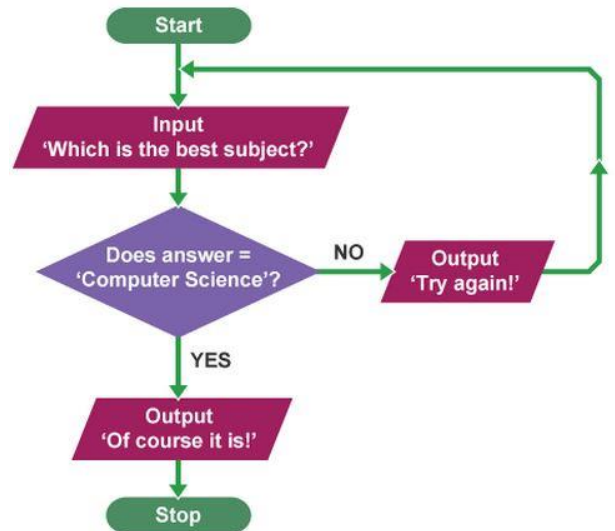**REMEBMER!**

Computer programming is about building cool stuff using:

1. **Input**
2. **Output**
3. **Decisions**
4. **Calculations**
5. **Repetition**

We have looked briefly at **output**, **input**, and a *tiny* peek at **decision**s. Let's get some practice with Calculations using Python.
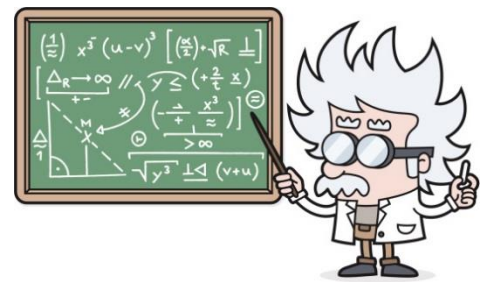
Calculations:

Computer programming makes it easy create procedures that can do difficult calculations for you! Once you've created a procedure, you can use it over and over again without much effort!

Using Python to make calculations is easy.

Here is a list of some of the symbols you need to know to coding calculations in Python. Look at this list very carefully.

Numbers and math

Operator	Description
+ plus	Sum
- minus	Subtraction
/ slash	Floor division
* asterisk	Multiplication
** double asterisk	Exponentiation
% percent	Remainder
< less-than	Comparison
> greater-than	Comparison
<= less-than-equal	Comparison
>= greater-than-equal	Comparison

Watch the videos on the course page to see how some of these work!

Exercise#1

The following program will calculate the area of *any* rectangle you wish. Please make note of the use of the **int** variable type.

Type in the following into Replit. Run the program to see what it does and **save your work.**

RECTANGLE
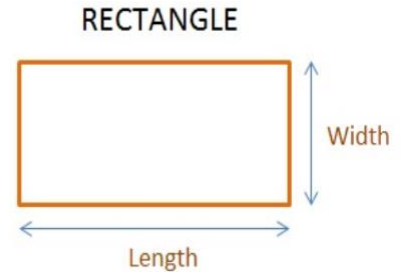
Width

Length

Area of rectangle = *Length X Width*

```
print('lets calculate the area of a rectangle')
length=int(input('Give me the Length of your rectangle'))
width=int(input('Gove me the width of your rectangle'))
area=length*width
print ('the length of your rectangle is:',area,'cm squared')
```
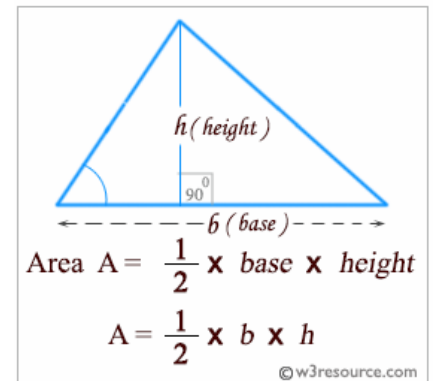
IMPORTANT NOTE:

int – means we have to change the input from a **string** (list of characters) into an **integer** (a whole number).

Exercise#2

This Python program that will accept the **base** and **height** of a triangle from the user and computes the AREA of the triangle! Thanks for doing my homework Python!

Type in the following into Replit. See what it does and **save** your work.

```
b = int(input('Input the base : '))

h = int(input('Input the height : '))

area = (b*h)/2

print('area = ', area)
```

h (height)

90⁰

b (base)

Area $A = \frac{1}{2}$ x base x height

$A = \frac{1}{2}$ x *b* x *h*

©w3resource.com

Exercise#3

Try **typing** the following operations in python and **look carefully at each result**.

```
print(3+4)
print(3*9)
print(18/2)
print(18/5)
print(5**2)
print(18-7)
print(7%2)
print(15//2)
```


Python Arithmetic Operators
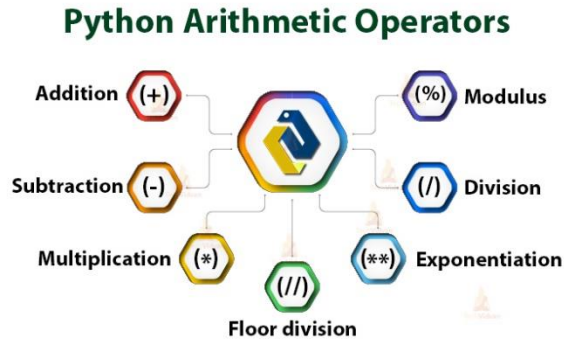
Try to **make sure you understand what operation is doing! Look up the % and the // operators to see what they do!**

Also notice that print(18/5) gives us a **decimal** number (not an integer or a whole number)...in programing decimal numbers are called **floats**.

