

Python

Module 1 Lesson 3



Name: _____

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Recap:

1. Strings
 - a. Concatenation
 - b. Strings + Integers
2. Arithmetic Operators
 - a. + (Addition of Integers and Strings)
 - b. - (Subtraction of Integers)
 - c. * (Multiplication of Integers)

Learning Outcomes:

1. Arithmetic Operators
 - a. / (Division)
 - b. % (Modulus)
 - c. // (Floor Division)
 - d. +=, -=, *=, /=, %=, **= (Operator AND)

Explanation Points:

- Difference between Modulus and Floor Division
 - Modulus – Returns remainder
 - Floor Division – Returns whole number (round down)
- Operator AND
 - Important learning point, will be applicable in functions and loops
 - Highlight how to use it, as well as what it represents
 - Showcase why they need it in future cases if possible (especially in loops)

Breakdown of Lesson Plan:

Recap Lesson 2 Quiz <ul style="list-style-type: none">No help provided. Student must write answer first before being allowed to try typing on computerStudent should score at least 75%	20 min (Test) 5 min (Explanation)
Lesson 3.1 (Modulus)	5 min
Lesson 3.2 (Floor Division)	10 min
Lesson 3.3 (Exponent)	10 min
Lesson 3.4 (Assignment Operators)	20 min
Lesson 3 Quiz	20 min

**Note: There is a high chance of student not being able to complete on time.*

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Lesson 3

Learning Objective

Lesson Number	Topics Covered
Quiz	Recap Quiz
3.1	Modulus
3.2	Floor Division
3.3	Exponent
3.4	Assignment Operators
Quiz	End of Lesson Quiz

In this lesson, we will be learning the remaining 3 operators (Modulus, Floor Division and Exponents), and we will be understanding how to use Assignment Operators.

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Recap Lesson 2 Quiz

Question 1

Use python to work the equation $(2 + 5.6)$ to get to the answer in the output column

Output

1	
2	
3	

1	The answer is 7.6
2	<class 'float'>

Question 2

Use python to work the equation $(10 * 2 + 5 - 2)$. Display the output in the format shown below.

Output

1	
2	
3	

1	The answer is
----------	---------------

Question 3

Create two integer variables, `number` and `costofone`. Create a variable called `totalcost` and assign `number * costofone` to it. The value of `totalcost` must be equal to 100. Display the output as shown below. *(Use any values to get to the output)*

Output

1	
2	
3	
4	
5	

1	The total cost of masks is \$100
----------	-----------------------------------------

Question 4

Use python to work the equation $(20 - 4*2 + 6 + 3*5)$. Display the output in the format shown below.

Output

1	
2	
3	

1	The answer is
----------	---------------

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Recap Lesson 2 Quiz

Question 5

Name a variable `stg` and assign "cake" to it. Using multiplication, display the output shown below

Output

1	
2	
3	

1	cakecakecakecake
---	------------------

Question 6

Create two integer variables, `endprice` and `begprice`. Create a variable called `pricedrop` and assign `begprice - endprice` to it. The value of `pricedrop` must be equal to 20. Display the output as shown below. *(Use any values to get to the output)*

Output

1	
2	
3	
4	
5	

1	The price dropped by \$20
---	---------------------------

Question 7

Use python to work the equation $((200 + 9) * 8 - (26 + 4 * 15))$. Display the output in the format shown below.

Output

1	
2	
3	

1	The answer is
---	---------------

Question 8

Use python string concatenation, name a variable `x` and assign "Jack" to it. Display the output shown below.

Output

1	
2	
3	

1	My name is Jack
---	-----------------

Lesson 3.1

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Let us begin with the next operator, Modulus "%". Modulus allows for us to find the remainder of a division, and always gives the answer as an integer.

Python Arithmetic Operators → Arithmetic Operators are special symbols in Python that carry out arithmetic or logical computation. (e.g. "+", "-", "/", "**")

Operator	Meaning	Example
+	Add two operands	x + y
-	Subtract right operand from the left	x - y
*	Multiply two operands	x * y
/	Divide left operand by the right one {always results into float (decimal place)}	x / y
%	Modulus - remainder of the division of left operand by the right	x % y (remainder of x/y)
//	Floor division - division that results into whole number adjusted to the left in the number line (round down)	x // y
**	Exponent - left operand raised to the power of right	x**y (x to the power y)

Operator = %

Operands = 21 and 2

Output = 1

1	combine=21 % 2
2	print(combine)

1	1
---	---

In this example, when dividing 21 by 2, there will be a remainder of 1.

Knowing the remainder is a useful tool, as it allows for us to calculate how much is left over. Moreover, as we progress further in programming, you will also realize that the Modulus sign can also help us check divisibility.

