

```
In [ ]: # imports
import pandas as pd
```

```
In [ ]: # load data
data = pd.read_csv("Employees.csv")
data.head()
```

```
Out[ ]:
```

	First Name	Gender	Start Date	Last Login Time	Salary	Bonus %	Senior Management	Team
0	Douglas	Male	8/6/1993	12:42 PM	97308	6.945	True	Marketing
1	Thomas	Male	3/31/1996	6:53 AM	61933	4.170	True	NaN
2	Maria	Female	4/23/1993	11:17 AM	130590	11.858	False	Finance
3	Jerry	Male	3/4/2005	1:00 PM	138705	9.340	True	Finance
4	Larry	Male	1/24/1998	4:47 PM	101004	1.389	True	Client Services

1. Write query to find how many null-values are there in each column.

```
In [ ]: for column in data.columns:
        print(column, "column has", data[column].isnull().sum(), "null values")
```

```
First Name column has 67 null values
Gender column has 145 null values
Start Date column has 0 null values
Last Login Time column has 0 null values
Salary column has 0 null values
Bonus % column has 0 null values
Senior Management column has 67 null values
Team column has 43 null values
```

2. Write query to find distinct values and their counts in each column.

```
In [ ]: for column in data.columns:
        print(column, len(data[column].unique()))
        print(data[column].unique())
```

First Name 201

['Douglas' 'Thomas' 'Maria' 'Jerry' 'Larry' 'Dennis' 'Ruby' nan 'Angela'
 'Frances' 'Louise' 'Julie' 'Brandon' 'Gary' 'Kimberly' 'Lillian' 'Jeremy'
 'Shawn' 'Diana' 'Donna' 'Lois' 'Matthew' 'Joshua' 'John' 'Craig' 'Scott'
 'Terry' 'Benjamin' 'Christina' 'Joyce' 'Jean' 'Theresa' 'Rachel' 'Linda'
 'Stephanie' 'Michael' 'Christine' 'Beverly' 'Marilyn' 'Cynthia' 'Roger'
 'Bruce' 'Kathy' 'Clarence' 'Chris' 'Nancy' 'Todd' 'Alan' 'Sara' 'Karen'
 'Carl' 'Henry' 'Irene' 'Paula' 'Denise' 'Kathleen' 'Steve' 'Jose'
 'Johnny' 'Bobby' 'Bonnie' 'Margaret' 'Charles' 'Robin' 'Gerald'
 'Christopher' 'Steven' 'Doris' 'Annie' 'Janice' 'James' 'Virginia'
 'Harry' 'Heather' 'Laura' 'Tina' 'Harold' 'Melissa' 'Aaron' 'Jack'
 'Phyllis' 'Paul' 'Russell' 'Shirley' 'Willie' 'Ashley' 'Pamela' 'Andrea'
 'Peter' 'Helen' 'Patricia' 'Michelle' 'William' 'Kenneth' 'Antonio'
 'Rebecca' 'Carlos' 'Carolyn' 'Gloria' 'Adam' 'Elizabeth' 'Teresa'
 'Nicole' 'Jennifer' 'Philip' 'Patrick' 'Sean' 'Ruth' 'Victor' 'Marie'
 'Howard' 'Norma' 'Arthur' 'Mary' 'Wayne' 'Jane' 'Jessica' 'Mark' 'Randy'
 'Sandra' 'Carol' 'Barbara' 'Ronald' 'Jonathan' 'Katherine' 'Emily' 'Lisa'
 'Evelyn' 'Gregory' 'Billy' 'Jason' 'Daniel' 'Sarah' 'George' 'Diane'
 'Kathryn' 'Cheryl' 'Kevin' 'Walter' 'Robert' 'Jimmy' 'Fred' 'Brenda'
 'Justin' 'Betty' 'Sharon' 'Ralph' 'Edward' 'Debra' 'Anne' 'Roy' 'Frank'
 'Nicholas' 'Judy' 'Tammy' 'Jesse' 'Joan' 'Ernest' 'Jacqueline' 'Jeffrey'
 'Samuel' 'Earl' 'Richard' 'Lori' 'Susan' 'Juan' 'Albert' 'Stephen' 'Rose'
 'Joe' 'Julia' 'Dorothy' 'Deborah' 'Alice' 'Wanda' 'Lawrence' 'Amy' 'Ryan'
 'Judith' 'Eugene' 'Donald' 'Ann' 'Raymond' 'Catherine' 'Amanda' 'Anna'
 'Joseph' 'Andrew' 'Kelly' 'Louis' 'Mildred' 'Eric' 'Timothy' 'Anthony'
 'Martha' 'Brian' 'Martin' 'Janet' 'Keith' 'Phillip' 'David']

