Merge

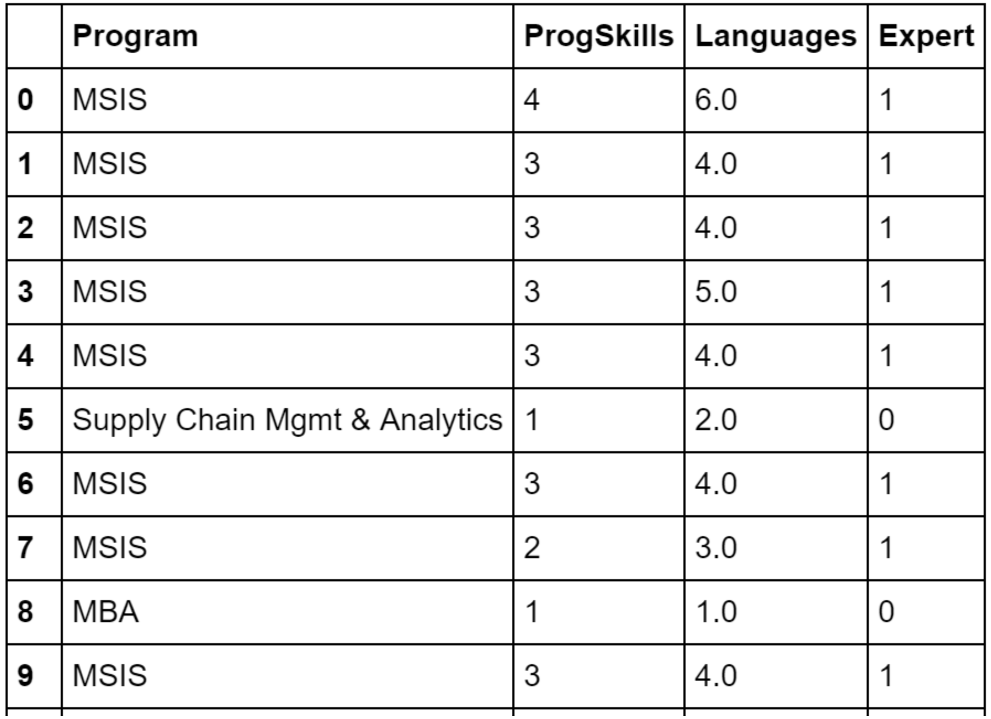
module 7

Announcement

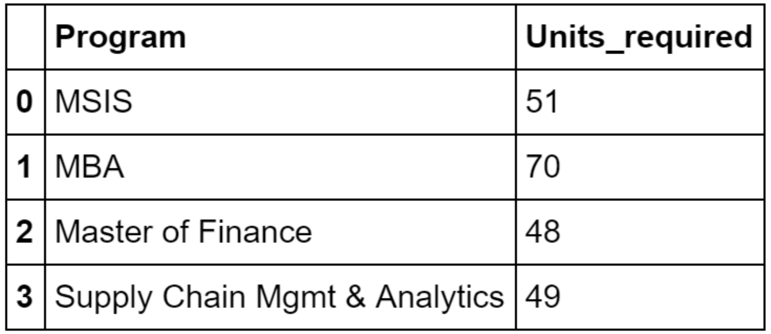
- **E-mail me your top 3 dataset candidates for your Final Project**
  - **URLs**
  - **High level description on data set**
  - **High level ideas what type of unexpected/interesting things you want to look for**
- **Quiz 3 today!**
- **Quiz 4 .groupby() and .merge() 5/4**
- **HW5 due 3/2 (Sat.)**

Merge

- Goal: retrieve information from a table to another



	Program	ProgSkills	Languages	Expert
0	MSIS	4	6.0	1
1	MSIS	3	4.0	1
2	MSIS	3	4.0	1
3	MSIS	3	5.0	1
4	MSIS	3	4.0	1
5	Supply Chain Mgmt & Analytics	1	2.0	0
6	MSIS	3	4.0	1
7	MSIS	2	3.0	1
8	MBA	1	1.0	0
9	MSIS	3	4.0	1



	Program	Units_required
0	MSIS	51
1	MBA	70
2	Master of Finance	48
3	Supply Chain Mgmt & Analytics	49

We want to bring the information on the units required from the table on the right to the table on the left

