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Group - 4

CSE

DATA DESCRIPTION

The dataset contains 718 rows and 8 columns, though some columns have missing values.

It appears to be a record of midterm marks for students across different subjects.

Columns:

S.NO (float64) - Serial number of students (601 non-null values, some missing).

SECTION (object) - Section name (e.g., ALPHA) of the student (691 non-null values).

DV (object) - Marks in a subject named "DV" (716 non-null values).

M-II (object) - Marks in "M-II" subject (716 non-null values).

PP (object) - Marks in "PP" subject (716 non-null values).

BEEE (object) - Marks in "BEEE" subject (716 non-null values).

FL (object) - Marks in "FL" subject (715 non-null values).

FIMS (object) - Marks in "FIMS" subject (716 non-null values).

```
import pandas as pd
```

```
import matplotlib.pyplot as plt
```

```
import seaborn as sns
```

```
pip install openpyxl
```

```
Requirement already satisfied: openpyxl in c:\programdata\anaconda3\lib\site-packages (3.1.5
Requirement already satisfied: et-xmlfile in c:\programdata\anaconda3\lib\site-packages (fro
Note: you may need to restart the kernel to use updated packages.
```

```
df = pd.read_excel(r"C:\Users\rohit\OneDrive\Desktop\MIDMARKS-MINOR1-EXAM.xlsx")
```

```
df
```

```
     S.NO SECTION  DV M-II  PP BEEE  FL FIMS
0       1   ALPHA  12    0  17    9  19   15
1       2   ALPHA  19   12  16   16  18    3
2       3   ALPHA  18   14  18   18  18   16
3       4   ALPHA  15    9  19   17  19   15
4       5   ALPHA  18   17  19   19  20   18
..    ...     ...  ..  ...  ..  ...  ..  ...
475   476     NaN  18    2  12    3  17   15
476   477     NaN  20    6  16   11  20   14
477   478     NaN  20  NaN  18   13  20   18
478   479     NaN  20   20   5   19  18   14
479   480     NaN  20   16  18   19  20   19

[480 rows x 8 columns]
```

```
df['SECTION'] = df['SECTION'].fillna('ZETA')
df
```

```
     S.NO SECTION  DV M-II  PP BEEE  FL FIMS
0       1   ALPHA  12    0  17    9  19   15
1       2   ALPHA  19   12  16   16  18    3
2       3   ALPHA  18   14  18   18  18   16
3       4   ALPHA  15    9  19   17  19   15
4       5   ALPHA  18   17  19   19  20   18
..    ...     ...  ..  ...  ..  ...  ..  ...
475   476    ZETA  18    2  12    3  17   15
476   477    ZETA  20    6  16   11  20   14
477   478    ZETA  20  NaN  18   13  20   18
478   479    ZETA  20   20   5   19  18   14
479   480    ZETA  20   16  18   19  20   19

[480 rows x 8 columns]
```

```
df['DV'] = df['DV'].replace(['MP'],0)
df
```

```
     S.NO SECTION  DV M-II  PP BEEE  FL FIMS
0       1   ALPHA  12    0  17    9  19   15
1       2   ALPHA  19   12  16   16  18    3
2       3   ALPHA  18   14  18   18  18   16
3       4   ALPHA  15    9  19   17  19   15
4       5   ALPHA  18   17  19   19  20   18
..    ...     ...  ..  ...  ..  ...  ..  ...
```

```
475   476    ZETA  18    2  12    3  17   15
476   477    ZETA  20    6  16   11  20   14
477   478    ZETA  20  NaN  18   13  20   18
478   479    ZETA  20   20   5   19  18   14
479   480    ZETA  20   16  18   19  20   19

[480 rows x 8 columns]
```

```
df.replace(["AB","mp"],0, inplace=True)
```

```
df
```

```
     S.NO SECTION  DV M-II  PP BEEE  FL FIMS
0       1   ALPHA  12    0  17    9  19   15
1       2   ALPHA  19   12  16   16  18    3
2       3   ALPHA  18   14  18   18  18   16
3       4   ALPHA  15    9  19   17  19   15
4       5   ALPHA  18   17  19   19  20   18
..    ...     ...  ..  ...  ..  ...  ..  ...
475   476     NaN  18    2  12    3  17   15
476   477     NaN  20    6  16   11  20   14
477   478     NaN  20  NaN  18   13  20   18
478   479     NaN  20   20   5   19  18   14
479   480     NaN  20   16  18   19  20   19

[480 rows x 8 columns]
```

```
df['S.NO'] = range(1, len(df) + 1)
```

```
df['SECTION'] = df['SECTION'].fillna('SIGMA')
df['SECTION'] = df['SECTION'].replace('', 'SIGMA')
df
```

```
df['S.NO'] = range(1, len(df) + 1)
df
```

```
df.shape
```

```
(480, 17)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 480 entries, 0 to 479
Data columns (total 17 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   S.NO           480 non-null    int64
 1   SECTION        480 non-null    object
 2   DV             480 non-null    int32
 3   M2             480 non-null    int32
```

```
 4   PP             480 non-null    int32
 5   BEEE           480 non-null    int32
 6   FL             480 non-null    int32
 7   FIMS           480 non-null    int32
 8   Total          480 non-null    int32
 9   Percentage     480 non-null    float64
 10  Grade          0 non-null      object
 11  backlogs       480 non-null    int64
 12  Coding-skills  480 non-null    object
 13  PP_Grade       480 non-null    object
 14  DV_Grade       480 non-null    object
 15  skills         480 non-null    object
 16  section        480 non-null    object
dtypes: float64(1), int32(7), int64(2), object(7)
memory usage: 50.8+ KB
```

```
df.shape
df.size
```

```
8160
```

```
df.size
```

```
8160
```

```
df.rename(columns={'M-II': 'M2'}, inplace=True)
```

```
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
```

```
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

df

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```python
df['S.NO'] = range(1, len(df) + 1)
df['SECTION'] = df['SECTION'].fillna('SIGMA')
df['SECTION'] = df['SECTION'].replace('', 'SIGMA')
print("Updated DataFrame with missing sections replaced by 'SIGMA':")
df
```

```
Updated DataFrame with missing sections replaced by 'SIGMA':
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
```

```
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
df['DV'] = pd.to_numeric(df['DV'], errors='coerce').fillna(0).astype(int)
df['M2'] = pd.to_numeric(df['M2'], errors='coerce').fillna(0).astype(int)
df['PP'] = pd.to_numeric(df['PP'], errors='coerce').fillna(0).astype(int)
df['BEEE'] = pd.to_numeric(df['BEEE'], errors='coerce').fillna(0).astype(int)
df['FL'] = pd.to_numeric(df['FL'], errors='coerce').fillna(0).astype(int)
df['FIMS'] = pd.to_numeric(df['FIMS'], errors='coerce').fillna(0).astype(int)
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN
```

```
     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
df['Total'] = df['DV'] + df['M2'] + df['PP'] + df['BEEE'] + df['FL'] + df['FIMS']
df['Percentage'] = round((df['Total'] / 120) * 100, 2)
```

```
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
df.loc[df['Total'] > 110, ['Grade']] = "A+"
df.loc[(df['Total'] > 90) & (df['Total'] <= 110), ['Grade']] = "A"
df.loc[(df['Total'] > 70) & (df['Total'] <= 90), ['Grade']] = "B+"
df.loc[(df['Total'] > 50) & (df['Total'] <= 70), ['Grade']] = "B"
df.loc[df['Total'] <= 50, ['Grade']] = "Fail"
failed_students_Total = df[df['Total'] < 50]
print("DataFrame of students who failed in subjects:")
print(failed_students_Total)
```

```
DataFrame of students who failed in subjects:
     S.NO  SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
20     21    ALPHA   4   2   5     3  16     9     39       32.50  Fail
27     28    ALPHA   5   4   3    12  13     5     42       35.00  Fail
57     58    ALPHA   2   2   4    10  10     3     31       25.83  Fail
75     76     BETA   5   8   7    15  10     2     47       39.17  Fail
82     83     BETA   2   0   2     0   0     0      4        3.33  Fail
88     89     BETA   2  17   0     3  15     2     39       32.50  Fail
147   148    DELTA   9   5   6     8  13     4     45       37.50  Fail
160   161    DELTA   7   0  14     5  10     5     41       34.17  Fail
178   179    DELTA  13   0   3     2  10    15     43       35.83  Fail
180   181    SIGMA   9   3   4     2  10    15     43       35.83  Fail
197   198  EPSILON  11   1   1     2  10     9     34       28.33  Fail
206   207  EPSILON   6   6   2     3  10    11     38       31.67  Fail
210   211  EPSILON   0   0   0     0   0     0      0        0.00  Fail
226   227  EPSILON   8   0   3     0  10    14     35       29.17  Fail
229   230  EPSILON  13   2   5     9  10    10     49       40.83  Fail
235   236  EPSILON   9   5   5     1  10    11     41       34.17  Fail
255   256    GAMMA  14   0   5    11   8    11     49       40.83  Fail
260   261    GAMMA  12   2   6     6   6    11     43       35.83  Fail
263   264    GAMMA  14   3   5     8  13     6     49       40.83  Fail
278   279    GAMMA  10   3   6     7  11     8     45       37.50  Fail
288   289    GAMMA  18   0   3     8  17     3     49       40.83  Fail
298   299    GAMMA  15   1   2     7  10     2     37       30.83  Fail
299   300    GAMMA  17   1   3     3  11    12     47       39.17  Fail
302   303    OMEGA   0   0   0     0   0     0      0        0.00  Fail
303   304    OMEGA   5   0   3    11   7    10     36       30.00  Fail
309   310    OMEGA  12   1   3    10  16     6     48       40.00  Fail
311   312    OMEGA   6   0   1    11   9     4     31       25.83  Fail
316   317    OMEGA  14   0   1     6   6     1     28       23.33  Fail
318   319    OMEGA  11   0   2     6  16    10     45       37.50  Fail
323   324    SIGMA   9   0   2     3  11     1     26       21.67  Fail
324   325    SIGMA   6   0   3     3  10     4     26       21.67  Fail
325   326    SIGMA   9   3   3    12  10     5     42       35.00  Fail
326   327    SIGMA   5   3   9    10  10     7     44       36.67  Fail
334   335    SIGMA  10   0   4     6  13     9     42       35.00  Fail
340   341    SIGMA   7   0   3     0  13     8     31       25.83  Fail
```

