

Educator Guide

Python 101 - Lesson 3

60 minutes

A Varied Outcome

VARIABLES

EDUCATION.MINECRAFT.NET

THEME OVERVIEW

In this lesson, students will assist CodingMine with the development of their new farming software. Students will use variables and world coordinates in this lesson.

LESSON OBJECTIVES

By the end of the lesson, students will:

- Learn and apply the coding concepts of variables
- Use predefined locations
- Create, test, and debug my Python code
- Embrace a coding mindset

KEY VOCABULARY

Variables – Box/placeholder for a numerical value, piece of text, command, or another variable.
World Position – Unique coordinate for each block in Minecraft

CODING CONCEPTS

- Variables
  Variables are used as place holders for pieces of text (strings), numerical values, commands, and even other variables. A variable inside a piece of code is replaced by a number or text when the code is run. You can think of a variable as a box that contains something (a number or text).
  For example, if you wanted to make a box/variable for countries, you could name your box/variable country. You can then pass the box called country to another student who places a piece of paper with the name of a country (America) inside the box. This gives the box/variable country a value of America. The box is then moved to another student who places their country of choice (France) inside the box and removed the previous one (America). The box/variable now has the value (France). Any time you want to see the current country, you can open the box/variable country and look.
- **World Position**
  There are two kinds of positional coordinates in Minecraft: **relative position** and **world position**. In this lesson, they will be working with world position. Every block in the Minecraft world has its own unique coordinates called world position, defined by three numbers world (0, 0, 0).
  At the start of Activity 2, the world coordinates will appear in the top left-hand corner. Coordinates in commands are not written with quotes as they

represent a numerical value. During the lesson, students will use predefined coordinates in their code and do not need to change any of their values.

USER INTERFACE

By the end of the lesson, students will:

- See displayed world coordinates in the top left-hand corner.
- Learn to use the half coding window, giving the students the possibility to see the coding window and world position at the same time.
- Use predefined given world locations, at the top of the coding window.

SYNTAX / OPERATORS :

Equals = :
Equals is used with variables to declare its value

Change += :
Increases the value by the defined amount

Change -= :
Decreases the value by the defined amount

LESSON ACTIVITIES

Direct Instruction (Teacher-Led; "I Do")

Today, we will continue working in our computer science unit, "Python 101". The lesson for today is called "A Varied Outcome". (**slide 1**)

Review the lesson objectives with students. (**slide 2**)

Define the important vocabulary with students. (**slide 3**)

"You will help CodingMine with the development of their new farming software. This software will be used to help farmers in every step of the farming process from planting and sorting to selling the produce. You will use variables in this lesson and world coordinates."
(**slide 4**)

Explain the coding concept focus for students. (**slide 5**)

Explain the new syntax focus for the lesson. (**slide 6**)

Guided Instruction (Teacher Modeling; "We Do")

Demonstrate how to locate and find the Python 101 lesson, "A Varied Outcome" from the in-game library. Showcase the spawn point for students and then explain that they will start their lesson by talking to the NPC, the CEO of CodingMine. (**slides 7-9**)

All students should log into Minecraft: Education Edition at this point and replicate these exact steps so you can complete the first activity together.

Activity 1: Sorting Things Out (Slides 9-16)
Objective: Develop software to sort out fruit

Explanation:
The programmer needs your help to develop software that is going to sort the different fruit that the farmers are picking. You need to work out the correct sequence of buttons to press on the sorting machine. You will do this by creating variables for the different fruits and finishing off the code so that when it is run, the correct sequence is shown.

Run the code and press the buttons for each fruit in the order that it is shown in the chat. When the students have entered the correct combination, the lights will be fully lit, and Activity 1 is complete.

Code snippet:

Before:

```
# Replace the lines below with your code #
a = "berries"
# variable b | Step 1
# variable c | Step 1
d = a
# fruit variable      | Step 2
player.say(fruit)

# fruit variable      | Step 2
player.say(fruit)

# fruit variable      | Step 2
player.say(fruit)

fruit = d
player.say(fruit)
```

After:

```
a = "berries"
b = "melon"
c = "apple"
d = a

fruit = a
player.say(fruit)

fruit = c
player.say(fruit)

fruit = b
player.say(fruit)

fruit = d
player.say(fruit)
```

Independent Work (Teacher Support; "You Do")

Activity 2: Ideal Planting Spot (Slides 17-23)
Objective: Program a code to plant the correct crop

Explanation:
The developer needs your help to program a piece of code that will plant the correct crop in a desired location. You will do this by matching the world positions in the Minecraft world with the different location variables in the coding window. This is done by looking at the world position in the top left-hand corner when the player is standing in the right location.

