```
import pandas as pd
import numpy as np

df = pd.read_csv("/content/bank-additional-full.csv", sep=";")
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutco
0	56	housemaid	married	basic.4y	no	no	no	telephone	may	mon	...	1	999	0	nonexiste
1	57	services	married	high.school	unknown	no	no	telephone	may	mon	...	1	999	0	nonexiste
2	37	services	married	high.school	no	yes	no	telephone	may	mon	...	1	999	0	nonexiste
3	40	admin.	married	basic.6y	no	no	no	telephone	may	mon	...	1	999	0	nonexiste
4	56	services	married	high.school	no	no	yes	telephone	may	mon	...	1	999	0	nonexiste

5 rows × 21 columns

```
df.tail()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous
41183	73	retired	married	professional.course	no	yes	no	cellular	nov	fri	...	1	999	0
41184	46	blue-collar	married	professional.course	no	no	no	cellular	nov	fri	...	1	999	0
41185	56	retired	married	university.degree	no	yes	no	cellular	nov	fri	...	2	999	0
41186	44	technician	married	professional.course	no	no	no	cellular	nov	fri	...	1	999	0
41187	74	retired	married	professional.course	no	yes	no	cellular	nov	fri	...	3	999	1

5 rows × 21 columns

```
def replace_marital(val):
  if val=="single":
    return 0
  else:
    return 1
df["marital"]=df["marital"].apply(replace_marital,1)
df.head()
```

```
<ipython-input-3-e3f3028052ce>:6: FutureWarning: the convert_dtype parameter is deprecated and will be removed in a future version.
  df["marital"]=df["marital"].apply(replace_marital,1)
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutco
0	56	housemaid	1	basic.4y	no	no	no	telephone	may	mon	...	1	999	0	nonexiste
1	57	services	1	high.school	unknown	no	no	telephone	may	mon	...	1	999	0	nonexiste
2	37	services	1	high.school	no	yes	no	telephone	may	mon	...	1	999	0	nonexiste
3	40	admin.	1	basic.6y	no	no	no	telephone	may	mon	...	1	999	0	nonexiste
4	56	services	1	high.school	no	no	yes	telephone	may	mon	...	1	999	0	nonexiste

5 rows × 21 columns

```
df["housing"]=df["housing"].map({
 "no":0,
 "yes":1
}.get)
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutco
0	56	housemaid	1	basic.4y	no	0.0	no	telephone	may	mon	...	1	999	0	nonexiste
1	57	services	1	high.school	unknown	0.0	no	telephone	may	mon	...	1	999	0	nonexiste
2	37	services	1	high.school	no	1.0	no	telephone	may	mon	...	1	999	0	nonexiste
3	40	admin.	1	basic.6y	no	0.0	no	telephone	may	mon	...	1	999	0	nonexiste
4	56	services	1	high.school	no	0.0	yes	telephone	may	mon	...	1	999	0	nonexiste

5 rows × 21 columns

```
df["loan"]=df["loan"].replace({
 "no":0,
 "yes":1
})
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutco
0	56	housemaid	1	basic.4y	no	0.0	0	telephone	may	mon	...	1	999	0	nonexiste
1	57	services	1	high.school	unknown	0.0	0	telephone	may	mon	...	1	999	0	nonexiste
2	37	services	1	high.school	no	1.0	0	telephone	may	mon	...	1	999	0	nonexiste
3	40	admin.	1	basic.6y	no	0.0	0	telephone	may	mon	...	1	999	0	nonexiste
4	56	services	1	high.school	no	0.0	1	telephone	may	mon	...	1	999	0	nonexiste

5 rows × 21 columns

```
df["job"].unique() #to find unique value of column job
```

```
array(['housemaid', 'services', 'admin.', 'blue-collar', 'technician',
       'retired', 'management', 'unemployed', 'self-employed', 'unknown',
       'entrepreneur', 'student'], dtype=object)
```

```
df["job"].replace({
 'unknown':np.nan,
 'unemployed':0, 'services':1, 'management':2, 'blue-collar':3,
 'self-employed':4, 'technician':5, 'entrepreneur':6,
'admin.':7, 'student':8,
 'housemaid':9, 'retired':10
},inplace=True)
df.head()
```

