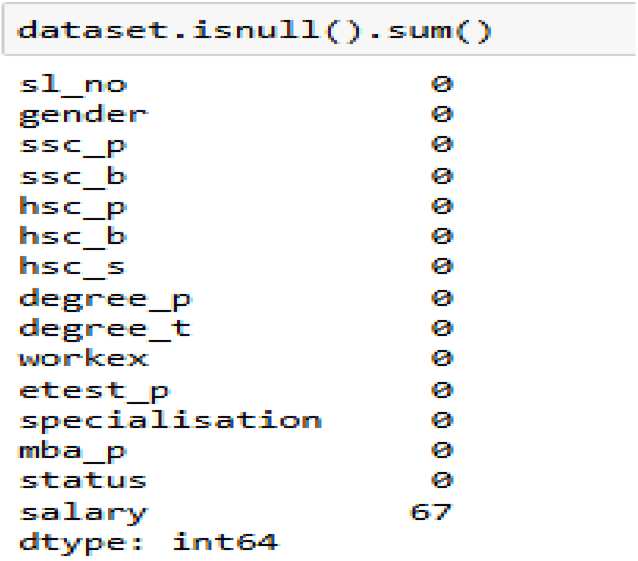
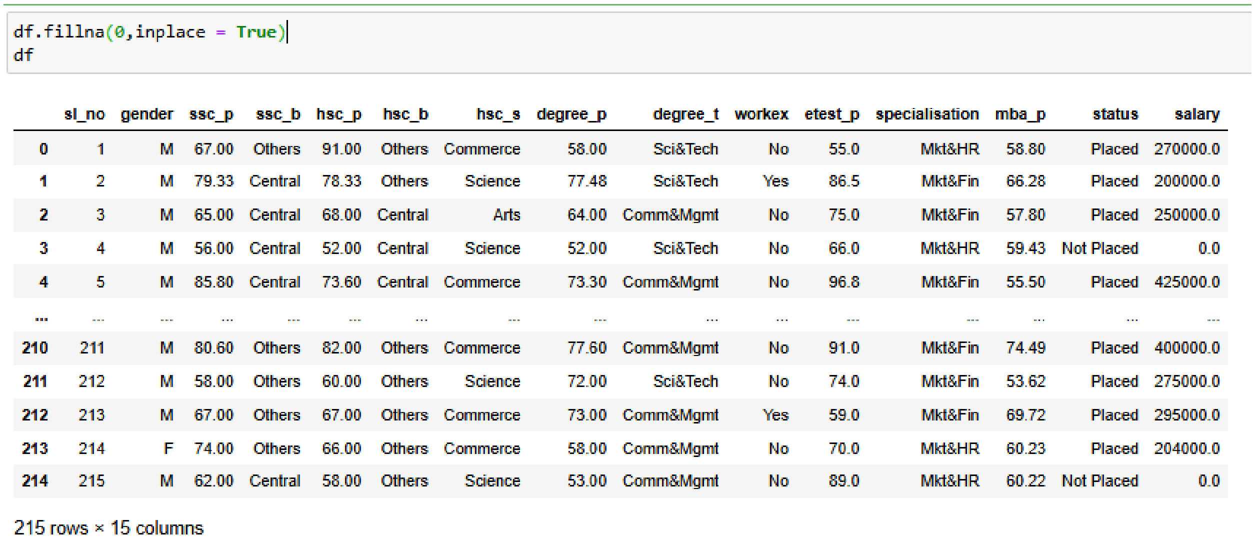
Inferential Analysis

1) Replace the NaN values with correct value.



```
dataset.isnull().sum()
```

```
sl_no              0
gender             0
ssc_p              0
ssc_b              0
hsc_p              0
hsc_b              0
hsc_s              0
degree_p           0
degree_t           0
workex             0
etest_p            0
specialisation     0
mba_p              0
status             0
salary            67
dtype: int64
```



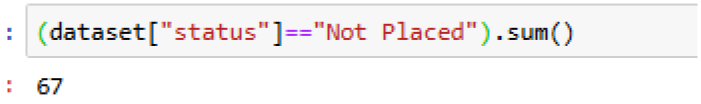
```
df.fillna(0,inplace = True)
df
```

	sl_no	gender	ssc_p	ssc_b	hsc_p	hsc_b	hsc_s	degree_p	degree_t	workex	etest_p	specialisation	mba_p	status	salary
0	1	M	67.00	Others	91.00	Others	Commerce	58.00	Sci&Tech	No	55.0	Mkt&HR	58.80	Placed	270000.0
1	2	M	79.33	Central	78.33	Others	Science	77.48	Sci&Tech	Yes	86.5	Mkt&Fin	66.28	Placed	200000.0
2	3	M	65.00	Central	68.00	Central	Arts	64.00	Comm&Mgmt	No	75.0	Mkt&Fin	57.80	Placed	250000.0
3	4	M	56.00	Central	52.00	Central	Science	52.00	Sci&Tech	No	66.0	Mkt&HR	59.43	Not Placed	0.0
4	5	M	85.80	Central	73.60	Central	Commerce	73.30	Comm&Mgmt	No	96.8	Mkt&Fin	55.50	Placed	425000.0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
210	211	M	80.60	Others	82.00	Others	Commerce	77.60	Comm&Mgmt	No	91.0	Mkt&Fin	74.49	Placed	400000.0
211	212	M	58.00	Others	60.00	Others	Science	72.00	Sci&Tech	No	74.0	Mkt&Fin	53.62	Placed	275000.0
212	213	M	67.00	Others	67.00	Others	Commerce	73.00	Comm&Mgmt	Yes	59.0	Mkt&Fin	69.72	Placed	295000.0
213	214	F	74.00	Others	66.00	Others	Commerce	58.00	Comm&Mgmt	No	70.0	Mkt&HR	60.23	Placed	204000.0
214	215	M	62.00	Central	58.00	Others	Science	53.00	Comm&Mgmt	No	89.0	Mkt&HR	60.22	Not Placed	0.0

