Intro to python 1 – Input and Print

Ex. 1: Write a program that asks the user which planet in our solar system is on average closest to Earth. After they answer the question display the response: You said [answer]. If you said Mercury that's correct, Venus comes closest to Earth during it's orbit but Mercury on Average is the closest.

```
#asking the user for input
planet = input("Which planet comes closest to Earth? ")

#displaying final message
print("You said",planet, "If you said Mercury that's correct, Venus comes closest to Earth during it's orbit but Mercury on Average is the closest.")
```

Ex. 2: Write a program that asks the user to name a new star that has been spotted and how many planets are around it and then displays a sentence letting them know what name they chose and how many planets can be seen around that star. Print(

```
#asking the user for inputs
name = input("What is the name of the new star you found? ")
planets = input("How many planets are around the new star you found? ")

#displaying final message
print("you found a star named", name, "and it has", planets,"planets around it")
```

Intro to python 2 – Math

Ex. 1: Write a program that asks the user how many moons Jupiter (79) and Saturn (82) have and calculates the difference between the two. Final output. **Saturn has 82 moons which is 3 more than Jupiter's 79 moons.**

```
#asking the user for inputs
jupiter = int(input("How many moons does Jupiter have? "))
saturn = int(input("How many moons does Saturn have? "))

#calculating difference
difference = saturn - jupiter

#display results of the calculation
print("Saturn has", saturn,"moons which is",difference,"more than Jupiter's",jupiter,"moons.")
```

Ex. 2: Prompt the user for the length in days of 1 Mars year (687) and 1 Venus year (225) in Earth days. Calculate the ratio between them. Final output: **Mars's year is 3.05 times longer than Venus's.**

```
#asking the user for inputs
mars = int(input("How long is one Mars year in Earth days? "))
venus = int(input("How long is one Venus year in Earth days? "))

#calculating the ratio
ratio = round(mars/venus, 2)

#display results of the calculation
print("Mars's year is",ratio,"times longer than Venus's")
```

Ex. 3: Prompt the user for the radius of the Earth (6371) and the Sun (695700) in km and calculate both volumes. After doing this find out how many entire Earths can fit into the sun and display the final answer. Note: volume of a sphere = 4/3 * pi * r ** 3

Final Output: **You can fit 1,302,097 Earths into the Sun. That's a lot of Earths.**

```
from math import pi

#asking the user for inputs
rEarth = int(input("What is the radius of the Earth in km? "))
rSun = int(input("What is the radius of the sun in km? "))

#performing calculations
vEarth = 4 / 3 * pi * rEarth**3
vSun = 4 / 3 * pi * rSun**3

ratio = vSun / vEarth

#displaying final message
print("You can fit", round(ratio),"Earths into the Sun. That's a lot of Earths")
```

Intro to python 3 – If Statements

Ex. 1: Write a program that asks the user for a fictional planet's distance from it's star in millons of Km. If the distance is less than 149 million km, the planet is closer to it's star than Earth is to the sun. Otherwise, it's further away. Use an if and Else statement to determine the correct answer and tell the user if their fictional planet is closer to or further away than Earth is to the Sun.

```
#asking the user for inputs
distance = int(input("How far is the planet from it's Sun in millions of km? "))

#checking criteria to display proper message
if distance < 149:
   print("The planet is closer to it's star than Earth is to the sun")
else:
   print("The planet is further from it's star than Earth is to the sun")
```

Ex. 2: Write a program that asks the user the age of the Sun in billions of years and tell the user which stage of it's life it's in:

0 to 10 billion years - Main Sequence

Display: The Sun is in its main sequence stage as it currently is now. In this stage the Sun uses nuclear fusion of hydrogen in its core to produce helium and emits energy as light and heat.

10 to 11 billion years – Red Giant

Display: The Sun is now a Red Giant. In this phase of its life is has used up all the hydrogen in its core and will now expand to 400 times its original size and engulf Earth completely. It will also cool and glow Red but we won't be around to see it.

More than 11 billion years – White Dwarf

Display: The sun is now a White Dwarf. This is the end stage for our Sun and it will shrink down to roughly the size of Earth. The Sun is not large enough to die in a supernova explosion as more massive stars do.

```
#asking the user for inputs
age = int(input("How old is the sun in billions of years? "))

#checking criteria to display proper message
if age <= 10:
   print("The Sun is in its main sequence stage as it currently is now. In this stage the Sun uses nuclear fusion of hydrogen in its core to produce helium and emits energy as light and heat.")

elif age <= 11:
   print("The Sun is now a Red Giant. In this phase of its life is has used up all the hydrogen in its core and will now expand to 400 times its original size and engulf Earth completely. It will also cool and glow Red but we won't be around to see it.")

else:
   print("The sun is now a White Dwarf. This is the end stage for our Sun and it will shrink down to roughly the size of Earth. The Sun is not large enough to die in a supernova explosion as more massive stars do.")
```

Intro to python 4 – The While loop

Exercise – write a program that uses a while loop to calculate the gravitational force between two objects given their masses m1 and m2 in Kg, their distance r from each other in metres, and the gravitational constant G = 6.67 * 10 ** -11. The loop should continue as many times as the user would like to by using a variable such as again.

Any two objects, even you and your friend, will have a gravitational pull on each other. The gravitational pull between you and you friend will be insignificant when compared to that of the Earth or Sun but it does exist. The formula used to calculate the Gravitational Force is:

Fg = (G * m1 * m2) / r**2 and the final units are N for Newtons which is what all forces are measured in. Display your answer afterwards to say:

The force between the two objects is [answer] N.

Don't forget to ask the user if they would like to repeat the code while still inside the loop.

```
#initializing the variable again to a capital Y so the code goes into the loop
again = "Y"

#creating a loop to continue running as long as the user says Y for yes
while again == "Y":

    #asking the user for inputs, you could use float instead of int as well

    m1 = int(input("Enter the mass of the first object in Kg: "))
    m2 = int(input("Enter the mass of the second object in Kg: "))
    r = int(input("Enter the distance the two objects are from each other in metres: "))

    #constansts for the formula
    G = 6.67 * 10 **-11

    #calculating the gravitational force between the two objects
    F = (G * m1 * m2)/r**2

    #displaying the final force output
    print("The force between the two objects is", F, "N.")

    #asking the user if they're like to go again, .upper() ensures the response is capitalized
    again = input("Would you like to calculate the force between two more objects? (Y/N").upper()
```