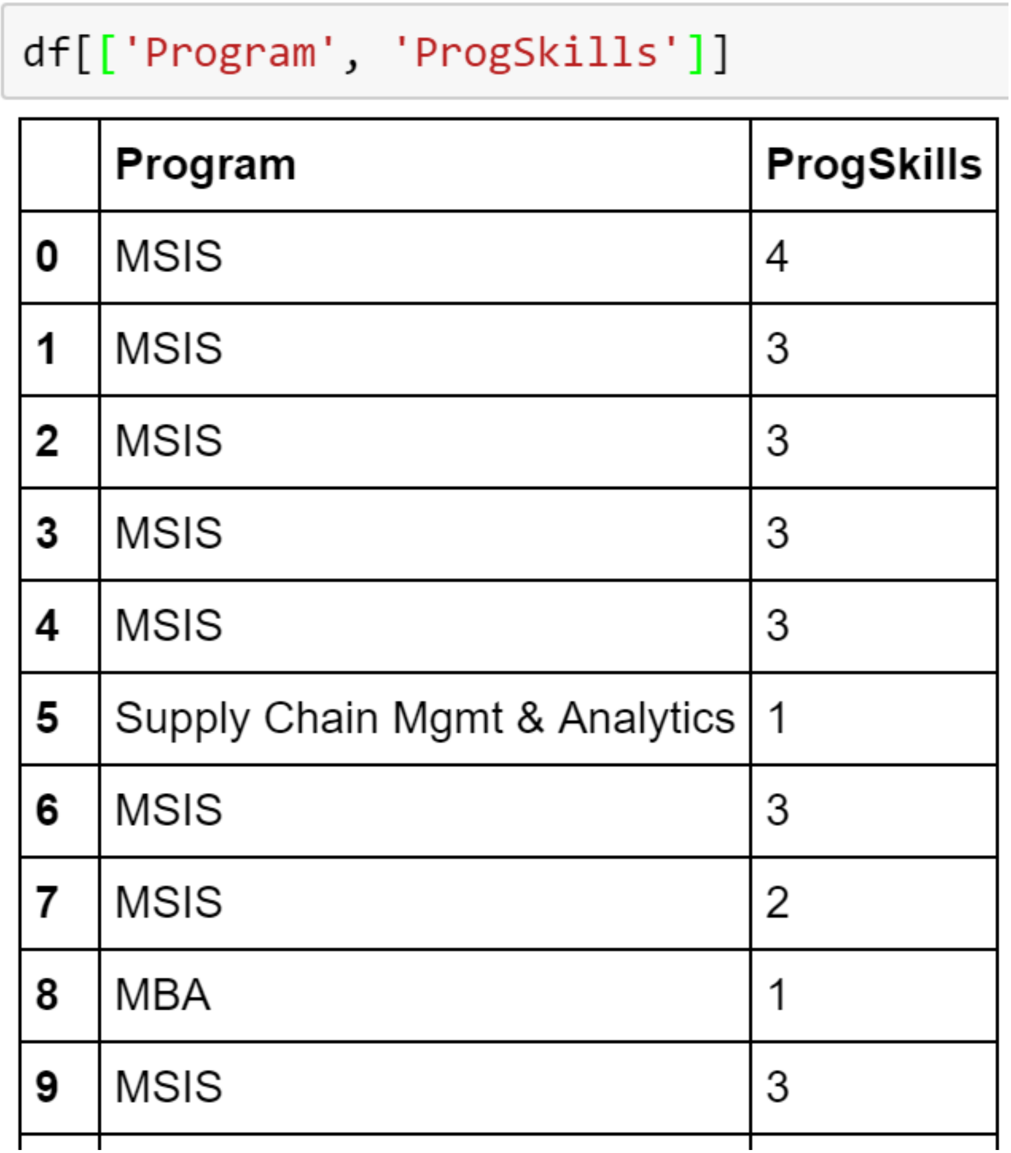
Today’s data set

- cleaned_survey.csv

Merge on columns

df

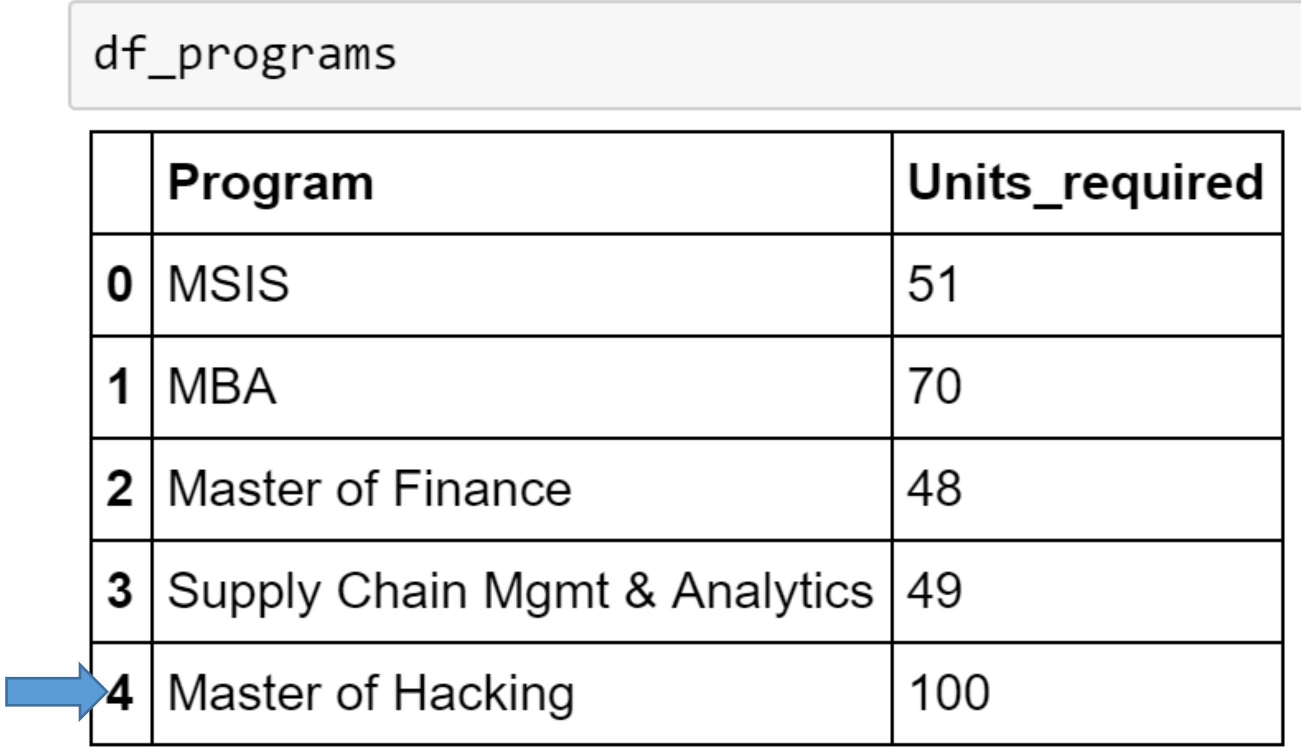
One row per student =>



```
df[['Program', 'ProgSkills']]
```

	Program	ProgSkills
0	MSIS	4
1	MSIS	3
2	MSIS	3
3	MSIS	3
4	MSIS	3
5	Supply Chain Mgmt & Analytics	1
6	MSIS	3
7	MSIS	2
8	MBA	1
9	MSIS	3

df_programs



```
df_programs
```

	Program	Units_required
0	MSIS	51
1	MBA	70
2	Master of Finance	48
3	Supply Chain Mgmt & Analytics	49
4	Master of Hacking	100

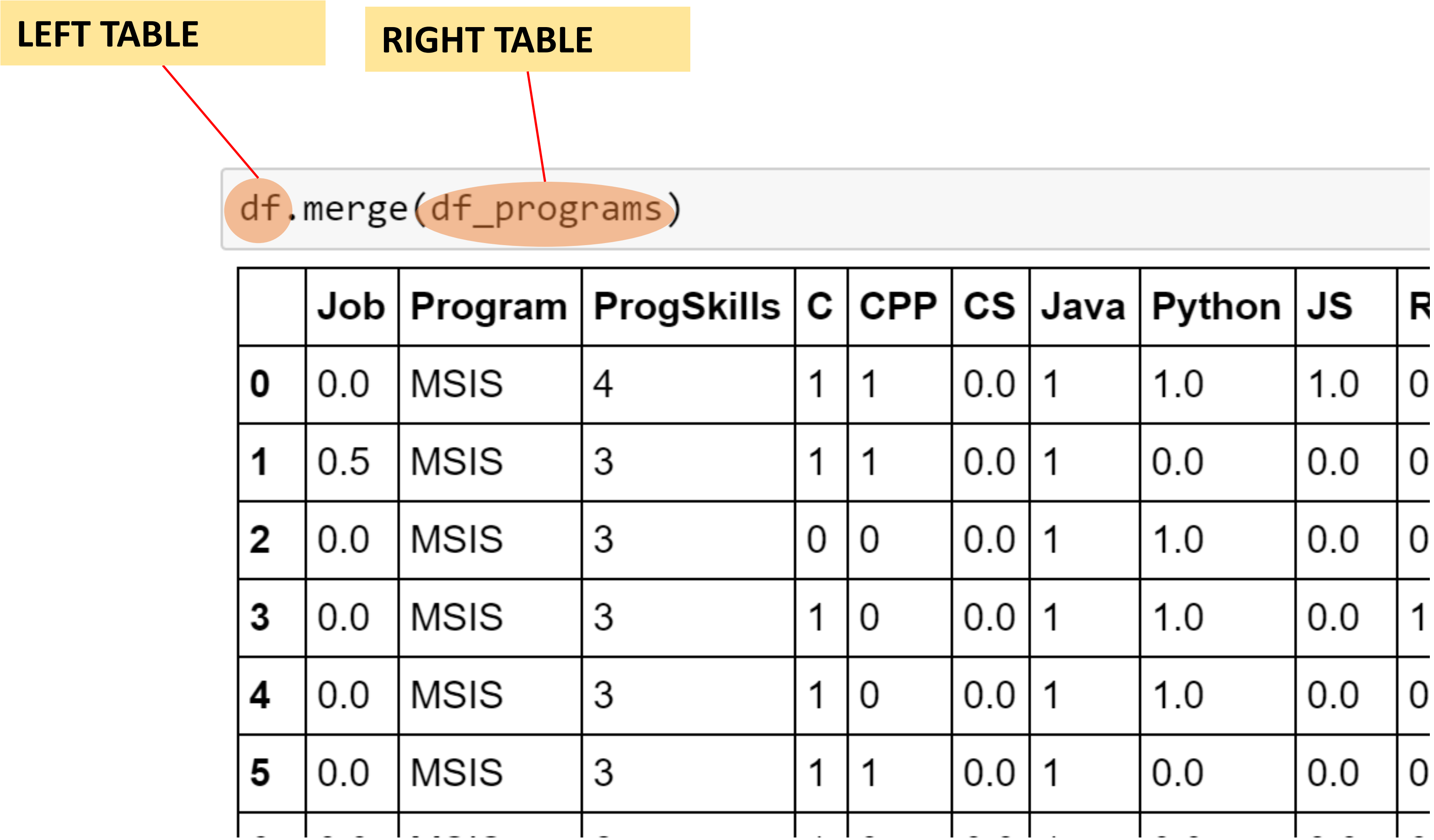
One row per Program

A fictitious program

df.merge(other_table)