215 rows × 15 columns

- Replaced null values of salary with zero because the students are not placed yet so not getting salary.

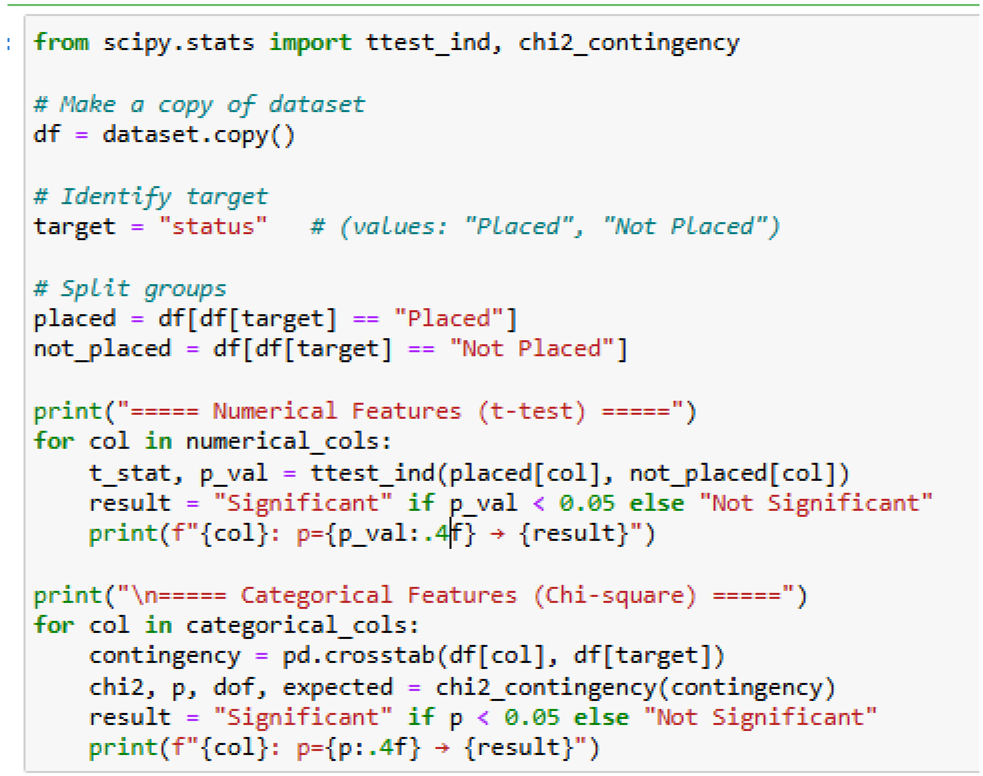
2) How many of them are not placed?



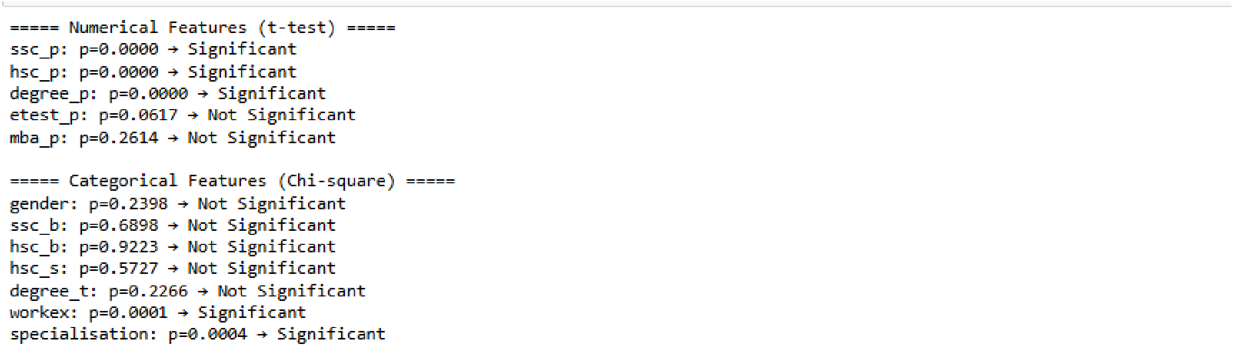
```
: (dataset["status"]=="Not Placed").sum()
```

```
: 67
```

