EE201920 3 ASSIGNMENT:

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Introduction:

To solve this problem, I will use exclusively python 3.7.3 without any additional l
ibrary.

Defining the base functions

Before answer any question I will create three main functions:
1- consumption(n): the consumption function computes the consumption given n as inp
ut, where n is income.
*I used an anonymous function to simplify.
2- incometax(n): the incometax function computes the income tax given n as input, w
here n is income.
*This function uses recursion to work.
3- ginindex(n): the ginindex function computes the Gini coefficient given n as inpu
t, where n is an array of real positive numbers.
*This function uses a subfunction called added to help itself.

```python
In [7]:   consumption=lambda n: 10000+0.7*(n-10000)
```

```python
In [8]:   def incometax(n):
              if n<=5000:
                  return 0
              if n>5000 and n<=12000:
                  return 0.19*(n-5000)+incometax(5000)
              if n>12000 and n<=20000:
                  return 0.24*(n-12000)+incometax(12000)
              if n>20000 and n<=35000:
                  return 0.3*(n-20000)+incometax(20000)
              if n>35000 and n<=60000:
                  return 0.37*(n-35000)+incometax(35000)
              if n>60000:
                  return 0.45*(n-60000)+incometax(60000)
```

```
In [12]: def ginindex(n):
             a=len(n)
             aa=1/len(n)
             t=0
             def added(x,vec):
                 if x==0:
                     return vec[0]
                 else:
                     return vec[x]+added(x-1,vec)
             for i in range(len(n)):
                 a-=1
                 if i==0:
                     t+=(((added(i,n))/sum(n))*aa)*(a+0.5)
                 if i==(len(n)-1):
                     t+=(((added(i,n))/sum(n))-((added(i-1,n))/sum(n)))*0.5*aa
                 if i!=0 and i!=(len(n)-1):
                     t+=((((added(i,n))/sum(n))-((added(i-1,n))/sum(n)))*aa)*(a+0.5)
             return 2*(0.5-t)
```

1. How much income tax and VAT pays each income group?

To answer this question I will first create an array of the five income levels and
then I will simply use a for loop with the consumption and incometax function.

```
In [13]: income=[10000, 25000, 40000, 50000, 65000]
         for i in income:
             print('The citizen with an income level of {:,}€, will have an income tax
          of {:,.2f}€, a VAT tax of {:,.2f}€ and a final income of {:,.2f}€\n'.
                   format(i,incometax(i),0.23*consumption(i),i-incometax(i)-0.23*consum
         ption(i)))
```

The citizen with an income level of 10,000€, will have an income tax of 950.0
0€, a VAT tax of 2,300.00€ and a final income of 6,750.00€

The citizen with an income level of 25,000€, will have an income tax of 4,75
0.00€, a VAT tax of 4,715.00€ and a final income of 15,535.00€

The citizen with an income level of 40,000€, will have an income tax of 9,60
0.00€, a VAT tax of 7,130.00€ and a final income of 23,270.00€

The citizen with an income level of 50,000€, will have an income tax of 13,30
0.00€, a VAT tax of 8,740.00€ and a final income of 27,960.00€

The citizen with an income level of 65,000€, will have an income tax of 19,25
0.00€, a VAT tax of 11,155.00€ and a final income of 34,595.00€

2. Which are the Gini coefficients before and after tax?

To answer this question I will just use the ginindex function, the incomelevels arr
ay and a new array of income after tax called incaftertax.

In [32]:
```python
incaftertax=[]
for i in income:
    incaftertax.append(i-incometax(i)-0.23*consumption(i))
print('The Gini coefficient before taxes is {:.25f}\n\nThe Gini coefficient af
ter taxes is {:.25f}\n'.format(ginindex(income),ginindex(incaftertax)))
```

The Gini coefficient before taxes is 0.2842105263157894690095873

The Gini coefficient after taxes is 0.2520210896309313941543451

3. Is the tax system progressive or regressive?

Comparing the Gini coeficcient before taxes and after taxes, we deduce the tax syst
em is progressive.

*All the functions used here are replicable, either with a different number of income level or sample
length. I made sure they all work fine testing them with the slides examples and other data.*