356	357	SIGMA	14	1	6	8	10	9	48	40.00	Fail
359	360	SIGMA	12	3	2	7	13	9	46	38.33	Fail
361	362	ZETA	0	0	6	7	13	0	26	21.67	Fail
364	365	ZETA	5	3	3	2	10	9	32	26.67	Fail
368	369	ZETA	0	0	0	0	0	0	0	0.00	Fail
372	373	ZETA	7	2	2	6	10	7	34	28.33	Fail
378	379	ZETA	8	0	2	6	15	8	39	32.50	Fail
380	381	OMEGA	0	0	0	0	0	0	0	0.00	Fail
388	389	OMEGA	10	12	1	8	15	3	49	40.83	Fail
393	394	OMEGA	2	5	1	2	10	6	26	21.67	Fail
394	395	OMEGA	12	0	6	4	10	9	41	34.17	Fail
409	410	OMEGA	12	5	1	20	10	0	48	40.00	Fail
416	417	OMEGA	9	0	0	0	0	0	9	7.50	Fail
424	425	SIGMA	6	1	0	0	0	0	7	5.83	Fail
430	431	SIGMA	6	1	9	11	8	10	45	37.50	Fail
444	445	SIGMA	5	2	11	0	10	0	28	23.33	Fail
453	454	SIGMA	1	5	0	0	0	0	6	5.00	Fail
457	458	SIGMA	12	3	2	8	7	12	44	36.67	Fail
461	462	SIGMA	0	0	0	0	0	0	0	0.00	Fail
469	470	SIGMA	1	1	2	0	10	0	14	11.67	Fail
474	475	SIGMA	11	4	2	2	8	10	37	30.83	Fail

	backlogs	Coding-skills	PP_Grade	DV_Grade	skills	section
20	5	poor	poor	Poor	Poor	alpha
27	4	poor	poor	Poor	Poor	alpha
57	4	poor	poor	Poor	Poor	alpha
75	4	poor	poor	Poor	Poor	alpha
82	6	poor	poor	Poor	Poor	alpha
88	4	poor	poor	Poor	Poor	alpha
147	5	poor	poor	Poor	Poor	alpha
160	4	average	Average	Average	Average	alpha
178	3	poor	poor	Poor	Poor	alpha
180	4	poor	poor	Poor	Poor	alpha
197	4	poor	poor	Poor	Poor	alpha
206	4	poor	poor	Poor	Poor	alpha
210	6	poor	poor	Poor	Poor	alpha
226	4	poor	poor	Poor	Poor	alpha
229	3	poor	poor	Poor	Poor	alpha
235	4	poor	poor	Poor	Poor	alpha
255	3	poor	poor	Poor	Poor	alpha
260	4	poor	poor	Poor	Poor	alpha
263	4	poor	poor	Poor	Poor	alpha
278	4	poor	poor	Poor	Poor	alpha
288	4	poor	poor	Poor	Poor	alpha
298	4	poor	poor	Poor	Poor	alpha
299	3	poor	poor	Poor	Poor	alpha

```
302         6          poor     poor     Poor     Poor   alpha
303         4          poor     poor     Poor     Poor   alpha
309         3          poor     poor     Poor     Poor   alpha
311         5          poor     poor     Poor     Poor   alpha
316         5          poor     poor     Poor     Poor   alpha
318         3          poor     poor     Poor     Poor   alpha
323         5          poor     poor     Poor     Poor   alpha
324         5          poor     poor     Poor     Poor   alpha
325         4          poor     poor     Poor     Poor   alpha
326         4          poor     poor     Poor     Poor   alpha
334         4          poor     poor     Poor     Poor   alpha
340         5          poor     poor     Poor     Poor   alpha
356         4          poor     poor     Poor     Poor   alpha
359         4          poor     poor     Poor     Poor   alpha
361         5          poor     poor     Poor     Poor   alpha
364         5          poor     poor     Poor     Poor   alpha
368         6          poor     poor     Poor     Poor   alpha
372         5          poor     poor     Poor     Poor   alpha
378         5          poor     poor     Poor     Poor   alpha
380         6          poor     poor     Poor     Poor   alpha
388         3          poor     poor     Poor     Poor   alpha
393         5          poor     poor     Poor     Poor   alpha
394         4          poor     poor     Poor     Poor   alpha
409         3          poor     poor     Poor     Poor   alpha
416         6          poor     poor     Poor     Poor   alpha
424         6          poor     poor     Poor     Poor   alpha
430         4          poor     poor     Poor     Poor   alpha
444         4          poor     poor     Poor     Poor   alpha
453         6          poor     poor     Poor     Poor   alpha
457         4          poor     poor     Poor     Poor   alpha
461         6          poor     poor     Poor     Poor   alpha
469         5          poor     poor     Poor     Poor   alpha
474         4          poor     poor     Poor     Poor   alpha
```

```
df.loc[df['Total'] > 110, ['Grade']] = "A+"
df.loc[(df['Total'] > 90) & (df['Total'] <= 110), ['Grade']] = "A"
df.loc[(df['Total'] > 70) & (df['Total'] <= 90), ['Grade']] = "B+"
df.loc[(df['Total'] > 50) & (df['Total'] <= 70), ['Grade']] = "B"
df.loc[df['Total'] <= 50, ['Grade']] = "Fail"
failed_students_Total = df[df['Total'] < 50]
print("DataFrame of students who failed in subjects:")
print(failed_students_Total)
```

```
DataFrame of students who failed in subjects:
     S.NO  SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
20     21    ALPHA   4   2   5     3  16     9     39       32.50  Fail
27     28    ALPHA   5   4   3    12  13     5     42       35.00  Fail
```

57	58	ALPHA	2	2	4	10	10	3	31	25.83	Fail
75	76	BETA	5	8	7	15	10	2	47	39.17	Fail
82	83	BETA	2	0	2	0	0	0	4	3.33	Fail
88	89	BETA	2	17	0	3	15	2	39	32.50	Fail
147	148	DELTA	9	5	6	8	13	4	45	37.50	Fail
160	161	DELTA	7	0	14	5	10	5	41	34.17	Fail
178	179	DELTA	13	0	3	2	10	15	43	35.83	Fail
180	181	SIGMA	9	3	4	2	10	15	43	35.83	Fail
197	198	EPSILON	11	1	1	2	10	9	34	28.33	Fail
206	207	EPSILON	6	6	2	3	10	11	38	31.67	Fail
210	211	EPSILON	0	0	0	0	0	0	0	0.00	Fail
226	227	EPSILON	8	0	3	0	10	14	35	29.17	Fail
229	230	EPSILON	13	2	5	9	10	10	49	40.83	Fail
235	236	EPSILON	9	5	5	1	10	11	41	34.17	Fail
255	256	GAMMA	14	0	5	11	8	11	49	40.83	Fail
260	261	GAMMA	12	2	6	6	6	11	43	35.83	Fail
263	264	GAMMA	14	3	5	8	13	6	49	40.83	Fail
278	279	GAMMA	10	3	6	7	11	8	45	37.50	Fail
288	289	GAMMA	18	0	3	8	17	3	49	40.83	Fail
298	299	GAMMA	15	1	2	7	10	2	37	30.83	Fail
299	300	GAMMA	17	1	3	3	11	12	47	39.17	Fail
302	303	OMEGA	0	0	0	0	0	0	0	0.00	Fail
303	304	OMEGA	5	0	3	11	7	10	36	30.00	Fail
309	310	OMEGA	12	1	3	10	16	6	48	40.00	Fail
311	312	OMEGA	6	0	1	11	9	4	31	25.83	Fail
316	317	OMEGA	14	0	1	6	6	1	28	23.33	Fail
318	319	OMEGA	11	0	2	6	16	10	45	37.50	Fail
323	324	SIGMA	9	0	2	3	11	1	26	21.67	Fail
324	325	SIGMA	6	0	3	3	10	4	26	21.67	Fail
325	326	SIGMA	9	3	3	12	10	5	42	35.00	Fail
326	327	SIGMA	5	3	9	10	10	7	44	36.67	Fail
334	335	SIGMA	10	0	4	6	13	9	42	35.00	Fail
340	341	SIGMA	7	0	3	0	13	8	31	25.83	Fail
356	357	SIGMA	14	1	6	8	10	9	48	40.00	Fail
359	360	SIGMA	12	3	2	7	13	9	46	38.33	Fail
361	362	ZETA	0	0	6	7	13	0	26	21.67	Fail
364	365	ZETA	5	3	3	2	10	9	32	26.67	Fail
368	369	ZETA	0	0	0	0	0	0	0	0.00	Fail
372	373	ZETA	7	2	2	6	10	7	34	28.33	Fail
378	379	ZETA	8	0	2	6	15	8	39	32.50	Fail
380	381	OMEGA	0	0	0	0	0	0	0	0.00	Fail
388	389	OMEGA	10	12	1	8	15	3	49	40.83	Fail
393	394	OMEGA	2	5	1	2	10	6	26	21.67	Fail
394	395	OMEGA	12	0	6	4	10	9	41	34.17	Fail
409	410	OMEGA	12	5	1	20	10	0	48	40.00	Fail
416	417	OMEGA	9	0	0	0	0	0	9	7.50	Fail