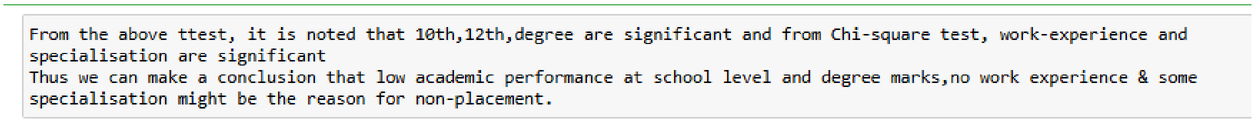
3) Find the reason for non placement from the dataset?



```
from scipy.stats import ttest_ind, chi2_contingency

# Make a copy of dataset
df = dataset.copy()

# Identify target
target = "status"   # (values: "Placed", "Not Placed")

# Split groups
placed = df[df[target] == "Placed"]
not_placed = df[df[target] == "Not Placed"]

print("===== Numerical Features (t-test) =====")
for col in numerical_cols:
    t_stat, p_val = ttest_ind(placed[col], not_placed[col])
    result = "Significant" if p_val < 0.05 else "Not Significant"
    print(f"{col}: p={p_val:.4f} → {result}")

print("\n===== Categorical Features (Chi-square) =====")
for col in categorical_cols:
    contingency = pd.crosstab(df[col], df[target])
    chi2, p, dof, expected = chi2_contingency(contingency)
    result = "Significant" if p < 0.05 else "Not Significant"
    print(f"{col}: p={p:.4f} → {result}")
```

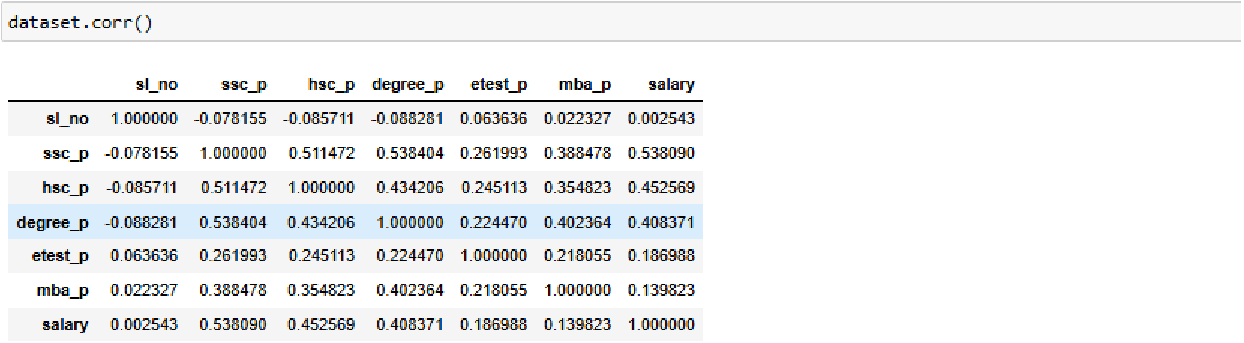


```
===== Numerical Features (t-test) =====
ssc_p: p=0.0000 → Significant
hsc_p: p=0.0000 → Significant
degree_p: p=0.0000 → Significant
etest_p: p=0.0617 → Not Significant
mba_p: p=0.2614 → Not Significant

===== Categorical Features (Chi-square) =====
gender: p=0.2398 → Not Significant
ssc_b: p=0.6898 → Not Significant
hsc_b: p=0.9223 → Not Significant
hsc_s: p=0.5727 → Not Significant
degree_t: p=0.2266 → Not Significant
workex: p=0.0001 → Significant
specialisation: p=0.0004 → Significant
```



From the above ttest, it is noted that 10th,12th,degree are significant and from Chi-square test, work-experience and specialisation are significant
Thus we can make a conclusion that low academic performance at school level and degree marks,no work experience & some specialisation might be the reason for non-placement.