```
<ipython-input-7-b2109e05a277>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained ass
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[co


  df["job"].replace({
<ipython-input-7-b2109e05a277>:1: FutureWarning: Downcasting behavior in `replace` is deprecated and will be removed in a future ve
  df["job"].replace({
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	em
0	56	9.0	1	basic.4y	no	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
1	57	1.0	1	high.school	unknown	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
2	37	1.0	1	high.school	no	1.0	0	telephone	may	mon	...	1	999	0	nonexistent	
3	40	7.0	1	basic.6y	no	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
4	56	1.0	1	high.school	no	0.0	1	telephone	may	mon	...	1	999	0	nonexistent	

5 rows × 21 columns

```
df["education"].unique()
```

```
array(['basic.4y', 'high.school', 'basic.6y', 'basic.9y',
       'professional.course', 'unknown', 'university.degree',
       'illiterate'], dtype=object)
```

```
df["education"].replace({
 'basic.4y':1, 'high.school':2, 'basic.6y':3, 'basic.9y':4, 'professional.course':5, 'university.degree':6, 'illiterate':0,'unknown':np
} ,inplace=True)
df.head()
```

```
<ipython-input-9-e00d0648f3b4>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained ass
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[co


  df["education"].replace({
<ipython-input-9-e00d0648f3b4>:1: FutureWarning: Downcasting behavior in `replace` is deprecated and will be removed in a future ve
  df["education"].replace({
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp
0	56	9.0	1	1.0	no	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
1	57	1.0	1	2.0	unknown	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
2	37	1.0	1	2.0	no	1.0	0	telephone	may	mon	...	1	999	0	nonexistent	
3	40	7.0	1	3.0	no	0.0	0	telephone	may	mon	...	1	999	0	nonexistent	
4	56	1.0	1	2.0	no	0.0	1	telephone	may	mon	...	1	999	0	nonexistent	

5 rows × 21 columns

```
df.contact.replace({"unknown":np.nan, "telephone":0, "cellular":1},
inplace=True)
df.head()
```

```
<ipython-input-10-b74c0a009967>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained as
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[co


  df.contact.replace({"unknown":np.nan, "telephone":0, "cellular":1},
<ipython-input-10-b74c0a009967>:1: FutureWarning: Downcasting behavior in `replace` is deprecated and will be removed in a future v
  df.contact.replace({"unknown":np.nan, "telephone":0, "cellular":1},
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.
0	56	9.0	1	1.0	no	0.0	0	0	may	mon	...	1	999	0	nonexistent	
1	57	1.0	1	2.0	unknown	0.0	0	0	may	mon	...	1	999	0	nonexistent	
2	37	1.0	1	2.0	no	1.0	0	0	may	mon	...	1	999	0	nonexistent	
3	40	7.0	1	3.0	no	0.0	0	0	may	mon	...	1	999	0	nonexistent	
4	56	1.0	1	2.0	no	0.0	1	0	may	mon	...	1	999	0	nonexistent	

5 rows × 21 columns

```
df.contact.unique()
```

```
array([0, 1])
```

```
df.month.unique()
```

```
array(['may', 'jun', 'jul', 'aug', 'oct', 'nov', 'dec', 'mar', 'apr',
       'sep'], dtype=object)
```

```
df.month=df.month.map({'oct':10, 'may':5, 'apr':4, 'jun':6, 'feb':2,
'aug':8, 'jan':1, 'jul':7, 'nov':11,
 'sep':9, 'mar':3, 'dec':12})
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.
0	56	9.0	1	1.0	no	0.0	0	0	5	mon	...	1	999	0	nonexistent	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	mon	...	1	999	0	nonexistent	
2	37	1.0	1	2.0	no	1.0	0	0	5	mon	...	1	999	0	nonexistent	
3	40	7.0	1	3.0	no	0.0	0	0	5	mon	...	1	999	0	nonexistent	
4	56	1.0	1	2.0	no	0.0	1	0	5	mon	...	1	999	0	nonexistent	

5 rows × 21 columns