Performs the merge on the columns with the same name. In this case,

- df.Program = df_programs.Program



LEFT TABLE

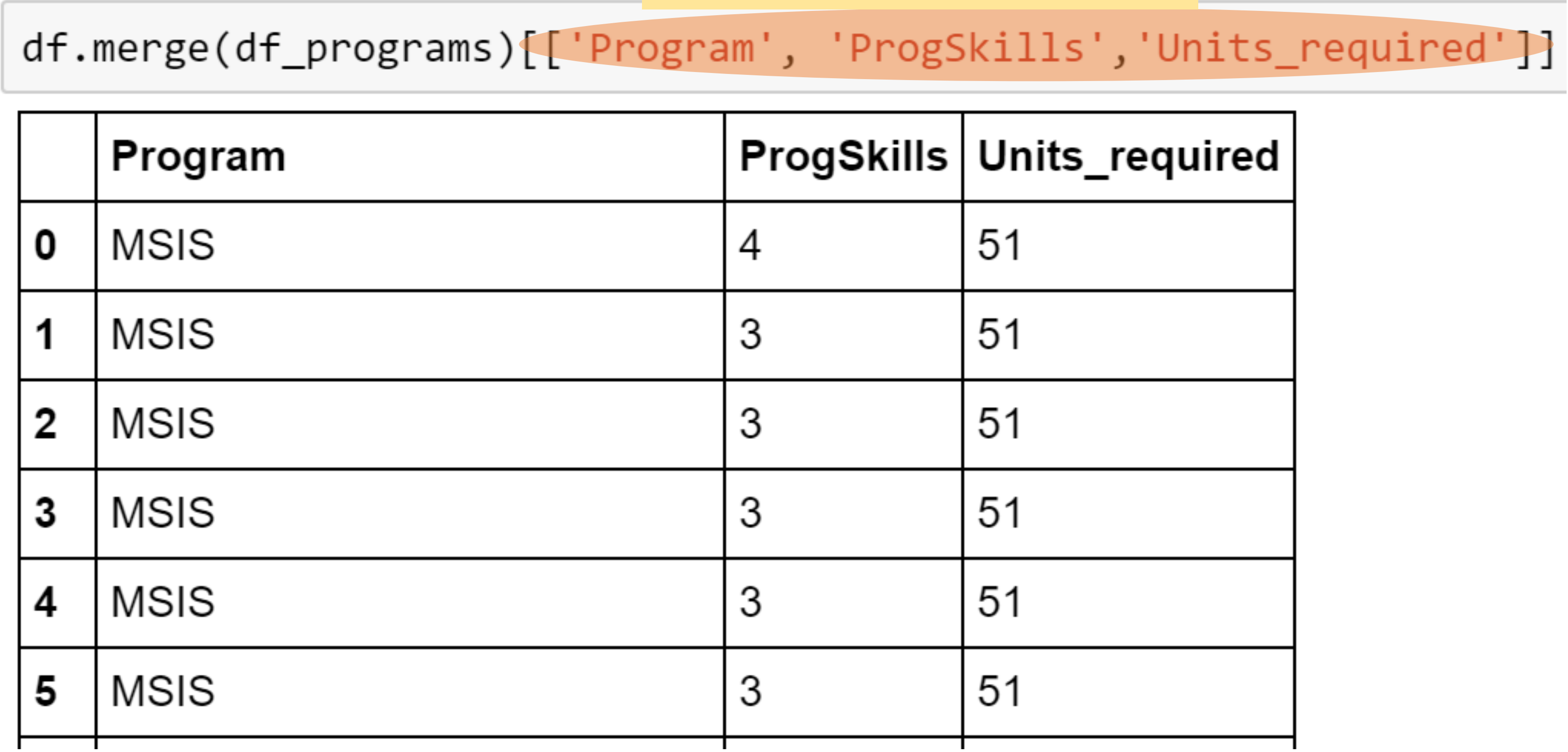
RIGHT TABLE

```
df.merge(df_programs)
```

	Job	Program	ProgSkills	C	CPP	CS	Java	Python	JS	R
0	0.0	MSIS	4	1	1	0.0	1	1.0	1.0	0
1	0.5	MSIS	3	1	1	0.0	1	0.0	0.0	0
2	0.0	MSIS	3	0	0	0.0	1	1.0	0.0	0
3	0.0	MSIS	3	1	0	0.0	1	1.0	0.0	1
4	0.0	MSIS	3	1	0	0.0	1	1.0	0.0	0
5	0.0	MSIS	3	1	1	0.0	1	0.0	0.0	0

df.merge(other_table)

Let’s show just few columns

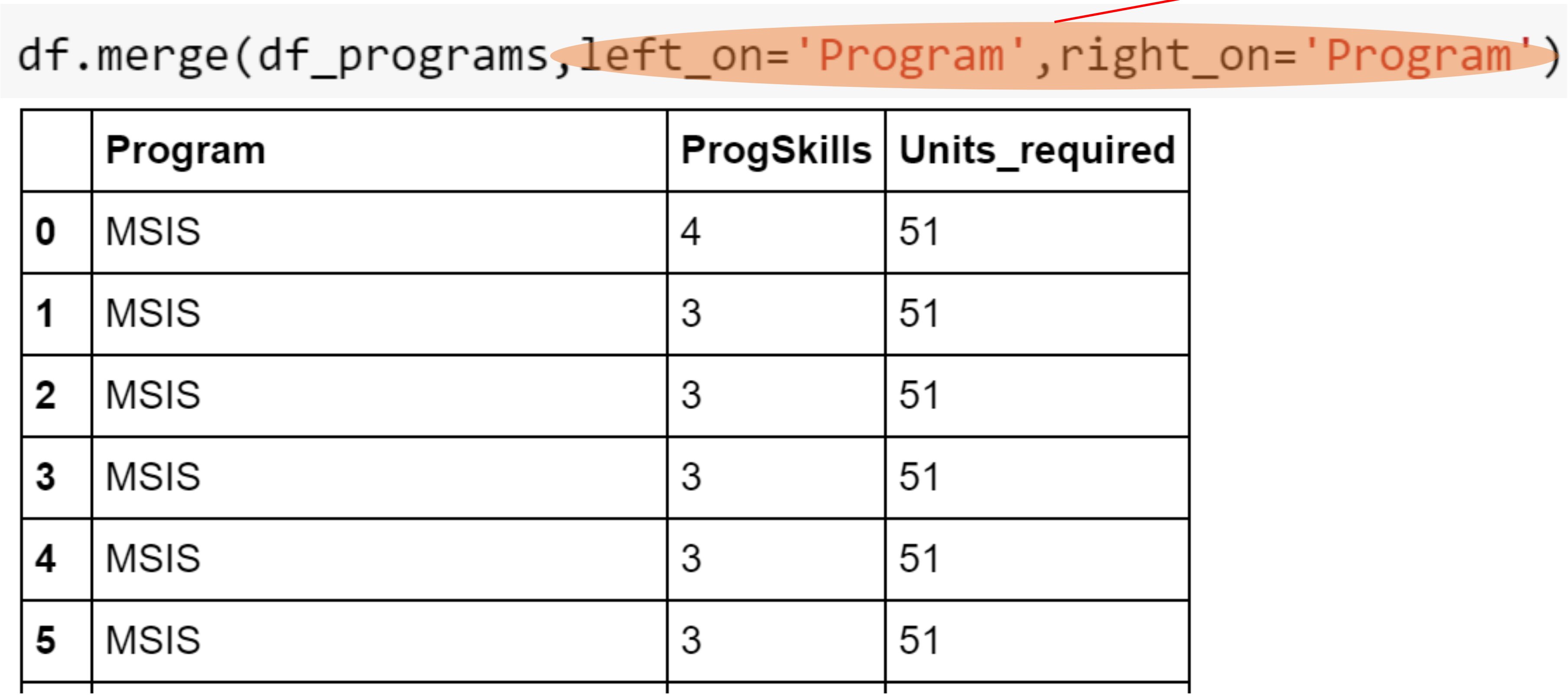


```
df.merge(df_programs)[['Program', 'ProgSkills','Units_required']]
```

