand

Return line `3` to `print("Hello World")`

- notice `print` turns back to purple.

Remove `"` so line `3` reads:

```
print(Hello World)
```

Run the program again

Error message in **Shell**:

```
Traceback (most recent call last):
  File "<string>", line 3
    print(Hello World)
          ^^^^^^^^^^^
SyntaxError: invalid syntax. Perhaps you forgot a comma?
```

Unpack the error message:

- shows you the line with the error `print(Hello World)`
- the line underneath uses `^` symbols to point to the error
- `SyntaxError: invalid syntax.` → not following Python's rules
- `Perhaps you forgot a comma?` → what you might have done wrong
    - suggestion is wrong in this case

Return line `3` back to `print("Hello World")`

- notice `"Hello World"` turns green
  - syntax highlighting
  - `Hello World` → string

Remove the `(` and `)` characters so line reads:

```
print Hello World
```

Run the program again

Error message in **Shell**:

```
Traceback (most recent call last):
  File "<string>", line 3
    print "Hello World"
    ^^^^^^^^^^^^^^^^^^^
SyntaxError: Missing parentheses in call to 'print'. Did you mean print(...)?
```

Unpack the error message:

- another `SyntaxError`
- error type → `Missing parentheses in call to 'print'`
- hint is correct → `Did you mean print(...)?`

Just replace the opening parenthesis `(`

Line `3` should read

```
print("Hello World"
```

Run the program again

Error message in **Shell**:

```
Traceback (most recent call last):
  File "<string>", line 3
    print ("Hello World"
          ^
SyntaxError: '(' was never closed
```

Unpack the error message:

- different type of syntax error
- failed to close your parenthesis

Every opening parenthesis `(` needs to be matched with a closing parenthesis `)`.

- notice from `(` onwards is highlighted grey
- Thonny letting you know a opening parenthesis was not closed

Modify

Time to *modify* the code

Return line `3` back to `print("Hello World")`

Spend some time making the code print different things to the **Shell**

Part 2: Introducing turtle

First turtle program

- Click the **New** icon
- type the following into the new file
- save it using the name **lesson_1_pt_1.py**.

```
# Our first turtle program
```

- Python has limited default commands (functions)
- access to whole libraries of other commands (modules)
    - *Turtle* one of those modules
- use the `import` command to access these other modules
- tell Python to `import turtle`
    - always put your `import` commands right at the top of your Python program

Your code should look like this:

```
# Our first turtle program

import turtle
```

Create a turtle

A turtle is a little arrow that you can command to move around the screen.

Before we can program the turtle, we have to make one

On line `5` type `my_ttl = turtle.Turtle()`

Explore that line:

- `turtle.Turtle()`
    - from the *turtle* module (`turtle.`)
    - use the `Turtle()` command
- `myttl =` names the turtle `myttl`

Your code should now look like this.

```
# Our first turtle program

import turtle

my_ttl = turtle.Turtle()
```

Make your turtle move

On line `7` type `my_ttl.forward(100)`

Your code should now look like this:

```python
# Our first turtle program

import turtle

my_ttl = turtle.Turtle()

my_ttl.forward(100)
```

PRIMM

- *Predict* what you think will happen
- *Run* the program and see if it follows your prediction
- *Investigate* the code by changing things and seeing what happens
- *Modify* the code so the draws different lengths of line

Changing the turtle environment

Change the turtle environment → make the Turtle window the same size across all computers

Change your code to make it look the same as below:

```python
# Our first turtle program

import turtle

window = turtle.Screen()
window.setup(500,500)

my_ttl = turtle.Turtle()

my_ttl.forward(100)
```

Line `5` of our new code makes a screen (window):

- `turtle.Screen()`
  - from the *turtle* module (`turtle.`)
  - use the `Screen()` command
- `window =` names the screen `window`

Line `6`:

- `window.setup(500,500)` to set the window size
  - 500 pixels wide
  - 500 pixels high

What's a pixel?

Screens are made up of thousand of little dots called pixels

A screen spec of 1920 x 1080 means:

- 1,920 pixels wide
- 1,080 pixels high

For our purposes: pixels are our measurement of movement on the screen

- `forward(100)` → move forward 100 pixels.

Second environment change is about looks.

From the code below, add line `9` to your code.

```python
# Our first turtle program

import turtle

window = turtle.Screen()
window.setup(500,500)

my_ttl = turtle.Turtle()
my_ttl.shape("turtle")

my_ttl.forward(100)
```

Predict what this change will do.

Change direction

At the bottom of your code, add two more lines:

- `my_ttl.left(90)`
- `my_ttl.forward(100)`

Your code should now look like this:

```
# Our first turtle program

import turtle

window = turtle.Screen()
window.setup(500,500)

my_ttl = turtle.Turtle()
my_ttl.shape("turtle")

my_ttl.forward(100)
my_ttl.left(90)
my_ttl.forward(100)
```

PRIMM

- Predict:
  - try to be specific
  - physically draw what you think will happen.
- Run:
  - Did the turtle drawing look the same as your drawing?
- Investigate:
  - try changing the values in the parenthesis

Exercises

The exercises are the *make* component of the PRIMM model

Work through the three exercise and *make* your own code