```
df.poutcome.unique()
```

```
array(['nonexistent', 'failure', 'success'], dtype=object)
```

```
df.poutcome=df.poutcome.map({'unknown':np.nan, 'failure':0, 'other':1,
'success':2})
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	no	0.0	0	0	5	mon	...	1	999	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	mon	...	1	999	0	NaN	
2	37	1.0	1	2.0	no	1.0	0	0	5	mon	...	1	999	0	NaN	
3	40	7.0	1	3.0	no	0.0	0	0	5	mon	...	1	999	0	NaN	
4	56	1.0	1	2.0	no	0.0	1	0	5	mon	...	1	999	0	NaN	

5 rows × 21 columns

```
df.pdays=df.pdays.apply(lambda v:(v-df.pdays.min())/(df.pdays.max()-
df.pdays.min()))
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	no	0.0	0	0	5	mon	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	mon	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	no	1.0	0	0	5	mon	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	no	0.0	0	0	5	mon	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	no	0.0	1	0	5	mon	...	1	1.0	0	NaN	

5 rows × 21 columns

```
df.y.unique()
```

```
array(['no', 'yes'], dtype=object)
```

```
df.y.replace({'no':0, 'yes':1}, inplace=True)
df.head()
```

```
<ipython-input-26-ce21d4741977>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained as
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[co


  df.y.replace({'no':0, 'yes':1}, inplace=True)
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	no	0.0	0	0	5	1	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	1	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	no	1.0	0	0	5	1	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	no	0.0	0	0	5	1	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	no	0.0	1	0	5	1	...	1	1.0	0	NaN	

5 rows × 21 columns

```
df.duration=df.duration.apply(lambda v:(v-df.duration.min())/(df.duration.max()-df.duration.min()))
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	no	0.0	0	0	5	mon	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	mon	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	no	1.0	0	0	5	mon	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	no	0.0	0	0	5	mon	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	no	0.0	1	0	5	mon	...	1	1.0	0	NaN	

5 rows × 21 columns

```
df.day_of_week.unique()
```

```
array(['mon', 'tue', 'wed', 'thu', 'fri'], dtype=object)
```

```
df.day_of_week=df.day_of_week.map({'mon':1, 'tue':2, 'wed':3, 'thu':4, 'fri':5})
df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	no	0.0	0	0	5	1	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	1	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	no	1.0	0	0	5	1	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	no	0.0	0	0	5	1	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	no	0.0	1	0	5	1	...	1	1.0	0	NaN	

5 rows × 21 columns

```
df["default"].replace({
 "no":0,
 "yes":1
},inplace=True)
df.head()
```

```
<ipython-input-29-83ce5d7dfc10>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained as
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[co


  df["default"].replace({
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	0	0.0	0	0	5	1	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	1	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	0	1.0	0	0	5	1	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	0	0.0	0	0	5	1	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	0	0.0	1	0	5	1	...	1	1.0	0	NaN	

5 rows × 21 columns

```
df.describe()
```

	age	job	marital	education	housing	contact	month	day_of_week	duration	c
count	41188.00000	40858.000000	41188.000000	39457.000000	40198.000000	41188.000000	41188.000000	41188.000000	41188.000000	4118
mean	40.02406	4.709188	0.719141	3.889931	0.536743	0.634748	6.607896	2.979581	0.052518	
std	10.42125	2.528108	0.449424	1.826720	0.498654	0.481507	2.040998	1.411514	0.052720	
min	17.00000	0.000000	0.000000	0.000000	0.000000	0.000000	3.000000	1.000000	0.000000	
25%	32.00000	3.000000	0.000000	2.000000	0.000000	0.000000	5.000000	2.000000	0.020740	
50%	38.00000	5.000000	1.000000	4.000000	1.000000	1.000000	6.000000	3.000000	0.036600	
75%	47.00000	7.000000	1.000000	6.000000	1.000000	1.000000	8.000000	4.000000	0.064864	
max	98.00000	10.000000	1.000000	6.000000	1.000000	1.000000	12.000000	5.000000	1.000000	5