Gender 3

['Male' 'Female' nan]

Start Date 972

['8/6/1993' '3/31/1996' '4/23/1993' '3/4/2005' '1/24/1998' '4/18/1987'
 '8/17/1987' '7/20/2015' '11/22/2005' '8/8/2002' '8/12/1980' '10/26/1997'
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 '12/23/1982' '10/15/2011' '7/10/1983' '11/26/1982' '12/8/2014'
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 '6/21/2013' '11/23/2014' '1/31/1984' '5/20/2013' '4/20/2013' '5/15/2012']

Last Login Time 720

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Salary 995

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63241 102508 112807 109831 41426 59414 90370 111737 132940 81014
64714 100612 90816 125792 97950 37076 37598 122367 124008 79529
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48866	106862	58112	35203	77834	61310	125250	51178	84834	100863
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137126	47369	35095	148115	83072	100238	103495	144887	64088	51082
91719	128771	119009	111858	130620	43026	142321	140371	100705	77544
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147113	42153	64363	114767	58698	54585	76189	109095	120204	41054
84885	119735	110169	73789	76078	49368	57325	66521	127654	60866
41334	94231	146670	106317	109260	134148	43542	95327	112238	132373
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84232	100888	141335	97691	47266	139754	116236	103405	41453	52730
60361	63103	65168	73105	37916	45682	69297	59070	81215	128036
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115582 148339 112975 36927 70248 141305 72002 102577 113554 47176
106428 75181 79047 52970 137979 114360 110306 46378 74104 132505
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92436 137954 124566 66146 142935 46233 148985 91411 146907 43455
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Bonus % 971

