



CHATting WITH A HISTORICAL FIGURE

For Computational
Thinking

STUDENT GUIDE

COMPUTE
Project

2021

PART I

PROBLEM + SOLUTION ENGLISH & PSEUDOCODE

- The Problem
- The Solution
- The Solution in Pseudocode

The Problem

We need to bring a historical figure to life. Not by acting, nor by summoning (did you really think of that?), but by coding!

We're looking for a program similar to this one. Check it out:

Lady Macbeth^[1]

1. Open the following project: <https://scratch.mit.edu/projects/554216995/>
2. Click on the green flag to start.
3. Let's play! Ask Lady Macbeth the following questions:
 - Who are you?
 - Do you like power?
 - Is the king dead?
 - What is your plan?
 - Any random question (e.g. "What is the meaning of life?", "What color is your shoe?")

Cool. Lady Macbeth's cool. But now we want *you* to bring a *historical figure* to life. Are you in? Don't worry—we will guide you through the solution.

Ready? Let's go!

The Solution

Let's start by analyzing how the Lady Macbeth^[1] program works.

Think for a moment—how do you think the code work works? Write your best guess below. All answers are valid.

Hint: What if instead of asking, “Who are you?” you asked, “What is your name?” or “Please tell me your name”. Try it! Does the code work? And if you asked, “What is your first name?” or “How should I call you?” What happens? Try variations of the questions listed above (e.g. “Tell me your plan”, “What idea do you have in mind?”, “Any ideas in mind?”) What happens? Are there certain words (or combinations of words) that trigger certain responses?

Your best guess: _____

Did you guess the program logic correctly? Let’s figure it out!

The Solution in Plain English

Fill in the Blanks

Choose from the following options to fill in the blanks:

plan

Who are

Only look up clear. To
alter favor ever is to fear.
Leave all the rest to me.

your name

Take note of user’s
input.

power

All we have to do is
wash our hands of it.

king

Ask me anything:

idea

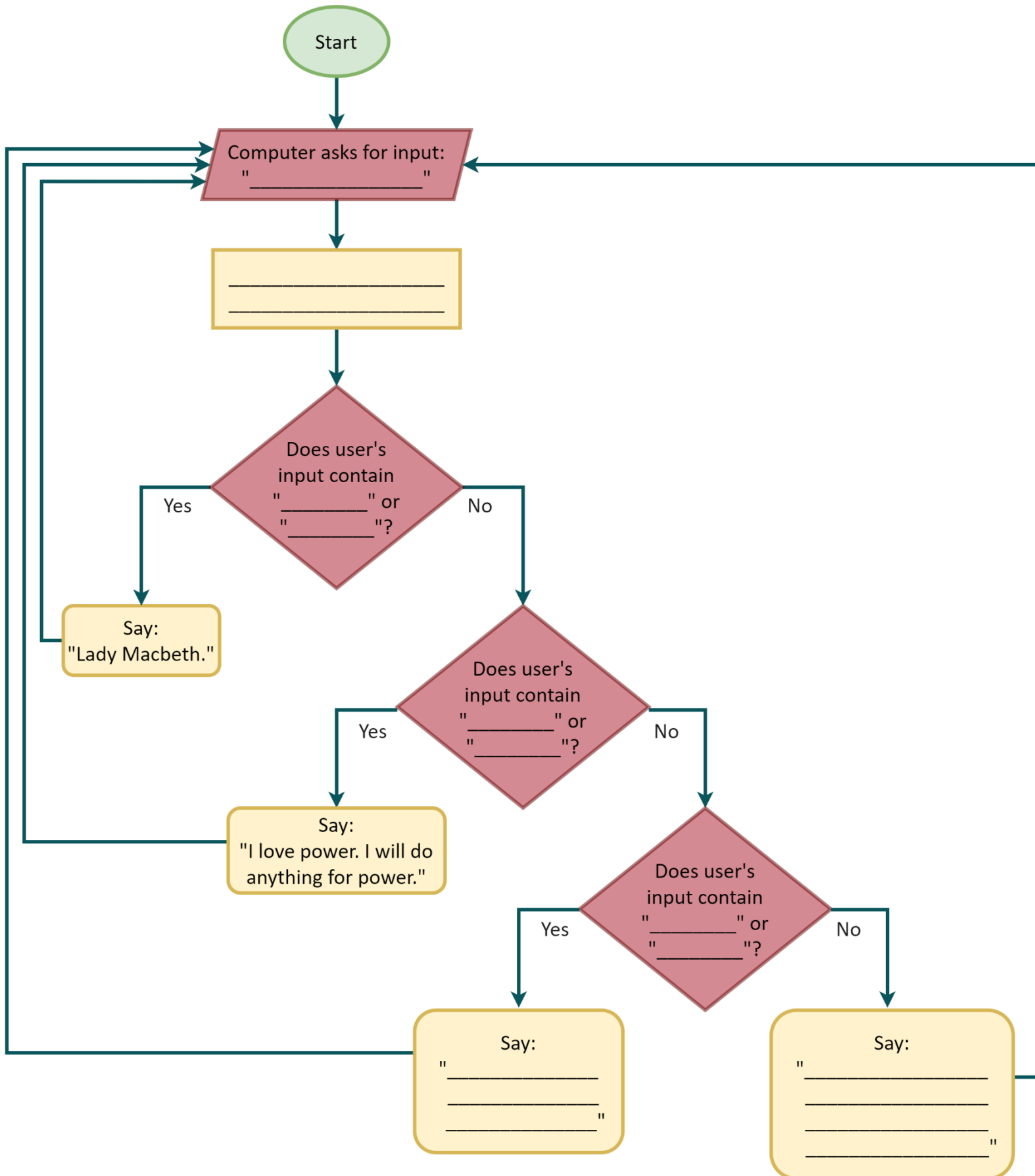
ideas

name

Note: Some of these options will not be used.

Flowchart of Lady Macbeth's Code^[1]

Fill in the blanks of the flowchart using the options from the green table above.



Pseudocode

Now let's start translating our solution into a language that is *similar* to the languages that computers understand. On the limbo between plain English and programming languages, there is pseudocode. For this exercise, we will use a variation of the conventional pseudocode.

Variables

Computers cannot “remember” the user's input unless you *store* this information somewhere. To achieve this in programming, we use variables.



You can think of variables as containers. Like a regular container, the content you put inside a variable can *vary* (thus its name!) depending on what you want it to store.

And like a tag on a regular container, it is wise to give variables a distinct name that alludes to what the variable is storing (e.g. “User's Input”). Unlike a tag on a regular container, spaces between words and apostrophes are normally not allowed, and you also want to keep the name short. Thus, “User's Input” may become something like “User_Input”, “userInput”, etc.



Matching Pairs Game + Fill in the Blanks (Next Pages)

Match each action of the solution in plain English (left mustard column) with its pseudocode translation (right mustard column). Use the options on the green chart to fill in all the blanks.

Tip: Start by filling in the blanks of the left mustard column. Note that the mustard columns continue on the next page. If possible, keep the colors of the words (e.g. “userInput” is orange).

Choose from the following options to fill in the blanks:

Lady Macbeth

All we have to do is wash
our hands of it.

userInput

king

userInput contains king

Ask me anything:

Only look up clear. To
alter favor ever is to fear.
Leave all the rest to me.

I love power. I will do
anything for power.

Who are

userInput contains Who are

userInput contains plan

answer

Note: All options will be used, and some may be used more than once.

Solution in Plain English (For Programming)

1. Asks for input by saying:
“ _____ ”
and wait for the user to respond.

2. After the user enters their answer,
save this info in a variable called
“userInput”.

Pseudocode

SET _____ TO _____

ASK _____ AND WAIT

3. If user's input contains
" _____ " or "your name", then
say: " _____ " for a
few seconds.

If not, then:

4. If user's input contains
" _____ " or "power", then
say: " _____ "
_____ for a few seconds.

If not, then:

5. If user's input contains
"plan" or "idea", then
say: " _____ "
_____ for a few seconds

If not, then:

6. say: " _____ "
_____ "
_____ for a few seconds

IF _____
OR userInput contains power

THEN

SAY _____

_____ FOR 3 SECONDS

ELSE

IF _____
OR userInput contains idea

THEN

SAY _____

_____ FOR 3 SECONDS

ELSE

IF _____
OR userInput contains your name

THEN

SAY _____ FOR 3 SECONDS

ELSE

SAY _____

_____ FOR 3 SECONDS

Reorder the Pseudocode

Now that you have matched each step with its pseudocode translation, write the whole pseudocode below in the right order. Pay close attention to the nested format of the lines below. We have helped you with some words to give you a sense of the nested structure, but feel free to check the flowchart you filled out earlier if you need a visual guide.

