

MA201_ASSIGNMENT 5

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TASK 1: Implement Central Limit Theorem:

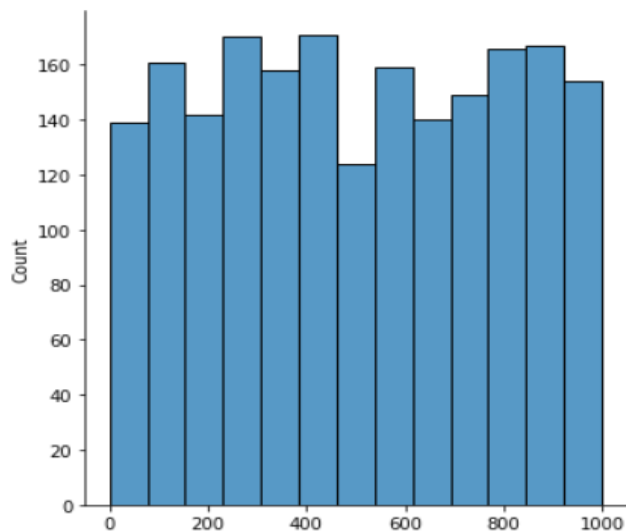
A) Take any I.I.D distributions X_1, X_2, \dots, X_n . Plot PDF.

```
import random
import seaborn as sbn
import numpy as np

print("enter population N: ")
N=int(input())

arr1=[]
for i in range(N):
    n=random.randint(0,1000)
    arr1.append(n)
sbn.displot(arr1)
```

```
enter population N:
2000
<seaborn.axisgrid.FacetGrid at 0x7fbbde6cb750>
```



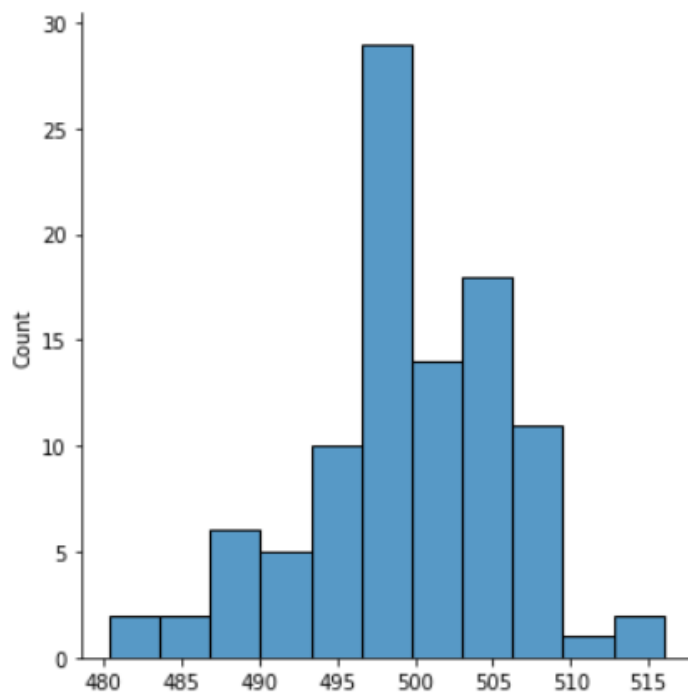
B) Let $Z = \sum_{i=1}^n X_i$, $Z = \sum_{i=1}^n X_i$. Plot PDF.

```
print("sampling size : ")
n=int(input())

mean=[]

for i in range(100):
    arr2=[]
    for j in range(n):
        x=random.randint(0,1000)
        arr2.append(x)
    temp=sum(arr2)
    mean.append(temp/n)
sbn.displot(mean)
```

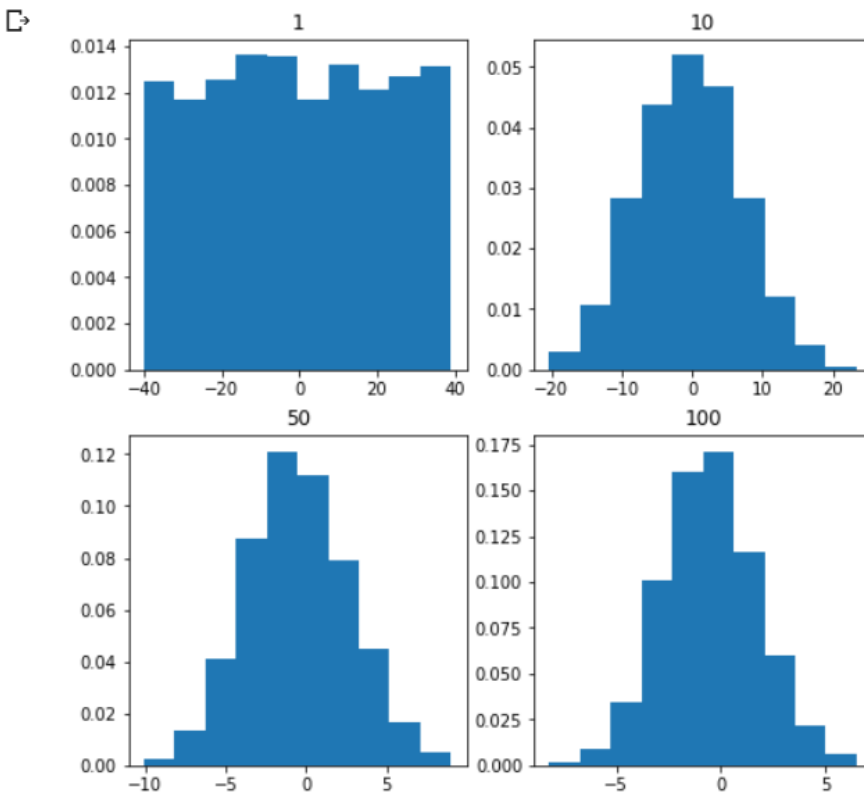
```
→ sampling size :
2000
<seaborn.axisgrid.FacetGrid at 0x7fbbf53e8710>
```



TASK 2: Plot distribution of Sample mean.

A) Let XX be any random variable with NN population. Plot PDF

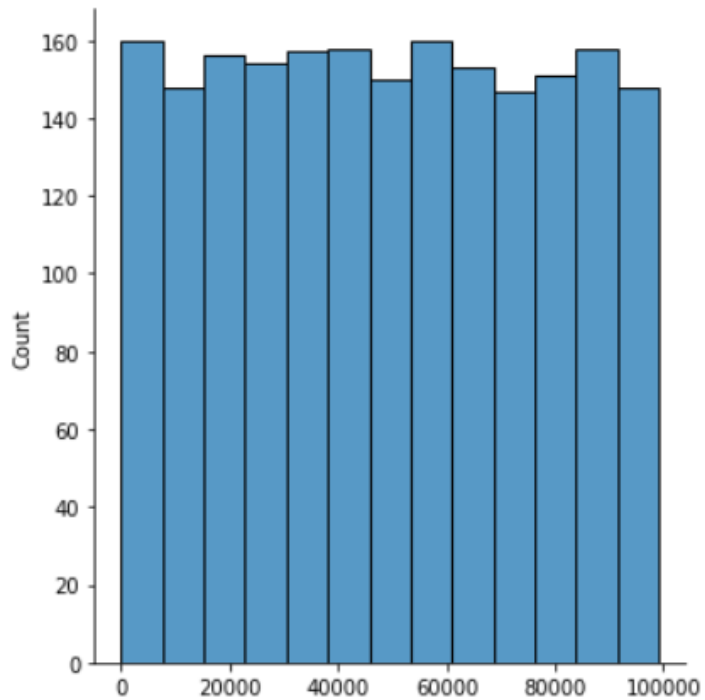
```
import numpy
import matplotlib.pyplot as plt
num = [1, 10, 50, 100]
means = []
for j in num:
    numpy.random.seed(1)
    x = [numpy.mean(numpy.random.randint(-40, 40, j)) for _i in range(2000)]
    means.append(x)
k = 0
fig, ax = plt.subplots(2, 2, figsize=(8, 8))
for i in range(0, 2):
    for j in range(0, 2):
        ax[i, j].hist(means[k], 10, density = True)
        ax[i, j].set_title(label = num[k])
        k = k + 1
plt.show()
```





```
arr3=[]
arr4=[]
ttemp=[]
for j in range(2000):
    x=random.randint(0,100)
    ttemp.append(x)
cc=sum(ttemp)/1000
arr3.append(cc)
summ=0
for j in ttemp:
    x=summ+j
    arr4.append(x)
    summ+=j
sbn.displot(arr4)
```

<seaborn.axisgrid.FacetGrid at 0x7fbbd9ecef50>



B) Take sampling with size nn and find RV \bar{X} . Plot PDF

```
shape, scale = 2., 2.
s = np.random.gamma(shape, scale, 1000000)
sbn.displot(s)
meansample = []

numofsample = [1000,2500,5000,10000,25000,50000]
samplesize = 500
for i in numofsample:
    eachmeansample = []
    for j in range(0,i):
        rc = random.choices(s, k=samplesize)
        eachmeansample.append(sum(rc)/len(rc))
    meansample.append(eachmeansample)
cols = 2
rows = 3
fig, ax = plt.subplots(rows, cols, figsize=(20,15))
n = 0
for i in range(0, rows):
    for j in range(0, cols):
        ax[i, j].hist(meansample[n], 200, density=True)
        ax[i, j].set_title(label="number of sampling :" + str(numofsample[n]))
        n += 1
plt.show()
```