424	425	SIGMA	6	1	0	0	0	0	7	5.83	Fail
430	431	SIGMA	6	1	9	11	8	10	45	37.50	Fail
444	445	SIGMA	5	2	11	0	10	0	28	23.33	Fail
453	454	SIGMA	1	5	0	0	0	0	6	5.00	Fail
457	458	SIGMA	12	3	2	8	7	12	44	36.67	Fail
461	462	SIGMA	0	0	0	0	0	0	0	0.00	Fail
469	470	SIGMA	1	1	2	0	10	0	14	11.67	Fail
474	475	SIGMA	11	4	2	2	8	10	37	30.83	Fail

	backlogs	Coding-skills	PP_Grade	DV_Grade	skills	section
20	5	poor	poor	Poor	Poor	alpha
27	4	poor	poor	Poor	Poor	alpha
57	4	poor	poor	Poor	Poor	alpha
75	4	poor	poor	Poor	Poor	alpha
82	6	poor	poor	Poor	Poor	alpha
88	4	poor	poor	Poor	Poor	alpha
147	5	poor	poor	Poor	Poor	alpha
160	4	average	Average	Average	Average	alpha
178	3	poor	poor	Poor	Poor	alpha
180	4	poor	poor	Poor	Poor	alpha
197	4	poor	poor	Poor	Poor	alpha
206	4	poor	poor	Poor	Poor	alpha
210	6	poor	poor	Poor	Poor	alpha
226	4	poor	poor	Poor	Poor	alpha
229	3	poor	poor	Poor	Poor	alpha
235	4	poor	poor	Poor	Poor	alpha
255	3	poor	poor	Poor	Poor	alpha
260	4	poor	poor	Poor	Poor	alpha
263	4	poor	poor	Poor	Poor	alpha
278	4	poor	poor	Poor	Poor	alpha
288	4	poor	poor	Poor	Poor	alpha
298	4	poor	poor	Poor	Poor	alpha
299	3	poor	poor	Poor	Poor	alpha
302	6	poor	poor	Poor	Poor	alpha
303	4	poor	poor	Poor	Poor	alpha
309	3	poor	poor	Poor	Poor	alpha
311	5	poor	poor	Poor	Poor	alpha
316	5	poor	poor	Poor	Poor	alpha
318	3	poor	poor	Poor	Poor	alpha
323	5	poor	poor	Poor	Poor	alpha
324	5	poor	poor	Poor	Poor	alpha
325	4	poor	poor	Poor	Poor	alpha
326	4	poor	poor	Poor	Poor	alpha
334	4	poor	poor	Poor	Poor	alpha
340	5	poor	poor	Poor	Poor	alpha
356	4	poor	poor	Poor	Poor	alpha

```
359         4          poor     poor     Poor     Poor   alpha
361         5          poor     poor     Poor     Poor   alpha
364         5          poor     poor     Poor     Poor   alpha
368         6          poor     poor     Poor     Poor   alpha
372         5          poor     poor     Poor     Poor   alpha
378         5          poor     poor     Poor     Poor   alpha
380         6          poor     poor     Poor     Poor   alpha
388         3          poor     poor     Poor     Poor   alpha
393         5          poor     poor     Poor     Poor   alpha
394         4          poor     poor     Poor     Poor   alpha
409         3          poor     poor     Poor     Poor   alpha
416         6          poor     poor     Poor     Poor   alpha
424         6          poor     poor     Poor     Poor   alpha
430         4          poor     poor     Poor     Poor   alpha
444         4          poor     poor     Poor     Poor   alpha
453         6          poor     poor     Poor     Poor   alpha
457         4          poor     poor     Poor     Poor   alpha
461         6          poor     poor     Poor     Poor   alpha
469         5          poor     poor     Poor     Poor   alpha
474         4          poor     poor     Poor     Poor   alpha
```

```python
def assign_grade(percentage):
    if percentage >= 90:
        return 'A'
    elif percentage >= 80:
        return 'B+'
    elif percentage >= 70:
        return 'B'
    elif percentage >= 60:
        return 'C+'
    elif percentage >=50:
        return 'C'
    elif percentage >=40:
        return 'D'
    else:
        return 'F'
df['Grade'] = df['Percentage'].apply(assign_grade)
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00    C+
1       2   ALPHA  19  12  16    16  18     3     84       70.00     B
2       3   ALPHA  18  14  18    18  18    16    102       85.00    B+
3       4   ALPHA  15   9  19    17  19    15     94       78.33     B
4       5   ALPHA  18  17  19    19  20    18    111       92.50     A
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83     C
```

```
476   477   SIGMA  20   6  16    11  20    14     87       72.50     B
477   478   SIGMA  20   0  18    13  20    18     89       74.17     B
478   479   SIGMA  20  20   5    19  18    14     96       80.00    B+
479   480   SIGMA  20  16  18    19  20    19    112       93.33     A
```

```
     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha
```

```
[480 rows x 17 columns]
```

```
df['backlogs'] = (df[['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']] < 10).sum(axis=1)
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00    C+
1       2   ALPHA  19  12  16    16  18     3     84       70.00     B
2       3   ALPHA  18  14  18    18  18    16    102       85.00    B+
3       4   ALPHA  15   9  19    17  19    15     94       78.33     B
4       5   ALPHA  18  17  19    19  20    18    111       92.50     A
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83     C
476   477   SIGMA  20   6  16    11  20    14     87       72.50     B
477   478   SIGMA  20   0  18    13  20    18     89       74.17     B
478   479   SIGMA  20  20   5    19  18    14     96       80.00    B+
479   480   SIGMA  20  16  18    19  20    19    112       93.33     A
```

```
     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
```

```
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
h = df[
    (df['DV'] < 10.0) |
    (df['PP'] < 10.0) |
    (df['M2'] < 10.0) |
    (df['BEEE'] < 10.0) |
    (df['FL'] < 10.0) |
    (df['FIMS'] < 10.0)
]
h['SECTION'].value_counts()
```

```
SECTION
SIGMA      73
GAMMA      43
EPSILON    41
OMEGA      41
DELTA      35
BETA       32
ALPHA      26
ZETA       13
Name: count, dtype: int64
```

```
df['backlogs'] = (df[['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']] < 10).sum(axis=1)
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00    C+
1       2   ALPHA  19  12  16    16  18     3     84       70.00     B
2       3   ALPHA  18  14  18    18  18    16    102       85.00    B+
3       4   ALPHA  15   9  19    17  19    15     94       78.33     B
4       5   ALPHA  18  17  19    19  20    18    111       92.50     A
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83     C
476   477   SIGMA  20   6  16    11  20    14     87       72.50     B
477   478   SIGMA  20   0  18    13  20    18     89       74.17     B
478   479   SIGMA  20  20   5    19  18    14     96       80.00    B+
479   480   SIGMA  20  16  18    19  20    19    112       93.33     A

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
```

```
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00    C+
1       2   ALPHA  19  12  16    16  18     3     84       70.00     B
2       3   ALPHA  18  14  18    18  18    16    102       85.00    B+
3       4   ALPHA  15   9  19    17  19    15     94       78.33     B
4       5   ALPHA  18  17  19    19  20    18    111       92.50     A
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83     C
476   477   SIGMA  20   6  16    11  20    14     87       72.50     B
477   478   SIGMA  20   0  18    13  20    18     89       74.17     B
478   479   SIGMA  20  20   5    19  18    14     96       80.00    B+
479   480   SIGMA  20  16  18    19  20    19    112       93.33     A

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]
```

```
less_than_10 = df[
    (df['DV'] < 10) |
    (df['M2'] < 10) |
    (df['PP'] < 10) |
    (df['BEEE'] < 10) |
    (df['FL'] < 10) |
    (df['FIMS'] < 10)
]
```

```
print("Students with less than 10 marks in at least one subject:")
print(less_than_10)
```

```
Students with less than 10 marks in at least one subject:
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00    C+
1       2   ALPHA  19  12  16    16  18     3     84       70.00     B
3       4   ALPHA  15   9  19    17  19    15     94       78.33     B
5       6   ALPHA  17  16  18    10  15     9     85       70.83     B
8       9   ALPHA  10  18   0    20  19    15     82       68.33    C+
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
474   475   SIGMA  11   4   2     2   8    10     37       30.83     F
475   476   SIGMA  18   2  12     3  17    15     67       55.83     C
476   477   SIGMA  20   6  16    11  20    14     87       72.50     B
477   478   SIGMA  20   0  18    13  20    18     89       74.17     B
478   479   SIGMA  20  20   5    19  18    14     96       80.00    B+

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
5           1     very good  Very Good  Very Good  Very Good   alpha
8           1          poor       poor       Poor       Poor   alpha
..        ...           ...        ...        ...        ...     ...
474         4          poor       poor       Poor       Poor   alpha
475         2          poor       poor       Poor       Poor   alpha
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha

[304 rows x 17 columns]
```

```
j=df.sort_values('backlogs')
j
```

```
     S.NO  SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
239   240  EPSILON  17  17  14    20  18    17    103       85.83    B+
194   195  EPSILON  18  11  19    10  20    20     98       81.67    B+
195   196  EPSILON  20  12  18    17  20    20    107       89.17    B+
201   202  EPSILON  18  17  15    18  19    19    106       88.33    B+
202   203  EPSILON  16  11  16    14  13    19     89       74.17     B
..    ...      ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
380   381    OMEGA   0   0   0     0   0     0      0        0.00     F
302   303    OMEGA   0   0   0     0   0     0      0        0.00     F
453   454    SIGMA   1   5   0     0   0     0      6        5.00     F
368   369     ZETA   0   0   0     0   0     0      0        0.00     F
461   462    SIGMA   0   0   0     0   0     0      0        0.00     F
```

```
     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
239         0       average    Average    Average    Average   alpha
194         0     very good  Very Good  Very Good  Very Good   alpha
195         0     very good  Very Good  Very Good  Very Good   alpha
201         0          good       Good       Good       Good   alpha
202         0          good       Good       Good       Good   alpha
..        ...           ...        ...        ...        ...     ...
380         6          poor       poor       Poor       Poor   alpha
302         6          poor       poor       Poor       Poor   alpha
453         6          poor       poor       Poor       Poor   alpha
368         6          poor       poor       Poor       Poor   alpha
461         6          poor       poor       Poor       Poor   alpha

[480 rows x 17 columns]
```

```
df.iloc[:, 2:] = df.iloc[:, 2:].apply(pd.to_numeric, errors='coerce')
backlog_counts = (df.iloc[:, 2:] < 10).sum()
highest_backlog_subject = backlog_counts.idxmax()
highest_backlog_count = backlog_counts.max()
print(f"The subject with the highest number of backlogs is '{highest_backlog_subject}' with
```

```
The subject with the highest number of backlogs is 'backlogs' with 480 backlogs.
```

```
df.iloc[:, 2:] = df.iloc[:, 2:].apply(pd.to_numeric, errors='coerce')
backlog_counts = (df.iloc[:, 2:] < 10).sum()
print("Number of backlogs in each subject:")
print(backlog_counts)
```

```
Number of backlogs in each subject:
DV                66
M2               226
PP               135
BEEE             127
FL                23
FIMS              86
Total              9
Percentage         9
Grade              0
backlogs         480
Coding-skills      0
PP_Grade           0
DV_Grade           0
skills             0
section            0
dtype: int64
```

```
import string
```

```
df.iloc[:, 2:] = df.iloc[:, 2:].apply(pd.to_numeric, errors='coerce')
absent_counts = df.iloc[:, 2:].isna().sum()
alpha_codes = {i: string.ascii_uppercase[i] for i in range(len(absent_counts))}
absent_alpha = absent_counts.map(alpha_codes)
print("Absentees in alphabetical codes for each subject:")
print(absent_alpha)
```

```
Absentees in alphabetical codes for each subject:
DV                 A
M2                 A
PP                 A
BEEE               A
FL                 A
FIMS               A
Total              A
Percentage         A
Grade            NaN
backlogs           A
Coding-skills    NaN
PP_Grade         NaN
DV_Grade         NaN
skills           NaN
section          NaN
dtype: object
```

```
%matplotlib inline
```

```
print(df.empty)
```

```
False
```

```
print(df.columns)
```

```
Index(['S.NO', 'SECTION', 'DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS', 'Total',
       'Percentage', 'Grade', 'backlogs', 'Coding-skills', 'PP_Grade',
       'DV_Grade', 'skills', 'section'],
      dtype='object')
```

```
print(df['Grade'].notna().sum())
```

```
0
```

```
if df['Grade'].notna().sum() > 0:
    df['Grade'].value_counts().plot(kind='bar', figsize=(8, 6), color='skyblue', edgecolor='
    plt.title('Distribution of Grades', fontsize=16)
    plt.xlabel('Grades', fontsize=14)
    plt.ylabel('Count', fontsize=14)
    plt.xticks(rotation=0)
    plt.grid(axis='y', linestyle='--', alpha=0.7)
    plt.show()
```