If possible, keep the color-coding of the pseudocode lines above. (E.g. "ASK" is turquoise; "SET" is orange)

IF _____ OR _____

SAY _____

ELSE

IF _____ OR _____

SAY _____

ELSE

IF _____ OR _____

SAY _____

ELSE

SAY _____

PART II

World War II

- Characterization
- Pseudocode for WWII

From Macbeth to WWII

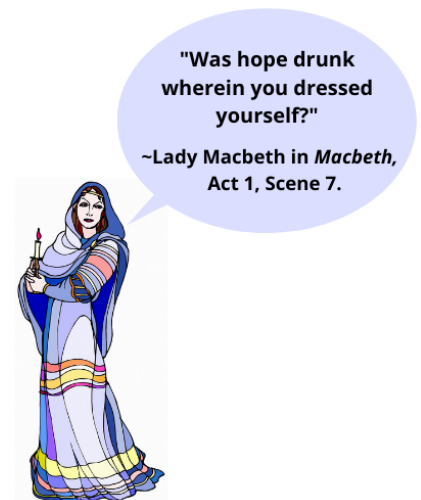
Let's begin adapting the Lady Macbeth's^[1] program to bring a historical figure to life instead. For this module, let's code one leader that led up to the start of World War II. Roosevelt, Churchill, Stalin, Mussolini, Hitler, De Gaulle—you choose!

Steps

1. Determine which important leader from WWII you want to program:

Hint: You don't have to limit your choices to the suggestions given above. You can code any leader from WWII you would like to!

2. Now take a look at your notes about this historical figure. (Feel free to do more research if you like!) **What questions would you like to ask this person? What are some likely questions that others would ask? How would this historical figure respond?** List 5 questions and answers below. For each question, **identify from one to two key words or combination of words** that the program should look for to give a certain answer. (e.g. Like the words “king” and “power” that triggered the “I will do anything for power” response from Lady Macbeth.)



For the answers, **you can search for some quirky quotes** by your chosen historical figure (as we did for Lady Macbeth) or come up with your own answers. Just make

sure to keep the essence of this historical figure—you want users to think that they really are chatting with them!

Additionally, **choose one “wildcard” response**: A response your chosen historical figure will give in case the program does not find any of your key words in the user’s question. (e.g. Just like the “Only look up clear . . .” response from Lady Macbeth.)

Have fun!

List 5 questions + answers + 1 wildcard response:

- Question 1: _____

Key Words: _____ and _____

Character’s Answer: _____

- Question 2: _____

Key Words: _____ and _____

Character’s Answer: _____

- Question 3: _____

Key Words: _____ and _____

Character's Answer: _____

- Question 4: _____

Key Words: _____ and _____

Character's Answer: _____

- Question 5: _____

Key Words: _____ and _____

Character's Answer: _____

- Wildcard Response: _____

3. Choose *three* questions and answers from the five you wrote above. (You will use the remaining two later).

4. Copy the pseudocode you wrote earlier but replacing the questions and answers from *Macbeth* with the three you chose for your chosen historical figure. Don't forget to include your "wildcard response":

