PYTHON
Coding Studio

GU Women Coders

GEORGETOWN UNIVERSITY

LECTURE OVERVIEW

- What is an algorithm? How do we write them?
- Python – Jupyter Notebooks
- Simple programs
- Basic Conditionals
- Magic 8 Ball

Computer Programming

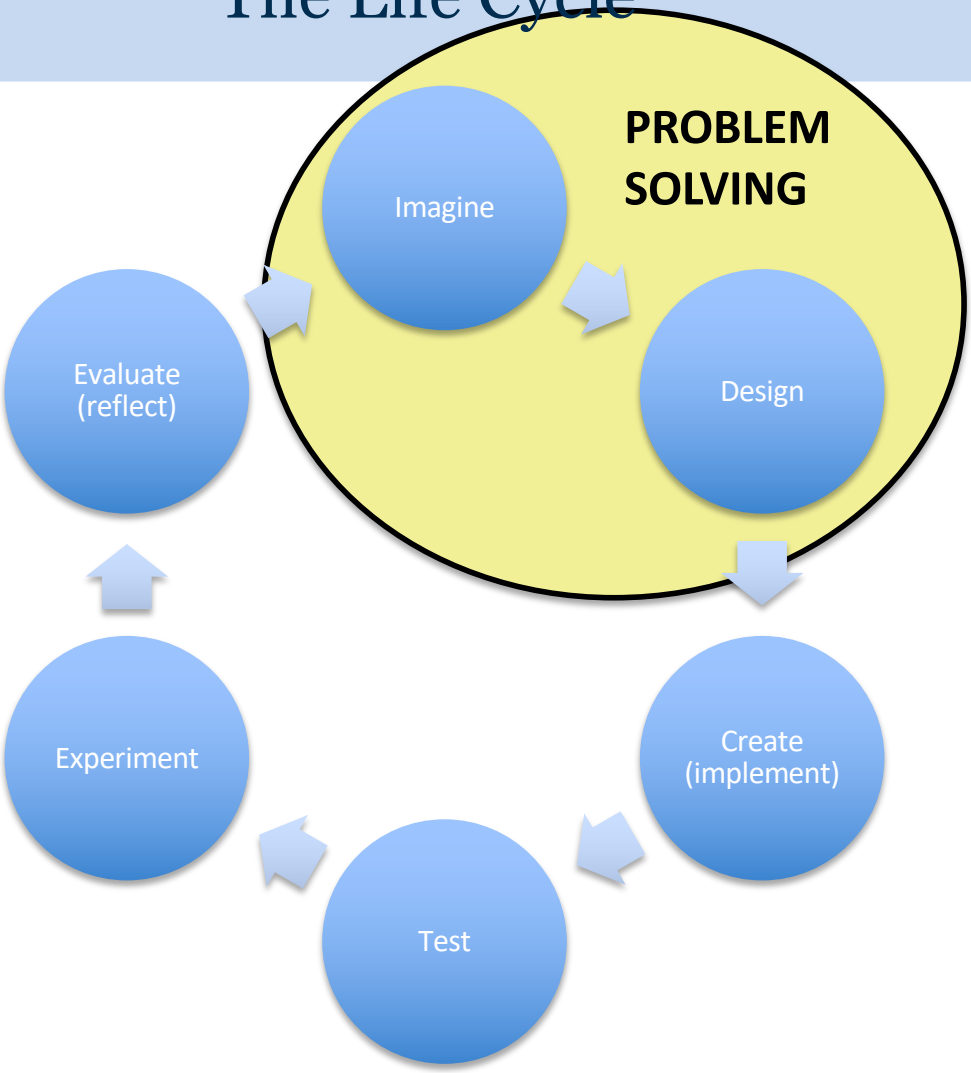
What is it?

Programming is a logical way of thinking. It is a deep thinking process that is not a rote skill. It involves the planning and designing of objects, tasks, or events.

Programming is fundamentally about problem solving using a computer.

Software Development

The Life Cycle



Problem Solving

What are the steps?

1. Identify the problem (idea)
2. Understand the problem
3. Identify alternative ways to solve the problem
4. Select the best solution
5. List the instructions or steps for the best solution (write the algorithm)
6. Evaluate the solution

Computer algorithms

What are they?

- The steps needed to solve a problem.

- An **algorithm** is a solution to a problem. The solution should be *unambiguous*, *executable*, and *terminating*.
  - Unambiguous – One does not need to guess what the output will be.
  - Executable – Every step can be completed.
  - Terminating - The process / algorithm will eventually finish.