Exercise#4

Create 4 mini programs that do the following:

- Convert Fahrenheit to Celsius
- Inches to cm
- Pounds to Kilograms
- Miles to Kilometers

Look up the conversions for each of the above online. Use your skills from the first unit to make your program is user friendly and visually appealing on the screen.

Bonus: combine all the conversions into one program that asks the user to select which conversion they would like to do first!

Import the Math "Library"
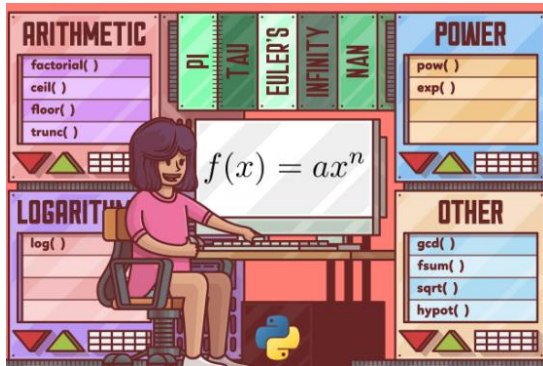
For some of the math functions in Python you need to import the **math library** before you use them.

In Python a "**library**" is just an added bag of tricks you can call upon to help you solve problems. Python uses libraries as a way to keep itself organized. When you customize the tools you at the beginning of your program, Python will be able to run faster and more efficiently (without having to search through thousands of unneeded commands). This also saves memory space in your computer.

Exercise#5

For finding the **square root** of a number you would do the following.
**Type** in the following into trinket. See what it does and **save** your work.

```
import math
x=int(input('Give me a number'))
answer = math.sqrt(x)
print(answer)
```

$$\sqrt{x}$$

For finding the **area of a circle** we will need to import the math library to use pi.
Type in the following into trinket. See what it does and **save** your work.

```
import math
radius = int(input('what\'s the radius of your circle?'))
answer = math.pi*(radius**2)
print(answer)
```


Area of Circle

r

Area of circle

$$A = \pi r^2$$
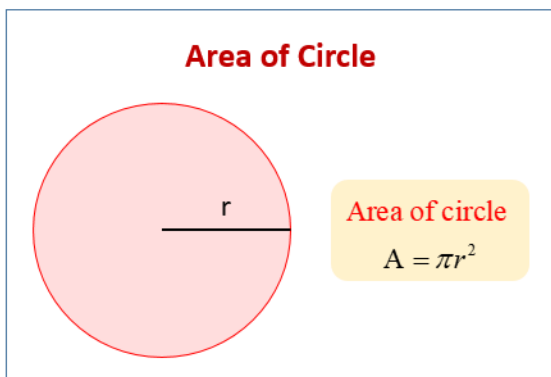
Additional Commonly Used Math Operations in Python:

```
Syntax          Math Operation Name
a%b                modulo (finds the remainder of division)

-a                 Negatives

abs(a)             absolute value

a**b               exponents

math.sqrt(a)    square root  (requires import math)

math.pi            3.1415… correct value of pi

a*b                multiplication

a/b                division

a+b                add

a-b                Subtract
```

Check out: https://www.w3schools.com/PYTHON/module_math.asp for more cool Python math functions.

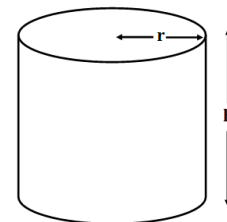**Remember** to watch your **brackets** and **order of operations**.

Exercise#6

Write a Python program that will accept the radius and height of a cylinder from a user and output its **volume**.

Use: `math.pi` as your value for pi
Use: `a**b` to get your exponent (r^2)

$$V = \pi r^2 h$$


Save and submit your work!

Exercise#7

A soda company wants to know how much it will cost to produce each aluminum can it manufactures. It has several different sizes but the company knows that aluminum cost **0.00223 cents/cm²**.

