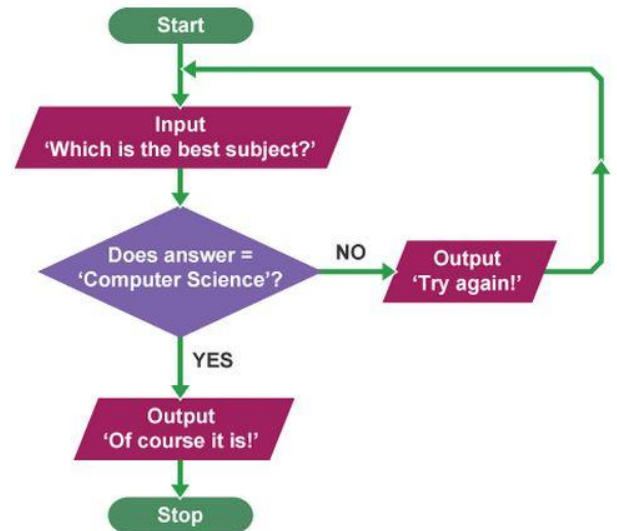


## Computer programming is about building cool stuff using:

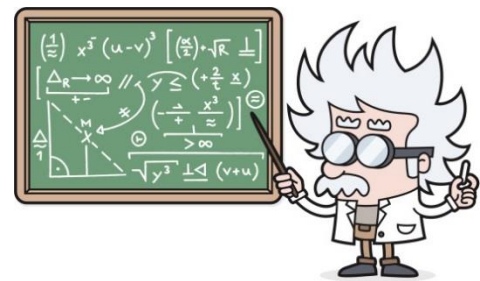
- 1. Input**
- 2. Output**
- 3. Decisions**
- 4. Calculations**
- 5. Repetition**

We have looked briefly at **output**, **input**, and a *tiny* peek at **decisions**. 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 this procedure then 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:

## Numbers and math

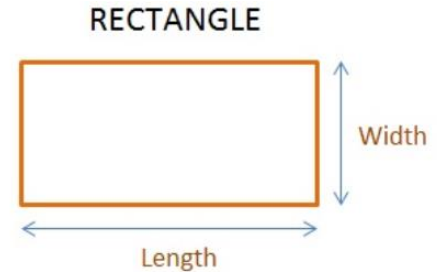
Operator	Description
+ plus	Sum
- minus	Subtraction
/ slash	Floor division
* asterisk	Multiplication
** double asterisk	Exponentiation
% percent	Remainder
< less-than	Comparison
> greater-than	Comparison
<= less-than-equal	Comparison
>= greater-than-equal	Comparison

**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 trinket. Run the program to see what it does and **save your work**.



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:

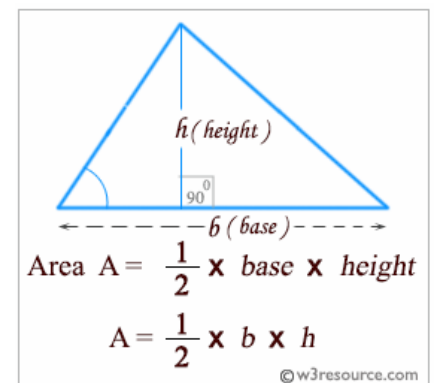
**int** – means we have to change the input from a **string** (list of characters) into an **integer** (a whole number).

## 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 trinket. 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)
```



## Exercise#3

Try **typing** the following operations in python and make note of 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)
```



Try to make sure you understand what operation is doing! You can look up the % and the // if you wish...we will discuss more about these operations later.

Also notice that `print(18/5)` gives us a **decimal** number (not an integer/whole number)...in programming 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

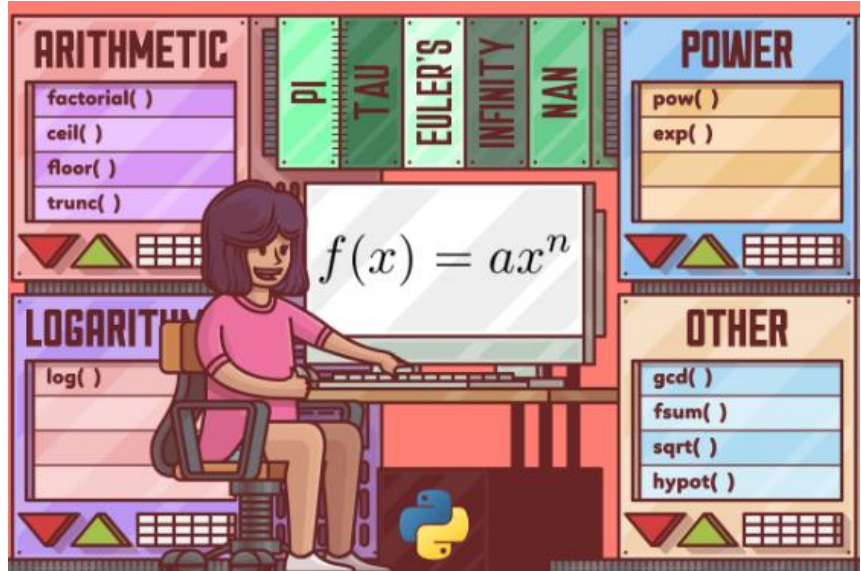
**Look up the conversions online.** Use your skills from the first unit to make your program is user friendly and visually appealing on the screen.