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2.665 11.308 15.835 5.207 7.482 13.886 6.796 9. 6.083 3.055
13.83 14.009 1.695 17.578 8.999 17.653 16.084 15.107 1.481 11.279
4.271 3.699 19.414 18.04 18.771 12.428 2.672 9.735 14.33 4.382
6.617 16.194 3.833 4.709 17.029 5.118 7.353 1.26 5.965 4.99
15.602 14.822 8.379 6.539 7.511 3.887 17.29 8.276 6.155 11.955
11.583 8.309 12.506 1.601 7.03 14.166 1.737 10.62 16.961 12.447
14.995 11.849 12.159 8.932 19.305 8.567 3.046 16.565 12.396 11.449
16.135 8.454 4.023 3.711 6.811 4.166 18.988 9.494 12.299 15.402
18.74 13.892 14.841 2.401 14.226 17.179 5.83 16.439 13.101 6.219
17.517 10.763 2.235 2.65 8.833 19.687 15.12 6.03 10.527 1.854
14.727 5.687 8.689 12.452 13.079 4.15 3.996 14.837 8.578 19.934
15.295 8.067 10.489 5.359 17.695 1.563 14.443 8.756 14.316 16.991
11.451 14.422 19.135 18.197 9.061 7.014 17.984 7.017 5.455 19.02
17.495 9.402 3.959 6.185 1.451 10.166 14.085 17.648 19.343 5.025
1.952 12.184 2.518 9.177 8.842 1.825 6.46 15.931 1.215 9.129
6.652 16.475 4.443 8.996 12.757 19.127 3.031 9.64 16.736 8.525
7.953 5.084 2.784 4.935 8.012 8.399 1.767 4.903 11.295 9.148
19.612 1.821 15.364 3.55 3.8 2.462 1.015 10.628 7.768 5.56

```


3.845	3.067	15.866	2.311	15.266	9.404	11.226	17.445	1.679	17.018
10.263	14.752	12.182	3.643	2.624	9.375	5.128	17.612	19.107	5.961
18.428	5.413	8.866	17.138	12.045	3.742	4.366	19.55	8.94	6.513
4.232	10.391	7.995	5.108	4.75	15.517	12.659	15.585	2.491	13.677
3.723	14.603	13.218	3.45	14.063	16.044	5.81	18.517	9.554	12.062
18.225	1.113	5.46	18.456	11.996	19.062	12.984	1.139	9.635	6.147
12.345	1.612	4.337	2.304	10.985	9.999	18.099	6.388	13.657	17.463
18.284	9.653	19.154	3.873	3.18	7.664	4.542	19.028	3.592	13.023
5.027	3.657	18.702	3.733	17.44	2.937	2.196	15.794	2.158	13.448
1.923	13.457	6.338	15.858	10.966	8.34	1.841	18.243	14.356	7.507
14.372	3.041	6.031	17.885	12.075	5.097	5.319	14.987	7.887	17.269
18.645	7.494	1.844	19.93	4.035	10.717	16.443	2.846	11.58	10.247
3.914	6.96	5.778	14.223	19.897	8.723	3.95	10.751	4.844	3.095
1.782	12.121	5.668	7.843	4.45	7.824	18.892	4.078	9.555	13.865
3.595	16.231	10.957	8.748	12.484	2.194	5.14	19.717	12.072	3.171
4.805	4.664	10.574	9.669	4.537	5.66	10.894	2.362	15.723	8.895
16.697	19.894	11.312	10.413	13.443	9.989	4.03	6.976	7.094	19.385
13.835	7.425	7.799	18.241	9.302	14.272	19.642	8.86	7.564	17.538
9.55	1.62	19.276	6.191	11.699	14.609	5.861	11.9	12.699	5.966
9.047	2.664	3.12	19.334	18.021	16.261	17.436	14.637	2.378	3.56
8.037	7.869	5.63	19.422	7.077	12.993	7.132	14.227	10.069	11.864