Python

- Python is a programming language that allows you to communicate with the computer using a higher level language than using 0s and 1s.
- A Python program is a text file that can be edited in a text editor (nano, vi, emacs) or IDLE.
- There are 2 production versions, 3.4.0 and 2.7.6
- We will use Jupyter Notebooks
  - Jupyter Notebooks is an interactive computational environment, that lets you combine code execution, rich text, mathematics, plots and other media.
- To allow for easy collaboration during lectures, we will use Google's Jupyter Notebooks cloud environment.

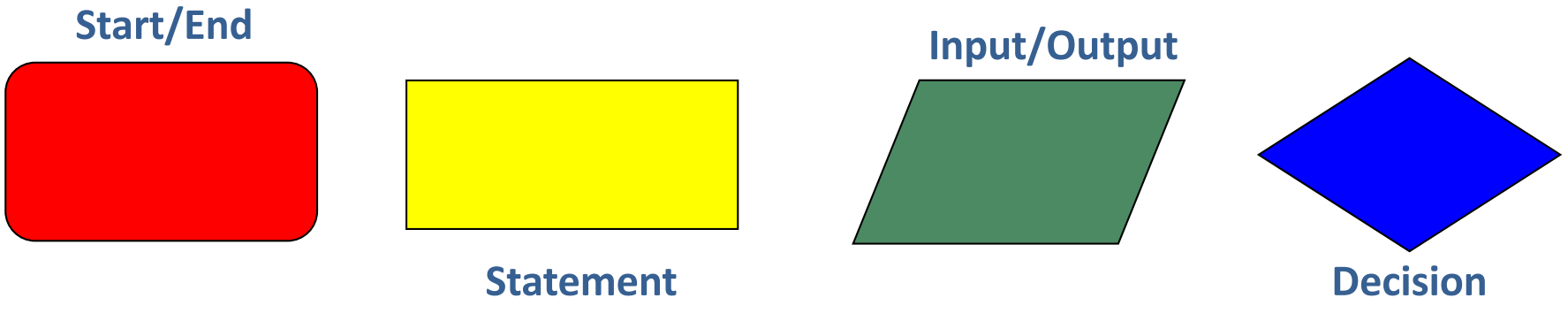
Go To Your Notebook

https://colab.research.google.com/notebooks/welcome.ipynb#

Algorithm

Flowchart Representation

- A flowchart is a graphical representation of an algorithm.
- Graphical elements:



STATEMENT

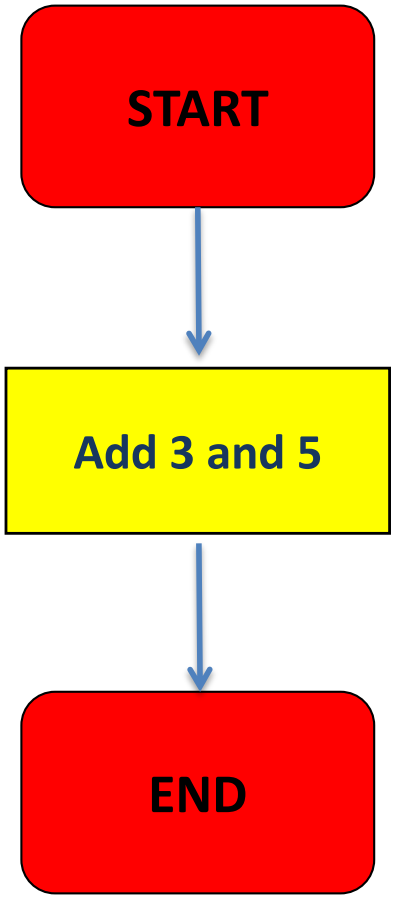
A statement executes a single action.

Addition Task

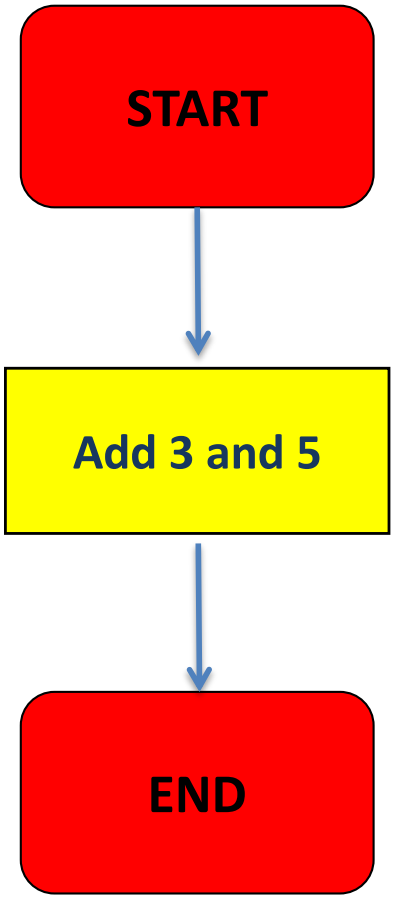
Write a program that adds two numbers together:

3+5

List the instructions or steps (write the algorithm)



Translate to Python




```
3 + 5
```

Variables

What are they?