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Lesson 3.1

Task 1:

Mr Tan owns an orchard. In 2020, there were a total of 256 tonnes of oranges harvested. He plans to sell them in sets of 3 tonnes. How many tonnes of oranges will be left behind? Write a simple program to find out, and print your answer in the format:

“Mr Tan will have ____ tonnes of oranges remaining.”

1	Total_Oranges = 256
2	Sets = 3
3	No_Of_Set =
4	
5	print(

Task 2:

Jane wants to know if 297645 is divisible by 9. Write a simple function find the remainder of the two numbers. Print your answer in the format:

“The remainder of 297645 by 9 is ____.”

1	Number1 = 297645
2	Number2 = 9
3	Remainder =
4	
5	print(

Task 3:

Johnson is celebrating a party. He invites 60 people to his party. He prepares 500 gift cards to be shared equally among the 60 people. How many gift cards will be left over? Write a simple program to find the remainder. Print your answer in the format:

“There will be ____ gift cards remaining.”

1	
2	
3	
4	
5	

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Lesson 3.2

The next operator that we will look at is the floor division “//” operator. Floor division provides the result of a division, rounded down to the next whole number. We can refer to the result as the Quotient.

Python Arithmetic Operators → Arithmetic Operators are special symbols in Python that carry out arithmetic or logical computation. (e.g. “+”, “-”, “/”, “*”)

Operator	Meaning	Example
+	Add two operands	x + y
-	Subtract right operand from the left	x - y
*	Multiply two operands	x * y
/	Divide left operand by the right one {always results into float (decimal place)}	x / y
%	Modulus - remainder of the division of left operand by the right	x % y (remainder of x/y)
//	Floor division - division that results into whole number adjusted to the left in the number line (round down)	x // y
**	Exponent - left operand raised to the power of right	x**y (x to the power y)

Operator = //

Operands = 50 and 3 (16.66667)

Output = 16

1	combine=50// 3
2	print(combine)

1	16
---	----

Floor division is useful for problems where we need to split items evenly between a known number of sets/groups. Let us explore some cases where this is useful.

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Lesson 3.2

Task 1:

Mrs Khoo prepared 40 chocolate muffins for her 3 children. She wants to be fair and split the chocolate muffins equally. How many chocolate muffins should each child get? Write a simple program to find the answer. Print your answer in the format:

“Each child will get ____ chocolate muffins.”

1	Total_Muffin =
2	Children =
3	Each_Child =
4	
5	print(

Extra:

Mrs Khoo realizes she has extra muffins. In order to prevent a squabble, she decides to eat some. How many muffins should she eat such that there is no remainder for the number of muffins proposed in Part 1?

HINT: Remember your Modulus?

Task2:

This question requires knowledge of the other Arithmetic Operators. Which Arithmetic Operators will you need?

Farmer Jones owns 3 plantations. Plantation 1 produces 50 tonnes of tomatoes. Plantation 2 produces 54 tonnes of tomatoes. Plantation 3 produces 70 tonnes of tomatoes. Farmer Jones plans to sell all these tomatoes at 3 different markets. However, he plans to sell equal amounts to each of the 3 markets. Write a simple program to find out how many tonnes of tomatoes he will sell to each market. Print your answer in the format:

“Farmer Jones will sell ____ tonnes of tomatoes to each market.”

1	Plantation1 =
2	Plantation2 =
3	Plantation3 =
4	Total =
5	Markets = 3
6	Per_Market =
7	
8	print(

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Lesson 3.3

The last operator we will look at is the Exponent “**” operator. Unlike multiplication, the exponent operator is made up of two (2) “*” symbols. It represents “to the power of”.

Python Arithmetic Operators → Arithmetic Operators are special symbols in Python that carry out arithmetic or logical computation. (e.g. “+”, “-”, “/”, “**”)

Operator	Meaning	Example
+	Add two operands	x + y
-	Subtract right operand from the left	x - y
*	Multiply two operands	x * y
/	Divide left operand by the right one {always results into float (decimal place)}	x / y
%	Modulus - remainder of the division of left operand by the right	x % y (remainder of x/y)
//	Floor division - division that results into whole number adjusted to the left in the number line (round down)	x // y
**	Exponent - left operand raised to the power of right	x**y (x to the power y)

Operator = **

Operands = 5 and 2

Output = 25

1	power = 5**2
2	print(power)

1	25
---	----

Exponents are useful at higher levels, to represent a number that is multiplied by itself repeatedly.

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Lesson 3.3

Task 1:

A cube of length 50 cm is to be printed via 3D printing. What is the volume of the plastic required?

Write a simple program to find the volume of plastic required. Print your answer in the format:

“A cube of side 50 cm requires ____ cm cube of plastic.”

1	Length = 50
2	Volume = Length **3
3	
4	print(

Notice that Volume can also be written as:

2	Volume = Length *Length * Length
---	----------------------------------

By writing it as *Length* ** 3, we can easily change the order of magnitude, without having to write the variable, *Length*, multiple times.

Task 2:

The area of a square is the square of its length. For a square of length 125 cm, write a simple program to find its area. Print your answer in the format:

“A square of side 125 cm has an area of ____ cm squared.”

1	Length =
2	Area =
3	
4	print(

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Lesson 3.4

Sometimes, a variable must take on a new value after certain Arithmetic Operations is conducted to it. To make it easier for us to do this, Python allows for us to use Assignment Operators to carry out such an Operation. Let us take a look at some examples:

Python Assignment Operators → Assignment Operators are special symbols in Python that carry out arithmetic or logical computation. (e.g. "+", "-", "/", "**")

Operator	Description	Example
=	Assigns values from right side operands to left side operand	<code>c = a + b</code> assigns value of <code>a + b</code> into <code>c</code>
<code>+=</code> Add AND	It adds right operand to the left operand and assign the result to left operand	<code>c += a</code> is equivalent to <code>c = c + a</code>
<code>-=</code> Subtract AND	It subtracts right operand from the left operand and assign the result to left operand	<code>c -= a</code> is equivalent to <code>c = c - a</code>
<code>*=</code> Multiply AND	It multiplies right operand with the left operand and assign the result to left operand	<code>c *= a</code> is equivalent to <code>c = c * a</code>
<code>/=</code> Divide AND	It divides left operand with the right operand and assign the result to left operand	<code>c /= a</code> is equivalent to <code>c = c / a</code>
<code>%=</code> Modulus AND	It takes modulus using two operands and assign the result to left operand	<code>c %= a</code> is equivalent to <code>c = c % a</code>
<code>**=</code> Exponent AND	Performs exponential (power) calculation on operators and assign value to the left operand	<code>c **= a</code> is equivalent to <code>c = c ** a</code>
<code>//=</code> Floor Division	It performs floor division on operators and assign value to the left operand	<code>c //= a</code> is equivalent to <code>c = c // a</code>

What do these Assignment Operators mean?

Case A:

1	<code>a=100</code>
2	<code>a=a+50</code>
3	<code>print(a)</code>

Case B:

1	<code>a=100</code>
2	<code>a+=50</code>
3	<code>print(a)</code>

Can you see that both cases have the same outputs?

Assignment operators are useful as they make each line clearer. In Case B, it is clearer to us that we are adding 50 to the value in `a`, as compared to Case A, whereby we are assigning the value of `a` to be `a + 50`.

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Lesson 3.4

Using this knowledge, let us find out what the answer to the following programs should be:

Task 1:

1	Bank = 1000
2	Bank -= 500
3	print("Mr Tan has \$" + str(Bank), "remaining")

A: Mr Tan has \$500 remaining

B: Mr Tan has \$1500 remaining

C: Mr Tan has \$1000 remaining

D: Mr Tan has \$ remaining

Task 2:

1	Amoeba = 5
2	Amoeba *= 2
3	print("There are", Amoeba, "amoebas remaining.")

A: There are 5 amoebas remaining

B: There are 10 amoebas remaining

C: There are 15 amoebas remaining

D: There are 50 amoebas remaining

Task 3:

1	Money = 100
2	Money += 20
3	Money += 60
4	print("James has \$" + str(Money), "now.")

A: James has \$120 now.

B: James has \$160 now.

C: James has \$180 now.

D: James has \$200 now.

Task 4:

1	Candy = 500
2	Candy /= 2
3	print("Tony has", Candy, "candies remaining after giving half.")

A: Tony has 500 candies remaining after giving half.

B: Tony has 250 candies remaining after giving half.

C: Tony has candies remaining after giving half.

D: Tony has 250.0 candies remaining after giving half.

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Lesson 3.4

Task 5:

1	Egg += 10
2	print("There are" , Egg, "eggs now.")

A: There are 10 eggs now.

B: There are eggs now.

C: There are None eggs now.

D: NameError: name 'Egg' not defined

HINT: What is the value of *Egg* in Task 5?

Task 6:

1	Money = 100
2	Money = 200
3	print('There is \$' + str(Money) , 'remaining.')

A: There is \$100 remaining.

B: There is \$200 remaining.

C: There is \$300 remaining.

D: There is remaining.