11.196	6.22	2.826	11.343	1.886	18.492	1.496	15.85	11.204	17.066
3.665	19.691	19.49	1.965	4.338	10.429	18.029	6.662	16.624	15.843
14.248	13.946	7.996	3.269	18.641	4.188	5.461	8.222	10.696	9.078
11.466	14.693	8.047	8.457	11.364	7.937	8.461	9.705	18.357	18.787
15.967	1.085	3.38	3.099	11.119	1.985	2.021	15.918	19.944	19.731
7.461	6.525	18.845	13.266	7.25	2.117	5.437	7.123	4.548	14.764
11.126	9.765	1.763	4.887	10.494	13.248	6.499	18.654	15.592	17.07
8.13	19.695	19.624	18.115	10.458	15.979	3.997	18.003	3.178	8.411
17.971	14.858	15.026	14.509	9.54	8.696	1.022	7.175	7.252	14.595
10.154	10.28	13.773	12.292	8.205	4.905	13.472	3.491	3.459	4.82
7.851	14.077	2.366	13.32	9.048	3.672	10.366	3.311	3.186	16.304
19.122	11.905	13.853	6.007	18.451	6.639	13.295	6.51	2.097	8.572
18.863	14.842	7.563	17.33	12.986	12.605	19.142	6.773	1.431	18.623
16.69	5.435	7.421	5.809	14.879	11.393	1.438	1.187	18.089	15.118
10.2	13.506	18.266	2.754	7.585	8.945	2.419	9.657	13.346	7.808
15.221	4.644	2.075	3.512	6.752	8.294	11.506	10.925	15.749	9.862
15.704	12.49	15.427	2.142	10.256	12.74	17.274	15.91	10.084	12.525
7.099	11.378	11.513	12.929	1.268	19.064	8.4	18.824	9.601	12.2
8.701	2.93	16.636	1.702	19.513	2.617	1.869	6.878	6.5	19.289
13.047	2.924	18.396	1.433	19.391	3.756	5.203	15.108	9.77	18.912
10.162	19.78	5.32	15.857	14.064	11.749	17.371	1.017	16.922	11.411
13.613	17.108	11.367	13.591	4.785	4.225	4.659	12.866	12.463	3.645
7.776	14.771	17.105	11.879	14.782	3.96	10.982	16.248	1.932	12.791
9.801	15.77	2.675	3.345	14.301	17.398	5.268	6.611	10.485	19.387
18.704	8.992	17.821	17.263	13.926	3.694	8.162	2.782	13.326	5.146
11.593	8.218	10.385	7.927	11.712	9.769	11.211	15.193	18.473	7.839
1.197	12.048	17.095	16.552	15.745	9.851	12.922	13.132	13.806	11.518
7.969	13.001	18.685	11.626	5.197	11.416	13.47	1.876	13.	12.942
19.111	18.674	12.772	1.432	3.655	1.4	6.837	11.716	14.618	12.737
14.737	3.533	15.941	2.844	13.813	5.19	14.625	1.027	16.559	19.626
9.712	16.379	3.369	18.338	5.478	2.03	10.615	7.783	7.617	10.895
4.02	10.006	3.947	3.019	15.343	11.479	9.699	18.769	9.66	9.849
13.178	12.026	18.018	10.736	10.867	6.06	18.784	4.513	5.266	17.799
16.843	9.127	17.68	13.592	3.453	8.941	2.58	4.135	16.353	6.293
11.058	19.601	9.564	13.707	10.286	3.319	12.801	19.85	17.952	2.712
11.517	17.499	13.623	19.075	10.664	15.081	6.081	2.089	19.754	7.227
6.818	19.767	3.221	4.	4.068	4.083	10.048	17.862	5.182	12.254
7.266	2.147	5.89	5.665	7.487	7.864	19.908	7.588	19.467	9.331
2.071	2.28	13.492	15.804	9.153	16.807	4.924	19.501	19.264	8.965