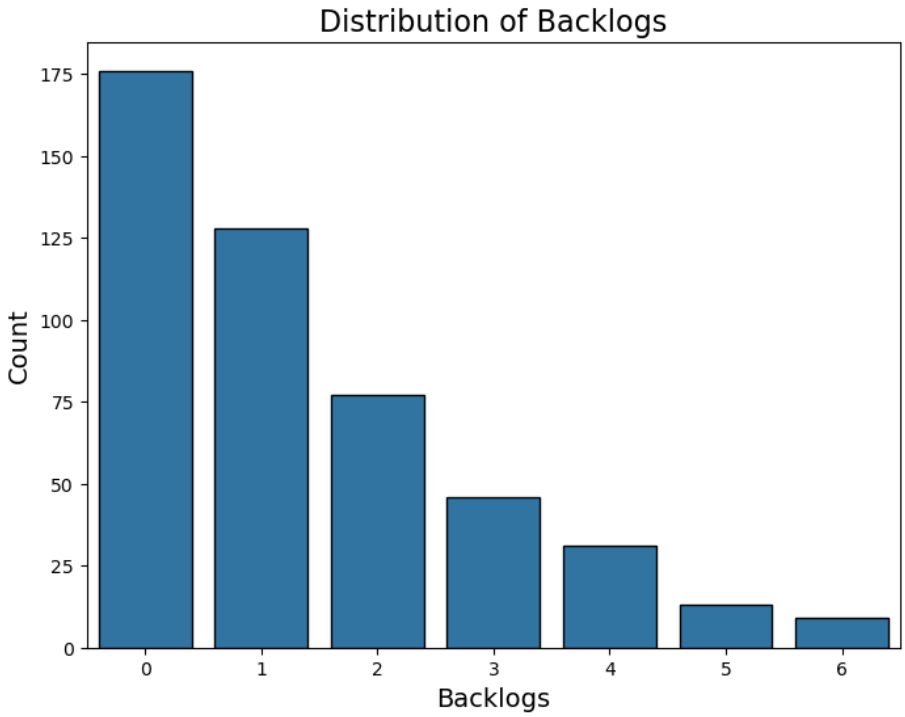
```
else:
    print("The 'Grade' column is empty or contains no valid data.")
```

```
The 'Grade' column is empty or contains no valid data.
```

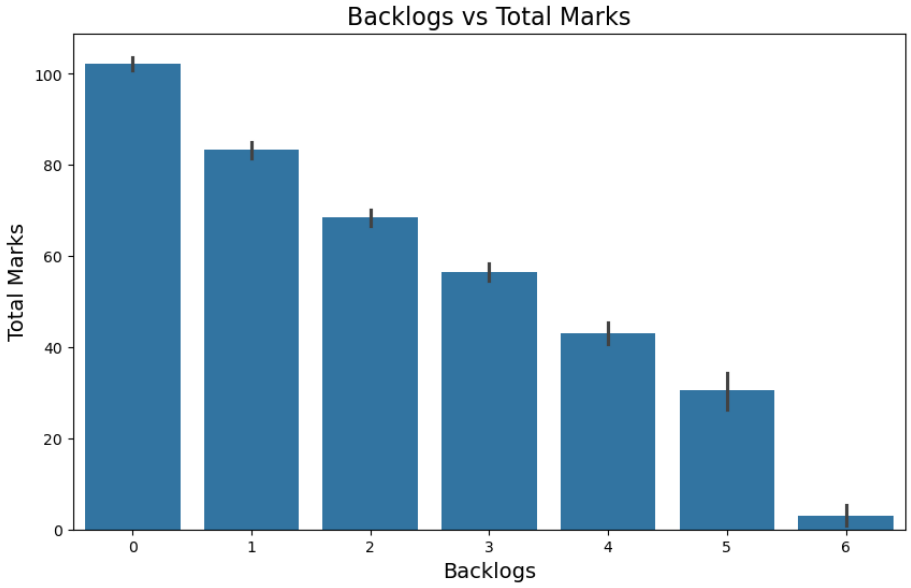
```
print(df.head())
```

```
   S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0     1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1     2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2     3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3     4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4     5   ALPHA  18  17  19    19  20    18    111       92.50   NaN

   backlogs Coding-skills PP_Grade DV_Grade skills section
0         2           NaN      NaN      NaN    NaN     NaN
1         1           NaN      NaN      NaN    NaN     NaN
2         0           NaN      NaN      NaN    NaN     NaN
3         1           NaN      NaN      NaN    NaN     NaN
4         0           NaN      NaN      NaN    NaN     NaN
```

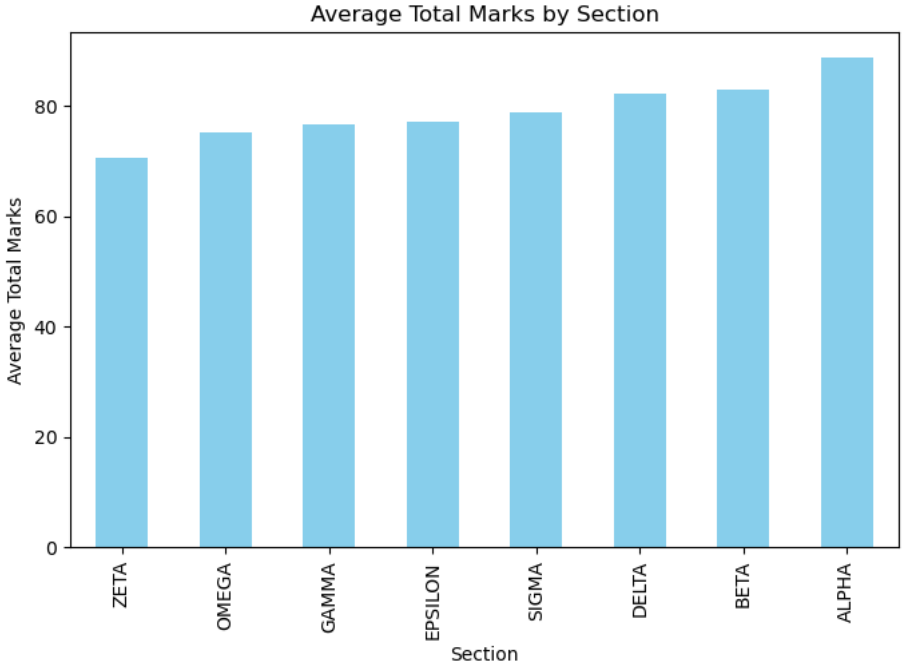
```
plt.figure(figsize=(8, 6))
sns.countplot(x='backlogs', data=df, edgecolor='black')
plt.title('Distribution of Backlogs', fontsize=16)
plt.xlabel('Backlogs', fontsize=14)
plt.ylabel('Count', fontsize=14)
plt.show()
```