A variable is a place to store information like numbers, text (strings), lists of numbers, etc.

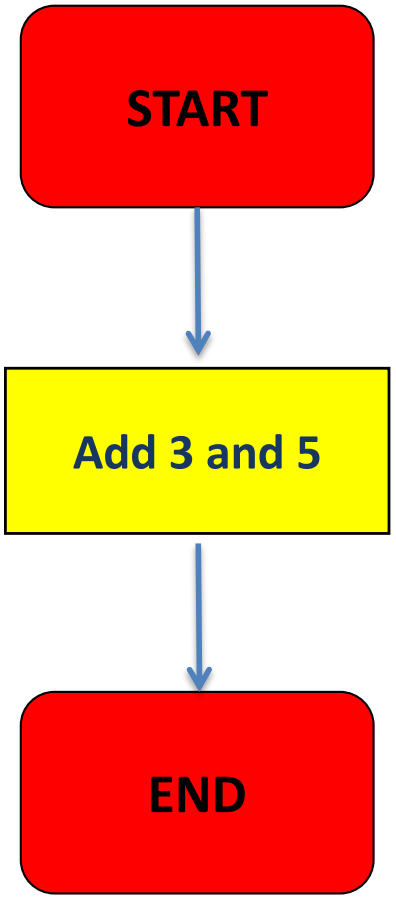
A variable is just a label for a piece of information.

lisa = 10

lisaAge = 21

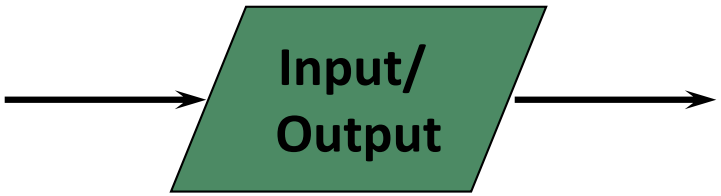
lisaDepartment = “Computer Science”

Translate to Python




```
result = 3 + 5
```

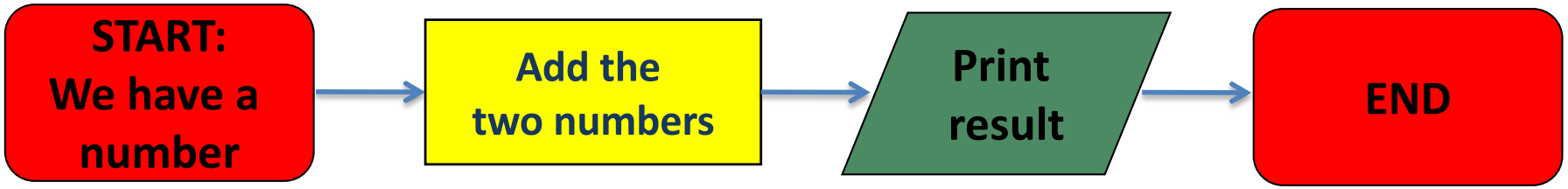
INPUT OUTPUT



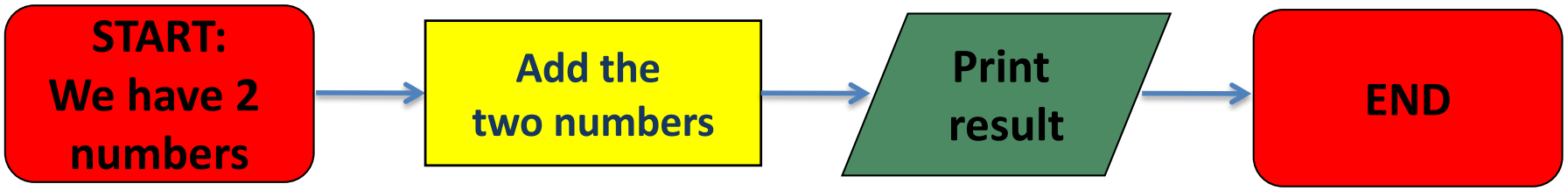
Print the result

Write a program that prints the result of adding 3 and 5.