```

8.738 11.682 15.574 4.707 2.88 9.192 6.002 16.158 17.343 11.39
10.411 2.277 12.211 7.943 9.634 19.239 14.66 18.855 18.536 6.842
6.01 16.306 14.249 7.737 7.986 18.751 2.469 19.332 4.299 3.525
9.212 8.219 13.823 8.064 19.132 8.382 6.318 14.344 18.015 18.53
9.16 15.407 11.934 1.552 7.1 8.475 2.709 5.681 7.645 16.968
3.942 10.146 15.211 16.323 18.178 6.911 6.322 14.955 6.16 4.363
17.667 10.081 3.283 6.466 8.879 15.528 1.02 6.168 5.272 6.716
7.696 6.339 19.475 8.957 9.828 18.9 3.412 4.38 9.624 19.388
19.488 16.014 2.673 1.079 2.386 3.771 2.01 3.799 3.787 12.09
10.056 18.424 2.657 8.611 15.653 6.537 2.728 1.905 17.426 16.941
5.329 11.048 8.226 10.833 9.662 11.907 1.148 11.176 8.115 15.901
9.631 5.85 18.093 3.05 16.923 17.94 12.391 18.393 9.146 19.572
11.671 17.308 15.397 5.368 11.159 11.105 16.455 12.467 4.195 5.949
11.178 13.198 8.862 19.28 8.639 11.738 13.04 1.909 17.999 10.331
11.209 3.794 11.051 11.625 19.04 4.479 16.655 19.675 1.421 11.985
10.169]

```

Senior Management 3

[True False nan]

Team 11

['Marketing' nan 'Finance' 'Client Services' 'Legal' 'Product'
 'Engineering' 'Business Development' 'Human Resources' 'Sales'
 'Distribution']

3. Drop the rows where the employees are null/empty.

In []: `data.dropna()`

Out[]:

	First Name	Gender	Start Date	Last Login Time	Salary	Bonus %	Senior Management	Team
0	Douglas	Male	8/6/1993	12:42 PM	97308	6.945	True	Marketing
2	Maria	Female	4/23/1993	11:17 AM	130590	11.858	False	Finance
3	Jerry	Male	3/4/2005	1:00 PM	138705	9.340	True	Finance
4	Larry	Male	1/24/1998	4:47 PM	101004	1.389	True	Client Services
5	Dennis	Male	4/18/1987	1:35 AM	115163	10.125	False	Legal
...
994	George	Male	6/21/2013	5:47 PM	98874	4.479	True	Marketing
996	Phillip	Male	1/31/1984	6:30 AM	42392	19.675	False	Finance
997	Russell	Male	5/20/2013	12:39 PM	96914	1.421	False	Product
998	Larry	Male	4/20/2013	4:45 PM	60500	11.985	False	Business Development
999	Albert	Male	5/15/2012	6:24 PM	129949	10.169	True	Sales

764 rows × 8 columns

4. Fill in the null/empty gender values with 'Unknown' value.

In []: `data = data.fillna({"Gender": "Unknown"})`
`print(data.Gender.unique())`
 ['Male' 'Female' 'Unknown']

5. Fill in the null/empty Team values with some new department value.

```
In [ ]: data = data.fillna({"Team": "Research and Development"})

print(data.Team.unique())

['Marketing' 'Research and Development' 'Finance' 'Client Services'
 'Legal' 'Product' 'Engineering' 'Business Development' 'Human Resources'
 'Sales' 'Distribution']
```

6. For the columns having empty-spaces in their names, replace them with underscore '_'. For example, change the 'First Name' column to 'First_Name' and so on.

```
In [ ]: new_columns = { column: "_".join(column.split(" ")) for column in data.columns }

data = data.rename(columns=new_columns)

print(data.columns)

Index(['First_Name', 'Gender', 'Start_Date', 'Last_Login_Time', 'Salary',
       'Bonus_%', 'Senior_Management', 'Team'],
      dtype='object')
```

7. Change the format of each date from (mm/dd/yyyy) to (dd/mm/yyyy).

```
In [ ]: def change_format(data):
        month, day, year = data.split("/")
        return f"{day}/{month}/{year}"

# data["Start_Date"] = data["Start_Date"].apply(change_format)

# or use built-ins
data["Start_Date"] = pd.to_datetime(data["Start_Date"])
data["Start_Date"] = data["Start_Date"].dt.strftime('%d/%m/%Y')

print(data.head())
```

	First_Name	Gender	Start_Date	Last_Login_Time	Salary	Bonus_%	\
0	Douglas	Male	06/08/1993	12:42 PM	97308	6.945	
1	Thomas	Male	31/03/1996	6:53 AM	61933	4.170	
2	Maria	Female	23/04/1993	11:17 AM	130590	11.858	
3	Jerry	Male	04/03/2005	1:00 PM	138705	9.340	
4	Larry	Male	24/01/1998	4:47 PM	101004	1.389	

	Senior_Management	Team
0	True	Marketing
1	True	Research and Development
2	False	Finance
3	True	Finance
4	True	Client Services

8. Round the bonus values to the next ceiling value, and change the data-type from 'float' to 'int'.

