```
import pandas as pd

data = {
    'Grade': ['A']*40 + ['B']*60,
    'Extracurricular': ['Yes']*30 + ['No']*10 + ['Yes']*20 + ['No']*40
}

df = pd.DataFrame(data)
```

```
df
```

	Grade	Extracurricular
0	A	Yes
1	A	Yes
2	A	Yes
3	A	Yes
4	A	Yes
...	...	...
95	B	No
96	B	No
97	B	No
98	B	No
99	B	No

100 rows × 2 columns

Marginal Probability

Q: Probability that a student got an "A"?

```
len(df)
```

```
100
```

```
len(df[df['Grade'] == "A"]) / len(df)
```

```
0.4
```

Conditional Probability

Q: Probability a student got an 'A' given they participate in extracurricular activities.

```
st_extra = df[df['Extracurricular'] == "Yes"]
st_no_extra = df[df['Extracurricular'] == "No"]
p_A_given_extra = len(st_extra[st_extra['Grade'] == "A"]) / len(st_extra)
p_A_given_extra
```

```
0.6
```

```
p_extra = len(df[df['Extracurricular'] == "Yes"]) / len(df)
p_extra
```

```
0.5
```

```
p_no_extra = 1 - p_extra
p_no_extra
```

```
0.5
```

```
p_A_given_extra = len(st_extra[st_extra['Grade'] == "A"]) / len(st_extra)
```

```
p_A_given_extra
```

```
0.6
```

```
p_A_given_no_extra = len(st_no_extra[st_no_extra['Grade'] == 'A']) / len(st_no_extra)
p_A_given_no_extra
```

```
0.2
```

```
p_total_A = p_A_given_extra * p_extra + p_A_given_no_extra * p_no_extra
p_total_A
```

```
0.4
```