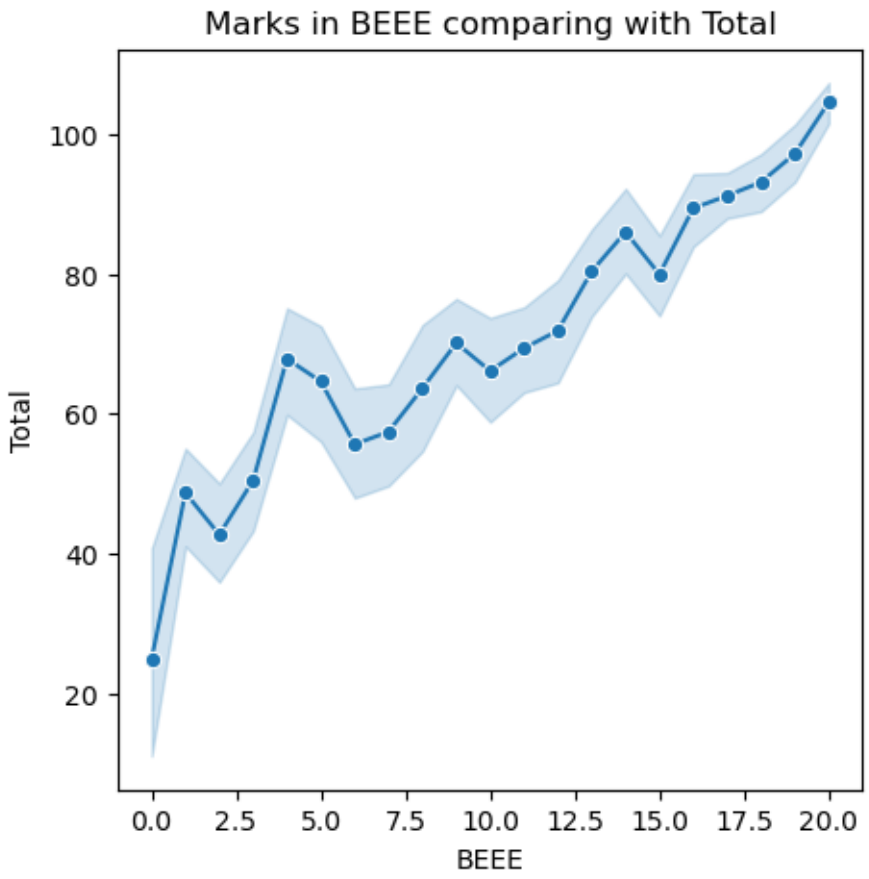

```
plt.figure(figsize=(10, 6))
sns.barplot(x='backlogs', y='Total', data=df)
plt.title('Backlogs vs Total Marks', fontsize=16)
plt.xlabel('Backlogs', fontsize=14)
plt.ylabel('Total Marks', fontsize=14)
plt.show()
```



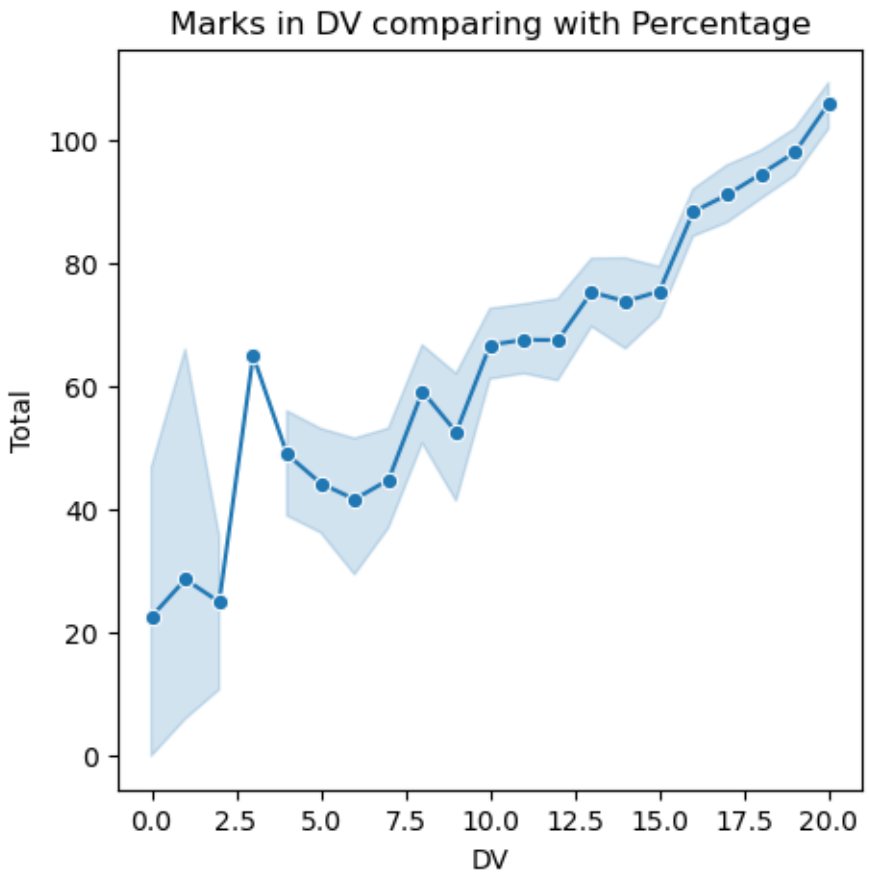

```
avg_by_section = df.groupby("SECTION")["Total"].mean().sort_values()
plt.figure(figsize=(8, 5))
avg_by_section.plot(kind="bar", color="skyblue")
plt.title("Average Total Marks by Section")
plt.xlabel("Section")
plt.ylabel("Average Total Marks")
plt.show()
```




```
plt.figure(figsize=(5, 5))
sns.lineplot(x="BEEE", y="Total", data=df, marker="o")
plt.xlabel("BEEE")
plt.ylabel("Total")
plt.title("Marks in BEEE comparing with Total")
plt.show()
```



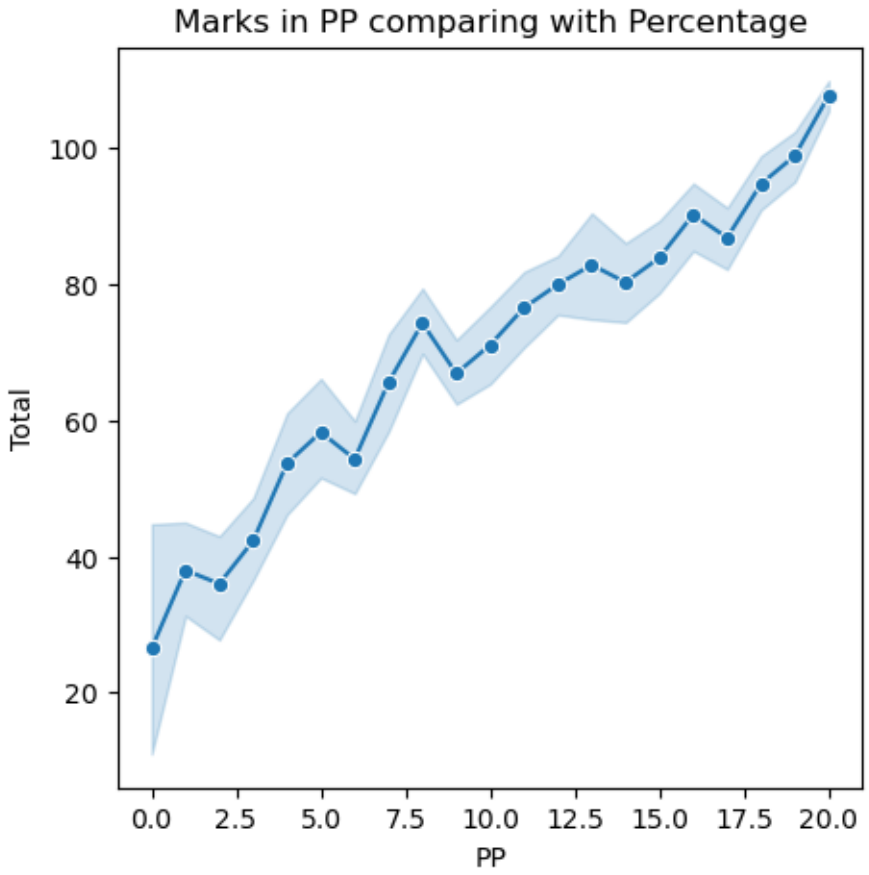

```
df.sort_values(["Total"], ascending=True)
plt.figure(figsize=(5, 5))
sns.lineplot(x="DV", y="Total", data=df, marker="o")
plt.xlabel("DV")
plt.ylabel("Total")
plt.title("Marks in DV comparing with Percentage")
plt.show()
```

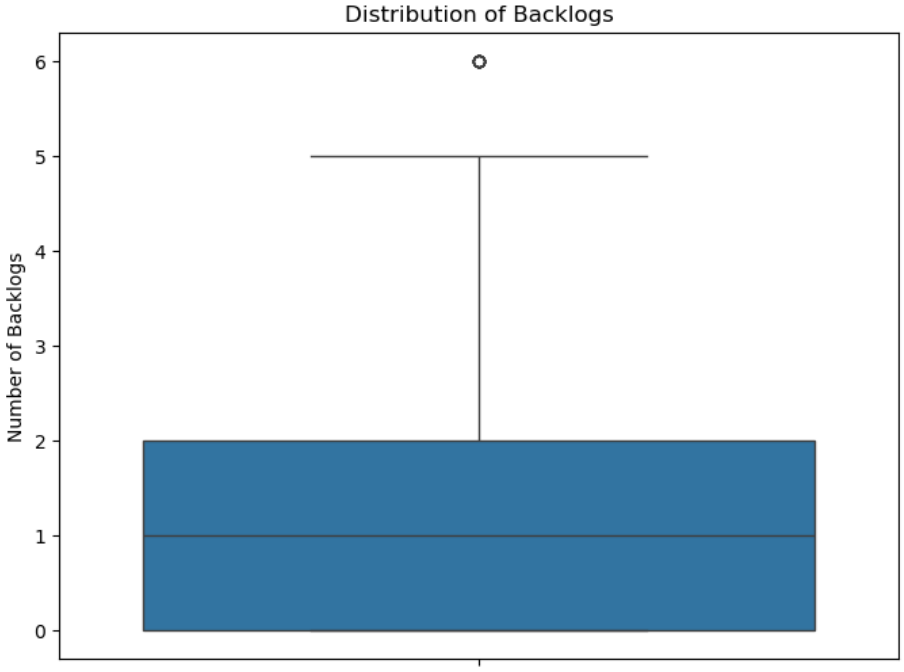



```
plt.figure(figsize=(5, 5))
sns.lineplot(x="PP", y="Total", data=df, marker="o")
plt.xlabel("PP")
plt.ylabel("Total")
plt.title("Marks in PP comparing with Percentage")
```