4)What kind of relation between salary and mba_p

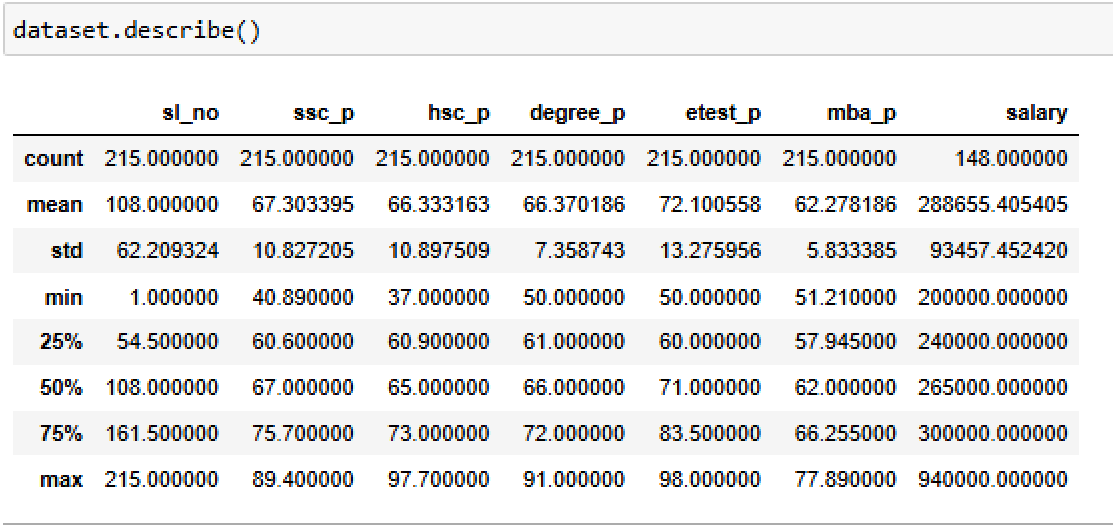


```
dataset.corr()
```

	sl_no	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
sl_no	1.000000	-0.078155	-0.085711	-0.088281	0.063636	0.022327	0.002543
ssc_p	-0.078155	1.000000	0.511472	0.538404	0.261993	0.388478	0.538090
hsc_p	-0.085711	0.511472	1.000000	0.434206	0.245113	0.354823	0.452569
degree_p	-0.088281	0.538404	0.434206	1.000000	0.224470	0.402364	0.408371
etest_p	0.063636	0.261993	0.245113	0.224470	1.000000	0.218055	0.186988
mba_p	0.022327	0.388478	0.354823	0.402364	0.218055	1.000000	0.139823
salary	0.002543	0.538090	0.452569	0.408371	0.186988	0.139823	1.000000

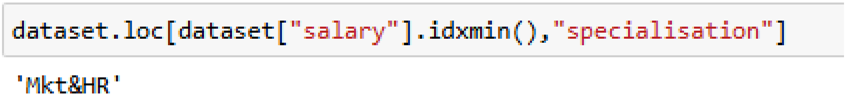
Correlation between Mba_p and salary is about 13%. Positive Correlation. When the Mba marks increases salary also increases by 13%.

5)Which specialization is getting minimum salary?



```
dataset.describe()
```

	sl_no	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
count	215.000000	215.000000	215.000000	215.000000	215.000000	215.000000	148.000000
mean	108.000000	67.303395	66.333163	66.370186	72.100558	62.278186	288655.405405
std	62.209324	10.827205	10.897509	7.358743	13.275956	5.833385	93457.452420
min	1.000000	40.890000	37.000000	50.000000	50.000000	51.210000	200000.000000
25%	54.500000	60.600000	60.900000	61.000000	60.000000	57.945000	240000.000000
50%	108.000000	67.000000	65.000000	66.000000	71.000000	62.000000	265000.000000
75%	161.500000	75.700000	73.000000	72.000000	83.500000	66.255000	300000.000000
max	215.000000	89.400000	97.700000	91.000000	98.000000	77.890000	940000.000000

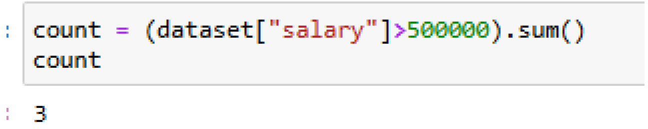


```
dataset.loc[dataset["salary"].idxmin(),"specialisation"]
```

```
'Mkt&HR'
```

Marketing and HR specialization is getting minimum salary.

6)How many of them getting above 500000 salary?

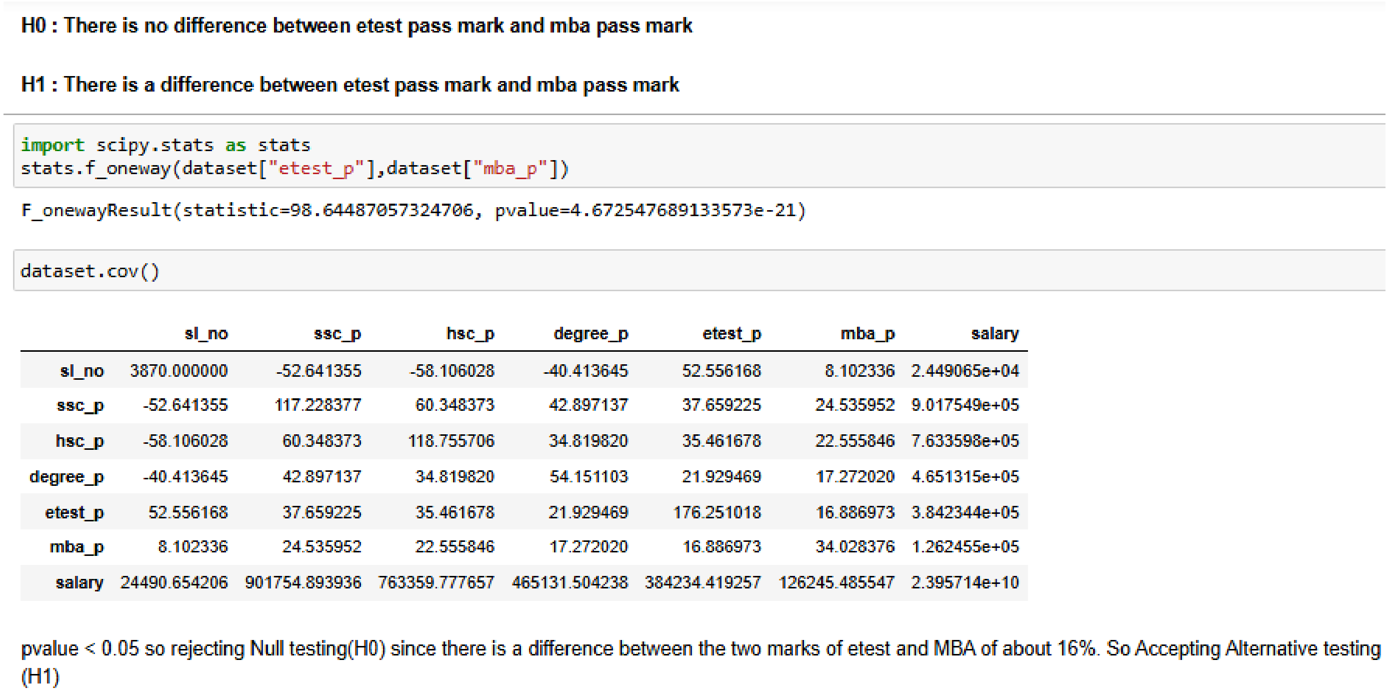


```
count = (dataset["salary"]>500000).sum()
count
```

```
3
```