```
In [ ]: import math

def to_ceil(value):
    return int(math.ceil(value))
```

```
data["Bonus_%"] = data["Bonus_%"].map(to_ceil)

print(data.head())

print(data.dtypes)
```

	First_Name	Gender	Start_Date	Last_Login_Time	Salary	Bonus_%	\
0	Douglas	Male	06/08/1993	12:42 PM	97308	7	
1	Thomas	Male	31/03/1996	6:53 AM	61933	5	
2	Maria	Female	23/04/1993	11:17 AM	130590	12	
3	Jerry	Male	04/03/2005	1:00 PM	138705	10	
4	Larry	Male	24/01/1998	4:47 PM	101004	2	

	Senior_Management	Team
0	True	Marketing
1	True	Research and Development
2	False	Finance
3	True	Finance
4	True	Client Services

```
First_Name      object
Gender           object
Start_Date       object
Last_Login_Time  object
Salary           int64
Bonus_%          int64
Senior_Management object
Team             object
dtype: object
```

9. For the 'Last_Login' Column , remove the AM/PM strings, and convert it to 24-hour format.

```
In [ ]: def to_24_hour(time):
    new_time, pm_am = time.split(" ")
    hour, minutes = new_time.split(":")

    if pm_am.lower() == "pm" and hour != "12":
        hour = str(int(hour) + 12)
    elif hour == "12":
        hour = "00"

    if (len(hour)) == 1:
        hour = "0" + hour

    return f"{hour}:{minutes}"

test_times = ["12:42 PM", "2:20 PM", "10:00 PM", "12:30 AM", "02:45 AM", "09:45 AM"]

for test_time in test_times:
    print(to_24_hour(test_time))

data["Last_Login_Time"] = data["Last_Login_Time"].map(to_24_hour)

# or use built-in
# data["Last_Login_Time"] = pd.to_datetime(data["Last_Login_Time"]).dt.strftime("%H:%M")

data.head()
```

00:42
14:20
22:00
00:30
02:45
09:45

Out[]:	First_Name	Gender	Start_Date	Last_Login_Time	Salary	Bonus_%	Senior_Management
0	Douglas	Male	06/08/1993	00:42	97308	7	True
1	Thomas	Male	31/03/1996	06:53	61933	5	True
2	Maria	Female	23/04/1993	11:17	130590	12	False
3	Jerry	Male	04/03/2005	13:00	138705	10	True
4	Larry	Male	24/01/1998	16:47	101004	2	True

10. For the 'Senior_Management' column, use forward fill technique to fill in the missing values.

```
In [ ]: data["Senior_Management"] = data["Senior_Management"].fillna(method="ffill")
print(data.Senior_Management.isnull().sum())
0
```

11. For the 'First_Name' column, remove or drop rows having duplicate values. That is, no two employees can have same name (let's assume that it might later act as a primary-key).

```
In [ ]: data["First_Name"].drop_duplicates()

Out[ ]: 0      Douglas
1      Thomas
2      Maria
3      Jerry
4      Larry
...
712    Martin
749    Janet
832    Keith
855    Phillip
887    David
Name: First_Name, Length: 201, dtype: object
```

12. Convert the salary values from numbers to strings. Add a currency symbol (dollar, pound etc.)

at the beginning of the string.

```
In [ ]: data["Salary"] = data["Salary"].astype(str)

def add_currency_symbol(salary):
    return "$" + salary

data["Salary"] = data["Salary"].map(add_currency_symbol)
```

```
data.head()
```

Out[]:

	First_Name	Gender	Start_Date	Last_Login_Time	Salary	Bonus_%	Senior_Management
0	Douglas	Male	06/08/1993	00:42	\$97308	7	True
1	Thomas	Male	31/03/1996	06:53	\$61933	5	True
2	Maria	Female	23/04/1993	11:17	\$130590	12	False
3	Jerry	Male	04/03/2005	13:00	\$138705	10	True
4	Larry	Male	24/01/1998	16:47	\$101004	2	True