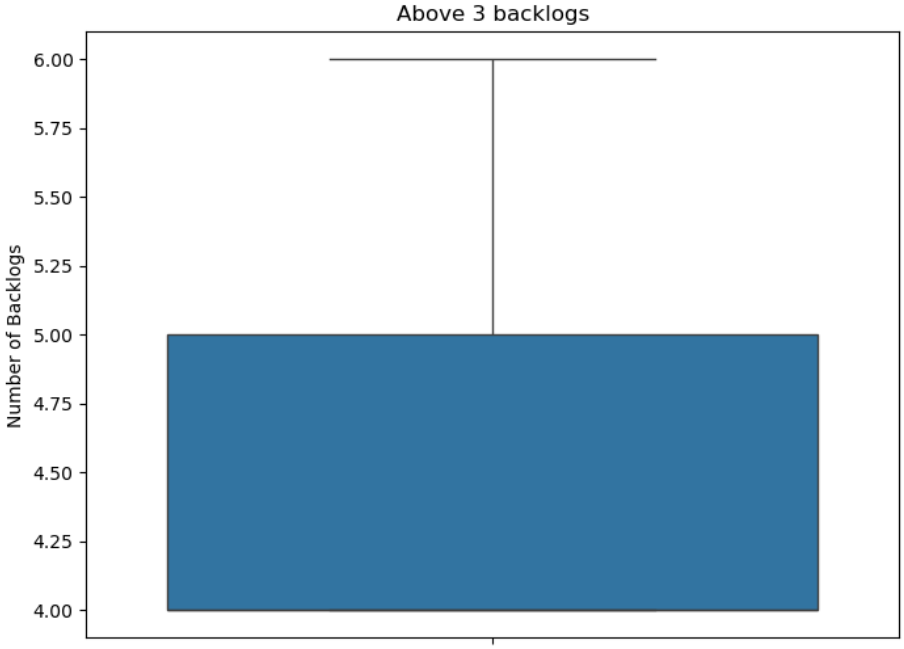
```
Text(0.5, 1.0, 'Marks in PP comparing with Percentage')
```

```
plt.figure(figsize=(8, 6))
sns.boxplot(y=df['backlogs'])
plt.title("Distribution of Backlogs")
plt.ylabel("Number of Backlogs")
plt.show()
```

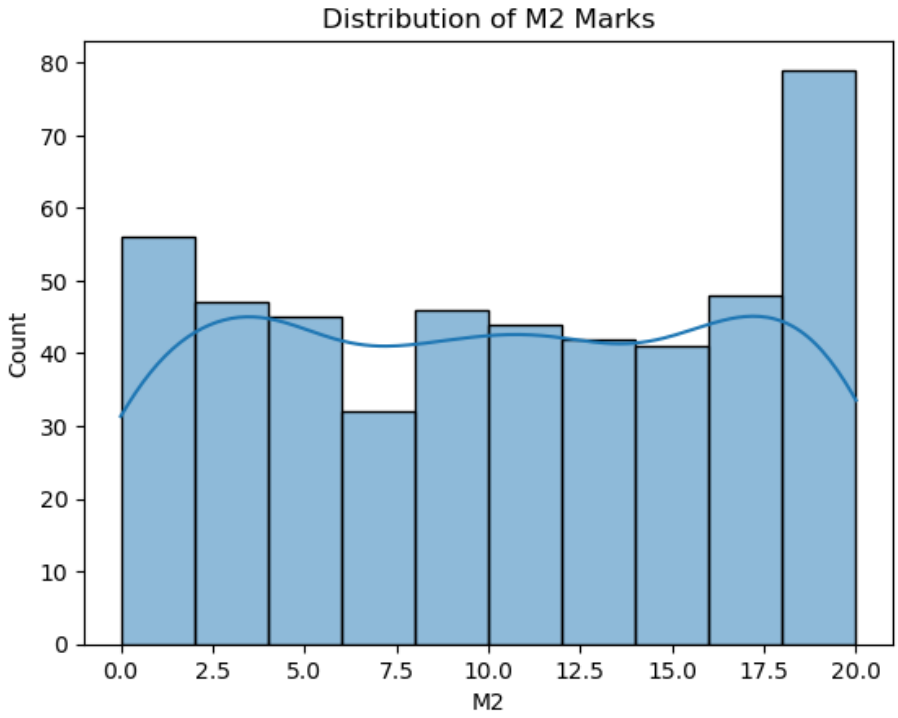

Marks in PP comparing with Percentage
Total
100
80
60
40
20
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
PP



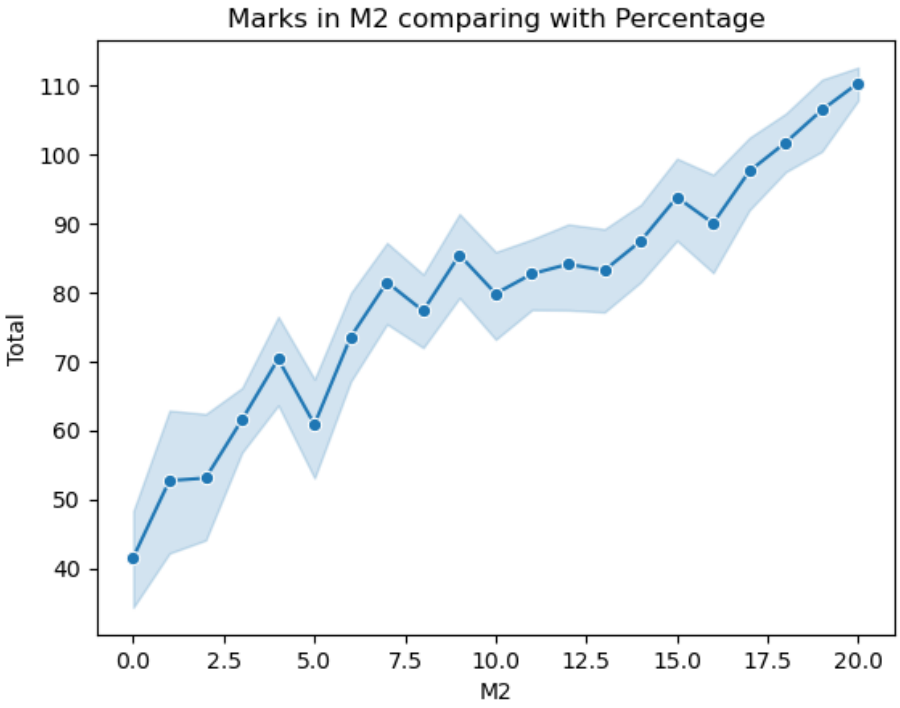

```
filtered_df = df[df['backlogs'] > 3]
plt.figure(figsize=(8, 6))
sns.boxplot(y=filtered_df['backlogs'])
plt.title("Above 3 backlogs")
plt.ylabel("Number of Backlogs")
plt.show()
```



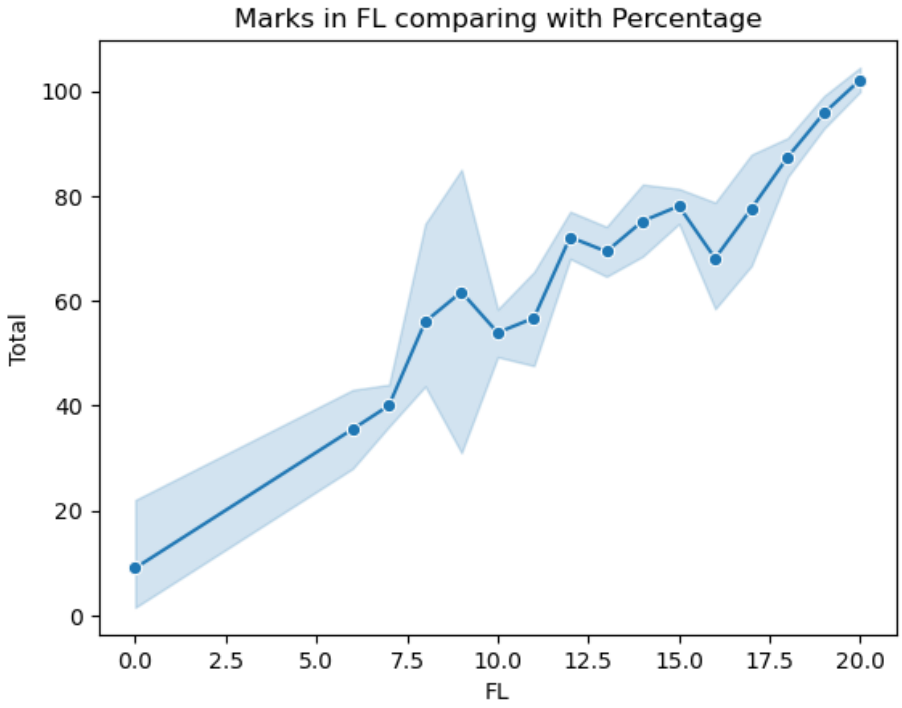

```
sns.histplot(df['M2'], kde=True)
plt.title('Distribution of M2 Marks')
plt.show()
```



