

Lab Cycle-3

```
import pandas as pd
df=pd.read_csv("/content/National_Universities_Rankings.csv")
```

1. Find the universities in which undergraduate students were admitted.
`df[df["Undergrad Enrollment"]>"0"]["Name"]`

Output:

```
0 Princeton University
1 Harvard University
2 University of Chicago
3 Yale University
4 Columbia University
...
226 University of Massachusetts--Dartmouth
227 University of Missouri--St. Louis
228 University of North Carolina--Greensboro
229 University of Southern Mississippi
230 Utah State University
Name: Name, Length: 231, dtype: object
```

2. List the states along with the cities in which universities located.
`print(df[['Name','Location']])`

Output:

Name	Location
0	Princeton University Princeton, NJ
1	Harvard University Cambridge, MA
2	University of Chicago Chicago, IL
3	Yale University New Haven, CT
4	Columbia University New York, NY
..	...
226	University of Massachusetts--Dartmouth North Dartmouth, MA
227	University of Missouri--St. Louis St. Louis, MO
228	University of North Carolina--Greensboro Greensboro, NC
229	University of Southern Mississippi Hattiesburg, MS
230	Utah State University Logan, UT

[231 rows x 2 columns]

3. List the cities & universities under each state.

```
df[['city','state']]=df.Location.str.split(', ',expand=True)
a=df.groupby(['state'])
l=df['state'].unique()
for i in l:
    print("state:",i)
```

```
print(a.get_group(i)[['city','Name']])
```

Output:

state: NJ

	city	Name
0	Princeton	Princeton University
69	Piscataway	Rutgers University--New Brunswick
71	Hoboken	Stevens Institute of Technology
118	South Orange	Seton Hall University
137	Newark	New Jersey Institute of Technology
138	Newark	Rutgers University--Newark
178	Montclair	Montclair State University

state: MA

	city	Name
1	Cambridge	Harvard University
6	Cambridge	Massachusetts Institute of Technology
26	Medford	Tufts University
30	Chestnut Hill	Boston College
33	Waltham	Brandeis University
38	Boston	Boston University
39	Boston	Northeastern University
64	Worcester	Worcester Polytechnic Institute
74	Worcester	Clark University
76	Amherst	University of Massachusetts--Amherst
157	Lowell	University of Massachusetts--Lowell
191	Boston	Suffolk University
197	Cambridge	Lesley University
225	Boston	University of Massachusetts--Boston
226	North Dartmouth	University of Massachusetts--Dartmouth

state: IL

	city	Name
2	Chicago	University of Chicago
12	Evanston	Northwestern University
46	Champaign	University of Illinois--Urbana-Champaign
99	Chicago	Loyola University Chicago
102	Chicago	Illinois Institute of Technology
124	Chicago	DePaul University
151	Normal	Illinois State University
155	Chicago	University of Illinois--Chicago
215	DeKalb	Northern Illinois University
217	Carbondale	Southern Illinois University--Carbondale
219	Lisle	Benedictine University

state: CT

	city	Name
3	New Haven	Yale University
62	Storrs	University of Connecticut
192	West Hartford	University of Hartford

state: NY

	city	Name
4	New York	Columbia University
14	Ithaca	Cornell University

32	Rochester	University of Rochester
35	New York	New York University
40	Troy	Rensselaer Polytechnic Institute
59	New York	Fordham University
61	Syracuse	Syracuse University
66	New York	Yeshiva University
85	Binghamton	Binghamton University--SUNY
97	Stony Brook	Stony Brook University--SUNY
100	Syracuse	SUNY College of Environmental Science and Fore...
101	Buffalo	University at Buffalo--SUNY
106	Rochester	Rochester Institute of Technology
129	Potsdam	Clarkson University
131	New York	New School
132	Hempstead	Hofstra University
145	Garden City	Adelphi University
148	Rochester	St. John Fisher College
149	Albany	University at Albany--SUNY
166	Queens	St. John's University
189	New York	Pace University