```
df.shape
```

```
(41188, 21)
```

```
df.to_csv("/content/bank-additional-new.csv",index=False)
new_df=pd.read_csv("/content/bank-additional-new.csv")
new_df.head()
```

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	campaign	pdays	previous	poutcome	emp.v
0	56	9.0	1	1.0	0	0.0	0	0	5	1	...	1	1.0	0	NaN	
1	57	1.0	1	2.0	unknown	0.0	0	0	5	1	...	1	1.0	0	NaN	
2	37	1.0	1	2.0	0	1.0	0	0	5	1	...	1	1.0	0	NaN	
3	40	7.0	1	3.0	0	0.0	0	0	5	1	...	1	1.0	0	NaN	
4	56	1.0	1	2.0	0	0.0	1	0	5	1	...	1	1.0	0	NaN	

5 rows × 21 columns

```
new_df.corr()
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-33-326e7bbec5b0> in <cell line: 1>()
----> 1 new_df.corr()

                                 3 frames
/usr/local/lib/python3.10/dist-packages/pandas/core/internals/managers.py in _interleave(self, dtype, na_value)
   1751             else:
   1752                 arr = blk.get_values(dtype)
-> 1753             result[rl.indexer] = arr
   1754             itemmask[rl.indexer] = 1
   1755 

ValueError: could not convert string to float: 'unknown'
```

Next steps: Explain error

```
new_df = pd.get_dummies(new_df, drop_first=True) # This will create dummy/indicator variables for categorical columns.
```

```
numeric_df = new_df.select_dtypes(include=['float64', 'int64'])
numeric_df.corr()
```

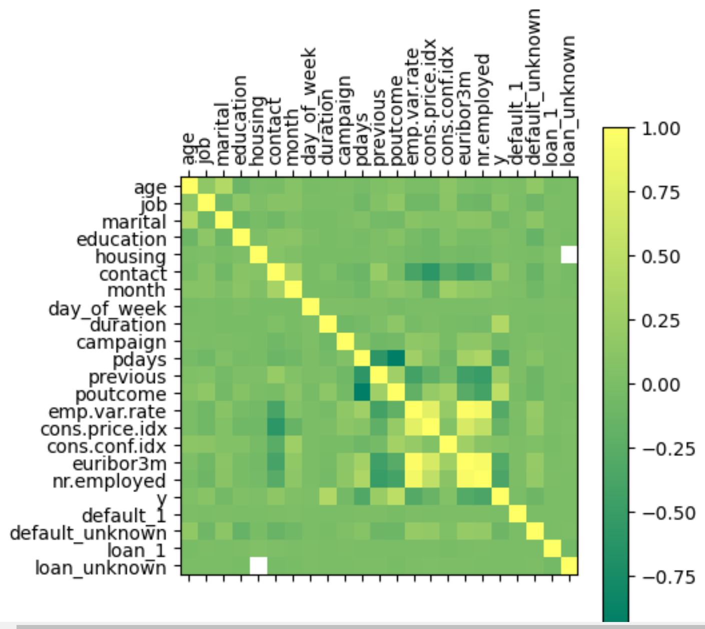
	age	job	marital	education	housing	contact	month	day_of_week	duration	campaign	pdays	pr
age	1.000000	0.150802	0.411703	-0.116074	-0.001636	-0.007021	0.077265	-0.018486	-0.000866	0.004594	-0.034369	0.
job	0.150802	1.000000	-0.072637	0.134969	0.009771	0.085828	0.086367	-0.002940	0.000821	-0.000159	-0.083395	0.
marital	0.411703	-0.072637	1.000000	-0.106687	-0.014681	-0.071159	0.017394	-0.010839	-0.007808	0.007624	0.042015	-0.
education	-0.116074	0.134969	-0.106687	1.000000	0.020255	0.096494	0.113639	0.007433	-0.016067	-0.001964	-0.028592	0.
housing	-0.001636	0.009771	-0.014681	0.020255	1.000000	0.083022	0.032084	-0.009083	-0.007806	-0.011168	-0.010649	0.
contact	-0.007021	0.085828	-0.071159	0.096494	0.083022	1.000000	0.324315	-0.019583	0.026657	-0.077368	-0.117970	0.
month	0.077265	0.086367	0.017394	0.113639	0.032084	0.324315	1.000000	-0.006959	-0.019302	-0.030635	-0.079556	0.
day_of_week	-0.018486	-0.002940	-0.010839	0.007433	-0.009083	-0.019583	-0.006959	1.000000	0.010549	0.015098	0.006765	0.
duration	-0.000866	0.000821	-0.007808	-0.016067	-0.007806	0.026657	-0.019302	0.010549	1.000000	-0.071699	-0.047577	0.
campaign	0.004594	-0.000159	0.007624	-0.001964	-0.011168	-0.077368	-0.030635	0.015098	-0.071699	1.000000	0.052584	-0.
pdays	-0.034369	-0.083395	0.042015	-0.028592	-0.010649	-0.117970	-0.079556	0.006765	-0.047577	0.052584	1.000000	-0.
previous	0.024365	0.066687	-0.048485	0.016876	0.021656	0.212848	0.063754	0.004013	0.020640	-0.079141	-0.587514	1.
poutcome	0.070651	0.155432	-0.052542	0.073859	0.000916	-0.007434	0.118006	-0.028250	0.130641	-0.058456	-0.936492	0.
emp.var.rate	-0.000371	-0.081441	0.099403	-0.028934	-0.060917	-0.393584	0.058874	-0.004401	-0.027968	0.150754	0.271004	-0.
cons.price.idx	0.000857	-0.070022	0.063013	-0.081933	-0.081396	-0.591474	-0.150350	-0.004586	0.005312	0.127836	0.078889	-0.
cons.conf.idx	0.129372	0.108297	0.056186	0.063389	-0.034167	-0.251614	0.264227	-0.000099	-0.008173	-0.013733	-0.091342	-0.
euribor3m	0.010767	-0.082316	0.109479	-0.019943	-0.059978	-0.399773	0.163411	-0.005552	-0.032897	0.135133	0.296899	-0.
nr.employed	-0.017725	-0.103960	0.102382	-0.017918	-0.046455	-0.269155	0.132697	-0.000734	-0.044703	0.144095	0.372605	-0.
y	0.030399	0.096900	-0.054133	0.038306	0.011662	0.144773	0.037187	0.010051	0.405274	-0.066357	-0.324914	0.

```
new_df.replace('unknown', np.nan, inplace=True) # Replace 'unknown' with NaN
new_df.corr()
```

	age	job	marital	education	housing	contact	month	day_of_week	duration	campaign	...	emp.v
age	1.000000	0.150802	0.411703	-0.116074	-0.001636	-0.007021	0.077265	-0.018486	-0.000866	0.004594	...	-0
job	0.150802	1.000000	-0.072637	0.134969	0.009771	0.085828	0.086367	-0.002940	0.000821	-0.000159	...	-0
marital	0.411703	-0.072637	1.000000	-0.106687	-0.014681	-0.071159	0.017394	-0.010839	-0.007808	0.007624	...	0
education	-0.116074	0.134969	-0.106687	1.000000	0.020255	0.096494	0.113639	0.007433	-0.016067	-0.001964	...	-0
housing	-0.001636	0.009771	-0.014681	0.020255	1.000000	0.083022	0.032084	-0.009083	-0.007806	-0.011168	...	-0
contact	-0.007021	0.085828	-0.071159	0.096494	0.083022	1.000000	0.324315	-0.019583	0.026657	-0.077368	...	-0
month	0.077265	0.086367	0.017394	0.113639	0.032084	0.324315	1.000000	-0.006959	-0.019302	-0.030635	...	0
day_of_week	-0.018486	-0.002940	-0.010839	0.007433	-0.009083	-0.019583	-0.006959	1.000000	0.010549	0.015098	...	-0
duration	-0.000866	0.000821	-0.007808	-0.016067	-0.007806	0.026657	-0.019302	0.010549	1.000000	-0.071699	...	-0
campaign	0.004594	-0.000159	0.007624	-0.001964	-0.011168	-0.077368	-0.030635	0.015098	-0.071699	1.000000	...	0
pdays	-0.034369	-0.083395	0.042015	-0.028592	-0.010649	-0.117970	-0.079556	0.006765	-0.047577	0.052584	...	0
previous	0.024365	0.066687	-0.048485	0.016876	0.021656	0.212848	0.063754	0.004013	0.020640	-0.079141	...	-0
poutcome	0.070651	0.155432	-0.052542	0.073859	0.000916	-0.007434	0.118006	-0.028250	0.130641	-0.058456	...	-0
emp.var.rate	-0.000371	-0.081441	0.099403	-0.028934	-0.060917	-0.393584	0.058874	-0.004401	-0.027968	0.150754	...	1
cons.price.idx	0.000857	-0.070022	0.063013	-0.081933	-0.081396	-0.591474	-0.150350	-0.004586	0.005312	0.127836	...	0
cons.conf.idx	0.129372	0.108297	0.056186	0.063389	-0.034167	-0.251614	0.264227	-0.000099	-0.008173	-0.013733	...	0
euribor3m	0.010767	-0.082316	0.109479	-0.019943	-0.059978	-0.399773	0.163411	-0.005552	-0.032897	0.135133	...	0
nr.employed	-0.017725	-0.103960	0.102382	-0.017918	-0.046455	-0.269155	0.132697	-0.000734	-0.044703	0.144095	...	0
y	0.030399	0.096900	-0.054133	0.038306	0.011662	0.144773	0.037187	0.010051	0.405274	-0.066357	...	-0
default_1	0.001891	-0.004664	0.005334	0.000525	-0.003524	0.006474	0.010003	-0.005923	-0.005101	-0.003803	...	0
default_unknown	0.165001	-0.094225	0.123565	-0.158554	-0.015793	-0.135604	-0.084801	-0.004040	-0.011588	0.033007	...	0
loan_1	-0.007198	0.007436	-0.004999	0.008268	0.046462	0.013367	-0.001696	0.001850	0.000121	0.005294	...	
loan_unknown	-0.001092	-0.005715	-0.000688	-0.006104	NaN	-0.022189	-0.011869	0.002607	-0.004897	-0.000396	...	0

23 rows × 23 columns