Write the algorithm



Translate to Python




```
result = 3 + 5
```

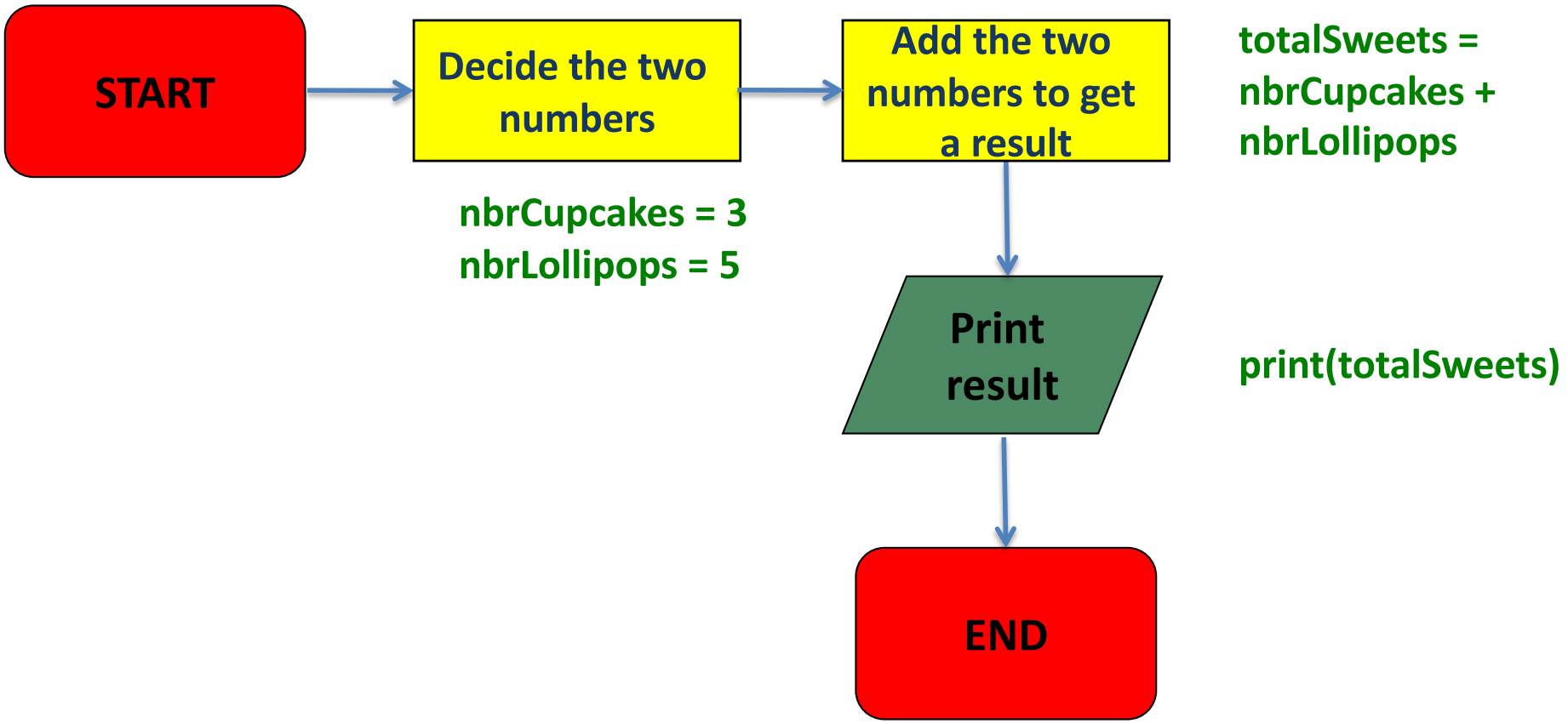
```
print(result)
```

SEQUENCE

A statement executes a single action.

A sequence is a series of statements that execute one after another.

Better Version



Python

Addition Task

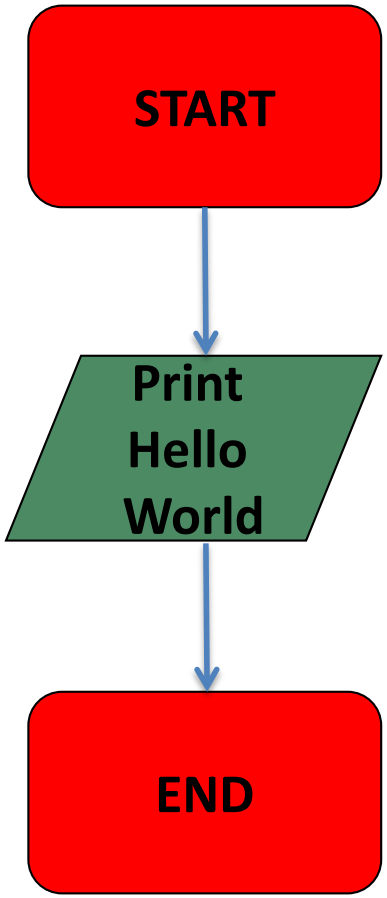
```
##########################
# Determine the total amount of candy
# Written by: Lisa Singh
# Version: 2
##########################
nbrCupcakes = 3
nbrLollipops = 5
totalSweets = nbrCupcakes + nbrLollipops
print(totalSweets)
```