state: CA

	city	Name
5	Stanford	Stanford University
11	Pasadena	California Institute of Technology
21	Berkeley	University of California--Berkeley
22	Los Angeles	University of Southern California
24	Los Angeles	University of California--Los Angeles
37	Santa Barbara	University of California--Santa Barbara
42	Irvine	University of California--Irvine
44	Davis	University of California--Davis
45	La Jolla	University of California--San Diego
49	Malibu	Pepperdine University
79	Santa Cruz	University of California--Santa Cruz
89	San Diego	University of San Diego
108	San Francisco	University of San Francisco
115	Stockton	University of the Pacific
120	Riverside	University of California--Riverside
147	San Diego	San Diego State University
154	Merced	University of California--Merced
156	La Verne	University of La Verne
163	La Mirada	Biola University
183	Azusa	Azusa Pacific University
201	Fullerton	California State University--Fullerton
220	Fresno	California State University--Fresno

state: NC

	city	Name
7	Durham	Duke University
28	Winston-Salem	Wake Forest University
29	Chapel Hill	University of North Carolina--Chapel Hill
92	Raleigh	North Carolina State University--Raleigh
206	Charlotte	University of North Carolina--Charlotte

209 Greenville East Carolina University
221 Boiling Springs Gardner-Webb University
228 Greensboro University of North Carolina--Greensboro
state: PA

	city	Name
8	Philadelphia	University of Pennsylvania
23	Pittsburgh	Carnegie Mellon University
43	Bethlehem	Lehigh University
51	Villanova	Villanova University
52	University Park	Pennsylvania State University--University Park
68	Pittsburgh	University of Pittsburgh
95	Philadelphia	Drexel University
119	Philadelphia	Temple University
125	Pittsburgh	Duquesne University
152	Immaculata	Immaculata University
186	Chester	Widener University
190	Moon Township	Robert Morris University

state: MD

	city	Name
9	Baltimore	Johns Hopkins University
63	College Park	University of Maryland--College Park
160	Baltimore	University of Maryland--Baltimore County

state: NH

	city	Name
10	Hanover	Dartmouth College
107	Durham	University of New Hampshire

state: RI

	city	Name
13	Providence	Brown University
161	Kingston	University of Rhode Island

state: TX

	city	Name
15	Houston	Rice University
56	Dallas	Southern Methodist University
58	Austin	University of Texas--Austin
70	Waco	Baylor University
75	College Station	Texas A&M University--College Station
83	Fort Worth	Texas Christian University
150	Richardson	University of Texas--Dallas
179	Lubbock	Texas Tech University
194	Houston	University of Houston
214	Dallas	Dallas Baptist University

state: IN

	city	Name
16	Notre Dame	University of Notre Dame
60	West Lafayette	Purdue University--West Lafayette
86	Bloomington	Indiana University--Bloomington
175	Muncie	Ball State University
196	Indianapolis	Indiana University-Purdue University--Indianap...

state: TN

	city	Name
17	Nashville	Vanderbilt University
105	Knoxville	University of Tennessee
168	Jackson	Union University
176	Nashville	Lipscomb University
224	Cookeville	Tennessee Technological University

state: MO

	city	Name
18	St. Louis	Washington University in St. Louis
96	St. Louis	Saint Louis University
112	Columbia	University of Missouri
164	St Louis	Maryville University of St. Louis
165	Rolla	Missouri University of Science & Technology
212	Kansas City	University of Missouri--Kansas City
227	St. Louis	University of Missouri--St. Louis

state: GA

	city	Name
19	Atlanta	Emory University
34	Atlanta	Georgia Institute of Technology
57	Athens	University of Georgia
136	Macon	Mercer University

state: DC

	city	Name
20	Washington	Georgetown University
55	Washington	George Washington University
73	Washington	American University
123	Washington	The Catholic University of America
126	Washington	Howard University

state: VA

	city	Name
25	Charlottesville	University of Virginia
31	Williamsburg	College of William & Mary
77	Blacksburg	Virginia Tech
142	Fairfax	George Mason University
167	Richmond	Virginia Commonwealth University
211	Norfolk	Old Dominion University
223	Winchester	Shenandoah University

state: MI

	city	Name
27	Ann Arbor	University of Michigan--Ann Arbor
82	East Lansing	Michigan State University
117	Houghton	Michigan Technological University
182	Berrien Springs	Andrews University
195	Kalamazoo	Western Michigan University
202	Mount Pleasant	Central Michigan University

state: OH

	city	Name
36	Cleveland	Case Western Reserve University
53	Columbus	Ohio State University--Columbus
78	Oxford	Miami University--Oxford