Only 3 Persons are getting above salary of 500000

7)Test the Analysis of Variance between etest_p and mba_p at signifance level 5%.(Make decision using Hypothesis Testing)



H0 : There is no difference between etest pass mark and mba pass mark

H1 : There is a difference between etest pass mark and mba pass mark

```
import scipy.stats as stats
stats.f_oneway(dataset["etest_p"],dataset["mba_p"])
```

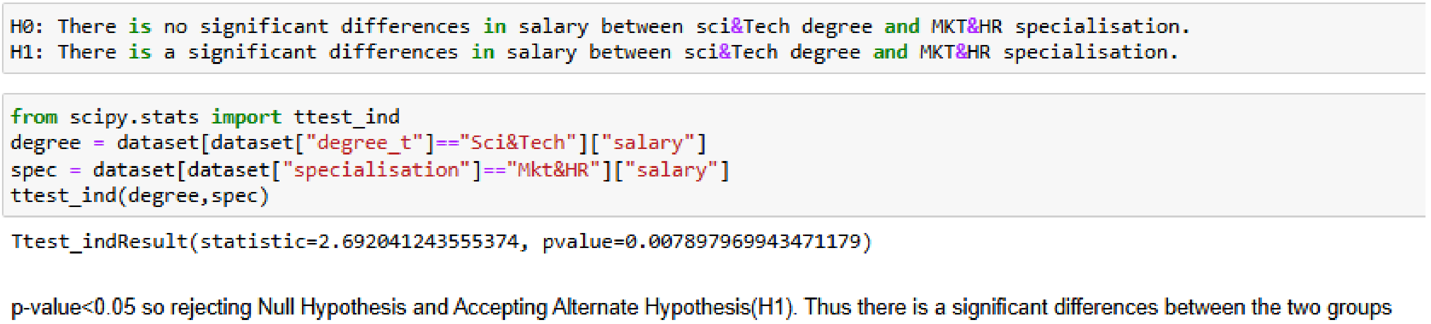
```
F_onewayResult(statistic=98.64487057324706, pvalue=4.672547689133573e-21)
```

```
dataset.cov()
```

	sl_no	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
sl_no	3870.000000	-52.641355	-58.106028	-40.413645	52.556168	8.102336	2.449065e+04
ssc_p	-52.641355	117.228377	60.348373	42.897137	37.659225	24.535952	9.017549e+05
hsc_p	-58.106028	60.348373	118.755706	34.819820	35.461678	22.555846	7.633598e+05
degree_p	-40.413645	42.897137	34.819820	54.151103	21.929469	17.272020	4.651315e+05
etest_p	52.556168	37.659225	35.461678	21.929469	176.251018	16.886973	3.842344e+05
mba_p	8.102336	24.535952	22.555846	17.272020	16.886973	34.028376	1.262455e+05
salary	24490.654206	901754.893936	763359.777657	465131.504238	384234.419257	126245.485547	2.395714e+10

pvalue < 0.05 so rejecting Null testing(H0) since there is a difference between the two marks of etest and MBA of about 16%. So Accepting Alternative testing (H1)

8)Test the similarity between the degree_t(Sci&Tech) and specialisation(Mkt&HR) with respect to salary at significance level of 5%.(Make decision using Hypothesis Testing)



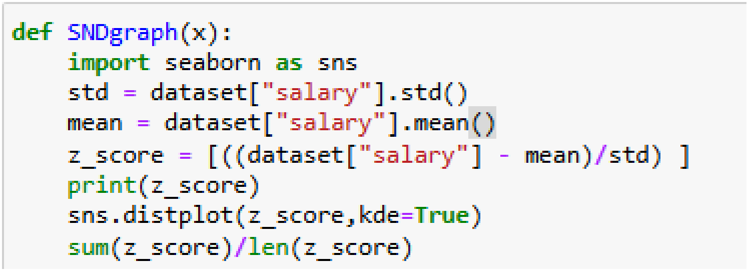
```
H0: There is no significant differences in salary between sci&Tech degree and MKT&HR specialisation.
H1: There is a significant differences in salary between sci&Tech degree and MKT&HR specialisation.
```

```
from scipy.stats import ttest_ind
degree = dataset[dataset["degree_t"]=="Sci&Tech"]["salary"]
spec = dataset[dataset["specialisation"]=="Mkt&HR"]["salary"]
ttest_ind(degree,spec)
```