The Hello World Task

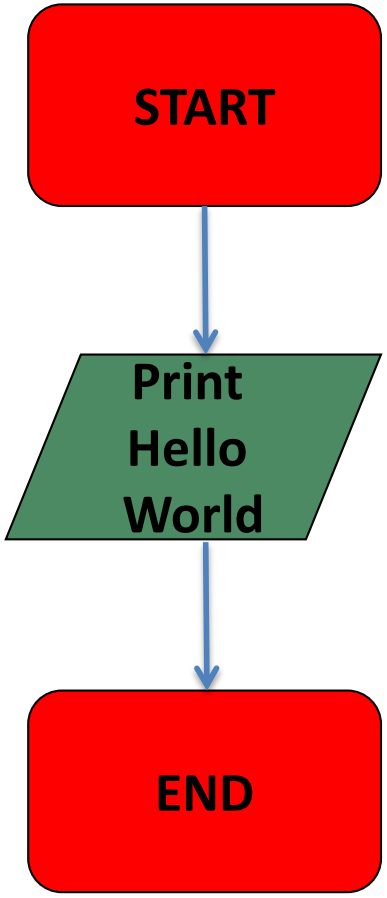
Write a program that prints the following words to the screen:

Hello World

Write the algorithm



Translate to Python




```
print("Hello World!")
```

Python

What happens if there is an error?

```
############################
# Our modified python program with an error
# Written by: Lisa Singh
# Date: October 2014
# Version: 1
############################

message = “Hello World!
print(message)
```

Python

How do we make it work?

OUTPUT:

```
line 16
    name = 'World
                ^
SyntaxError: EOL while scanning string literal
```

Python – A few other notes

- Variables do not need to be pre-declared
- Proper indentation is required. Otherwise you will get an error.

Python

Getting Input from Screen

- Sometimes we want to ask the user for information or input into the program.
- In python, there is a function for this.

input( ) [Python 3.4]

raw_input ( ) [Python 2.7]

Ask the user for input – What is your favorite color?

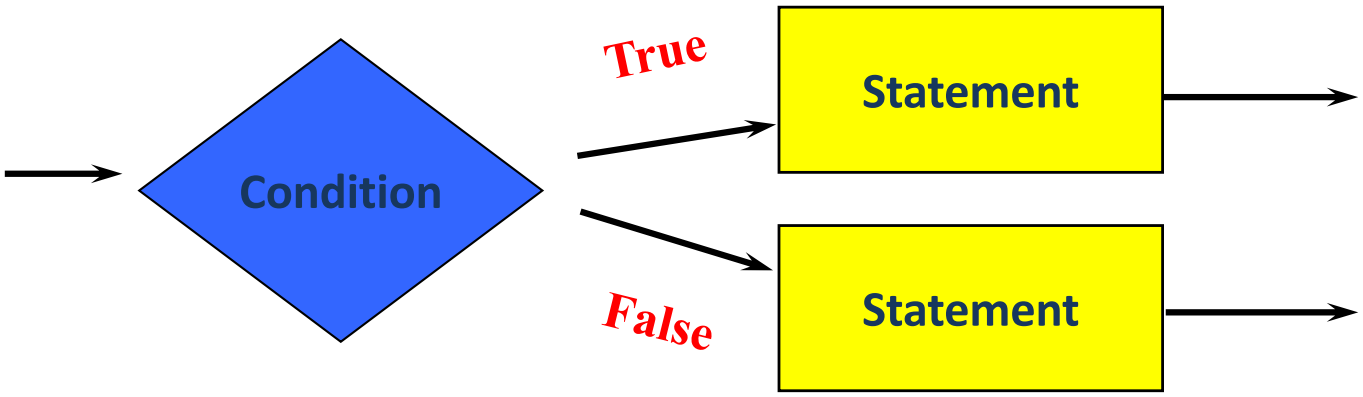
```
# Ask the user a question and store the result
user_input = input("What is your favorite color?")

# Print the user's answer
print(user_input)
```

SELECTION (if or when)

A selection statement specifies a condition that is used to determine when to execute particular statements.