111 Dayton University of Dayton
140 Cincinnati University of Cincinnati
146 Athens Ohio University
187 Kent Kent State University
193 Bowling Green Bowling Green State University
213 Ashland Ashland University

state: LA

city	Name
41 New Orleans	Tulane University
135 Baton Rouge	Louisiana State University--Baton Rouge
203 Ruston	Louisiana Tech University

state: FL

city	Name
47 Coral Gables	University of Miami
50 Gainesville	University of Florida
91 Tallahassee	Florida State University
162 Tampa	University of South Florida
171 Melbourne	Florida Institute of Technology
180 Orlando	University of Central Florida
216 Ft. Lauderdale	Nova Southeastern University

state: WI

city	Name
48 Madison	University of Wisconsin--Madison
87 Milwaukee	Marquette University
170 Madison	Edgewood College

state: WA

city	Name
54 Seattle	University of Washington
144 Pullman	Washington State University
158 Seattle	Seattle Pacific University

state: SC

city	Name
65 Clemson	Clemson University
109 Columbia	University of South Carolina

state: UT

city	Name
67 Provo	Brigham Young University--Provo
116 Salt Lake City	University of Utah
230 Logan	Utah State University

state: MN

city	Name
72 Minneapolis	University of Minnesota--Twin Cities
122 St. Paul	University of St. Thomas

state: DE

city	Name
80 Newark	University of Delaware

state: CO

city	Name
81 Golden	Colorado School of Mines
88 Denver	University of Denver

93 Boulder University of Colorado--Boulder
130 Fort Collins Colorado State University
199 Denver University of Colorado--Denver
state: IA
city Name
84 Iowa City University of Iowa
110 Ames Iowa State University
state: OK
city Name
90 Tulsa University of Tulsa
114 Norman University of Oklahoma
153 Stillwater Oklahoma State University
state: VT
city Name
94 Burlington University of Vermont
state: AL
city Name
98 Auburn Auburn University
103 Tuscaloosa University of Alabama
159 Birmingham University of Alabama--Birmingham
198 Huntsville University of Alabama--Huntsville
state: OR
city Name
104 Eugene University of Oregon
143 Corvallis Oregon State University
state: NE
city Name
113 Lincoln University of Nebraska--Lincoln
state: KS
city Name
121 Lawrence University of Kansas
134 Manhattan Kansas State University
state: AZ
city Name
127 Tucson University of Arizona
128 Tempe Arizona State University--Tempe
state: KY
city Name
133 Lexington University of Kentucky
173 Louisville University of Louisville
state: AR
city Name
139 Fayetteville University of Arkansas
state: MS
city Name
141 University University of Mississippi
177 Mississippi State Mississippi State University
229 Hattiesburg University of Southern Mississippi
state: HI
city Name

169 Honolulu University of Hawaii--Manoa
state: ID
city Name
172 Moscow University of Idaho
state: WY
city Name
174 Laramie University of Wyoming
state: NM
city Name
181 Albuquerque University of New Mexico
222 Las Cruces New Mexico State University
state: ME
city Name
184 Orono University of Maine
state: WV
city Name
185 Morgantown West Virginia University
state: ND
city Name
188 Fargo North Dakota State University
207 Grand Forks University of North Dakota
state: NV
city Name
200 Reno University of Nevada--Reno
state: SD
city Name
204 Brookings South Dakota State University
208 Vermillion University of South Dakota
state: AK
city Name
205 Fairbanks University of Alaska--Fairbanks
state: MT
city Name
210 Bozeman Montana State University
218 Missoula University of Montana