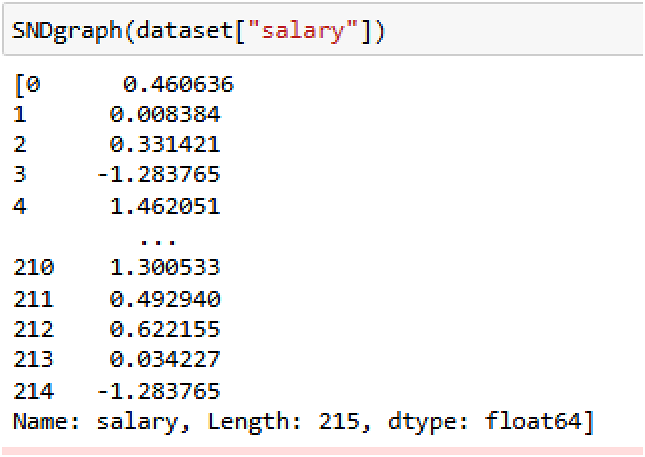
```
Ttest_indResult(statistic=2.692041243555374, pvalue=0.007897969943471179)
```

p-value<0.05 so rejecting Null Hypothesis and Accepting Alternate Hypothesis(H1). Thus there is a significant differences between the two groups

9)Convert the normal distribution to standard normal distribution for salary column

