[1]
```
import math
import random
import pandas as pd
import numpy as np
import scipy.stats as ss
import matplotlib.pyplot as plt
```

5.1

The Career Development Centre at INSEAD is interested in the mean μ for consultants' starting salaries. The population standard deviation σ is assumed to be EUR 10,000. A random sample of size n from the relevant population of consultants is being considered. What is the probability that the sample mean (X) will be within μ ± 5000 if
(a) n= 36,
(b) n = 100? Do you need to make any assumptions for your answers?

[2]
```
# a
n = 36

me_n36 = 10000/(math.sqrt(n))
me_n36
```

```
1666.6666666666667
```

[3]
```
5000/me_n36
```

```
3.0
```

[4]
```
# b
n = 100
me_n100 = 10000/(math.sqrt(n))
me_n100
```

```
1000.0
```

[5]
```
5000/me_n100
```

```
5.0
```

5.4

In Exercise 5.1 above, suppose that the Career Development Centre takes a random sample of 100 consultants and finds the sample mean of their starting salaries to be EUR 150,000. Construct a 95% and a 99% confidence interval for the true mean of the starting salaries for the entire population of consultants. (Assume the population standard deviation to be EUR 10,000, as mentioned in Exercise 5.1.)

[6]
```
me_n100
```

```
1000.0
```

[7]
```
z95 = 1.96
z99 = 2.575
```

[8]
```
print(f"At 95%, we believe the range is {150000 - z95 * me_n100}
and {150000 + z95 * me_n100}")
```

```
At 95%, we believe the range is 148040.0 and 151960.0
```

[9]
```
print(f"At 99%, we believe the range is {150000 - z99 * me_n100}
and {150000 + z99 * me_n100}")
```

```
At 99%, we believe the range is 147425.0 and 152575.0
```

[ ]

6.4

An opinion poll is taken on the eve of a presidential election in a large democratic country. 1,600 registered voters are asked whom they would vote for in the election on the next day. Among those in the sample, 750 say they would vote for the conservative candidate and 850 say they would vote for the liberal candidate. Construct a 95% and a 99% confidence interval for the proportion of all registered voters who would vote for the liberal candidate,

assuming that the voters' preferences will not change between the time the poll is taken and the election day.

[10]
```
n = 1600
n_cons = 750
n_lib = 850
```

[11]
```
x_cons = n_cons/n
x_lib = n_lib/n

x_cons,x_lib
```

```
(0.46875, 0.53125)
```

[12]
```
# cons
p = x_cons
q = 1 - p

print(f"At 95%, conservative likely voters will be {n * (x_cons -
z95 * (math.sqrt(p*q/n)))} and {n * (x_cons + z95 *
(math.sqrt(p*q/n)))}")
print(f"At 99%, conservative likely voters will be {n * (x_cons -
z99 * (math.sqrt(p*q/n)))} and {n * (x_cons + z99 *
(math.sqrt(p*q/n)))}")
```

```
At 95%, conservative likely voters will be 710.8766374144553 and
789.1233625855447
At 99%, conservative likely voters will be 698.6006843582767 and
801.3993156417232
```

[13]
```
# libs
p = x_lib
q = 1 - p

print(f"At 95%, liberal likely voters will be {n * (x_lib - z95 *
(math.sqrt(p*q/n)))} and {n * (x_lib + z95 *
(math.sqrt(p*q/n)))}")
print(f"At 99%, liberal likely voters will be {n * (x_lib - z99 *
(math.sqrt(p*q/n)))} and {n * (x_lib + z99 *
(math.sqrt(p*q/n)))}")
```

```
At 95%, liberal likely voters will be 810.8766374144553 and
889.1233625855447
```

At 99%, liberal likely voters will be 798.6006843582767 and 901.3993156417232

```
[ ]
```