4. How many universities in each state have ranking<50? Print them along with ranking.

```
a=df.groupby('state')
l=df['state'].unique()
for i in l:
    s=a.get_group(i)[['Name','Rank']]
    s=s[s['Rank']<50]
    if s.empty==False:
        print("State:",i)
        print(s)
```

Output:

State: NJ

Name Rank
0 Princeton University 1
State: MA

Name Rank
1 Harvard University 2
6 Massachusetts Institute of Technology 7
26 Tufts University 27
30 Boston College 31
33 Brandeis University 34
38 Boston University 39
39 Northeastern University 39
State: IL

Name Rank
2 University of Chicago 3
12 Northwestern University 12
46 University of Illinois--Urbana-Champaign 44
State: CT

Name Rank
3 Yale University 3
State: NY

Name Rank
4 Columbia University 5
14 Cornell University 15
32 University of Rochester 32
35 New York University 36
40 Rensselaer Polytechnic Institute 39
State: CA

Name Rank
5 Stanford University 5
11 California Institute of Technology 12
21 University of California--Berkeley 20
22 University of Southern California 23
24 University of California--Los Angeles 24
37 University of California--Santa Barbara 37
42 University of California--Irvine 39
44 University of California--Davis 44
45 University of California--San Diego 44
State: NC

Name Rank
7 Duke University 8
28 Wake Forest University 27
29 University of North Carolina--Chapel Hill 30
State: PA

Name Rank
8 University of Pennsylvania 8
23 Carnegie Mellon University 24
43 Lehigh University 44
State: MD

Name Rank
9 Johns Hopkins University 10

State: NH

	Name	Rank
10	Dartmouth College	11

State: RI

	Name	Rank
13	Brown University	14

State: TX

	Name	Rank
15	Rice University	15

State: IN

	Name	Rank
16	University of Notre Dame	15

State: TN

	Name	Rank
17	Vanderbilt University	15

State: MO

	Name	Rank
18	Washington University in St. Louis	19

State: GA

	Name	Rank
19	Emory University	20
34	Georgia Institute of Technology	34

State: DC

	Name	Rank
20	Georgetown University	20

State: VA

	Name	Rank
25	University of Virginia	24
31	College of William & Mary	32

State: MI

	Name	Rank
27	University of Michigan--Ann Arbor	27

State: OH

	Name	Rank
36	Case Western Reserve University	37

State: LA

	Name	Rank
41	Tulane University	39

State: FL

	Name	Rank
47	University of Miami	44

State: WI

	Name	Rank
48	University of Wisconsin--Madison	44

5. How many universities have both out-of state and in-state students?

```
print("number of universities have both out-of state and in-  
state students",len(df[(df["Tuition and fees"].isnull()==False)&(df["In-  
state"].isnull()==False)]))
```

Output:

number of universities have both out-of state and in-state students 133

6. How many universities have marginal difference $\leq \$5000$ in in-state & out-of state tuition fees.

```
k=df[(df["Tuition and fees"].isnull()==False)&(df["In-state"].isnull()==False)]
l1=k["Tuition and fees"].str.replace(',','').str.split('$',expand=True)
l1=l1[1].astype('int64')
l2=k["In-state"].str.replace(',','').str.split('$',expand=True)
l2=l2[1].astype('int64')
c=len(k[(l1-l2)<=5000])
print("Number of universities that have marginal difference<=$5000 in in-state &out-
of state tuition fees are:",c)
```

Output:

Number of universities that have marginal difference $\leq \$5000$ in in-state & out-of state tuition fees are: 2

7. List the universities having tuition fee $> \$15000$ and rank between 120 to 170

```
k=df["Tuition and fees"].str.replace(',','').str.split('$',expand=True)
l=k[1].astype('int64')
df[(l>15000)&((df['Rank']>=120)&(df['Rank']<=170))]['Name']
```

Output:

123 The Catholic University of America 124 DePaul University 125 Duquesne University
126 Howard University 127 University of Arizona 128 Arizona State University--Tempe 129
Clarkson University 130 Colorado State University 131 New School 132 Hofstra University
133 University of Kentucky 134 Kansas State University 135 Louisiana State University--
Baton Rouge 136 Mercer University 137 New Jersey Institute of Technology 138 Rutgers
University--Newark 139 University of Arkansas 140 University of Cincinnati 141 University
of Mississippi 142 George Mason University 143 Oregon State University 144 Washington
State University 145 Adelphi University 146 Ohio University 147 San Diego State University
148 St. John Fisher College 149 University at Albany--SUNY 150 University of Texas--
Dallas 151 Illinois State University 152 Immaculata University 153 Oklahoma State
University 154 University of California--Merced 155 University of Illinois--Chicago 156
University of La Verne 157 University of Massachusetts--Lowell 158 Seattle Pacific
University 159 University of Alabama--Birmingham 160 University of Maryland--Baltimore
County 161 University of Rhode Island 162 University of South Florida 163 Biola University
164 Maryville University of St. Louis 165 Missouri University of Science & Technology 166
St. John's University 167 Virginia Commonwealth University 168 Union University 169
University of Hawaii--Manoa Name: Name, dtype: object

8. Find the campuses of universities located in different cities (multiple cities)

```
df[['university','branch']]=df.Name.str.split('--',expand=True)
l=df.university.unique()
```

```
a=df.groupby('university')
for i in l:
    b=a.get_group(i)[['university','branch']]
    b=b[b['branch'].isna()==False]
    if b.empty==False:
        print(b)
```

Output:

```
university    branch
21 University of California    Berkeley
24 University of California    Los Angeles
37 University of California    Santa Barbara
42 University of California    Irvine
44 University of California    Davis
45 University of California    San Diego
79 University of California    Santa Cruz
120 University of California    Riverside
154 University of California    Merced
university    branch
27 University of Michigan    Ann Arbor
university    branch
29 University of North Carolina    Chapel Hill
206 University of North Carolina    Charlotte
228 University of North Carolina    Greensboro
university    branch
46 University of Illinois    Urbana-Champaign
155 University of Illinois    Chicago
university    branch
48 University of Wisconsin    Madison
university    branch
52 Pennsylvania State University    University Park
university    branch
53 Ohio State University    Columbus
university    branch
58 University of Texas    Austin
150 University of Texas    Dallas
university    branch
60 Purdue University    West Lafayette
university    branch
63 University of Maryland    College Park
160 University of Maryland    Baltimore County
university    branch
67 Brigham Young University    Provo
university    branch
69 Rutgers University    New Brunswick
138 Rutgers University    Newark
university    branch
72 University of Minnesota    Twin Cities
university    branch
```

- 75 Texas A&M University College Station
university branch
- 76 University of Massachusetts Amherst
- 157 University of Massachusetts Lowell
- 225 University of Massachusetts Boston
- 226 University of Massachusetts Dartmouth
university branch
- 78 Miami University Oxford
university branch
- 85 Binghamton University SUNY
university branch
- 86 Indiana University Bloomington
university branch
- 92 North Carolina State University Raleigh
university branch
- 93 University of Colorado Boulder
- 199 University of Colorado Denver
university branch
- 97 Stony Brook University SUNY
university branch
- 101 University at Buffalo SUNY
university branch
- 159 University of Alabama Birmingham
- 198 University of Alabama Huntsville
university branch
- 212 University of Missouri Kansas City
- 227 University of Missouri St. Louis
university branch
- 113 University of Nebraska Lincoln
university branch
- 128 Arizona State University Tempe
university branch
- 135 Louisiana State University Baton Rouge
university branch
- 149 University at Albany SUNY
university branch
- 169 University of Hawaii Manoa
university branch
- 196 Indiana University-Purdue University Indianapolis
university branch
- 200 University of Nevada Reno
university branch
- 201 California State University Fullerton
- 220 California State University Fresno
university branch
- 205 University of Alaska Fairbanks
university branch
- 217 Southern Illinois University Carbondale

