

In [3]:

```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
```

In [4]:

```
df = pd.read_csv("Ads_Optimisation.csv")
df
```

Out[4]:

	Ad 1	Ad 2	Ad 3	Ad 4	Ad 5	Ad 6	Ad 7	Ad 8	Ad 9	Ad 10
0	1	0	0	0	1	0	0	0	1	0
1	0	0	0	0	0	0	0	0	1	0
2	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	1	0	0
4	0	0	0	0	0	0	0	0	0	0
...
9995	0	0	1	0	0	0	0	1	0	0
9996	0	0	0	0	0	0	0	0	0	0
9997	0	0	0	0	0	0	0	0	0	0
9998	1	0	0	0	0	0	0	1	0	0
9999	0	1	0	0	0	0	0	0	0	0

10000 rows × 10 columns

In [5]:

```
import random
N = 10000
d = 10
ads_selected = []
total_reward = 0
for m in range(N):
    ad = random.randrange(d)
    ads_selected.append(ad)
    reward = df.values[m,ad]
    total_reward = total_reward + reward
```

In [6]:

```
pd.Series(ads_selected).head(10000).value_counts(normalize=True)
```

Out[6]:

```
1    0.1028
3    0.1024
8    0.1020
5    0.1016
2    0.0998
9    0.0997
6    0.0987
7    0.0983
4    0.0979
0    0.0968
dtype: float64
```

In [28]:

```
print(total_reward)
```

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Implementing UCB

In [9]:

```
import math
N = 10000
d = 10
ads_selected = []
number_of_selection = [0]*d
sum_of_reward = [0]*d
total_reward = 0
for n in range(N):
    ad = 0
    max_upper_bound = 0
    for i in range(d):
        if(number_of_selection[i] > 0):
            average_reward = sum_of_reward[i]/number_of_selection[i]
            delta_i = math.sqrt(2 * math.log(n+1)/number_of_selection[i])
            upper_bound = average_reward + delta_i
        else:
            upper_bound = 1e400
        if upper_bound > max_upper_bound:
            max_upper_bound = upper_bound
            ad = i
    ads_selected.append(ad)
    number_of_selection[ad] += 1
    reward = df.values[n,ad]
    sum_of_reward[ad] += reward
    total_reward += reward
print(total_reward)
```

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In [45]:

```
pd.Series(ads_selected).tail(1500).value_counts(normalize=True)
```

Out[45]:

```
4    0.810000
0    0.077333
7    0.026667
3    0.024667
2    0.019333
6    0.019333
1    0.007333
8    0.006000
5    0.004667
9    0.004667
dtype: float64
```

REDUCING SIZE OF THE LIST

In [10]:

```
import math
N = 10000
d = 10
ads_selected = []
number_of_selection = [0]*d
sum_of_reward = [0]*d
total_reward = 0
for n in range(5000):
    ad = 0
    max_upper_bound = 0
    for i in range(d):
        if(number_of_selection[i] > 0):
            average_reward = sum_of_reward[i]/number_of_selection[i]
            delta_i = math.sqrt(2 * math.log(n+1)/number_of_selection[i])
            upper_bound = average_reward + delta_i
        else:
            upper_bound = 1e400
    if upper_bound > max_upper_bound:
        max_upper_bound = upper_bound
        ad = i
    ads_selected.append(ad)
    number_of_selection[ad] += 1
    reward = df.values[n,ad]
    sum_of_reward[ad] += reward
    total_reward += reward
print(total_reward)
```

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In []:

