```
import seaborn as sns
df = sns.load_dataset("flights")
df
```

	year	month	passengers
0	1949	Jan	112
1	1949	Feb	118
2	1949	Mar	132
3	1949	Apr	129
4	1949	May	121
...	...	...	...
139	1960	Aug	606
140	1960	Sep	508
141	1960	Oct	461
142	1960	Nov	390
143	1960	Dec	432

144 rows × 3 columns

```
df[(df.passengers > 400) & (df.year > 1955) & ((df.month == "Jul") | (df.month == "Aug"))].reset_index(drop="firs
```

	year	month	passengers
0	1956	Jul	413
1	1956	Aug	405
2	1957	Jul	465
3	1957	Aug	467
4	1958	Jul	491
5	1958	Aug	505
6	1959	Jul	548
7	1959	Aug	559
8	1960	Jul	622
9	1960	Aug	606

```
df.shape[0] - df.where(df.passengers > 400).isnull().sum() #subtract passengers where greater then 400
```

	0
year	28
month	28
passengers	28

dtype: int64

```
df.month = df.month.str.upper()
df
```

	year	month	passengers
0	1949	JAN	112
1	1949	FEB	118
2	1949	MAR	132
3	1949	APR	129
4	1949	MAY	121
...	...	...	...
139	1960	AUG	606
140	1960	SEP	508
141	1960	OCT	461
142	1960	NOV	390
143	1960	DEC	432

144 rows × 3 columns

```
df[df.month.str.contains('N')]
```

	year	month	passengers
0	1949	JAN	112
5	1949	JUN	135
10	1949	NOV	104
12	1950	JAN	115
17	1950	JUN	149
22	1950	NOV	114
24	1951	JAN	145
29	1951	JUN	178
34	1951	NOV	146
36	1952	JAN	171
41	1952	JUN	218
46	1952	NOV	172
48	1953	JAN	196
53	1953	JUN	243
58	1953	NOV	180
60	1954	JAN	204
65	1954	JUN	264
70	1954	NOV	203
72	1955	JAN	242
77	1955	JUN	315
82	1955	NOV	237
84	1956	JAN	284
89	1956	JUN	374
94	1956	NOV	271
96	1957	JAN	315
101	1957	JUN	422
106	1957	NOV	305
108	1958	JAN	340
113	1958	JUN	435
118	1958	NOV	310
120	1959	JAN	360

```
df.passengers.astype('str').str.join(".")
```

130	1959	NOV	362
132	1960	JAN	417
137	1960	JUN	535
142	1960	NOV	390

	passengers
0	1.1.2
1	1.1.8
2	1.3.2
3	1.2.9
4	1.2.1
...	...
139	6.0.6
140	5.0.8
141	4.6.1
142	3.9.0
143	4.3.2

144 rows × 1 columns

dtype: object

```
df.passengers.astype('str').str.join(".").str.contains(".")
```

	passengers
0	True
1	True
2	True
3	True
4	True
...	...
139	True
140	True
141	True
142	True
143	True

144 rows × 1 columns

dtype: bool

```
import pandas as pd
df['date'] = pd.to_datetime(df['year'].astype(str) + '-' + df['month'].astype(str), format = '%Y-%b')
df
```

	year	month	passengers	date
0	1949	JAN	112	1949-01-01
1	1949	FEB	118	1949-02-01
2	1949	MAR	132	1949-03-01
3	1949	APR	129	1949-04-01
4	1949	MAY	121	1949-05-01
...	...	...	...	...
139	1960	AUG	606	1960-08-01
140	1960	SEP	508	1960-09-01
141	1960	OCT	461	1960-10-01
142	1960	NOV	390	1960-11-01
143	1960	DEC	432	1960-12-01

144 rows × 4 columns

```
df['month_num'] = df['date'].dt.month
df['quarter'] = df['date'].dt.quarter
df['month-name'] = df["date"].dt.month_name()
df
```

	year	month	passengers	date	month_num	quarter	month-name
0	1949	JAN	112	1949-01-01	1	1	January
1	1949	FEB	118	1949-02-01	2	1	February
2	1949	MAR	132	1949-03-01	3	1	March
3	1949	APR	129	1949-04-01	4	2	April
4	1949	MAY	121	1949-05-01	5	2	May
...	...	...	...	...	...	...	...
139	1960	AUG	606	1960-08-01	8	3	August
140	1960	SEP	508	1960-09-01	9	3	September
141	1960	OCT	461	1960-10-01	10	4	October
142	1960	NOV	390	1960-11-01	11	4	November
143	1960	DEC	432	1960-12-01	12	4	December

144 rows × 7 columns

```
df.dtypes
```

	0
year	int64
month	object
passengers	int64
date	datetime64[ns]
month_num	int32
quarter	int32
month-name	object

dtype: object

```
pivot_df = df.pivot_table(values="passengers", index="year", columns="month",aggfunc="sum")
pivot_df
```

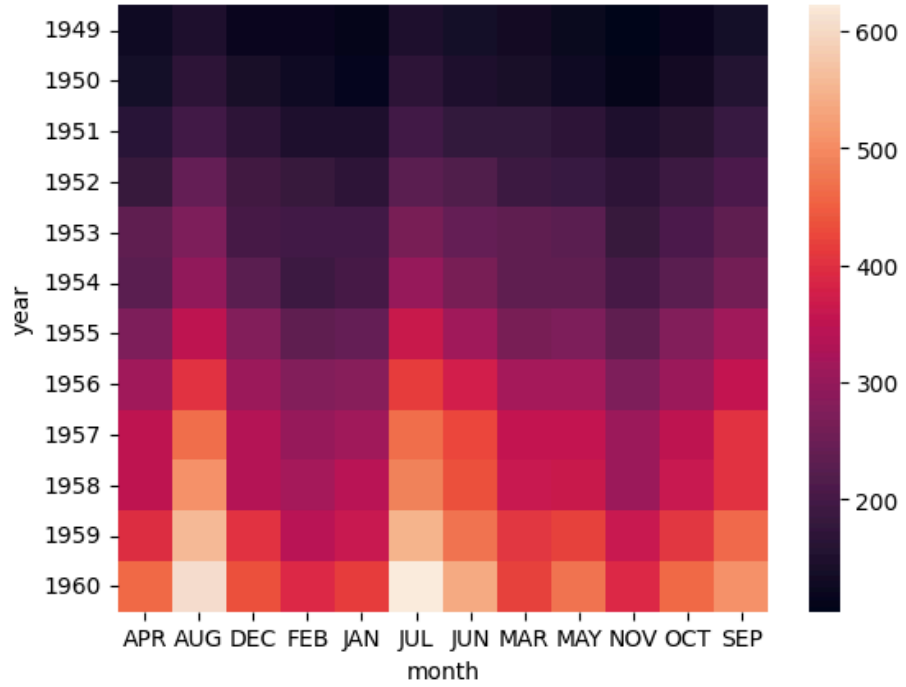
month	APR	AUG	DEC	FEB	JAN	JUL	JUN	MAR	MAY	NOV	OCT	SEP
year												
1949	129	148	118	118	112	148	135	132	121	104	119	136
1950	135	170	140	126	115	170	149	141	125	114	133	158
1951	163	199	166	150	145	199	178	178	172	146	162	184
1952	181	242	194	180	171	230	218	193	183	172	191	209
1953	235	272	201	196	196	264	243	236	229	180	211	237
1954	227	293	229	188	204	302	264	235	234	203	229	259
1955	269	347	278	233	242	364	315	267	270	237	274	312
1956	313	405	306	277	284	413	374	317	318	271	306	355
1957	348	467	336	301	315	465	422	356	355	305	347	404
1958	348	505	337	318	340	491	435	362	363	310	359	404
1959	396	559	405	342	360	548	472	406	420	362	407	463
1960	461	606	432	391	417	622	535	419	472	390	461	508

```
pivot_df.corr(numeric_only=True) #Correlation
```

month	APR	AUG	DEC	FEB	JAN	JUL	JUN	MAR	MAY	NOV	OC
month											
APR	1.000000	0.992308	0.990684	0.994752	0.995918	0.994981	0.994910	0.991589	0.998290	0.992867	0.99627
AUG	0.992308	1.000000	0.993931	0.995954	0.997479	0.997756	0.997674	0.994852	0.995219	0.997102	0.99742
DEC	0.990684	0.993931	1.000000	0.991053	0.991821	0.996202	0.994374	0.990635	0.993936	0.998601	0.99710
FEB	0.994752	0.995954	0.991053	1.000000	0.998247	0.994991	0.997296	0.991813	0.995039	0.994475	0.99640
JAN	0.995918	0.997479	0.991821	0.998247	1.000000	0.997717	0.998700	0.993215	0.996823	0.995648	0.99792
JUL	0.994981	0.997756	0.996202	0.994991	0.997717	1.000000	0.998211	0.991882	0.996357	0.997343	0.99898
JUN	0.994910	0.997674	0.994374	0.997296	0.998700	0.998211	1.000000	0.994923	0.995804	0.997113	0.99785
MAR	0.991589	0.994852	0.990635	0.991813	0.993215	0.991882	0.994923	1.000000	0.994742	0.994334	0.99231
MAY	0.998290	0.995219	0.993936	0.995039	0.996823	0.996357	0.995804	0.994742	1.000000	0.996645	0.99783
NOV	0.992867	0.997102	0.998601	0.994475	0.995648	0.997343	0.997113	0.994334	0.996645	1.000000	0.99856
OCT	0.996277	0.997429	0.997108	0.996401	0.997920	0.998987	0.997856	0.992312	0.997837	0.998563	1.00000
SEP	0.995188	0.997334	0.997680	0.995011	0.996372	0.998808	0.998527	0.994969	0.996724	0.998478	0.99856

```
sns.heatmap(pivot_df)
```

```
<Axes: xlabel='month', ylabel='year'>
```



JOINTS(COMBINING DATA FRAMES)

```
df7 = pd.DataFrame({
    "customer_id" : ['101', '102', '103', '104'],
    'category' : ["cat2", "cat2", "cat1", "cat3"],
    "important" : ["yes", "no", "yes", "yes"],
    "sales" : [123, 52, 214, 663]},index = [0,1,2,3]
```

```
                    )
df8 = pd.DataFrame({
    "customer_id" : ["101", "103", "104", "105"],
    "color" : ["yellow", "green", "green", "blue"],
    "distance" : [12,9,44,21],
    "sales" : [123,214,663,331]},index=[4,5,6,7]
                    )
df7
```

	customer_id	category	important	sales
0	101	cat2	yes	123
1	102	cat2	no	52
2	103	cat1	yes	214
3	104	cat3	yes	663

```
df8
```

	customer_id	color	distance	sales
4	101	yellow	12	123
5	103	green	9	214
6	104	green	44	663
7	105	blue	21	331

```
pd.concat([df7,df8], axis=0, sort=False)
```

	customer_id	category	important	sales	color	distance
0	101	cat2	yes	123	NaN	NaN
1	102	cat2	no	52	NaN	NaN
2	103	cat1	yes	214	NaN	NaN
3	104	cat3	yes	663	NaN	NaN
4	101	NaN	NaN	123	yellow	12.0
5	103	NaN	NaN	214	green	9.0
6	104	NaN	NaN	663	green	44.0
7	105	NaN	NaN	331	blue	21.0

```
pd.concat([df7,df8], axis=1, sort=False)
```

	customer_id	category	important	sales	customer_id	color	distance	sales
0	101	cat2	yes	123.0	NaN	NaN	NaN	NaN
1	102	cat2	no	52.0	NaN	NaN	NaN	NaN
2	103	cat1	yes	214.0	NaN	NaN	NaN	NaN
3	104	cat3	yes	663.0	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	101	yellow	12.0	123.0
5	NaN	NaN	NaN	NaN	103	green	9.0	214.0
6	NaN	NaN	NaN	NaN	104	green	44.0	663.0
7	NaN	NaN	NaN	NaN	105	blue	21.0	331.0

```
pd.concat([df7,df8], axis=0,join="inner", sort=False) #join is used in concat
```

	customer_id	sales
0	101	123
1	102	52
2	103	214
3	104	663
4	101	123
5	103	214
6	104	663
7	105	331

```
pd.concat([df7,df8], axis=0,join="outer", sort=False)
```

	customer_id	category	important	sales	color	distance
0	101	cat2	yes	123	NaN	NaN
1	102	cat2	no	52	NaN	NaN
2	103	cat1	yes	214	NaN	NaN
3	104	cat3	yes	663	NaN	NaN
4	101	NaN	NaN	123	yellow	12.0
5	103	NaN	NaN	214	green	9.0
6	104	NaN	NaN	663	green	44.0
7	105	NaN	NaN	331	blue	21.0

```
pd.concat([df7,df8],keys=["df7", "df8"], axis=0,names=["first_index", "second_index"])
```

		customer_id	category	important	sales	color	distance
first_index	second_index						
df7	0	101	cat2	yes	123	NaN	NaN
	1	102	cat2	no	52	NaN	NaN
	2	103	cat1	yes	214	NaN	NaN
	3	104	cat3	yes	663	NaN	NaN
df8	4	101	NaN	NaN	123	yellow	12.0
	5	103	NaN	NaN	214	green	9.0
	6	104	NaN	NaN	663	green	44.0
	7	105	NaN	NaN	331	blue	21.0

```
pd.concat([df7,df8],keys=["df7", "df8"], axis=0,names=["first_index", "second_index"],join="inner")
```

		customer_id	sales
first_index	second_index		
df7	0	101	123
	1	102	52
	2	103	214
	3	104	663
df8	4	101	123
	5	103	214
	6	104	663
	7	105	331

```
Start coding or generate with AI.
```

Merge and Join

```
pd.merge(df7,df8,how="outer",on=["customer_id", "sales"])
```

	customer_id	category	important	sales	color	distance
0	101	cat2	yes	123	yellow	12.0
1	102	cat2	no	52	NaN	NaN
2	103	cat1	yes	214	green	9.0
3	104	cat3	yes	663	green	44.0
4	105	NaN	NaN	331	blue	21.0

```
pd.merge(df7,df8,how="left",on=["customer_id", "sales"])
```

	customer_id	category	important	sales	color	distance
0	101	cat2	yes	123	yellow	12.0
1	102	cat2	no	52	NaN	NaN
2	103	cat1	yes	214	green	9.0
3	104	cat3	yes	663	green	44.0

```
pd.merge(df7,df8,how="right",on=["customer_id", "sales"])
```

	customer_id	category	important	sales	color	distance
0	101	cat2	yes	123	yellow	12
1	103	cat1	yes	214	green	9
2	104	cat3	yes	663	green	44
3	105	NaN	NaN	331	blue	21

```
df7.merge(df8, how="cross")
```

	customer_id_x	category	important	sales_x	customer_id_y	color	distance	sales_y
0	101	cat2	yes	123	101	yellow	12	123
1	101	cat2	yes	123	103	green	9	214
2	101	cat2	yes	123	104	green	44	663
3	101	cat2	yes	123	105	blue	21	331
4	102	cat2	no	52	101	yellow	12	123
5	102	cat2	no	52	103	green	9	214
6	102	cat2	no	52	104	green	44	663
7	102	cat2	no	52	105	blue	21	331
8	103	cat1	yes	214	101	yellow	12	123
9	103	cat1	yes	214	103	green	9	214
10	103	cat1	yes	214	104	green	44	663
11	103	cat1	yes	214	105	blue	21	331
12	104	cat3	yes	663	101	yellow	12	123
13	104	cat3	yes	663	103	green	9	214
14	104	cat3	yes	663	104	green	44	663
15	104	cat3	yes	663	105	blue	21	331

```
df9 = pd.DataFrame({
    "Q1" : [101,102,103],
    "Q2" : [201, 202, 203],
}, index = ["10", "11", "12"]
df10 = pd.DataFrame({
    "Q3" : [301, 302, 302],
    "Q4" : [401, 402, 403],
},index=["10", "12", "13"])
```

```
print(df9)
```

```
     Q1   Q2
10  101  201
11  102  202
12  103  203
     Q3   Q4
10  301  401
12  302  402
13  302  403
```

```
df9.join(df10, how="left")
```

	Q1	Q2	Q3	Q4
10	101	201	301.0	401.0
11	102	202	NaN	NaN
12	103	203	302.0	402.0

```
df9.join(df10, how="inner")
```

	Q1	Q2	Q3	Q4
10	101	201	301	401
12	103	203	302	402

```
df9.join(df10, how="outer")
```

	Q1	Q2	Q3	Q4
10	101.0	201.0	301.0	401.0
11	102.0	202.0	NaN	NaN
12	103.0	203.0	302.0	402.0
13	NaN	NaN	302.0	403.0

```
df9.join(df10, how="right")
```

	Q1	Q2	Q3	Q4