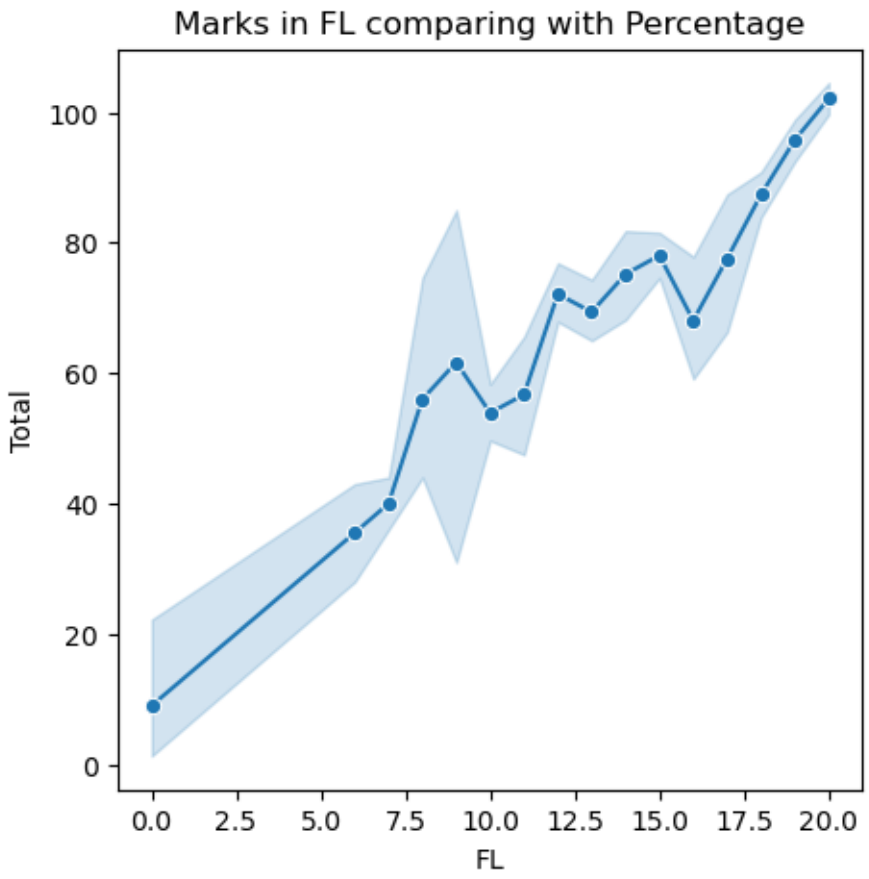

```
sns.lineplot(x="M2", y="Total", data=df, marker="o")
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```



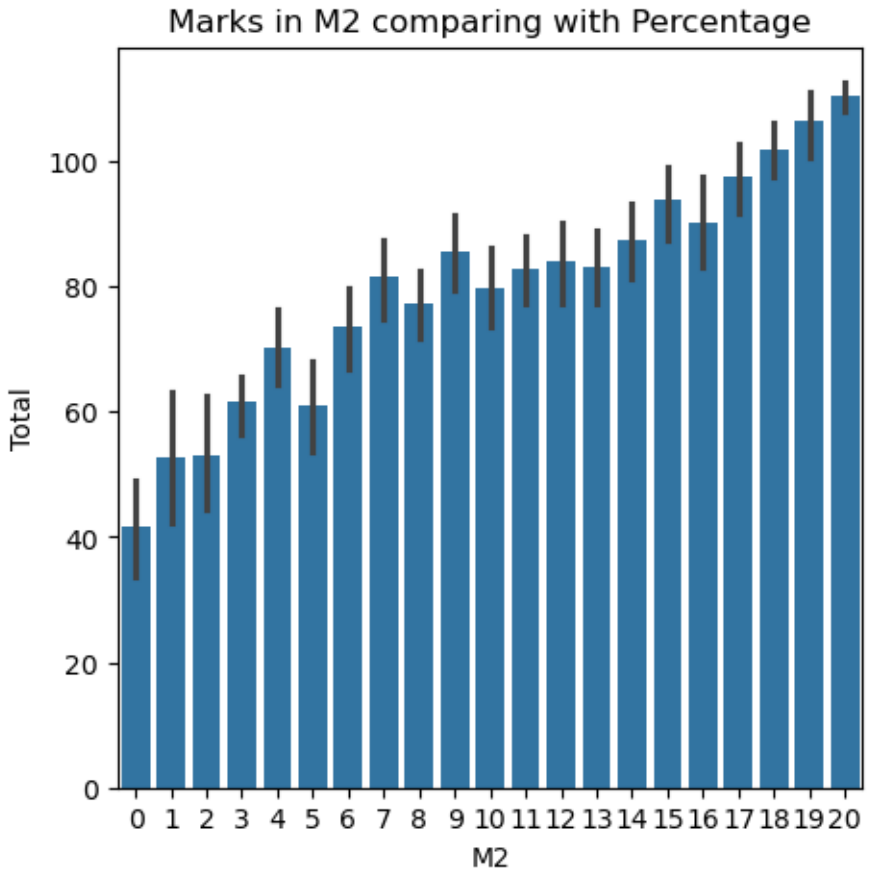

```
sns.lineplot(x="FL", y="Total", data=df, marker="o")
plt.xlabel("FL")
plt.ylabel("Total")
plt.title("Marks in FL comparing with Percentage")
plt.show()
```



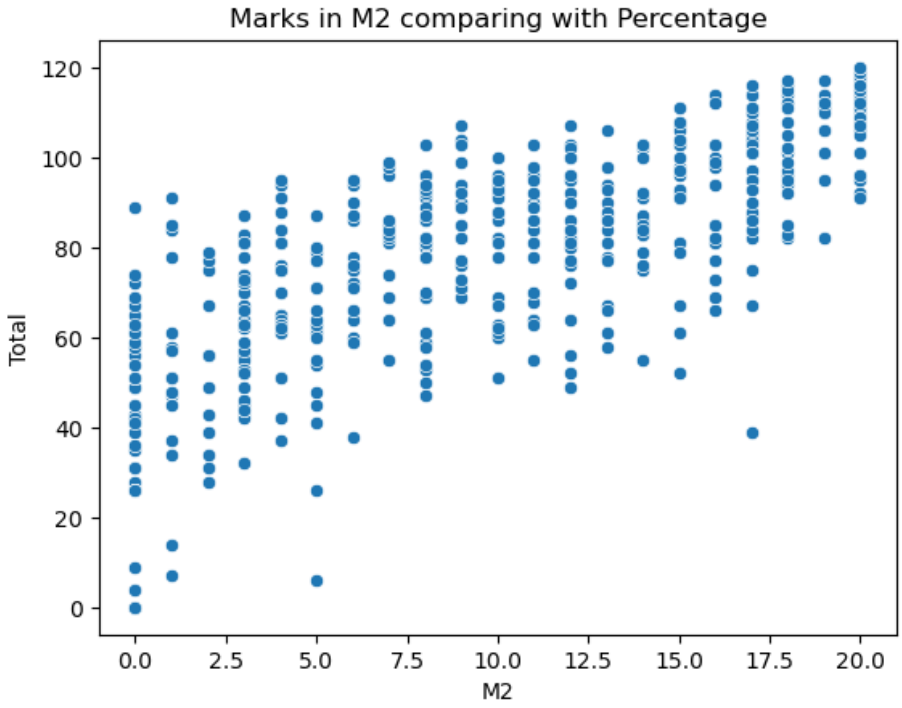

```
plt.figure(figsize=(5, 5))
sns.lineplot(x="FL", y="Total", data=df, marker="o")
plt.xlabel("FL")
plt.ylabel("Total")
plt.title("Marks in FL comparing with Percentage")
plt.show()
```



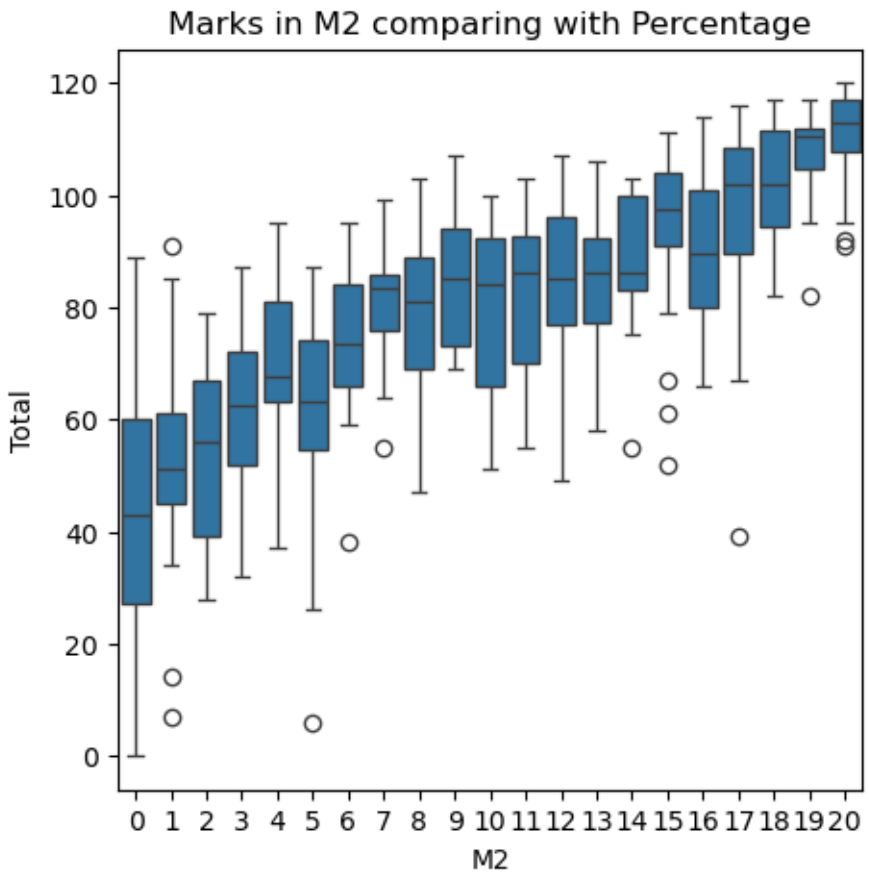

```
plt.figure(figsize=(5, 5))
sns.barplot(x="M2", y="Total", data=df)
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```