Once you have found the location, place a block, using code, that corresponds to the type of block hanging above the location (melon block or pumpkin block) using the place black at position command with that location variable as the position. Use the half coding window button in the top left-hand corner of the coding window to be able to see the world position and coding window at the same time. (**Hint**: The students will be given predefined locations at the top of the coding window, called location1, location2, location3... The should use these locations when coding).

When the students place the last crop, Activity 2 is complete.

Code snippet:

Before:

```
location1 = world(-24, 40, -18)
location2 = world(-31, 40, -11)
location3 = world(-28, 40, -16)
location4 = world(-25, 40, -13)
location5 = world(-31, 40, -17)
# Replace the lines below with your code #

# place block at location1 command
# place block at location2 command
# place block at location3 command
# place block at location4 command
# place block at location5 command
```

After:

```
location1 = world(-24, 40, -18)
location2 = world(-31, 40, -11)
location3 = world(-28, 40, -16)
location4 = world(-25, 40, -13)
location5 = world(-31, 40, -17)

blocks.place(MELON_BLOCK, location1)
blocks.place(MELON_BLOCK, location2)
blocks.place(PUMPKIN, location3)
blocks.place(PUMPKIN, location4)
blocks.place(MELON_BLOCK, location5)
```

Activity 3: Are My Calculations Off? (Slides 24-28)
Objective: Write three pieces of code to calculate the cost of fruit

Explanation:
The data scientist needs your help to write three pieces of code that will calculate the cost of the fruit when the farmers are selling them. You will code three different calculations for different situations; examples would be when the price of fruit increases or decreases and when the farmers add a new type of crop. Once calculated, they will have to show the total cost in the chat using the say command. The students should then press the button that corresponds to the cost shown in the chat. They will be working on one piece of code in this activity, adding additional parts as needed.

Whenever the students run the code, the say command will show the numerical value of the variable cost in the chat. Press the button that corresponds to that number and if correct, a receipt will print out.

When the students have pressed all of the last correct button, they will receive their last receipt. The students will then have completed Activity 3 and the lesson.

Code Snippet:

Before:

```
apple = 10
melon = 15
berries = 20
potato = 2
# Replace the lines below with your code #
# replace with pumpkin variable | Step 2
# apple change                          | Step 3
# melon change                          | Step 3
# cost variable        | Step 1
player.say(cost)
```

After:

```
apple = 10
melon = 15
berries = 20
potato = 2
# Replace the lines below with your code #
# replace with pumpkin variable | Step 2
# apple change                          | Step 3
# melon change                          | Step 3
cost = apple + melon + (berries * 2) + potato
player.say(cost)
```

Hint: Total cost = 67

```
apple = 10
melon = 15
berries = 20
potato = 2
pumpkin = berries - apple
# apple change                          | Step 3
# melon change                          | Step 3
cost = apple + melon + (berries * 2) + pumpkin + potato
player.say(cost)
```

Hint: Total cost = 77

```
apple = 10
melon = 15
berries = 20
potato = 2
pumpkin = berries - apple
apple += 2
melon -= 3
cost = apple + melon + (berries * 2) + pumpkin + potato
player.say(cost)
```

Hint: Total cost = 76

LESSON CONCLUSION

Ask students about the skills that they have learned during the lesson to reinforce the concepts learned. (**slides 29-30**)

1. What is a variable?
   Answer: A variable is a box/placeholder for a numerical value, piece of text, command, or another variable.
2. How do you set the value of a variable?
   Answer: Using equals, e.g. a = 1.
3. If apple = 3 and we use apple+=2, what is the new value of apple?
   Answer: 5

These questions are also available as a printable handout at the end of this document. They can be used as a formative assessment for this lesson's learning objectives.

EDUCATIONAL STANDARDS

UNITED STATES: CSTA

- **3A-AP-13** Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
- **3A-AP-18** Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.

UNITED STATES: ISTE

- **1.5.a** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
- **1.5.c** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

AUSTRALIAN F-10 CURRICULUM: DIGITAL TECHNOLOGIES (YEAR 9 AND 10)

- Designing algorithms to solve real-world problems and describing algorithms using flow charts and structured English (ACTDIP040)
- Recognising that different algorithms can solve a problem with different trade-offs (ACTDIP040)

UK NATIONAL CURRICULUM: COMPUTING (KEY STAGE 4)

- Develop and apply their analytic, problem-solving, design, and computational thinking skills

NAME: _____ **DATE:** _____

PYTHON 101: LESSON 3 FORMATIVE ASSESSMENT

What is a variable?	
How do you set the value of a variable?	
If apple = 3 and we use apple+=2, what is the new value of apple?	