IF Condition THEN Statement1 ELSE Statement2

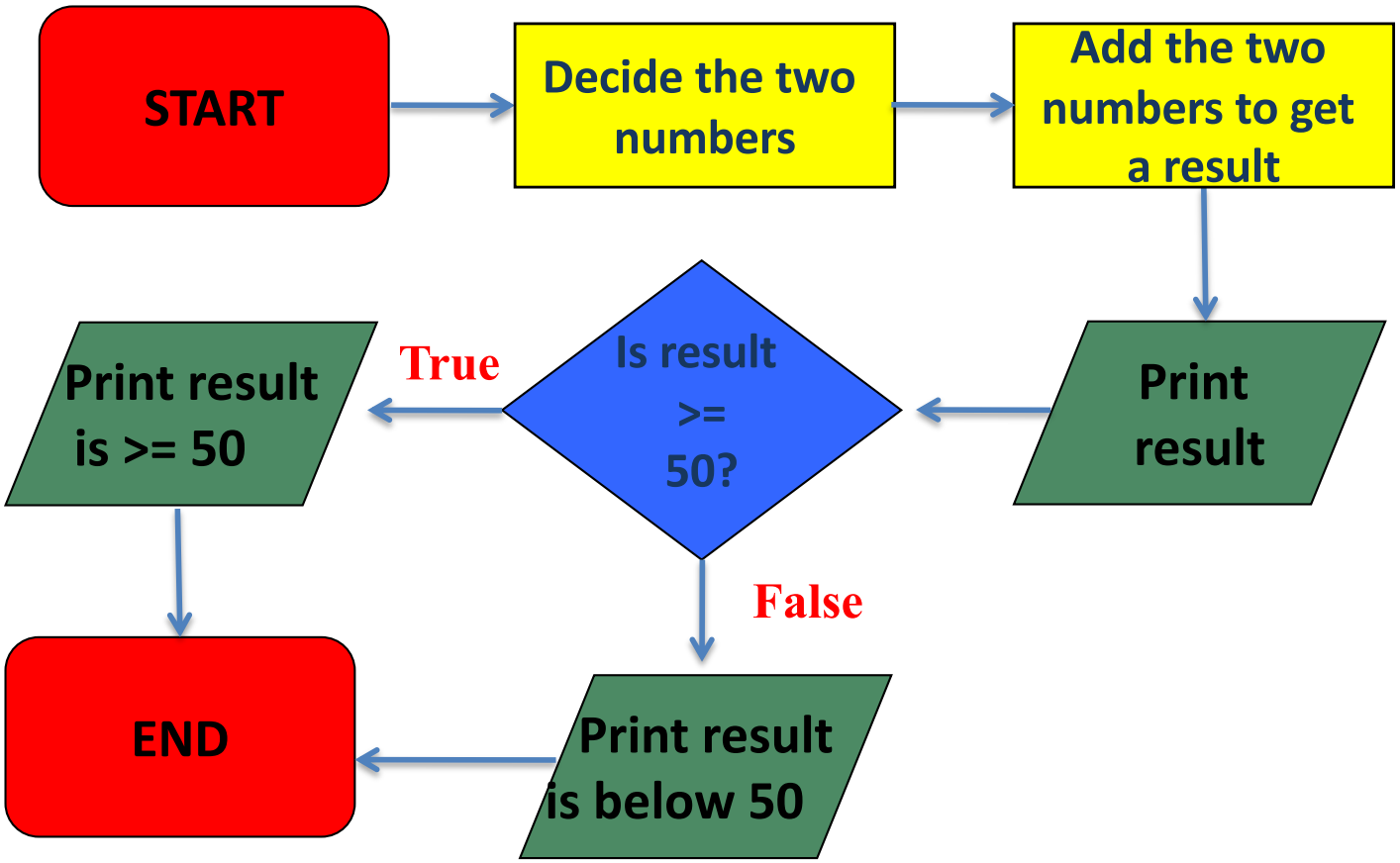


Conditional Task

Example

Add two numbers and print the result. Determine if the result of adding two numbers is greater than or equal to 50 or less than 50. Print whether or not the result is greater than or equal to 50 or less than 50.

Write the algorithm



Logical Expressions

How do they help?

- Computer programs need to make choices and decisions. Logical expressions can be used to construct the different options, choices, or conditions.
- These logical expressions are part of statements that result in a true or a false.
- Arithmetic operators can be used as part of comparison (<, > , ==, !=).