IF _____ OR _____

SAY _____

ELSE

IF _____ OR _____

SAY _____

ELSE

IF _____ OR _____

SAY _____

ELSE

SAY _____

PART III

SCRATCH

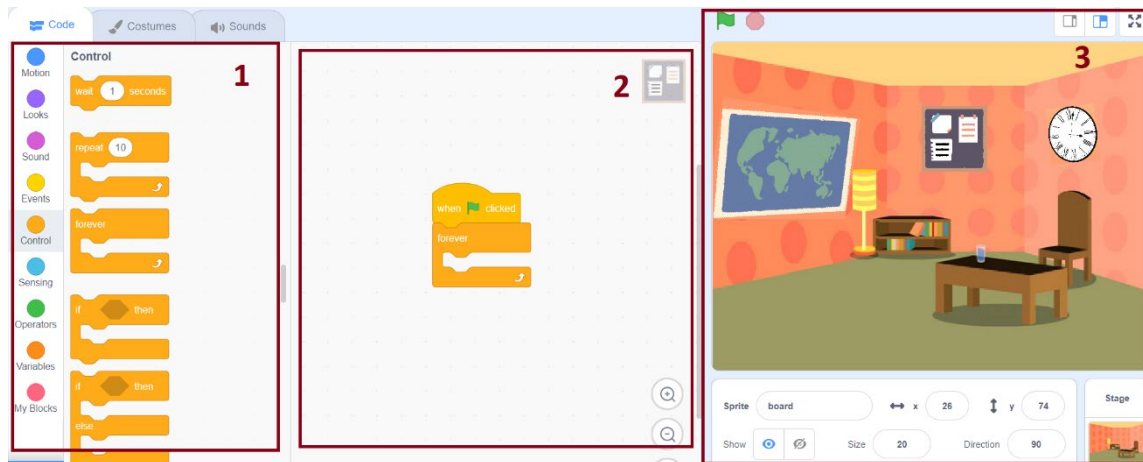
- Getting started
- Coding on Scratch

Getting Started

1. Open Scratch (<https://scratch.mit.edu/>) and create a free account.
2. Follow this link: <https://scratch.mit.edu/projects/618596837/editor/> to open the WWII template. **Do not edit this template!**
3. **Create a copy** of this template by clicking on *File > Remix*. Work on this copy (“remix”) from now on.
4. Find an image of your chosen historical figure and save it to your computer.
Hover over the “Choose a Sprite” button (cat icon on the bottom right) and click on “Upload Sprite”.

Coding on Scratch

1. Let’s start by familiarizing ourselves with Scratch:



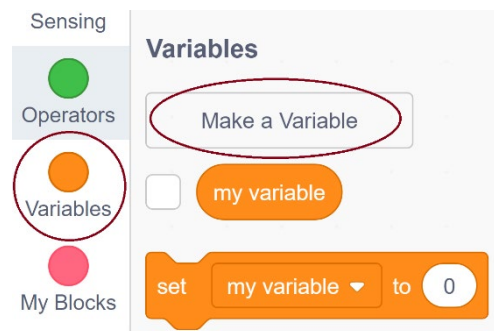
- 1.1 The first block (left) contains all the possible lines of code you can use on Scratch. The menu on the far left shows the different categories of code (“Motion”, “Looks”, “Sound”, etc.)

1.2 The second block (middle) is “your workspace”. This is where you write your code.

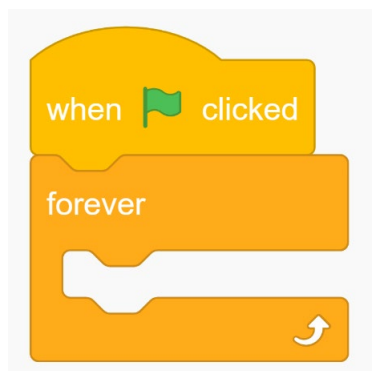
1.3 The third block (right) will show the end result of your code.

2. Let's code!

2.1. Let's start by creating our variable “userInput” by clicking on *Variables > Make a Variable*. Create the variable for all sprints.



2.2. We will help you with the first *two* lines of code, because they were not in your pseudocode. Look at all the possible lines of code listed on the left side on Scratch, and then choose these:



Hint: Have you noticed that the first line is yellow just like the “Events” category on Scratch?

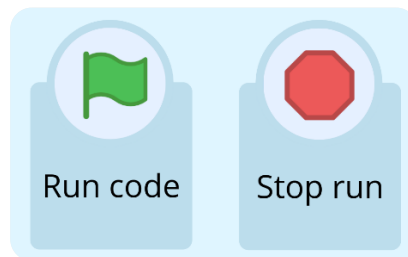
Can you guess what these first two lines do?

Your job is to fill everything inside the “forever” block with the pseudocode you wrote earlier. To do this, look at all the possible lines of code listed on the left side on Scratch, and then choose those that most resemble the lines of your pseudocode. Work line by line. Part by part.