```
import matplotlib.pyplot as plt
%matplotlib inline
plt.matshow(new_df.corr(), cmap='summer')
plt.colorbar()
plt.xticks(list(range(len(new_df.columns))), new_df.columns,
rotation='vertical')
plt.yticks(list(range(len(new_df.columns))), new_df.columns,
rotation='horizontal')
plt.show()
```

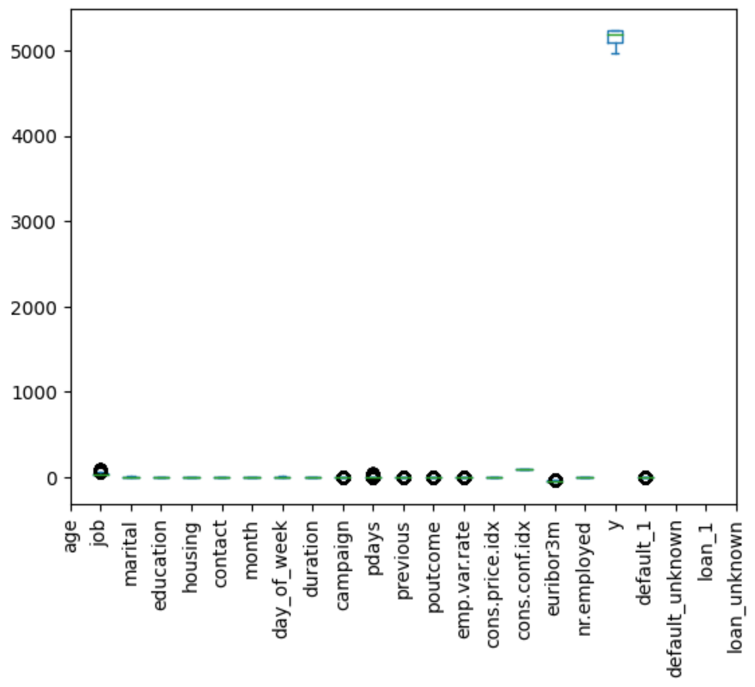