	Program	ProgSkills	Units_required
0	MSIS	4	51
1	MSIS	3	51
2	MSIS	3	51
3	MSIS	3	51
4	MSIS	3	51
5	MSIS	3	51

df.merge(other_table)

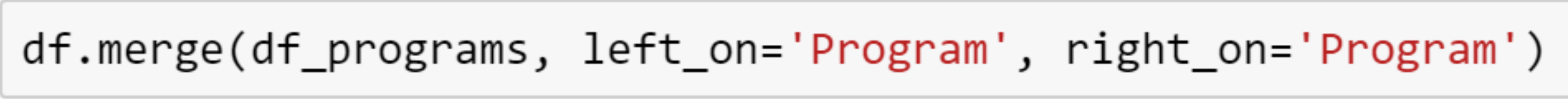
We can specify the keys to merge on for the table on the left (in this case, df) and the table on the right (in this case, df_programs)



```
df.merge(df_programs,left_on='Program',right_on='Program')
```

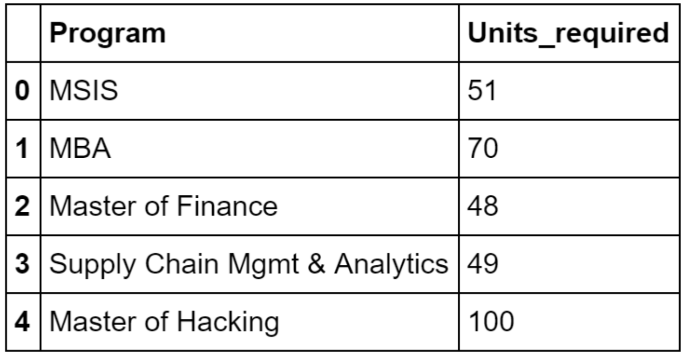
	Program	ProgSkills	Units_required
0	MSIS	4	51
1	MSIS	3	51
2	MSIS	3	51
3	MSIS	3	51
4	MSIS	3	51
5	MSIS	3	51

(default)INNER JOIN:



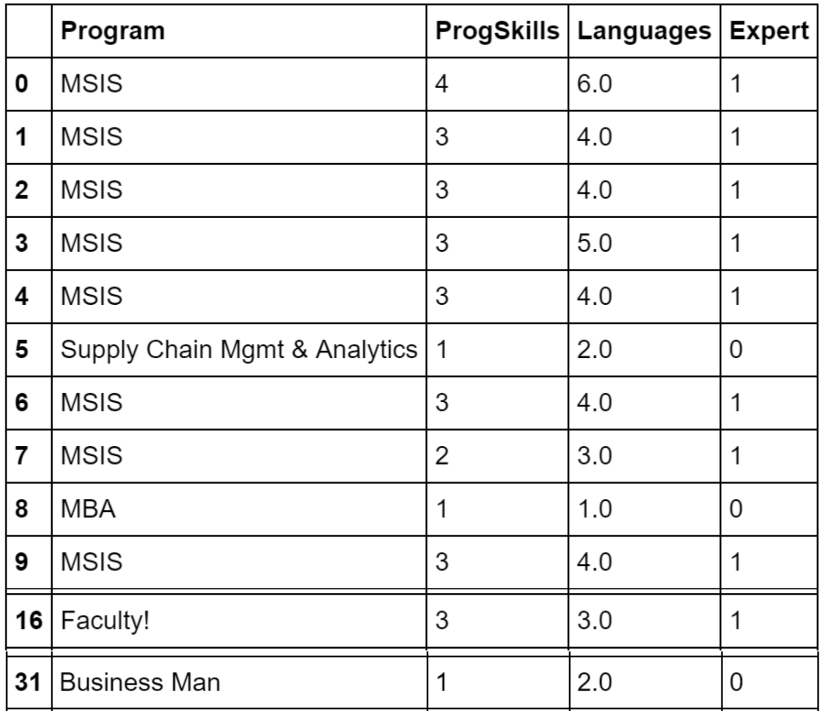
```
df.merge(df_programs, left_on='Program', right_on='Program')
```

df_programs

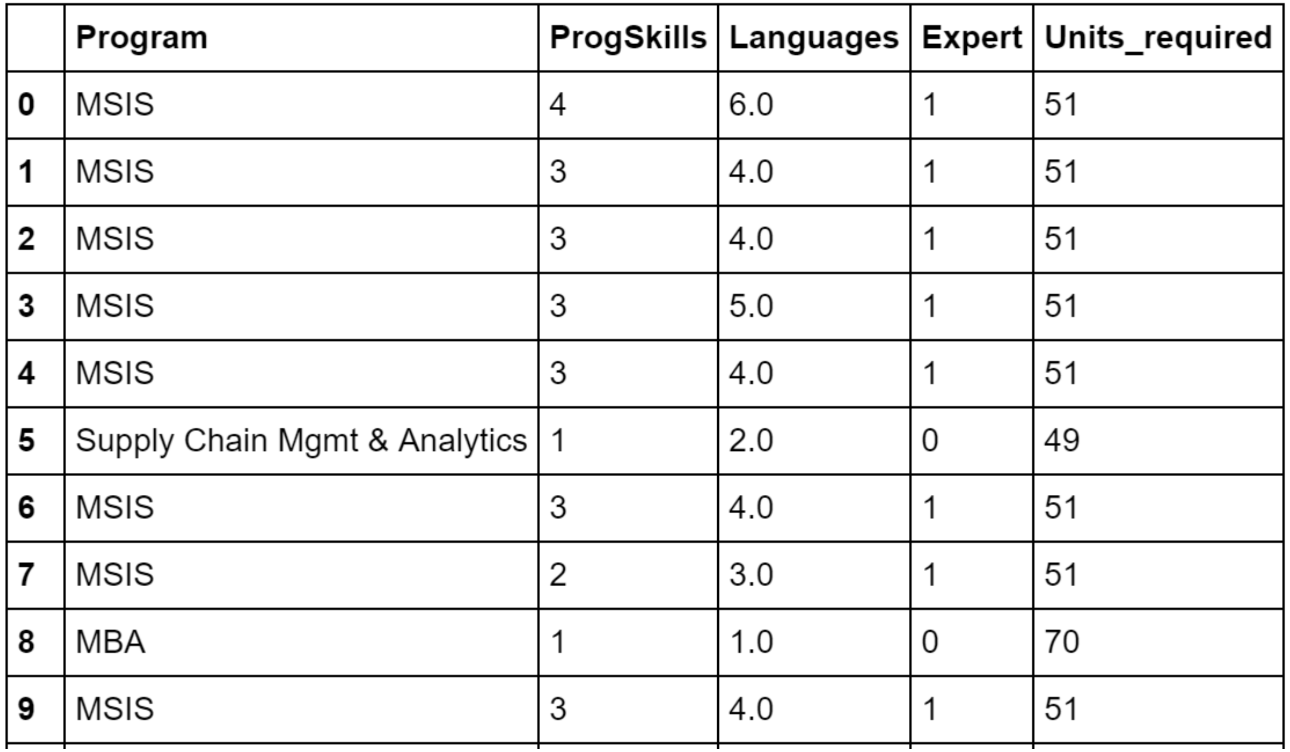


	Program	Units_required
0	MSIS	51
1	MBA	70
2	Master of Finance	48
3	Supply Chain Mgmt & Analytics	49
4	Master of Hacking	100

df



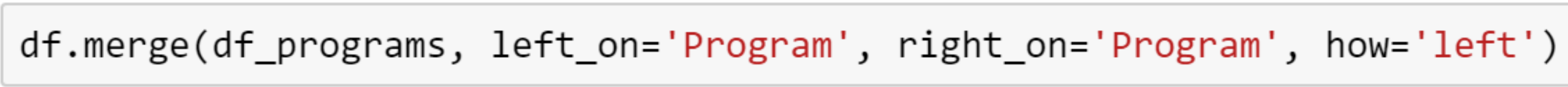
	Program	ProgSkills	Languages	Expert
0	MSIS	4	6.0	1
1	MSIS	3	4.0	1
2	MSIS	3	4.0	1
3	MSIS	3	5.0	1
4	MSIS	3	4.0	1
5	Supply Chain Mgmt & Analytics	1	2.0	0
6	MSIS	3	4.0	1
7	MSIS	2	3.0	1
8	MBA	1	1.0	0
9	MSIS	3	4.0	1
16	Faculty!	3	3.0	1
31	Business Man	1	2.0	0



	Program	ProgSkills	Languages	Expert	Units_required
0	MSIS	4	6.0	1	51
1	MSIS	3	4.0	1	51
2	MSIS	3	4.0	1	51
3	MSIS	3	5.0	1	51
4	MSIS	3	4.0	1	51
5	Supply Chain Mgmt & Analytics	1	2.0	0	49
6	MSIS	3	4.0	1	51
7	MSIS	2	3.0	1	51
8	MBA	1	1.0	0	70
9	MSIS	3	4.0	1	51

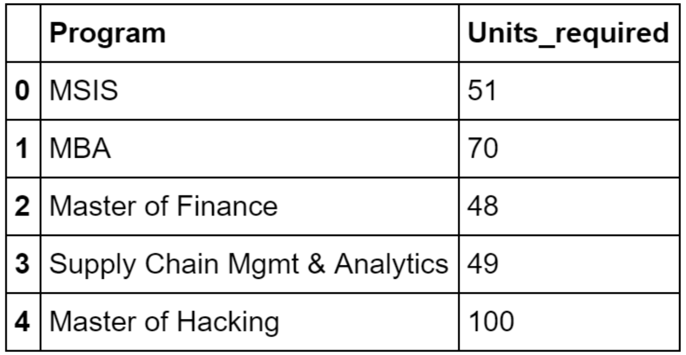
INNER JOIN:
Only the values in both tables are kept: "Faculty!" and "Business Man" from df and "Master of Hacking" from df_programs are dropped

LEFT JOIN:



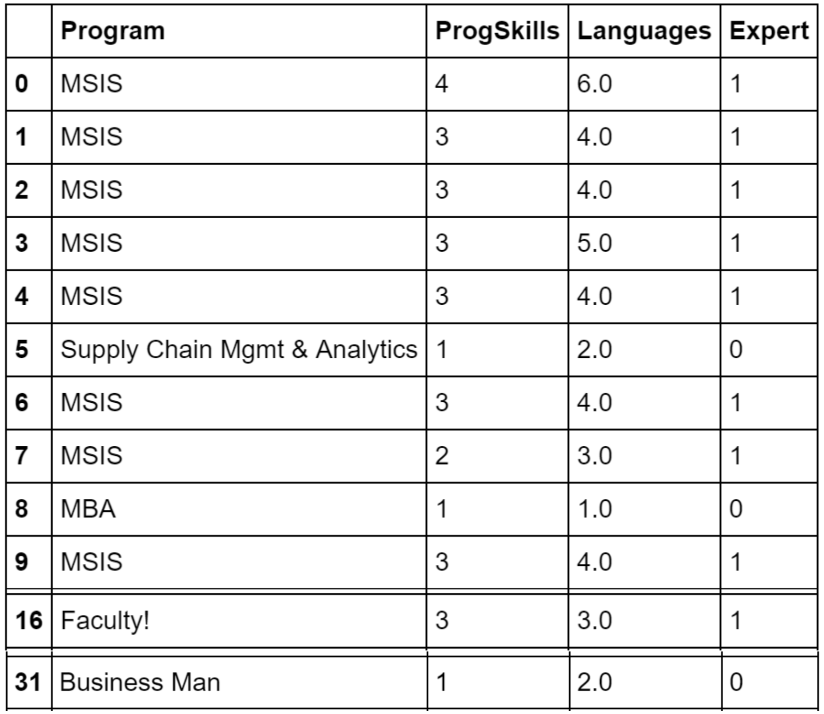
```
df.merge(df_programs, left_on='Program', right_on='Program', how='left')
```

df_programs

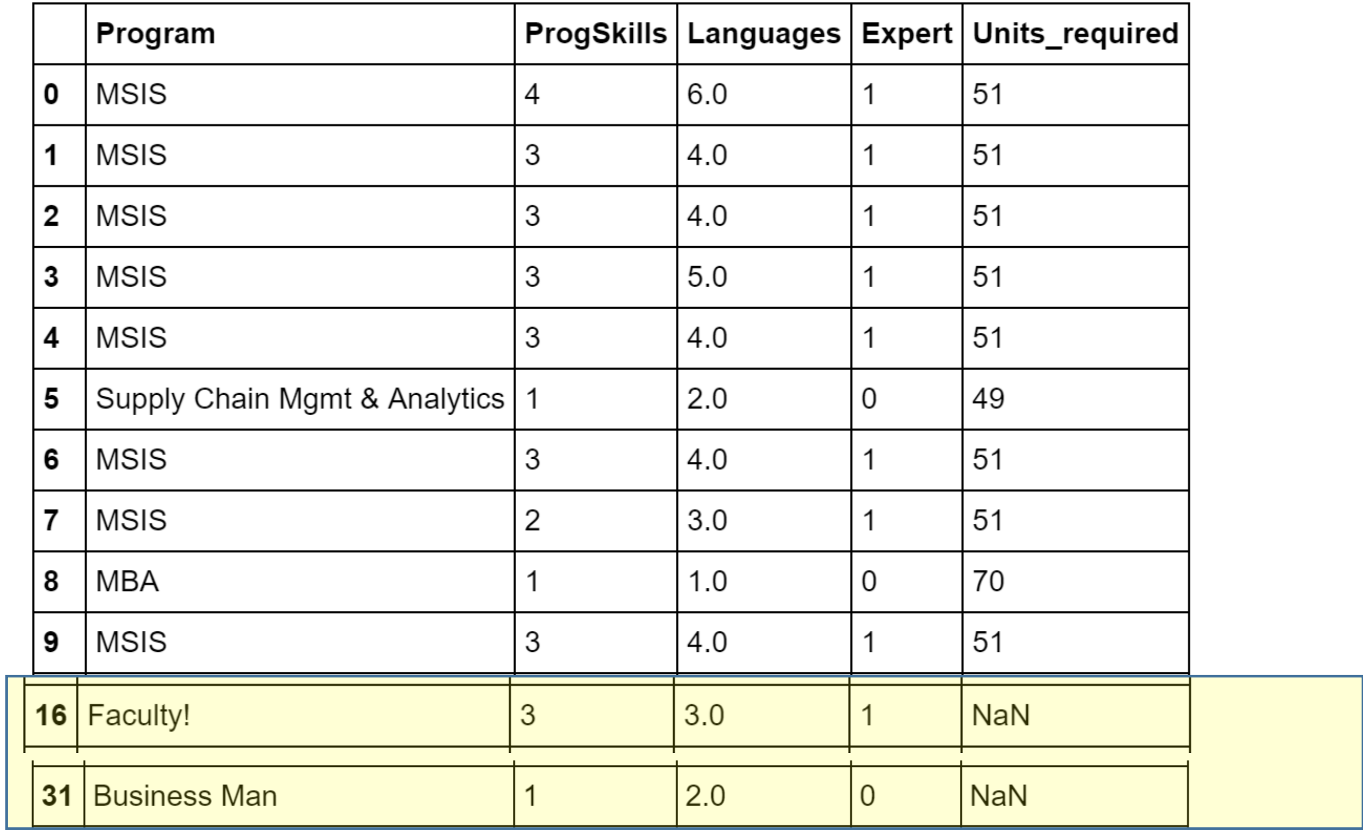


	Program	Units_required
0	MSIS	51
1	MBA	70
2	Master of Finance	48
3	Supply Chain Mgmt & Analytics	49
4	Master of Hacking	100

df



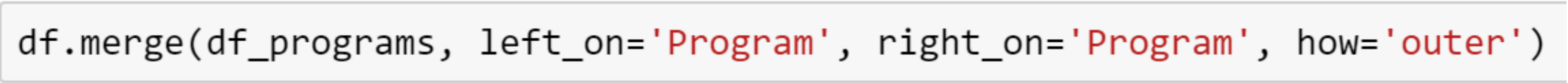
	Program	ProgSkills	Languages	Expert
0	MSIS	4	6.0	1
1	MSIS	3	4.0	1
2	MSIS	3	4.0	1
3	MSIS	3	5.0	1
4	MSIS	3	4.0	1
5	Supply Chain Mgmt & Analytics	1	2.0	0
6	MSIS	3	4.0	1
7	MSIS	2	3.0	1
8	MBA	1	1.0	0
9	MSIS	3	4.0	1
16	Faculty!	3	3.0	1
31	Business Man	1	2.0	0



	Program	ProgSkills	Languages	Expert	Units_required
0	MSIS	4	6.0	1	51
1	MSIS	3	4.0	1	51
2	MSIS	3	4.0	1	51
3	MSIS	3	5.0	1	51
4	MSIS	3	4.0	1	51
5	Supply Chain Mgmt & Analytics	1	2.0	0	49
6	MSIS	3	4.0	1	51
7	MSIS	2	3.0	1	51
8	MBA	1	1.0	0	70
9	MSIS	3	4.0	1	51
16	Faculty!	3	3.0	1	NaN
31	Business Man	1	2.0	0	NaN

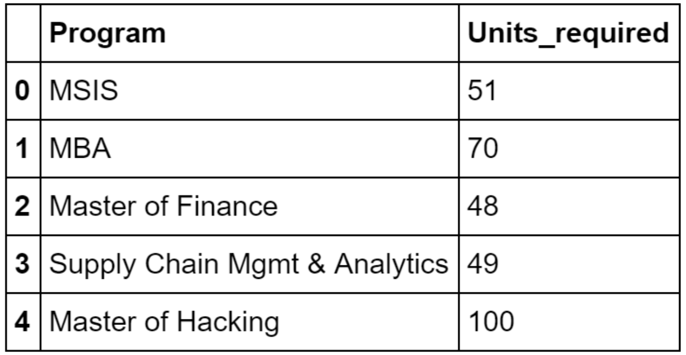
LEFT JOIN:
All values from the left table are kept:
“Faculty!” and “Business Man” are kept, “Master of Hacking” is not

OUTER JOIN:



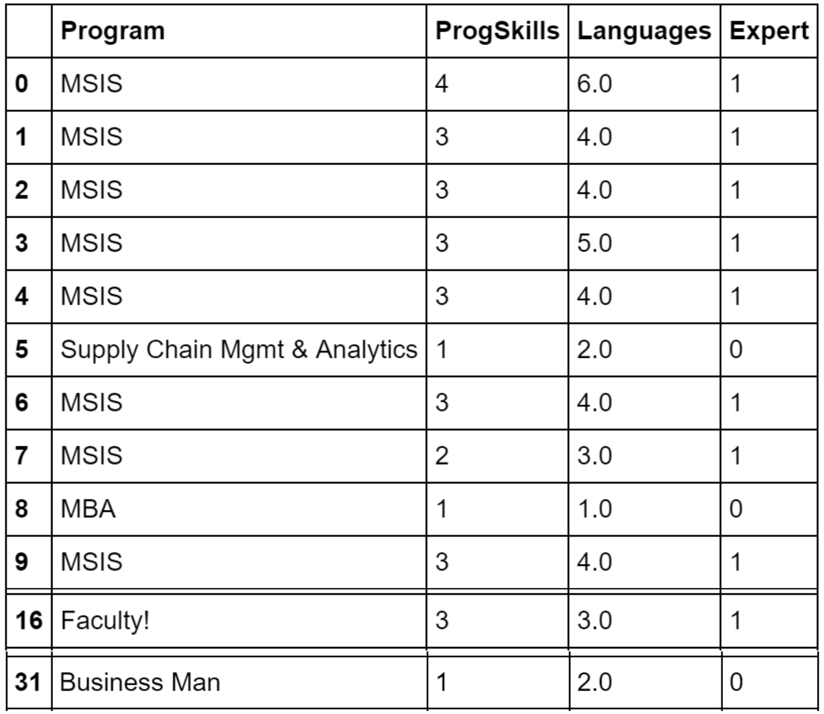
```
df.merge(df_programs, left_on='Program', right_on='Program', how='outer')
```

df_programs

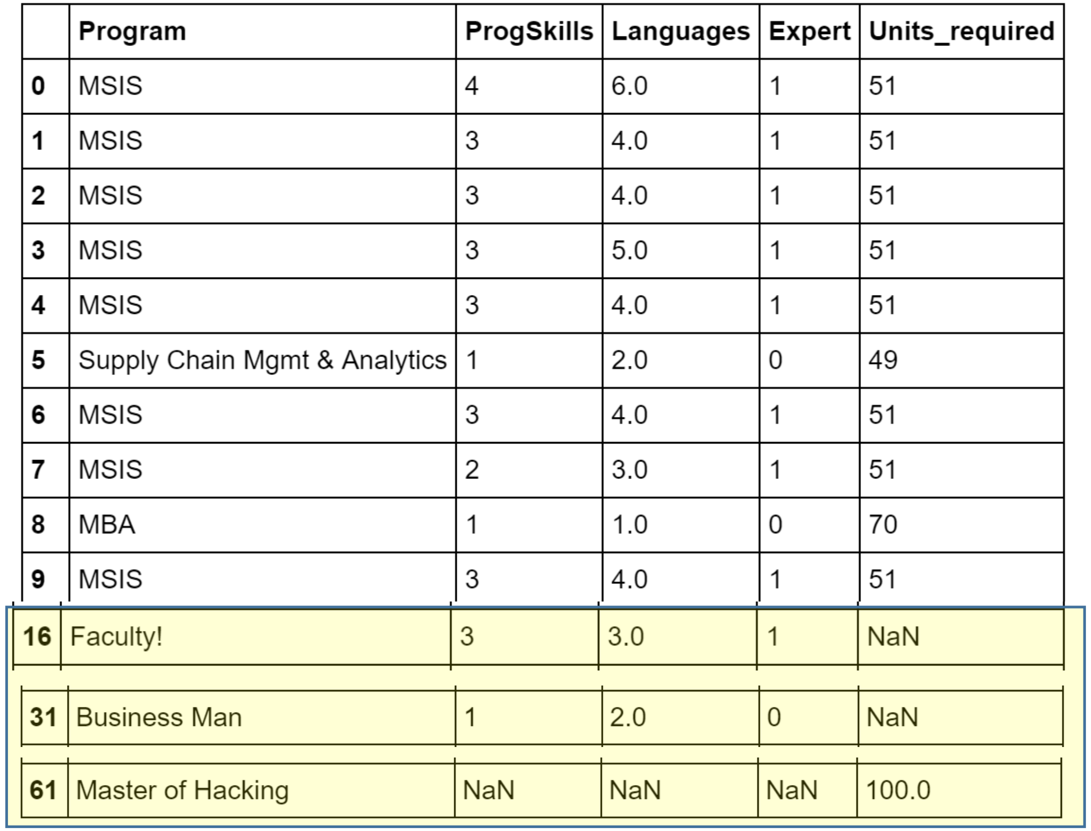


	Program	Units_required
0	MSIS	51
1	MBA	70
2	Master of Finance	48
3	Supply Chain Mgmt & Analytics	49
4	Master of Hacking	100

df



	Program	ProgSkills	Languages	Expert
0	MSIS	4	6.0	1
1	MSIS	3	4.0	1
2	MSIS	3	4.0	1
3	MSIS	3	5.0	1
4	MSIS	3	4.0	1
5	Supply Chain Mgmt & Analytics	1	2.0	0
6	MSIS	3	4.0	1
7	MSIS	2	3.0	1
8	MBA	1	1.0	0
9	MSIS	3	4.0	1
16	Faculty!	3	3.0	1
31	Business Man	1	2.0	0



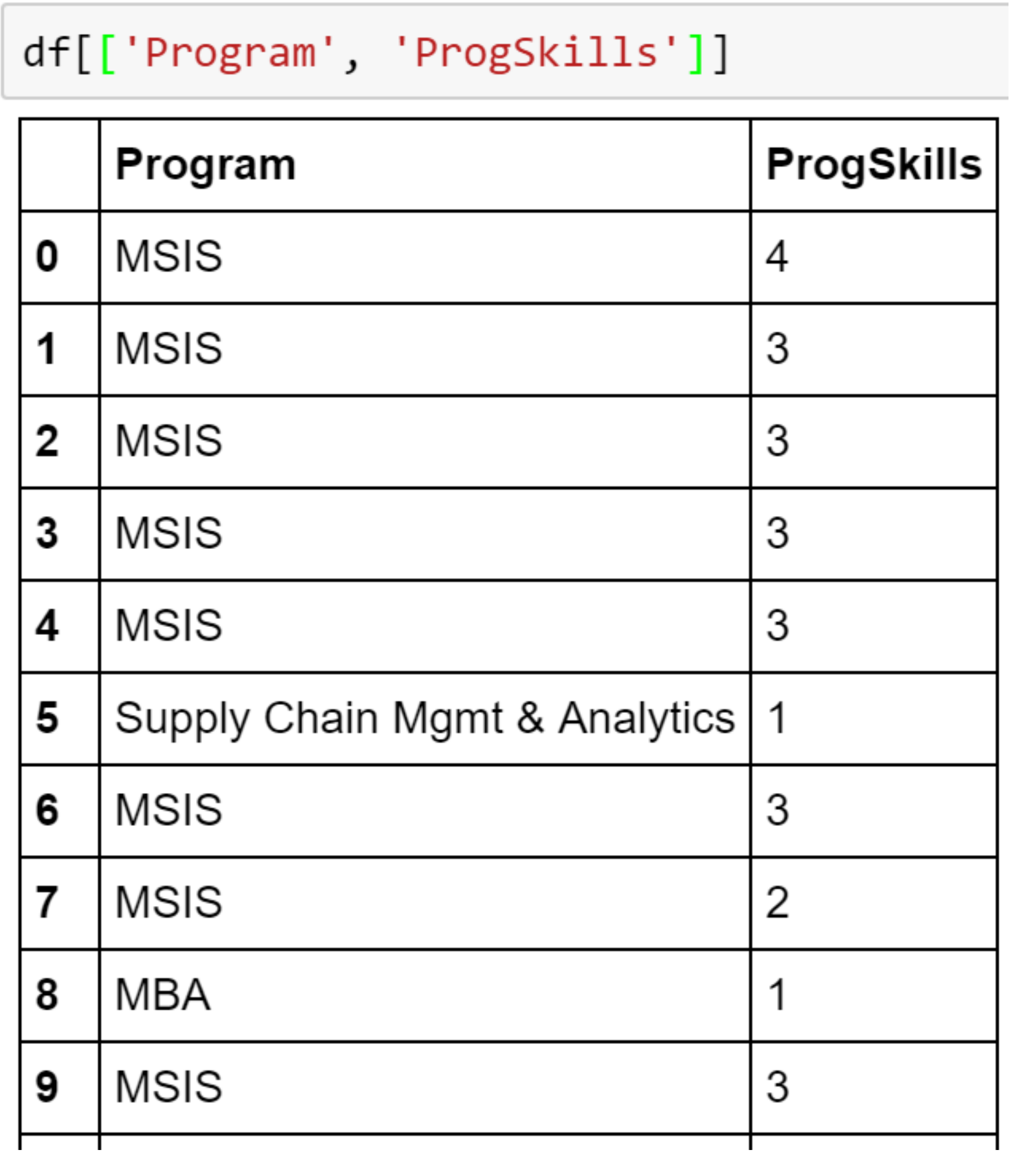
	Program	ProgSkills	Languages	Expert	Units_required
0	MSIS	4	6.0	1	51
1	MSIS	3	4.0	1	51
2	MSIS	3	4.0	1	51
3	MSIS	3	5.0	1	51
4	MSIS	3	4.0	1	51
5	Supply Chain Mgmt & Analytics	1	2.0	0	49
6	MSIS	3	4.0	1	51
7	MSIS	2	3.0	1	51
8	MBA	1	1.0	0	70
9	MSIS	3	4.0	1	51
16	Faculty!	3	3.0	1	NaN
31	Business Man	1	2.0	0	NaN
61	Master of Hacking	NaN	NaN	NaN	100.0

OUTER JOIN:
All values from the both tables are kept:
“Faculty!” and “Business Man” are kept, as well as
“Master of Hacking”

Merge on **indices**

df

One row per student =>



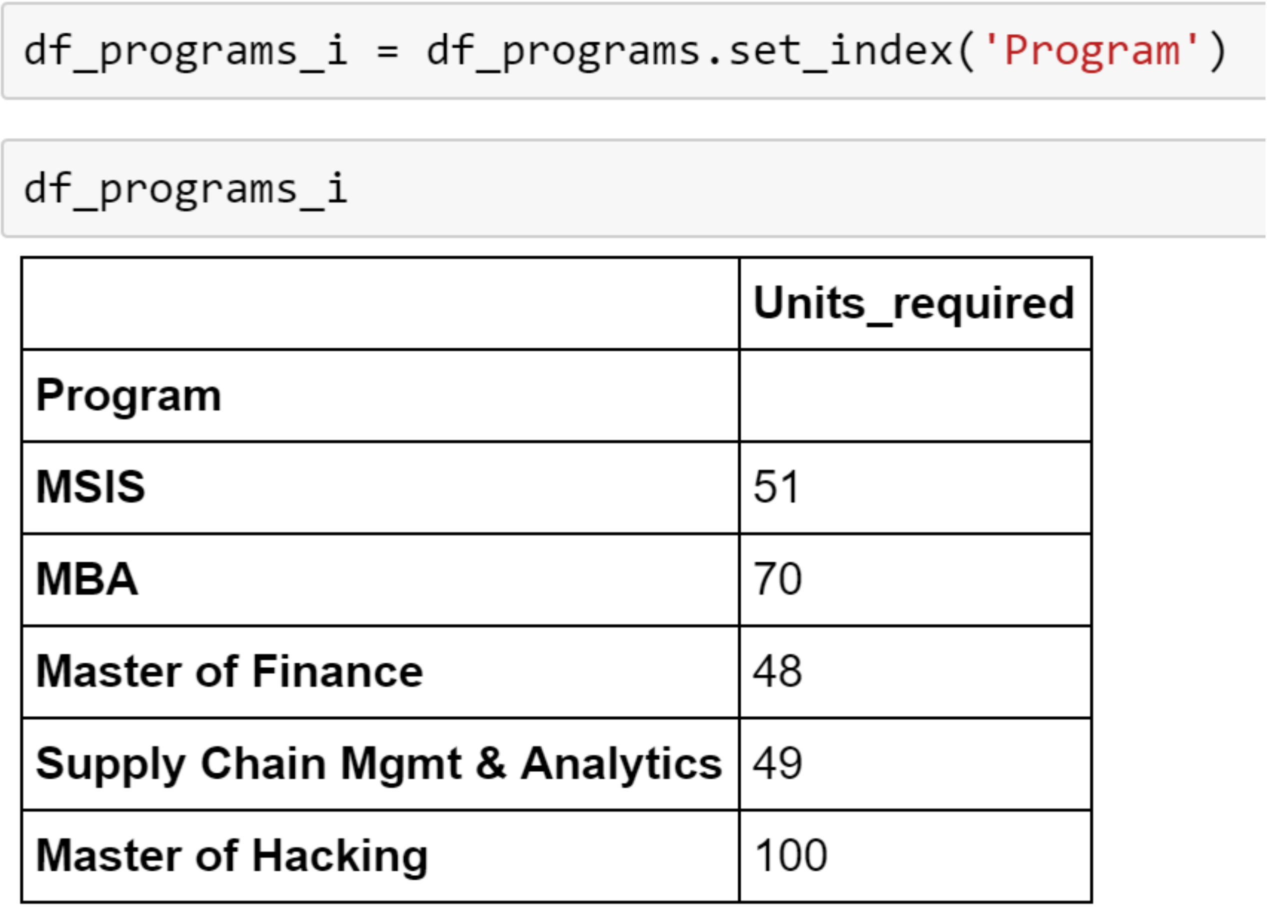
```
df[['Program', 'ProgSkills']]
```

	Program	ProgSkills
0	MSIS	4
1	MSIS	3
2	MSIS	3
3	MSIS	3
4	MSIS	3
5	Supply Chain Mgmt & Analytics	1
6	MSIS	3
7	MSIS	2
8	MBA	1
9	MSIS	3

df_programs_i

One row per Program

Program is the index

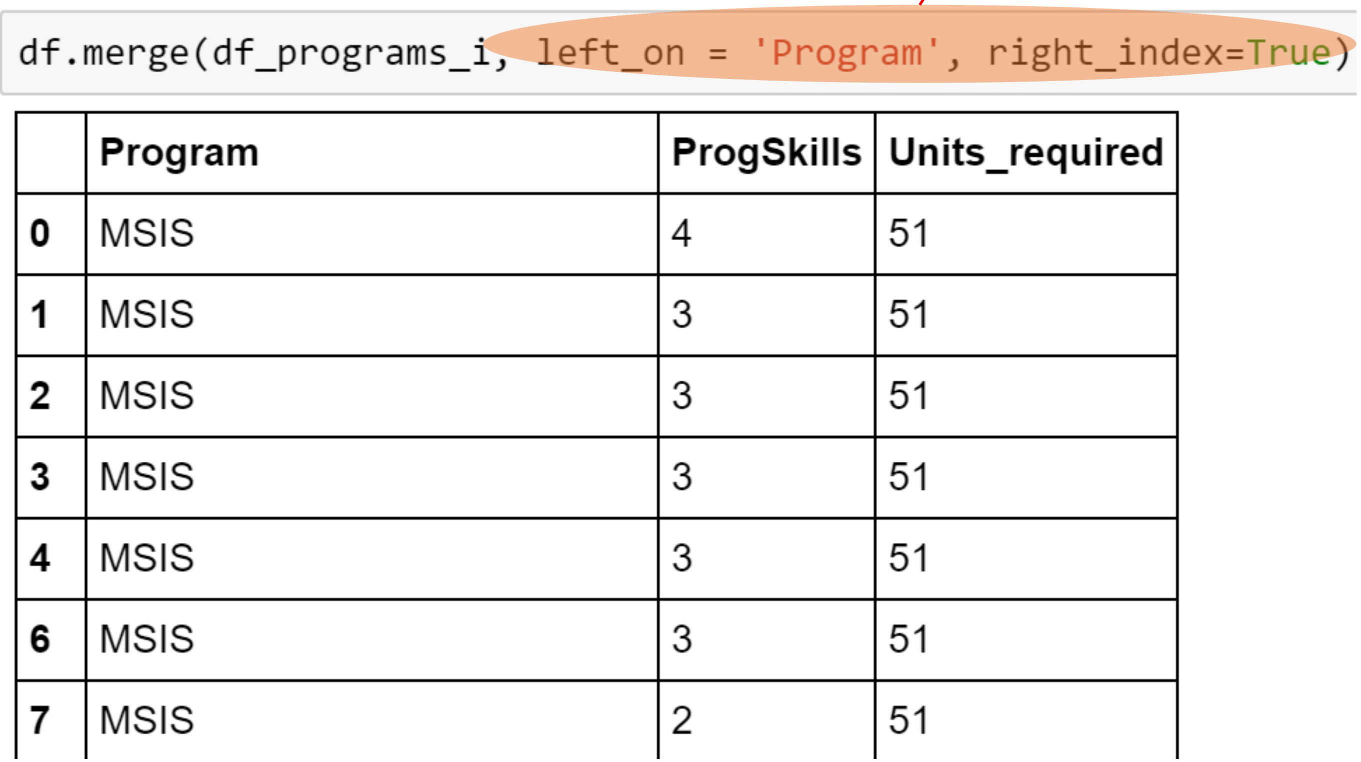


```
df_programs_i = df_programs.set_index('Program')
```

```
df_programs_i
```

	Units_required
Program	
MSIS	51
MBA	70
Master of Finance	48
Supply Chain Mgmt & Analytics	49
Master of Hacking	100

The key to use in the right table is the index



```
df.merge(df_programs_i, left_on = 'Program', right_index=True)
```

	Program	ProgSkills	Units_required
0	MSIS	4	51
1	MSIS	3	51
2	MSIS	3	51
3	MSIS	3	51
4	MSIS	3	51
6	MSIS	3	51
7	MSIS	2	51

Problems

1. For each programming skills level, find the average number of units to be completed by students with that programming skill level
2. For each existing program (i.e., for each Program in df_programs), find the units required to complete it and the number of students belonging to that program that responded to the survey.
3. For each student in df_students, the number of weekly hours they are working, assuming that:
    1. each required unit of coursework is 0.25 hours a week of work
    2. Job=0 is 0 hours a week of work
    3. Job=0.5 is 20 hours a week of work
    4. Job=1 is 40 hours a week of work