Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

OLLSCOIL TEICNEOLAÍOCHTA
BHAILE ÁTHA CLIATH
TU DUBLIN
TECHNOLOGICAL
UNIVERSITY DUBLIN

pytch_

Lesson 4

The "Chase Game": introducing Variables

Fondúireacht Eolaíochta Éireann
Dá bhfuil romhainn
Science Foundation Ireland
For what's next

Developed by:

pytch.team

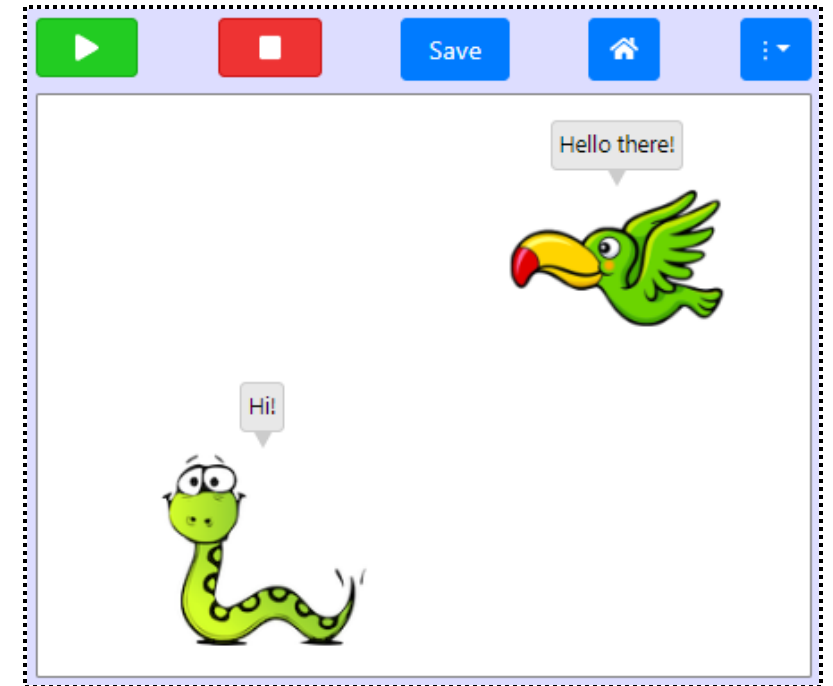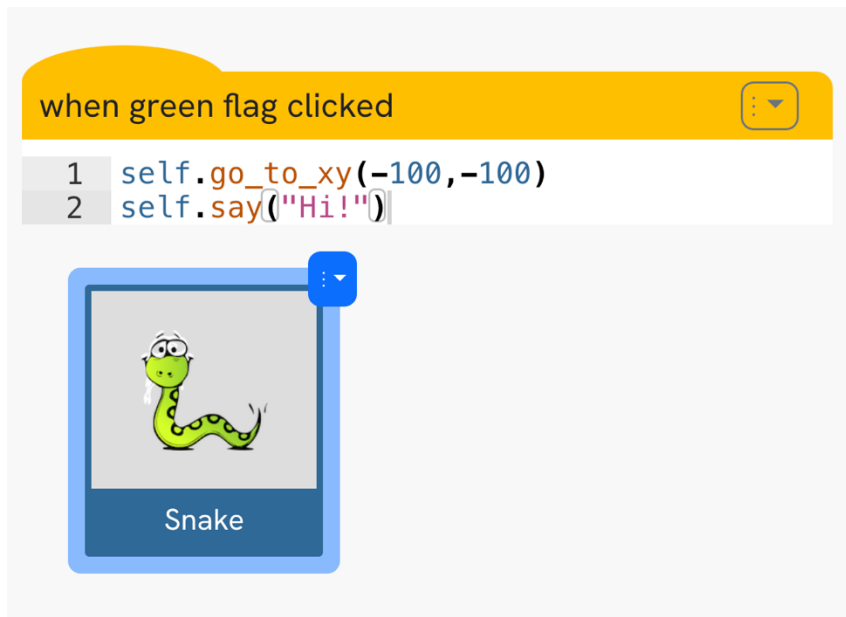https://pytch.org/
https://pytch.scss.tcd.ie/

Python Variables — 1

You can output information to the screen in Python. This is typically used for two purposes

1. Users of a computer program

2. Programmers for debugging purposes

We saw this in the last lesson, where we could make the sprite say "Hi!"