```
new_df.corr()["y"].sort_values(ascending=False)
```

	y
y	1.000000
poutcome	0.494368
duration	0.405274
previous	0.230181
contact	0.144773
job	0.096900
cons.conf.idx	0.054878
education	0.038306
month	0.037187
age	0.030399
housing	0.011662
day_of_week	0.010051
loan_unknown	-0.002270
default_1	-0.003041
loan_1	-0.004466
marital	-0.054133
campaign	-0.066357
default_unknown	-0.099293
cons.price.idx	-0.136211
emp.var.rate	-0.298334
euribor3m	-0.307771
pdays	-0.324914
nr.employed	-0.354678

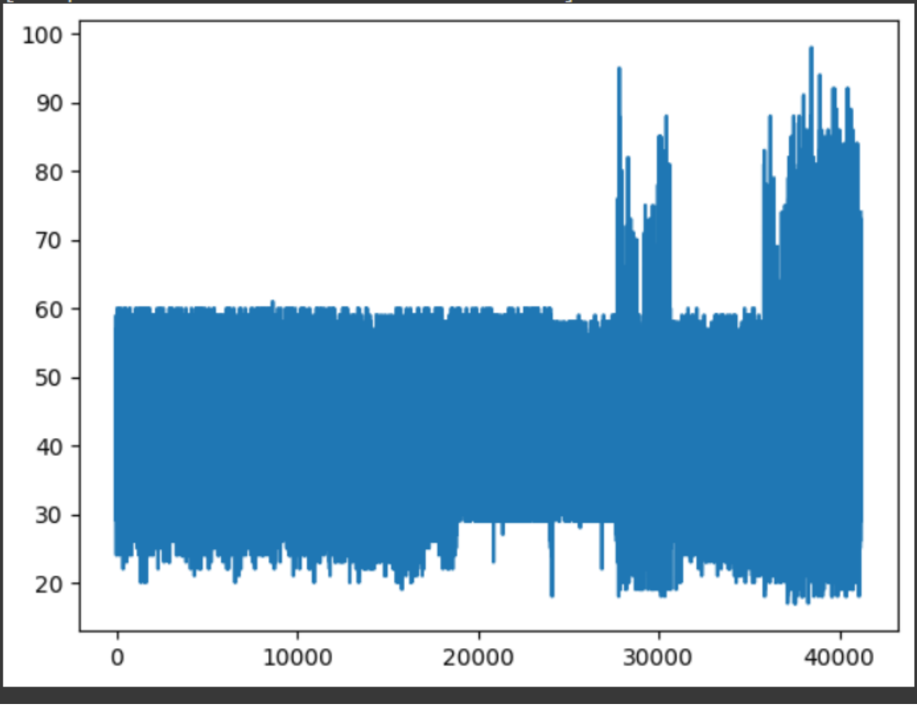
```
new_df.plot.box()
plt.xticks(list(range(len(new_df.columns))), new_df.columns,
rotation='vertical')
```