Write a Python program to calculate cost of manufacturing materials to produce any sized can they need to manufacture.
Your program should:

- As the user what the radius and height of the surface area of a cylinder.
- Output the cost to produce one aluminum can of that size
- Hint: **cost** (in cents)=(**0.00223**) x (**surface area** of the can).

$$A = 2\pi r h + 2\pi r^2$$

r	Radius	Enter value
h	Height	Enter value
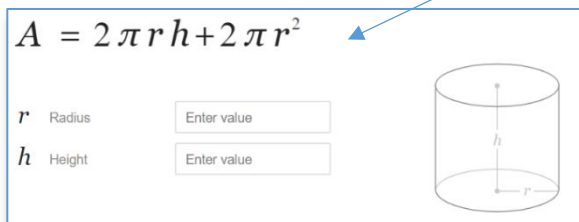
Exercise#8

You have baked some cookies for a party. Write a python program that will help you distribute cookies equitably to your guests. The program should:

1. Ask how many cookies you have baked.
2. Ask how many guests showed up at the party.
3. **If** there are more cookies than guests, output: **how many cookies each guest should get** and **how many are left over**. Use the **//** and **%** operations for this (look up what each operation does).
4. **If** there is more guests than cookies, output **how many cookies need to still be baked**.
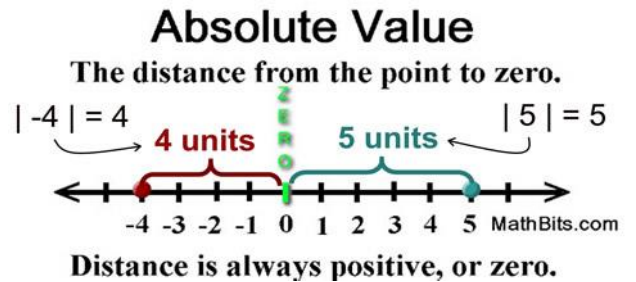
Note: Only **whole numbers** can be output by the program. The program **should not output any decimal** answers. Examples below:

- Each person should get 3.234 cookies. (**this is NOT a valid response**).
  In this case the answer should something like: *"Each person gets 3 cookies with 8 cookies left over"*.

- The program should also **NOT output 0.234** cookies for each person.
  In this case the program's result should be something like: *"Only 5 people will get cookies, there are 17 people at the party. you should go home and bake some more"*.

Exercise#9

Create a program that can find the absolute value of a number using the **abs()** function.

Then a second program that can find the absolute value of a number **without** the **abs()** function. **Hint:** if the number they enter is positive, return the same value. If the answer negative multiply it by (-1).

Absolute Value
The distance from the point to zero.

$|-4| = 4$ 4 units   5 units $|5| = 5$

-4 -3 -2 -1 0 1 2 3 4 5   MathBits.com

Distance is always positive, or zero.

Exercise#10

You are at the top of Whistler Blackcomb and the wind is howling and you are freezing. Use the formula below to create a Python program that can **calculate the wind chill temperature** if you are given the **current air temperature in °C** and **windspeed in Km/h.**

Your Program should ask the user for **T** and **V** and then Calculate actual **Wind Chill Temperature.**

$$T = \quad V =$$

T=Current temperature in °C

V=Wind Speed in Km/h

**Wind Chill Temperature** = $0.6215T - 11.37V^{0.16} + 0.3965TV^{0.16} + 13.12$

You will probably have to use brackets and the exponents correctly to get this correct. Test out your program to see if your output makes sense. Wind chill temp should be lower than current temperature. The faster the wind in blowing the colder it should get.

Bonus Exercise (Not mandatory... only for extra marks if you wish)

Your boss wants you to create an app for the iphone that can find the height of objects.

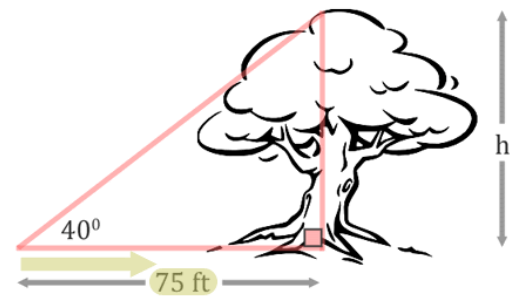Create a program that takes the following **inputs**:

1. The **distance** you are away from an object
2. The **angle** your phone is at when you point it at the very top of an object
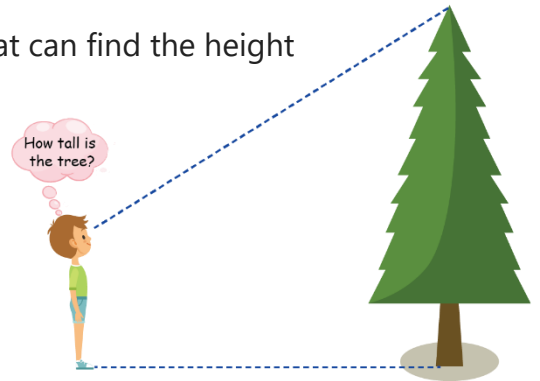
Then the program will **output**:

1. the **height** of the object

Math Help:

How tall is the tree?

40^0

75 ft

h

EXAMPLES

TOA *tangent is opposite over adjacent*

$\tan 60 = \dfrac{x}{13}$

$\tan 60 = 1.73$

$1.73 = \dfrac{x}{13}$

$x = (1.73) \times (13) = 22.49$

$60°$

x

13 cm

©Study.com