However, as we will see, we can get the sprite to output data that has been changed during the running of the program.
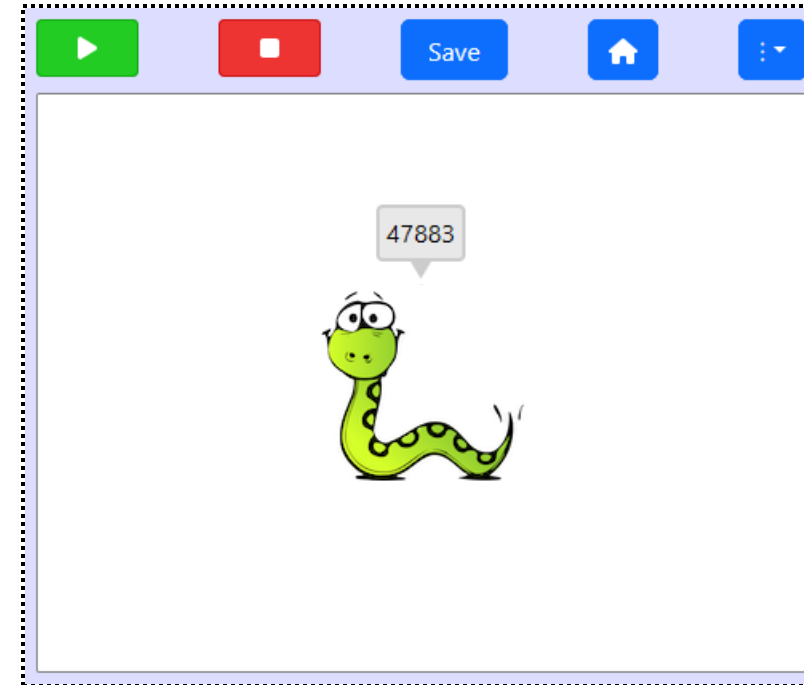
Python Variables — 2

In a Python program, you can do calculations, like 5+6, 7×9, 4–1.

Suppose we multiplied 33 by 1451 in our script. Python uses * for multiplying.

```
when green flag clicked
1  myresult = 33 * 1451
2  self.say_for_seconds("Calculation done!",3.0)
3  self.say_for_seconds(myresult,3.0)
```

For this to be useful we need to **store** this result in some place in the computer's memory, and then be able to **refer** to that location later.

Variables give names to locations in the computer's memory, where we can store all sorts of information for later use.
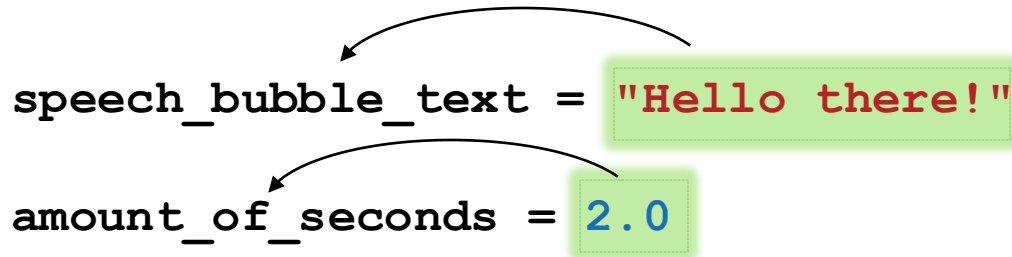
Variable syntax

Variables can store things like text and numbers.

As their name might suggest they can also be changed.

As we just saw, variables involve taking a value <u>on the right</u> and saving it in some location we give a name to, <u>on the left</u>

```
speech_bubble_text = "Hello there!"

amount_of_seconds = 2.0
```

We can also update and alter these values in the same way

```
                       "Hello there!"
speech_bubble_text = speech_bubble_text + " General Kenobi"

                       2.0
amount_of_seconds = amount_of_seconds - 0.5
```
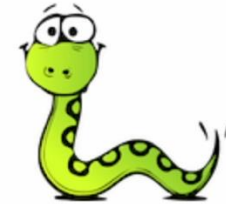
pytch_

Variables in Loops

Here is an example of using and re-using a variable in a loop:

```python
while True:

    my_random_number = random.randint(1, 10)

    self.say_for_seconds("I will move this much", 1)

    self.say_for_seconds(my_random_number, 1)

    self.change_x(my_random_number)
```

Showing a variable on the stage can help you figure out what is wrong if your program is not doing what you expected…

If you expect the variable to store an x-position on the stage but the speech bubble says a number like "10000" then you know there is an error in your code and you have to correct it.