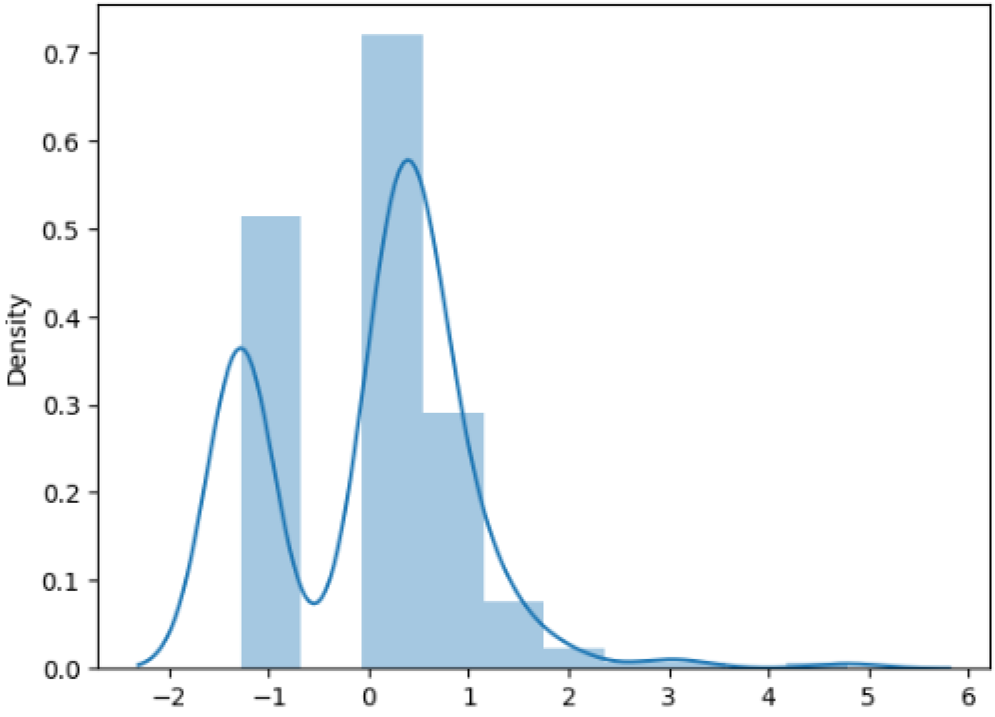


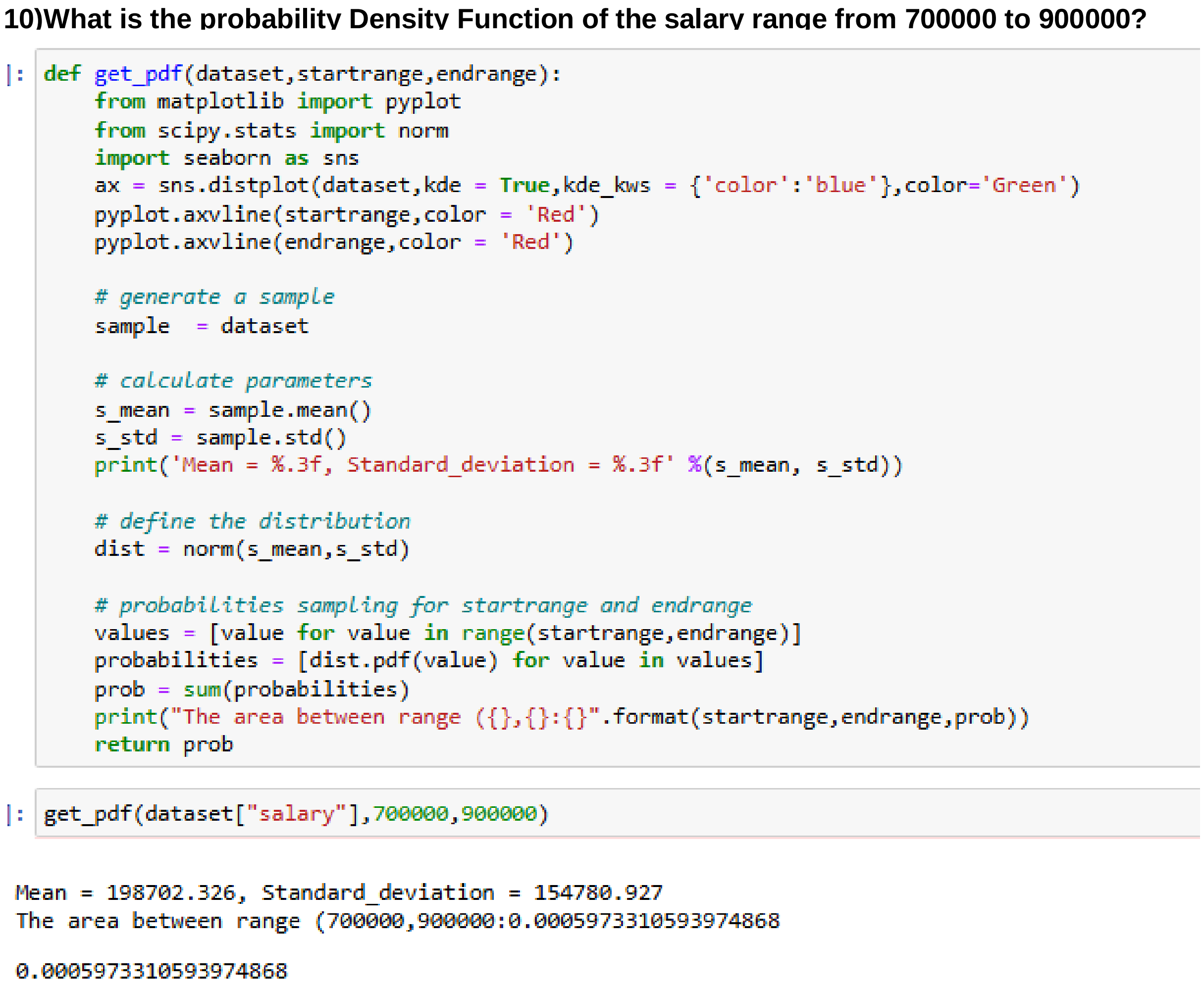
```
def SNDgraph(x):
    import seaborn as sns
    std = dataset["salary"].std()
    mean = dataset["salary"].mean()
    z_score = [((dataset["salary"] - mean)/std) ]
    print(z_score)
    sns.distplot(z_score,kde=True)
    sum(z_score)/len(z_score)
```



```
SNDgraph(dataset["salary"])
```

```
[0      0.460636
1      0.008384
2      0.331421
3     -1.283765
4      1.462051
         ...
210    1.300533
211    0.492940
212    0.622155
213    0.034227
214   -1.283765
Name: salary, Length: 215, dtype: float64]
```



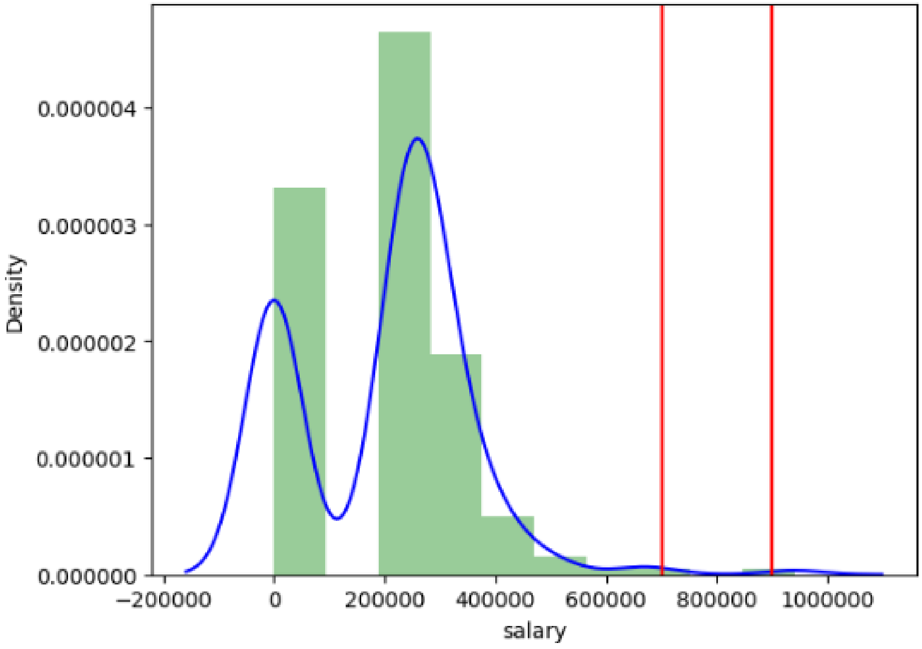


10)What is the probability Density Function of the salary range from 700000 to 900000?