Task 7:

A submarine has a small leak. Every second, 5 cm³ of water enters the submarine. Write a simple program to find the amount of water after 5 seconds. Print your answer in the format:

"After 5 seconds, there were ____ cm cube of water."

1	Water = 0
2	Water += 5
3	Water
4	Water
5	Water
6	Water
7	
8	print(

While the current method of writing works, it is not the best method of writing. There are many ways of solving this problem. Can you think of another way using an Arithmetic Operator?

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Task 6:

Simplify the following code using the assignment operators that were taught:

1	X=50
2	X=X*5
3	X=X/2
4	X=X+3
5	print(X)

Output

1	128
---	-----

Answer:

1	X=50
2	
3	
4	
5	

Output

1	128
---	-----

For the following questions, decide if the outputs of the 2 cases are the same or different. If they are different, what are the 2 outputs?

Task 7:

Let us see if the 2 values of A are different:

Case A:

1	A = 5
2	B = 10
3	A += B
4	print(A)

Case B:

1	A = 5
2	B = 10
3	A = A + B
4	print(A)

Task 8:

What about the value of B? Does it change?

Case A:

1	A = 5
2	B = 10
3	A += B
4	print(A)

Case B:

1	A = 5
2	B = 10
3	A += B
4	print(B)

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End of Lesson 3 Quiz

Question 1

Work out the following equations and print in the format "The answer of *equation* is ____"

Eg. "The answer of $5 ** 2$ is 25"

- a. $5 ** 2$
- b. $11 // 7$
- c. $(21192 \% 3)$
- d. $(56745 // 3) * 3 + (56745 \% 3)$
- e. $2 ** (5 \% 2)$
- f. $2 ** 5 \% 2$

Here is an example of one solution, $3 ** 7$

1	<code>print("The answer of $3 ** 7$ is", $3 ** 7$)</code>
---	---------------------------------------------------------------------------------

Output:

1	The answer of $3 ** 7$ is 2187
---	--------------------------------

Question 2

There are 200 sweets distributed equally to 19 students. Write a simple program to get the answer of remaining sweets not distributed to students. Print your answer in the format:

"There are ____ sweets remaining."

Question 3

There are 99 oranges. Each paper bag can contain only 2 oranges. Write a simple program to find the number of paper bags used. Print your answer in the format:

"The number of bags used is ____"

Question 4

A rectangle has a length of 15 and a breadth of 7. Write a simple program to find the area of the rectangle. Print your answer in the format:

"The area of the rectangle is ____"

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End of Lesson 3 Quiz

For the following 10 questions, look at the two cases and decide if the output is the same, or if the outputs are different. Explain why.

Question 5:

Case A:

1	X=50
2	X=X*5
3	print('The answer is', X)

Case B:

1	X=50
2	X*=X
3	print('The answer is', X)

Question 6:

Case A:

1	Y=20
2	Z=Y/5
3	print('The answer type is', type(Z))

Case B:

1	Y=20
2	Y/=5
3	print('The answer type is', type(Y))

Question 7:

Case A:

1	Y=5
2	Y**2
3	print('The answer is', Y)

Case B:

1	Y=5
2	Y**=2
3	print('The answer is', Y)

Question 8:

Case A:

1	Y='5'
2	Z='10'
3	print(Y+' '+Z+' is equal to '+' str(int(Y) + int(Z))

Case B:

1	Y=5
2	Z=10
3	print(str(Y)+' '+str(Z)+' is equal to '+' str(Y+Z))

Question 9:

Case A:

1	A=200
2	B=50
3	A/=B
4	print('The answer is ' + str(A))
5	print('The type is ' + type(A))

Case B:

1	A=200
2	B=50
3	A=A/B
4	print('The answer is ' + str(A))
5	print('The type is ' + type(A))

End of Lesson 3 Quiz

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Name:

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Question 10:

Case A:

1	X=100
2	X%=19
3	print(X)

Case B:

1	X=100
2	X//=19
3	print(X)

Question 11:

Case A:

1	X=5
2	X+=1
3	print(type(X))

Case B:

1	X=5
2	X=X+1
3	print(type(X))

Question 12:

Case A:

1	X=99
2	Y=X//2
3	Z=Y*2
4	print(Z)

Case B:

1	X=99
2	Y=X%2
3	Z=Y*2
4	print(Z)

Question 13:

Case A:

1	X=2
2	Y=10
3	Z=X*Y
4	print(Z)

Case B:

1	X=2
2	Y=10
3	X*=Y
4	print(X)

Question 14:

Case A:

1	X=15
2	Y=5
3	X=X/Y
4	print('The answer is', X)

Case B:

1	X=15
2	Y=5
3	X/=Y
4	print('The answer is ' + str(X))