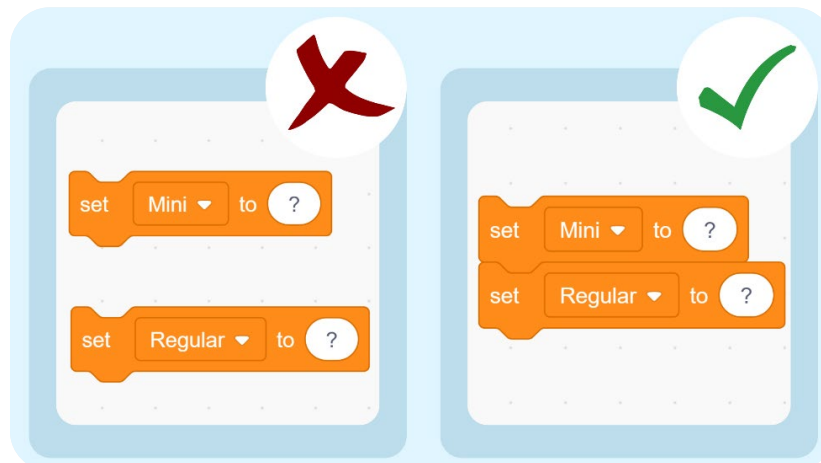
Hint: Remember that the pseudocode lines in our previous exercises were color-coded. (e.g. “ASK” was turquoise, just as the “Sensing” category on Scratch!)

Some useful tips:

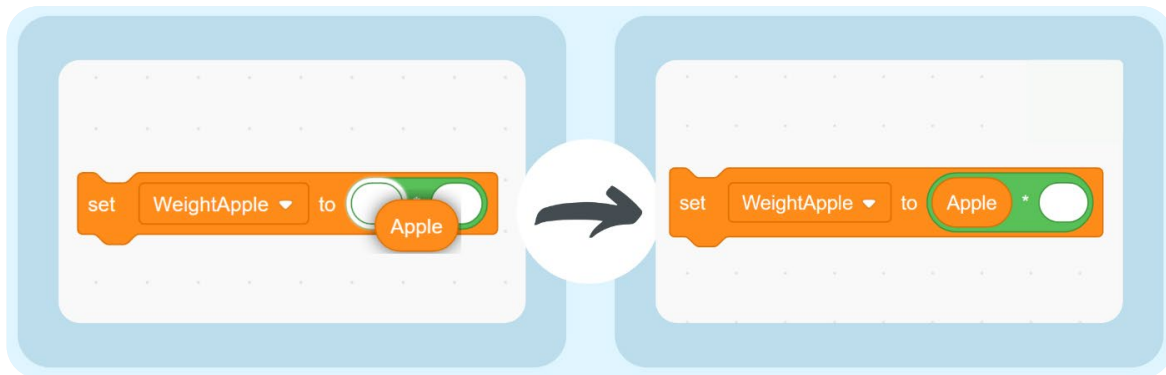
- To run and stop the code:



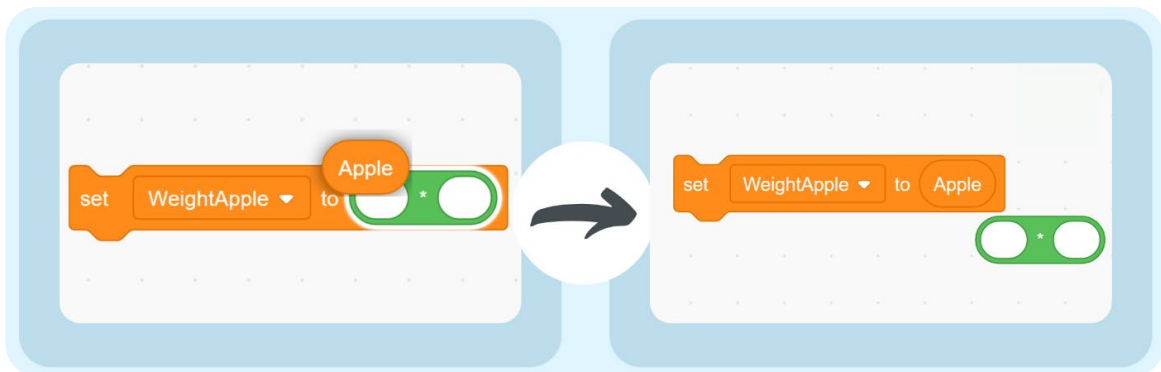
- To add new coding lines:



- To embed elements:
 - Drag an element towards the container block. Check the highlighted area before dropping it.
 - The highlighted area tells you where the new element will be placed:



The new element will be inserted into the first blank space.



The new element will replace the whole green block.

Once you finish your code on Scratch, test it! Assume the role of “user” and ask the program some questions. Is the program answering as you intended to?

Hint: Remember the nested format of your pseudocode!

Revise your code if necessary; test it again. Revise it until you get it right. When your code works with three questions and answers, add the remaining two.

Happy coding!

PART IV

PYTHON

- Writing in Python
- Jupyter Notebook

Python

Look at the following Python code. Can you guess what it does?

```
userInput = input("Ask me anything:")

if "Who are" in userInput or "your name" in userInput:

    print("Lady Macbeth.")

else:

    print("Was hope drunk wherein you dressed yourself?")
```

Did you guess correctly? Check it out:

```
userInput = input("Ask me anything:")
```

Asks for **input** by saying:
"Ask me anything:"
and stores the user's answer in
a variable called "userInput".

```
if "Who are" in userInput or "your name" in userInput:
    print("Lady Macbeth.")
else:
    print("Was hope drunk wherein you dressed
          yourself?")
```

If the program finds the words
"Who are" in "userInput" or
"your name" in "userInput":

then it **prints** on screen:
"Lady Macbeth."

If not:

then it **prints** on screen:
"Was hope drunk wherein
you dressed yourself?"

Fill in the Blanks

Take the following coding structure for Python and fill in the blanks with *three* of the five questions and answers you wrote for your chosen historical figure plus your “wildcard response”. Use the previous Python code as a guide. You may also refer to your Scratch code and the flowchart you filled out earlier if you need a visual guide of the code structure.

Make sure to include the required punctuation (use the previous Python code as a guide). Every character matters in coding!

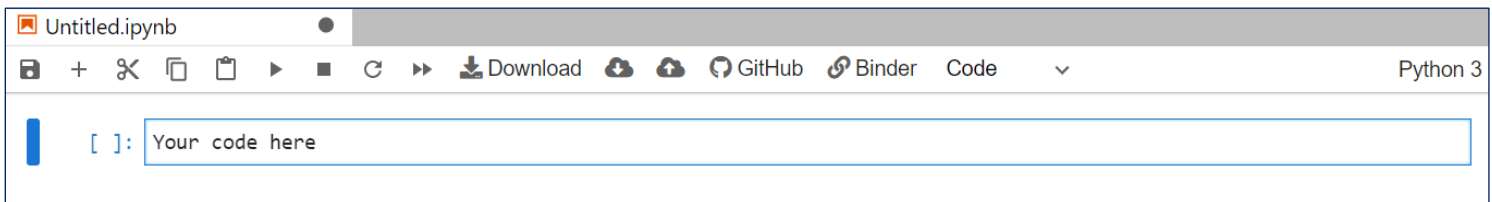
Tip: It is not necessary to keep the color-coding this time.

```
userInput = _____  
if _____  
    print _____  
else:  
    if _____  
        print _____  
    else:  
        if _____  
            print _____  
        else:  
            print _____
```

Run Your Code

1. Open Jupyter Notebook: <https://jupyter.org/try>
2. Open JupyterLab and wait a few seconds for it to load.
3. Click on “Python 3” under “Notebook”.
4. Type the Python code you wrote above in the coding block as shown below. Make sure to include all the required punctuation and *to maintain the indented structure of the code*. (Each indentation matters in Python!) Press the “Tab” key to indent a line.

Note: The user will only be able to ask one question this time. If you want to ask another question, you will have to copy and paste the code into a new coding block.



5. Click on the “Play” button to run your code and test it.
6. Is the program running correctly? Revise it if necessary. Once the program runs correctly with three questions and answers, add the remaining two.

You may add even more questions and answers if you like!

7. Test your code until you get it right.
8. Congratulations! You just brought a historical figure to life by coding in Python.

References

- [1] *Module Adapted from* W. McKnight and Exploring Computational Thinking team at Google, "ECT Pencil Code Program: Lady Macbeth Chat Bot," *ISTE*, 09-Jun-2015. [Online]. Available: <https://learn.iste.org/d2l/lor/viewer/view.d2l?ou=6606&lolidentId=194>. [Accessed: 16-Dec-2021].