**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

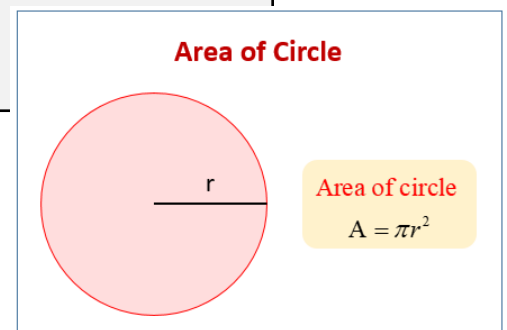
For finding the **square root** of a number you would do the following.  
**Type** in the following into trinket. See what it does and **save** your work.

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



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)
```



## Additional Commonly Used Math Operations in Python:

Syntax	Math Operation Name
<code>a%b</code>	<u>modulo</u> (finds the remainder of division)
<code>-a</code>	<u>Negatives</u>
<code>abs(a)</code>	<u>absolute value</u>
<code>a**b</code>	<u>exponents</u>
<code>math.sqrt(a)</code>	<b>square root</b> (requires import math)
<code>math.pi</code>	<b>3.1415... correct value of pi</b>
<code>a*b</code>	multiplication
<code>a/b</code>	division
<code>a+b</code>	add
<code>a-b</code>	Subtract

Check out: <https://docs.python.org/3/library/math.html> for more

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

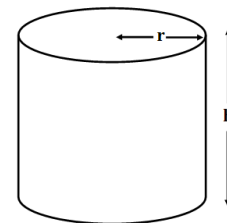
## Exercise#6

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!

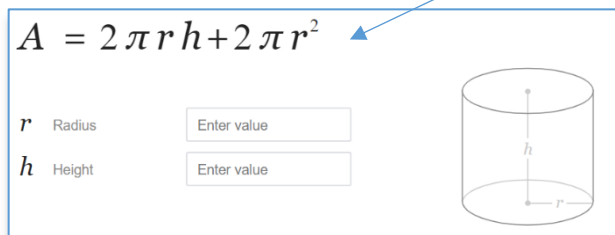
## Exercise#7

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/cm<sup>2</sup>**.

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).



## Exercise#8

Write a python program that will help you distribute cookies when you arrive at party. The program should:

- Ask how many cookies you have baked.
- Ask how many guests showed up at the party
- Output: **how many cookies each guest should get** and **how many are left over**.



**Important 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)**.

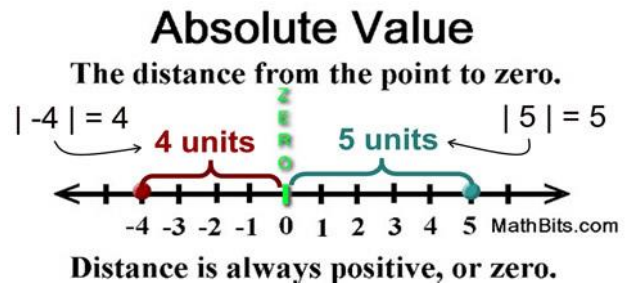
In this case the answer should something like: *"Each person gets 3 with 8 cookies left over"*.

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 create a program that can find the absolute value of a number **without** the **abs()** function



## Exercise#9

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 **calculate the wind chill temperature** if you are given the **current air temperature** and **windspeed**



$$R = 13.12 + 0.6215 \times T - 11.37 \times V^{0.16} + 0.3965 \times T \times V^{0.16}$$

where  $\begin{cases} R \text{ is the wind chill index} \\ T \text{ is the air temperature in degrees Celsius (}^{\circ}\text{C)} \\ V \text{ is the wind speed at 10 metres (standard anemometer height), in kilometres per hour (km/h).} \end{cases}$



## Bonus Exercise#1 (Not mandatory only for extra marks)

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

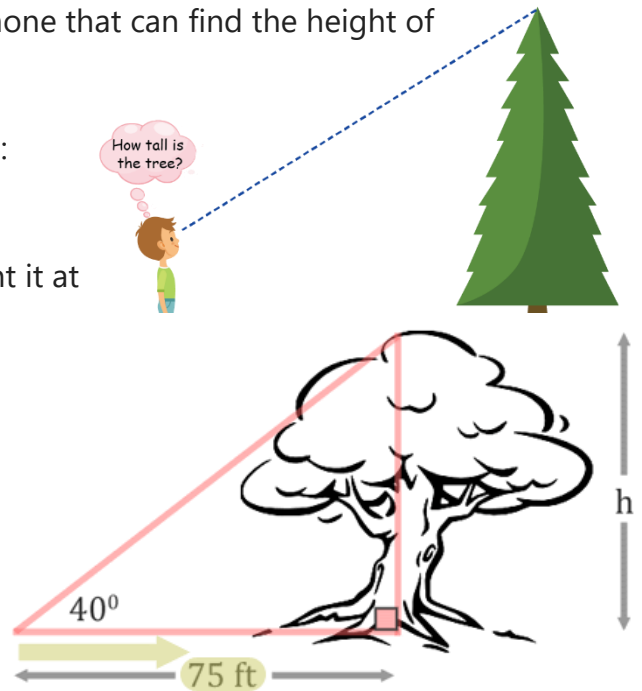
Create a program that takes the following inputs:

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



EXAMPLES

**TOA** tangent is opposite over adjacent

$$\tan 60 = \frac{x}{13}$$
$$\tan 60 = 1.73$$
$$1.73 = \frac{x}{13}$$
$$x = (1.73) \times (13) = 22.49$$

The diagram shows a right-angled triangle with a 60° angle at the bottom-left vertex. The horizontal base (adjacent side) is labeled '13 cm' in red. The vertical height (opposite side) is labeled 'x' in green. A right-angle symbol is at the bottom-right vertex. A yellow pencil is pointing at the triangle.

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