9. Mention the states where out-of state fee is more than in-state students. Print Maximum and Minimum fees.

```
print(df[df['Tuition and fees']>df['In-state']][['state']].unique())  
print("Maximum fees:",max(df['Tuition and fees']))  
print("minimum fees:",min(df['Tuition and fees']))
```

Output:

```
['CA' 'VA' 'MI' 'GA' 'IL' 'WI' 'PA' 'OH' 'WA' 'IN' 'CT' 'MD'  
'SC' 'NJ' 'MN' 'TX' 'MA' 'DE' 'CO' 'VT' 'AL' 'OR' 'TN' 'NH'  
'KS' 'AZ' 'KY' 'RI' 'HI' 'ME' 'MO']
```

Maximum fees: \$55,056

minimum fees: \$11,403

10. Find the cities locating top 100 universities.

```
df[df['Rank']<=100][['city']]
```

Output:

	city
0	Princeton
1	Cambridge
2	Chicago
3	New Haven
4	New York
5	Stanford
6	Cambridge
7	Durham
8	Philadelphia
9	Baltimore
10	Hanover
11	Pasadena
12	Evanston
13	Providence
14	Ithaca
15	Houston

city

- | | |
|----|-----------------|
| 16 | Notre Dame |
| 17 | Nashville |
| 18 | St. Louis |
| 19 | Atlanta |
| 20 | Washington |
| 21 | Berkeley |
| 22 | Los Angeles |
| 23 | Pittsburgh |
| 24 | Los Angeles |
| 25 | Charlottesville |
| 26 | Medford |
| 27 | Ann Arbor |
| 28 | Winston-Salem |
| 29 | Chapel Hill |
| 30 | Chestnut Hill |
| 31 | Williamsburg |
| 32 | Rochester |
| 33 | Waltham |
| 34 | Atlanta |
| 35 | New York |
| 36 | Cleveland |
| 37 | Santa Barbara |
| 38 | Boston |
| 39 | Boston |
| 40 | Troy |

city

41	New Orleans
42	Irvine
43	Bethlehem
44	Davis
45	La Jolla
46	Champaign
47	Coral Gables
48	Madison
49	Malibu
50	Gainesville
51	Villanova
52	University Park
53	Columbus
54	Seattle
55	Washington
56	Dallas
57	Athens
58	Austin
59	New York
60	West Lafayette
61	Syracuse
62	Storrs
63	College Park
64	Worcester
65	Clemson

	city
66	New York
67	Provo
68	Pittsburgh
69	Piscataway
70	Waco
71	Hoboken
72	Minneapolis
73	Washington
74	Worcester
75	College Station
76	Amherst
77	Blacksburg
78	Oxford
79	Santa Cruz
80	Newark
81	Golden
82	East Lansing
83	Fort Worth
84	Iowa City
85	Binghamton
86	Bloomington
87	Milwaukee
88	Denver
89	San Diego
90	Tulsa

	city
91	Tallahassee
92	Raleigh
93	Boulder
94	Burlington
95	Philadelphia
96	St. Louis
97	Stony Brook
98	Auburn
99	Chicago
100	Syracuse
101	Buffalo

11. Find universities with least no of undergraduate students & highest no of graduate students.

```
print("university with highest number of graduate students")
print(df[df['Undergrad Enrollment']==min(df['Undergrad Enrollment'])[['Name']])
print("university with highest number of graduate students")
print(df[df['Undergrad Enrollment']==max(df['Undergrad Enrollment'])[['Name']])
```

Output:

```
university with highest number of graduate students
      Name
11  California Institute of Technology
university with highest number of graduate students
      Name
224  Tennessee Technological University
```

12. Identifying correlations between enrollment numbers and university rank.

```
df['Undergrad Enrollment']=df['Undergrad Enrollment'].str.replace(',', '')
df['Undergrad Enrollment']=df['Undergrad Enrollment'].astype('int64')
df['Undergrad Enrollment'].corr(df.Rank)
```

Output:

```
-0.04077093578774782
```