Declarative expressions example

- Professor Singh has two arms
- Janet has 12 fingers
- Cupcakes are sweet
- Candy is salty

Examples with Numbers

- Assume

  A = 3

  B = 5

- True or false

A does not equal B	**A != B**
A multiplied by B is 15	**(A * B) == 15**
A is greater than B	**A > B**

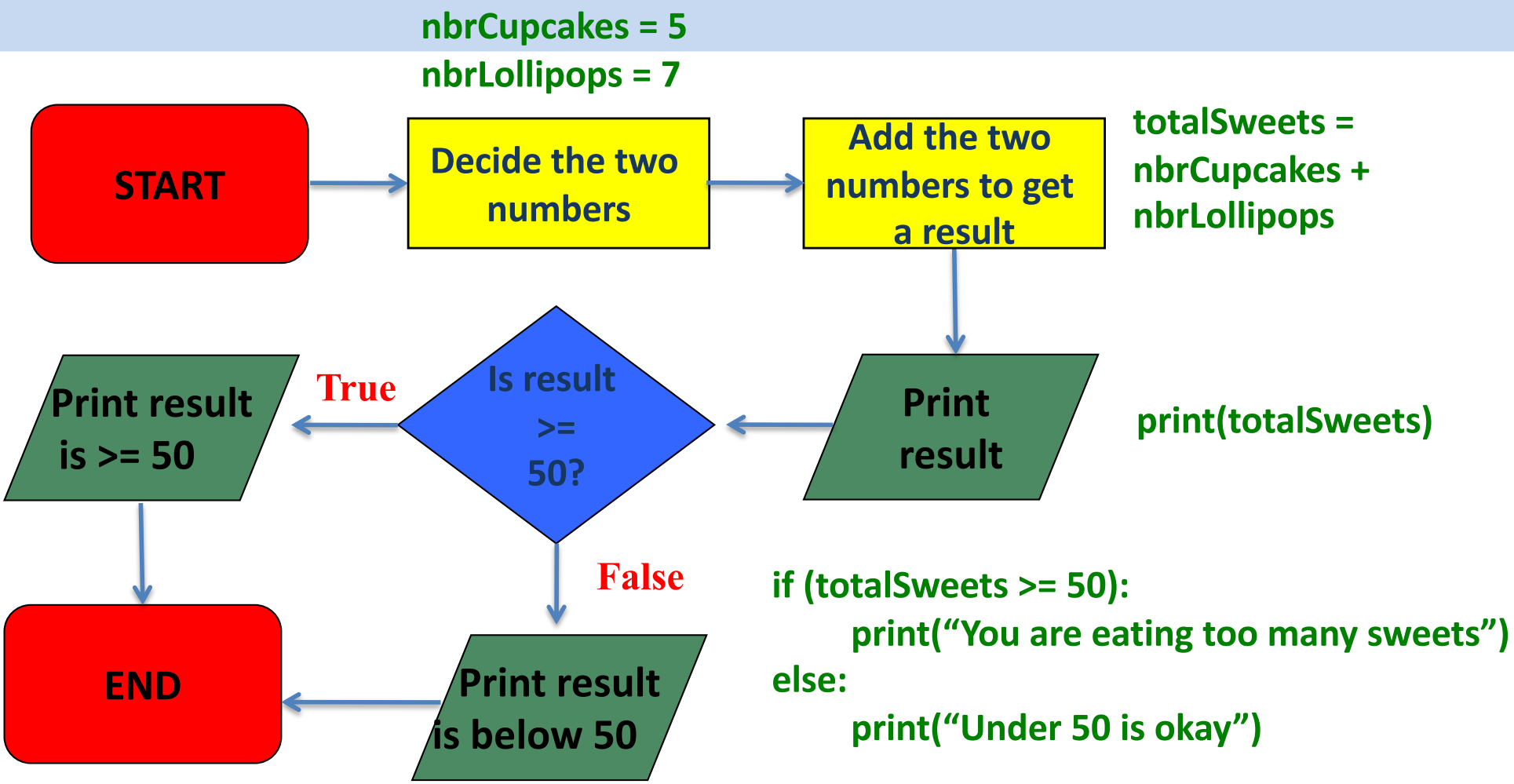
Conditionals - if else

- Decisions are put into conditions (if – elif – else)

```
nbrCats = 3

if ( nbrCats == 0):
    print("no cats")
else:
    print("cats")
```

Step 5: Translate to code



Complete code

```
nbrCupcakes = 5
nbrLollipops = 7
totalSweets = nbrCupcakes + nbrLollipops
print(totalSweets)

if (totalSweets >= 50):
    print(“You are eating too many sweets”)
else:
    print(“Under 50 is okay”)
```

Python

Libraries, packages, modules

- Python (and other programming languages) have a standard library that contains a large number of modules (or pieces of code that you can use without rewriting yourself).
- We will use different libraries and packages (other code written by programmers and shared) for computing network metrics and visualizing networks.
- In order to use a library package or module in your code, you must import it using the following syntax:

```
import packageName
```