```
 <matplotlib.axis.XTick at 0x79e76aecd600>,
 <matplotlib.axis.XTick at 0x79e76af7f490>,
 <matplotlib.axis.XTick at 0x79e76af04ee0>,
 <matplotlib.axis.XTick at 0x79e76af05990>,
 <matplotlib.axis.XTick at 0x79e76af05150>,
 <matplotlib.axis.XTick at 0x79e76b0455d0>,
 <matplotlib.axis.XTick at 0x79e76b046da0>,
 <matplotlib.axis.XTick at 0x79e76b047b50>,
 <matplotlib.axis.XTick at 0x79e76af050f0>,
 <matplotlib.axis.XTick at 0x79e76b0462f0>,
 <matplotlib.axis.XTick at 0x79e76b0478e0>,
 <matplotlib.axis.XTick at 0x79e76aed83a0>,
 <matplotlib.axis.XTick at 0x79e76aeda2f0>,
 <matplotlib.axis.XTick at 0x79e76b044850>,
 <matplotlib.axis.XTick at 0x79e76aed9960>,
 <matplotlib.axis.XTick at 0x79e76aedb8e0>,
 <matplotlib.axis.XTick at 0x79e76aedad70>,
 <matplotlib.axis.XTick at 0x79e76aed8f40>,
 <matplotlib.axis.XTick at 0x79e76af7e110>,
 <matplotlib.axis.XTick at 0x79e76af7fac0>,
 <matplotlib.axis.XTick at 0x79e76af7d990>,
 <matplotlib.axis.XTick at 0x79e76af7d390>],
[Text(0, 0, 'age'),
 Text(1, 0, 'job'),
 Text(2, 0, 'marital'),
 Text(3, 0, 'education'),
 Text(4, 0, 'housing'),
 Text(5, 0, 'contact'),
 Text(6, 0, 'month'),
 Text(7, 0, 'day_of_week'),
 Text(8, 0, 'duration'),
 Text(9, 0, 'campaign'),
 Text(10, 0, 'pdays'),
 Text(11, 0, 'previous'),
 Text(12, 0, 'poutcome'),
 Text(13, 0, 'emp.var.rate'),
 Text(14, 0, 'cons.price.idx'),
 Text(15, 0, 'cons.conf.idx'),
 Text(16, 0, 'euribor3m'),
 Text(17, 0, 'nr.employed'),
 Text(18, 0, 'y'),
 Text(19, 0, 'default_1'),
 Text(20, 0, 'default_unknown'),
 Text(21, 0, 'loan_1'),
 Text(22, 0, 'loan_unknown')])
```



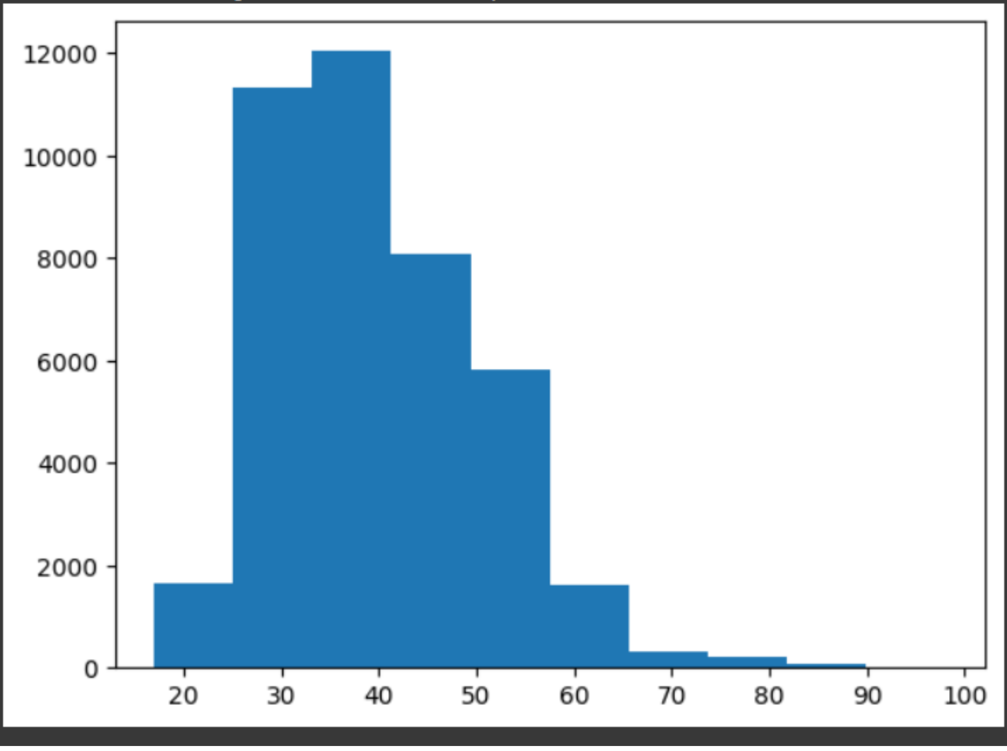
```
plt.plot(df.age.values) #line plot
```

```
[<matplotlib.lines.Line2D at 0x79e76aedf3a0>]
```



```
plt.hist(df.age.values) #histogram
```

```
(array([1.6660e+03, 1.1343e+04, 1.2037e+04, 8.0870e+03, 5.8230e+03,
        1.6130e+03, 3.1800e+02, 2.0200e+02, 8.9000e+01, 1.0000e+01]),
 array([17. , 25.1, 33.2, 41.3, 49.4, 57.5, 65.6, 73.7, 81.8, 89.9, 98. ]),
 <BarContainer object of 10 artists>)
```


12000
10000
8000
6000
4000
2000
0
20
30
40
50
60
70
80
90
100