Programming in Python
Variables

Why Variables?

(Just like in Math class) A variable is a name that holds a value. All you need to do to create a variable and assign it a new value and Python will remember it.The value of a variable may be changed at any time during program execution through input or through the use of formula.

In Python, as in other programming languages, there are different types of variables, called variable types. In most programming languages, the programmer uses a keyword to define the variable type. In Python, the information stored in the variable determines the type of variable.

In other words, you can create and assign a variable the value of 3 as follows:

myVariable = 3

Note that = assigns the value of 3 to myVariable. It is not a check to see if myVariable is equal to 3. That will come later with if statements.

Data Types

Data Type	Description	Assignment Examples
integer	positive and negative whole numbers, no decimals	age = 16
float	positive or negative with decimal points	payRate = 10.50
string	a sequence of characters that can be made up of numbers, letters or symbols.	address = “1050 McIntosh Drive”
boolean	is either a True or a False	isDead = False

All variable names are case sensitive and do not have spaces. This means that the variable age is different from Age or AGE.

Variable Names

Your variable names can consist of letters, numbers and underscores (_) but must begin with a letter. e.g.

Good	Bad
`name`	`4you`
`age`	`more$`
`shipShields`	`first name`
`ID_number`	
`lock12`	

Choosing good variable names is extremely important to help the overall clarity of your program.

Example #1
Type the following program and then execute it. The purpose is in the first comment.

```
#Write a program that calculates the degree Fahrenheit of 20 degrees Celsius.

celsius = 20    # assigns a value of 20 to the variable celsius
fahren = int(celsius * 9/5 + 32)    # using a formula to recalculate the fahrenheit temperature
print ("20 degrees celsius is", fahren, "degrees fahrenheit.")  #output the answer
```

Example #2
Same program as above, but the answer is given to two decimal places.

```
celsius = 20    # assigns a value of 20 to the variable celsius
fahren = celsius *9/5 + 32    # using a formula to recalculate the temperature
print ("20 degrees celsius is %.2f degrees fahrenheit." %fahren)  #output the answer
```

For division or multiplication, the following rule holds true.

int / int → always a float answer (version 3 of Python)

- **Not shown correctly on following table**

Some Basic Math

Use this	To do this		Example	
`+, -, *`	standard math operators		`a = x + 3`	
`/`	divides two numbers, answer based on types.	int / int -> int	`a = 5 / 2`	(a → 2)
		float / float -> float	`a = 5.0 / 2.0`	(a → 2.5)
		int / float -> float	`a = 5 / 2.0`	(a → 2.5)
		float / int -> float	`a = 5.0 / 2`	(a → 2.5)
`%`	remainder of integer division		`a = 58 % 10`	(a → 8)
`**`	exponentiation operator		`a = 2**10`	(a → 1024)
`abs`	find the absolute value of a number		`a = abs(-23)`	(a→ 23)
`round`	rounds off a `float` number, answer is still `float`. Can specify # of decimals.		`a = round(3.1234)`	(a → 3.0)
			`a = round(3.1254,2)`	(a → 3.13)
`float`	converts an `int` to `float` (can be useful with division)		`a = float(12)`	(a → 12.0)
`int`	converts a `float` to `int` by chopping off all decimals.		`a = int(3.64)`	(a → 3)
`str`	converts anything to a string, allows us to use string formatting methods		`a = str(3.64)`	(a → '3.64')

Exercise #3

Write a program for each of the following situations. Make sure your variables are meaningful and your variables are assigned a value. Your output should be identical to what is indicated. Make sure the computer is doing any calculations, not you, just in case we change some of the values given. (? indicated where the answer should be written)

1) `

2) A car travels for 2.5 hours at 80.5 km/h. Your program is to calculate the distance travelled by the car to two decimal places and output as follows:

A car travelling at 80.5 km/h for 2.5 hours would travel ? km.

3) A circle has a radius of 3 cm. Your program is to calculate both the area and circumference of the circle to one decimal place and output as follows:

A circle with radius of 3 cm has an area of ? cm^2 and a circumference of ? cm.

Note: To use the exact value of π use math.pi but also import math at the top, as shown by the following example:

```
import math
print (math.pi)
```