Generate a random number

```
# import random number library
import random

my_nbr = random.randint(1,20)
print(my_nbr)
```

Magic 8 Ball

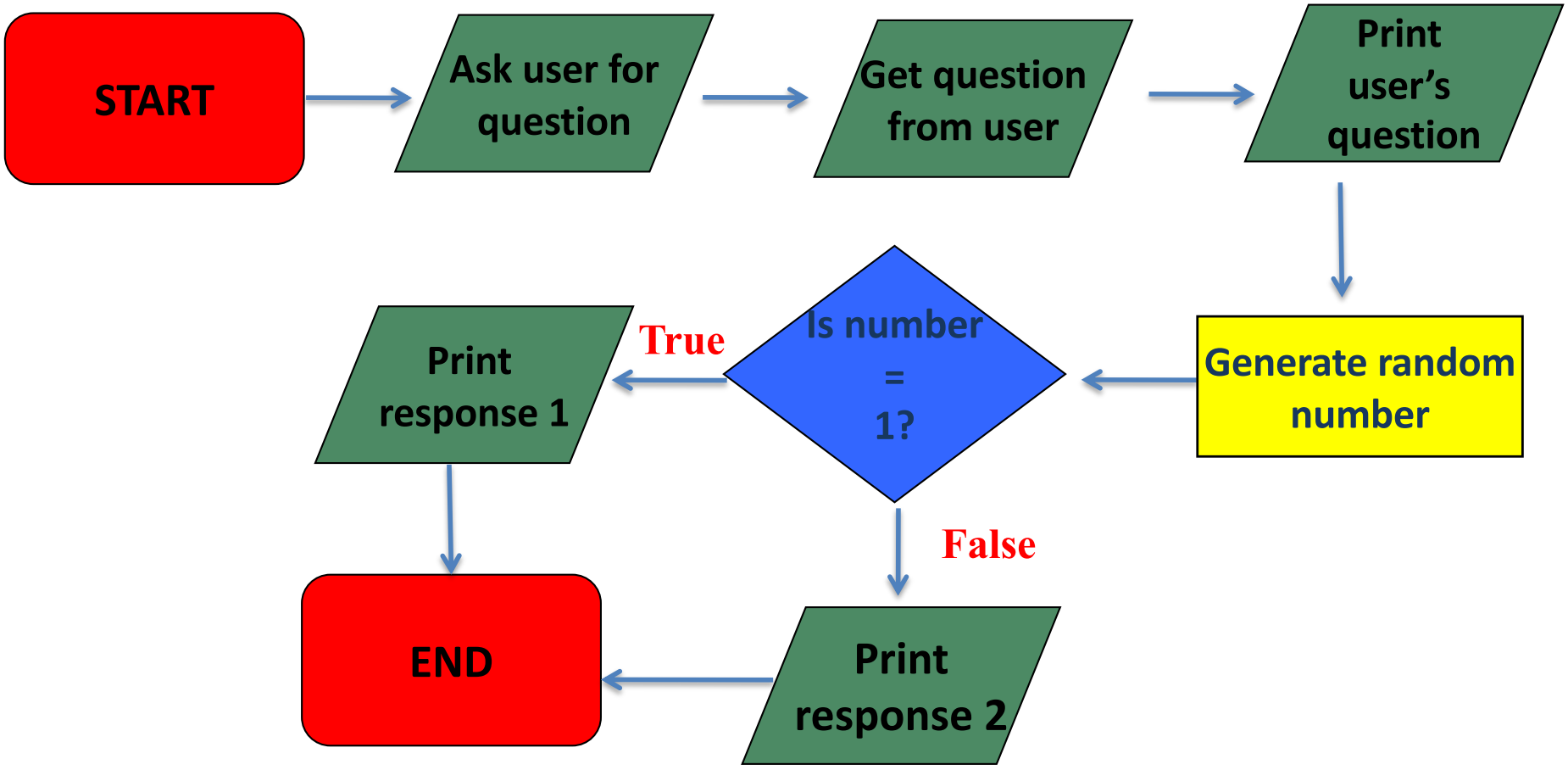
Ask the user for a question and tell the user whether it will happen or not (2 choices).

Example:
Ask the magic 8 ball a question:

Will I live forever?

It is possible.

Magic 8 Ball Algorithm



TIME TO CODE

Making More than 2 Choices

- First choice

  if (CONDITION):
- Second, third, fourth…

  elif (CONDITION):
- All other cases

  else:

Improve Magic 8 Ball

Ask the user for a question and tell the user the likelihood that it will happen (4 – 8 choices)

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http://creativitywindow.com/

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