In [1]:

```python
# Exercise 1
def Print_values(a,b,c):
    list1=[]
    if a>b:
        if b>c:
            list1=[a,b,c]
        elif a>c:
            list1=[a,c,b]
        else:
            list1=[c,a,b]
    elif b>c:
        if a>c:
            list1=[a,c,b]
        else:
            list1=[c,a,b]
    else:
        list1=[c,b,a]
    return list1
a=float(input("Please input a: "))
b=float(input("Please input b: "))
c=float(input("Please input c: "))
list1=Print_values(a,b,c)
x=list1[0]
y=list1[1]
z=list1[2]
print(x+y-10*z)
```

```
Please input a: 10
Please input b: 5
Please input c: 1
5.0
```

In [2]:

```python
# Exercise 2
import math
list=input("Please input a list with N positive intergers: ")
list=list.split(",")
list=[int(list[i]) for i in range(len(list))]
N=len(list)
list2=[]

def F(x):
    if x==1:
        Fx=1
    else:
        Fx=F(math.ceil(x/3))+2*x
    return Fx

for i in range(0,N):
    x=list[i]
    list2.append(F(x))
print(list2)
```

```
Please input a list with N positive intergers: 1,2,3,4,5
[1, 5, 7, 13, 15]
```

In [5]:

```
# Exercise 3.1
def Find_number_of_ways(x):
    sum_number=0
    for i in range(0,11):
        for j in range(0,11):
            for k in range(0,11):
                for l in range(0,11):
                    for m in range(0,11):
                        for n in range(0,11):
                            if(1*i+2*j+3*k+4*l+5*m+6*n )==x and (i+j+k+l+m+n)==10:
                                sum_number=sum_number+1
    return sum_number
# x=int(input("Please input x: "))
# print(Find_number_of_ways(x))

# Exercise 3.2
Number_of_ways=[]
index=[]
for x in range(10,61):
    Number_of_ways.append(Find_number_of_ways(x))

maximum=max(Number_of_ways)
for i in range(0,50):
    if(Number_of_ways[i]==maximum):
        index.append(i)

print(Number_of_ways)
print("the maximum is ", maximum)
print("x which yield the maximum is ",index )
```

```
[1, 1, 2, 3, 5, 7, 10, 13, 18, 23, 30, 36, 45, 53, 63, 72, 83, 92, 103, 111, 121, 12
7, 134, 137, 141, 141, 141, 137, 134, 127, 121, 111, 103, 92, 83, 72, 63, 53, 45, 3
6, 30, 23, 18, 13, 10, 7, 5, 3, 2, 1, 1]
the maximum is  141
x which yield the maximum is  [24, 25, 26]
```

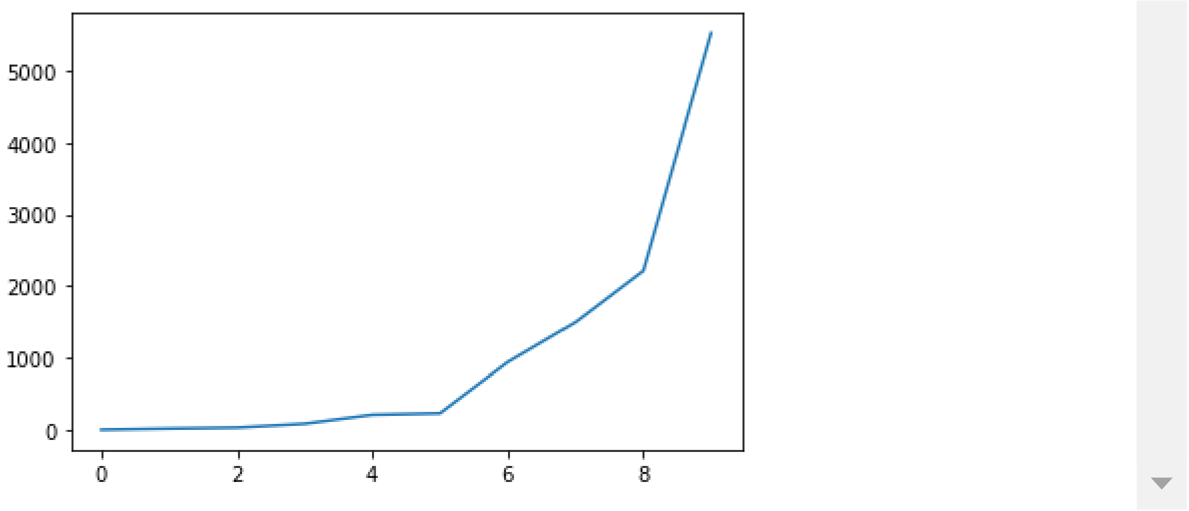
In [57]:

```
# Exercise 4.1
import numpy as np
import matplotlib.pyplot as plt
def Random_interger(N):
    M=np.random.randint(1,11,N)
    return M
# N=int(input("Please input N: "))
# print("Array of N elements is ",M)

# Exercise 4.2
def subsets(N):
    result=[[]]
    M=Random_interger(N)
#     print(M)
    for i in range(N):
        for j in range(len(result)):
            result.append(result[j]+[M[i]])
    return result

# print(subsets(N)) ##I got inspired by reading "https://blog.csdn.net/qq_34170700/article/deta
def Sum_average(N):
    average=[]
    sub=subsets(N)
#     print(sub)
    for i in range(len(sub)):
        if(len(sub[i])!=0):
            average.append(sum(sub[i])/len(sub[i]))
    return sum(average)
# print(Sum_average(N))

# Exercise 4.3

Total_sum_averages=[]
for N in range(1,11):
    Total_sum_averages.append(Sum_average(N))
print(Total_sum_averages)
plt.plot(Total_sum_averages)
```

```
[3.0, 19.5, 32.666666666666664, 86.25, 210.79999999999998, 230.99999999999997, 943.4
285714285714, 1498.125, 2214.3333333333335, 5524.2]
```

Out[57]:

```
[<matplotlib.lines.Line2D at 0x1fc94f57430>]
```


5000
4000
3000
2000
1000
0
0
2
4
6
8

In [50]:

```python
# Exercise 5.1
from numpy import random
N=int(input("Please input N: "))
M=int(input("Please input M: "))
def Matrix(N,M):
    array=[]
    for i in range(N):
        list1=[random.randint(0,2)for j in range(M)]
        array.append(list1)
        array[0][0]=1;array[-1][-1]=1
    return array

# Exercise 5.2 ##I got inspired by reading "https://www.nhooo.com/note/qa55bq.html"
def Count_path(array):
    dp = [[0] * len(array[0]) for _ in range(len(array))]
    dp[0][0] = 1
    for i in range(1, len(array)):
        if array[i][0] == 0:
            break
        else:
            dp[i][0] = 1
    for j in range(1, len(array[0])):
        if array[0][j] == 0:
            break
        else:
            dp[0][j] = 1
    for i in range(1, len(array)):
         for j in range(1, len(array[0])):
            if array[i][j] == 0:
                dp[i][j] = 0
            else:
                dp[i][j] = dp[i - 1][j] + dp[i][j - 1]
#     print(dp)
    return dp[-1][-1]
# print(Count_path(array))

# Exercise 5.3
number=[]
for i in range(1000):
    array=Matrix(N,M)
    number.append(Count_path(array))
print(sum(number)/len(number))
```

```
Please input N: 10
Please input M: 8
1.5811818181818182
```