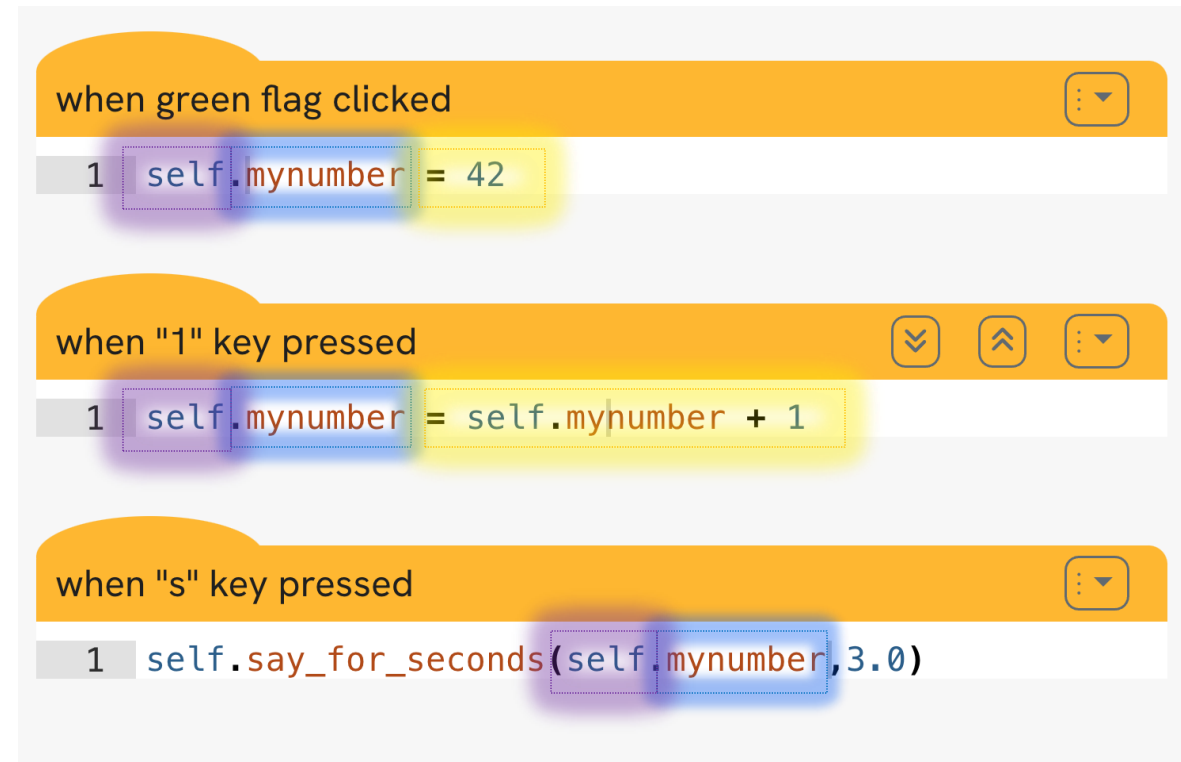When you identify and remove errors, **you are debugging your code**!

Sprite Variables

Sprites can have special variables that can be accessed anywhere within the Sprite.

These are **Sprite-based variables**.

The variable does not exist until you store something in it, so usually they should be set up in a 'green flag' script before anything else happens.

Referring to these variables in scripts within

the Sprite requires the special syntax of `self.`

followed by the variable name

when green flag clicked

```
1  self.mynumber = 42
```

when "1" key pressed

```
1  self.mynumber = self.mynumber + 1
```

when "s" key pressed

```
1  self.say_for_seconds(self.mynumber,3.0)
```

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

pytch_

Worksheet 1

Now work in pairs:

- What does this code do?

- Write your answers on worksheet 1

<After>

```
when green flag clicked
1    self.set_size(0.3)
2    self.speed = 3

when "⇨" key pressed
1    self.change_x(self.speed)

when "⇩" key pressed
1    self.change_y(-self.speed)
```

[… other movement directions …]

<Before>

[…]

```
when "⇨" key pressed
1    self.change_x(3)

when "⇩" key pressed
1    self.change_y(-3)
```

[… other movement directions …]

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

pytch_

Try it out

- Follow this link to get a Pytch project that you can run

- Run the program

- Does the bird do *exactly* what you thought it would do?

- If not:
  - Look at the differences
  - Correct your answer on worksheet 1

https://pytch.org/app/lesson/sbys/4

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

pytch_

Questions to do in pairs – Worksheet 2

1. How can you increase the speed from 3 to 4 for all four directions of movement? Do you think it is easier to make this change because of the "*self.speed*" variable?

2. When the variable speed is created in the Bird sprite, the bird "owns" it. To see what this means, try adding '*self.say_for_seconds(self.speed, 1)*' to the Star's movement script, and see what happens.

3. The variable speed is created when the bird first stores something in it. Try removing the line "*self.speed = 3*" in the Bird sprite and investigate what happens when a sprite uses a variable it never created.

4. Create a variable speed in Star, with the number 100 in it. Does this variable make any difference to how quickly the Bird moves?

https://pytch.org/app/lesson/sbys/4

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

pytch_

Tasks – Worksheet 3

Work in pairs on these two activities:

1. Add a feature so you can change the speed of the bird. E.g., add a script that increases the speed when you press 'f'. Add a script that will reset the Bird's speed to 3 when 'r' is pressed. (To increase the speed, you can use the calculation `self.speed = self.speed + 1`)

2. Can you create a *new* second variable that allows the bird to have different speeds for up-and-down movement and side-to-side movement?

Extension

Finished early? Let's learn some debugging skills for your code: you can use the Python function "print(value)", to ask Python to tell you the value. Pytch will show you what has been printed in the "Output" window, which is a tab under the coding area.

>>> Print the new values of the horizontal and vertical speeds whenever your program changes them.

Test other values for the amount by which you increase the bird's speed.

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

pytch_

Recap

Today we have

1. Learned about Python Variables

2. Learned how to make programs use variables

3. Learned how to change program behaviour by calculating new values for variables

In the next lesson we will learn more about Python and finish off our "Chase Game" project.