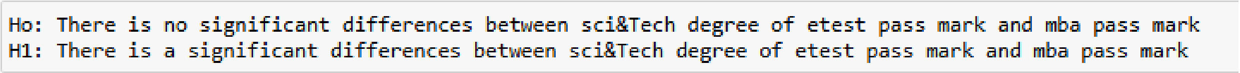
```
def get_pdf(dataset,startrange,endrange):
    from matplotlib import pyplot
    from scipy.stats import norm
    import seaborn as sns
    ax = sns.distplot(dataset,kde = True,kde_kws = {'color':'blue'},color='Green')
    pyplot.axvline(startrange,color = 'Red')
    pyplot.axvline(endrange,color = 'Red')

    # generate a sample
    sample  = dataset

    # calculate parameters
    s_mean = sample.mean()
    s_std = sample.std()
    print('Mean = %.3f, Standard_deviation = %.3f' %(s_mean, s_std))

    # define the distribution
    dist = norm(s_mean,s_std)

    # probabilities sampling for startrange and endrange
    values = [value for value in range(startrange,endrange)]
    probabilities = [dist.pdf(value) for value in values]
    prob = sum(probabilities)
    print("The area between range ({},{}:{}".format(startrange,endrange,prob))
    return prob
```

```
get_pdf(dataset["salary"],700000,900000)
```

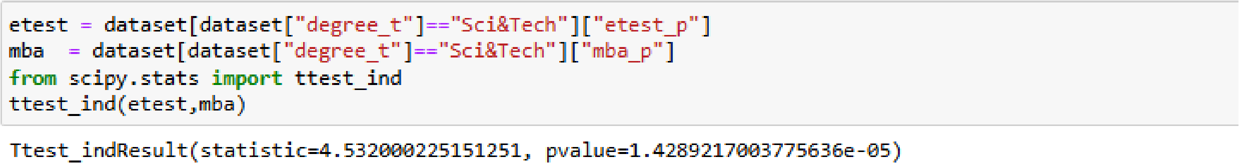
```
Mean = 198702.326, Standard_deviation = 154780.927
The area between range (700000,900000:0.0005973310593974868

0.0005973310593974868
```



11)Test the similarity between the degree_t(Sci&Tech)with respect to etest_p and mba_p at significance level of 5%.(Make decision using Hypothesis Testing)

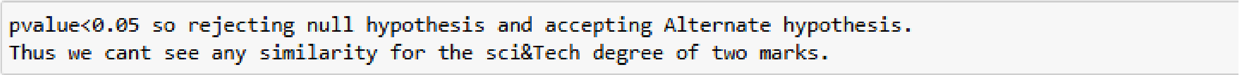


```
Ho: There is no significant differences between sci&Tech degree of etest pass mark and mba pass mark
H1: There is a significant differences between sci&Tech degree of etest pass mark and mba pass mark
```



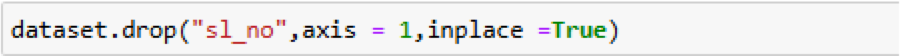
```
etest = dataset[dataset["degree_t"]=="Sci&Tech"]["etest_p"]
mba  = dataset[dataset["degree_t"]=="Sci&Tech"]["mba_p"]
from scipy.stats import ttest_ind
ttest_ind(etest,mba)
```

```
Ttest_indResult(statistic=4.532000225151251, pvalue=1.4289217003775636e-05)
```

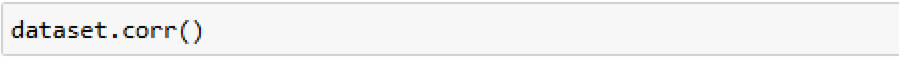


```
pvalue<0.05 so rejecting null hypothesis and accepting Alternate hypothesis.
Thus we cant see any similarity for the sci&Tech degree of two marks.
```

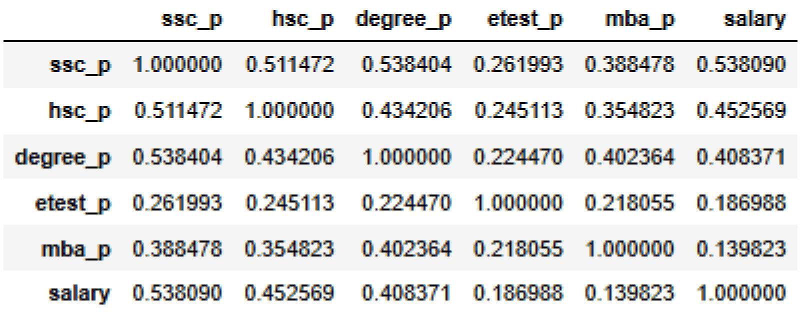
12)Which parameter is highly correlated with salary?



```
dataset.drop("sl_no",axis = 1,inplace =True)
```



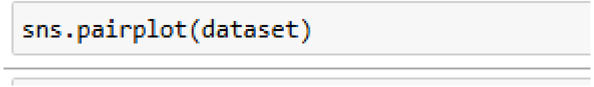
```
dataset.corr()
```



	ssc_p	hsc_p	degree_p	etest_p	mba_p	salary
ssc_p	1.000000	0.511472	0.538404	0.261993	0.388478	0.538090
hsc_p	0.511472	1.000000	0.434206	0.245113	0.354823	0.452569
degree_p	0.538404	0.434206	1.000000	0.224470	0.402364	0.408371
etest_p	0.261993	0.245113	0.224470	1.000000	0.218055	0.186988
mba_p	0.388478	0.354823	0.402364	0.218055	1.000000	0.139823
salary	0.538090	0.452569	0.408371	0.186988	0.139823	1.000000

10th mark is highly correlated with salary

13) plot any useful graph and explain it.



```
sns.pairplot(dataset)
```

GitHub Link: https://github.com/Geetharani-CodeAI/DataScience_Bivariate_Analysis/blob/main/DS_Assignment%20.ipynb