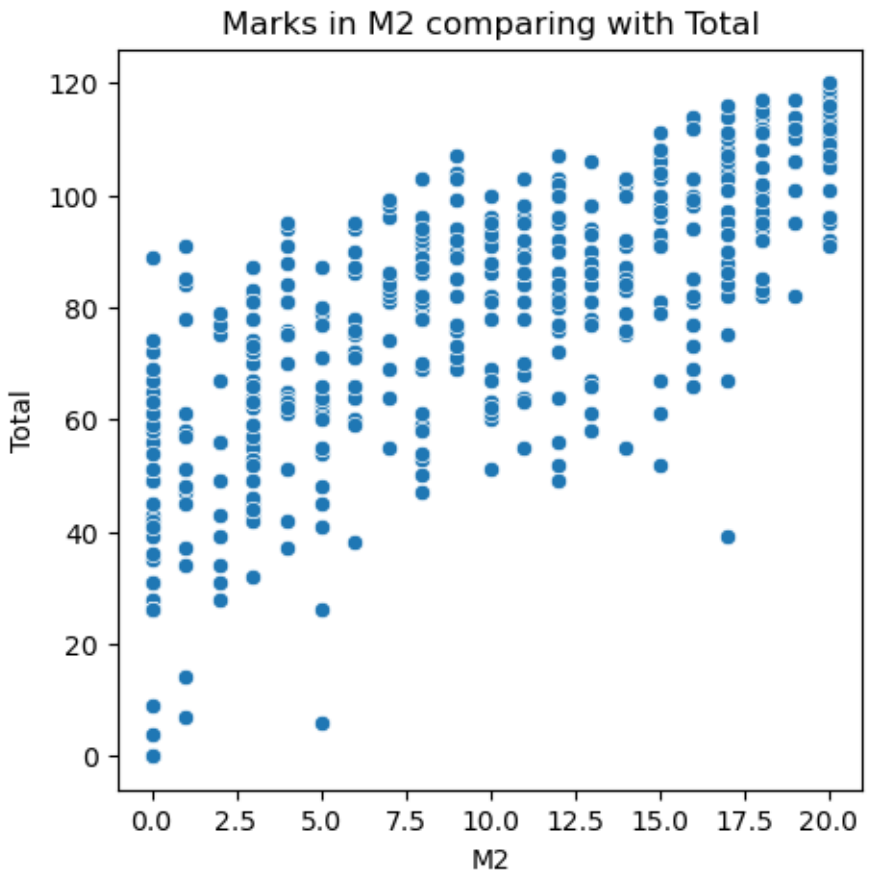

```
sns.scatterplot(x="M2", y="Total", data=df, marker="o")
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```



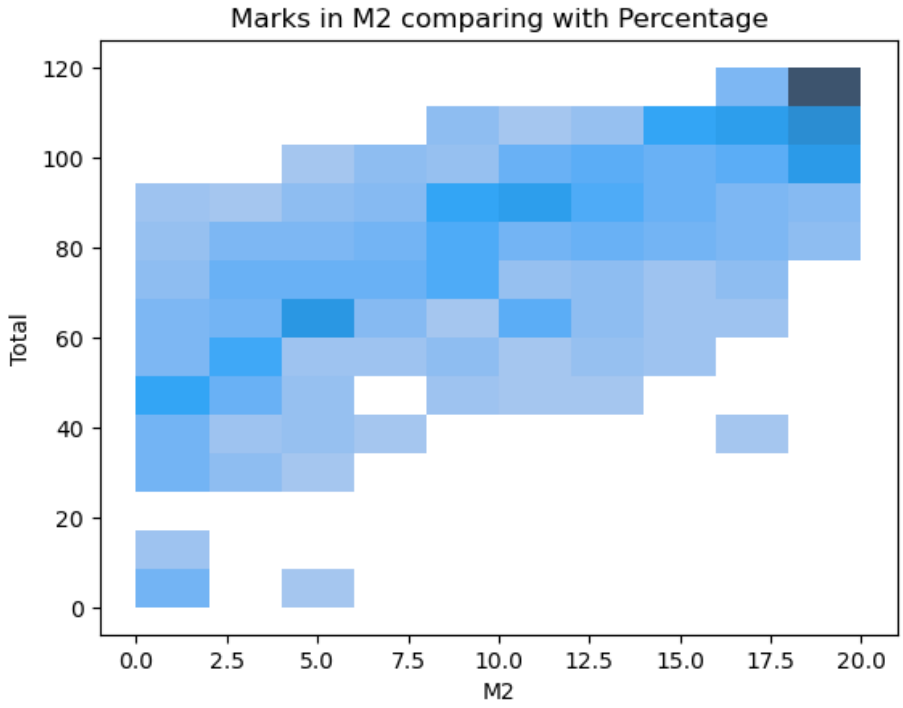

```
plt.figure(figsize=(5, 5))
sns.boxplot(x="M2", y="Total", data=df)
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```




```
plt.figure(figsize=(5, 5))
sns.scatterplot(x="M2", y="Total", data=df, marker="o")
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Total")
plt.show()
```




```
sns.histplot(x="M2", y="Total", data=df)
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```




```
def assign_grade(PP):
    if PP >=18 :
        return "very good"

    elif PP >=15 :
        return 'good'
    elif PP >= 13:
        return 'average'
    else:
        return 'poor'
df['Coding-skills'] = df['PP'].apply(assign_grade)
df
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
```

```
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills PP_Grade DV_Grade skills section
0           2          good      NaN      NaN    NaN     NaN
1           1          good      NaN      NaN    NaN     NaN
2           0     very good      NaN      NaN    NaN     NaN
3           1     very good      NaN      NaN    NaN     NaN
4           0     very good      NaN      NaN    NaN     NaN
..        ...           ...      ...      ...    ...     ...
475         2          poor      NaN      NaN    NaN     NaN
476         1          good      NaN      NaN    NaN     NaN
477         1     very good      NaN      NaN    NaN     NaN
478         1          poor      NaN      NaN    NaN     NaN
479         0     very good      NaN      NaN    NaN     NaN

[480 rows x 17 columns]
```

```
def assign_grade(PP):
    if 18 <= PP <= 20:
        return 'Very Good'
    elif 13 <= PP <= 14:
        return 'Average'
    elif 13 <= PP <= 17:
        return 'Good'
    else:
        return 'poor'

df['PP_Grade'] = df['PP'].apply(assign_grade)
print(df)
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade DV_Grade skills section
0           2          good       Good      NaN    NaN     NaN
1           1          good       Good      NaN    NaN     NaN
```

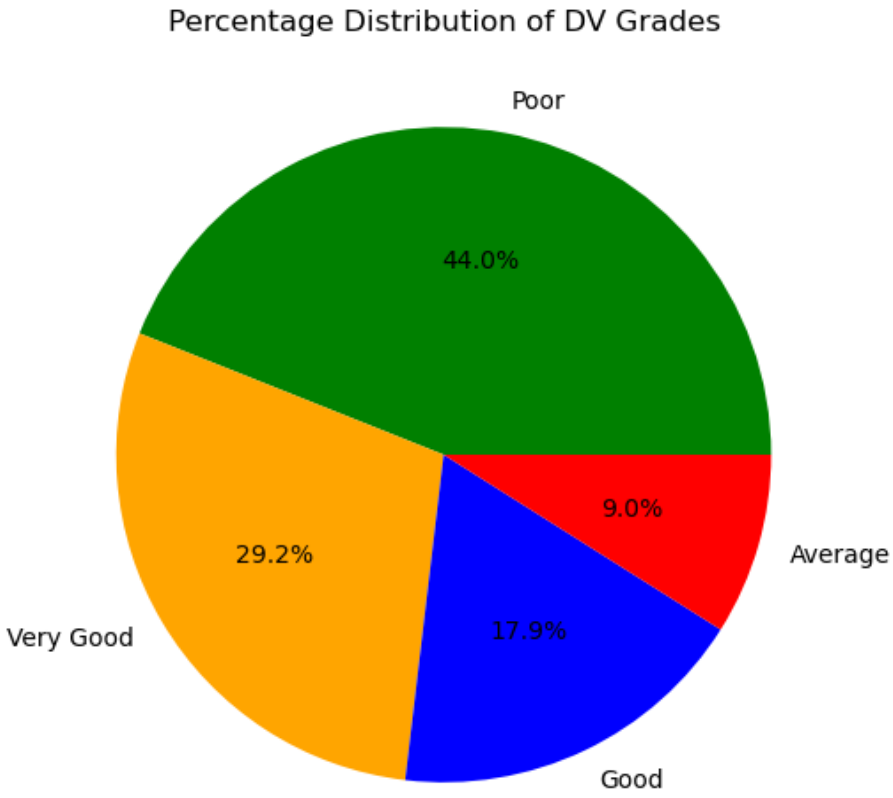
```
2           0     very good  Very Good      NaN    NaN     NaN
3           1     very good  Very Good      NaN    NaN     NaN
4           0     very good  Very Good      NaN    NaN     NaN
..        ...           ...        ...      ...    ...     ...
475         2          poor       poor      NaN    NaN     NaN
476         1          good       Good      NaN    NaN     NaN
477         1     very good  Very Good      NaN    NaN     NaN
478         1          poor       poor      NaN    NaN     NaN
479         0     very good  Very Good      NaN    NaN     NaN

[480 rows x 17 columns]
```

```python
def assign_grade(DV):
    if 18 <= DV <= 20:
        return 'Very Good'
    elif 13 <= DV <= 14:
        return 'Average'
    elif 13 <= DV <= 17:
        return 'Good'
    else:
        return 'poor'

df['DV_Grade'] = df['PP'].apply(assign_grade)
print(df)
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade skills section
0           2          good       Good       Good    NaN     NaN
1           1          good       Good       Good    NaN     NaN
2           0     very good  Very Good  Very Good    NaN     NaN
3           1     very good  Very Good  Very Good    NaN     NaN
4           0     very good  Very Good  Very Good    NaN     NaN
..        ...           ...        ...        ...    ...     ...
475         2          poor       poor       poor    NaN     NaN
476         1          good       Good       Good    NaN     NaN
```

```
477         1     very good  Very Good  Very Good    NaN     NaN
478         1          poor       poor       poor    NaN     NaN
479         0     very good  Very Good  Very Good    NaN     NaN

[480 rows x 17 columns]
```

```
def assign_grade(DV):
    if 18 <= DV <= 20:
        return 'Very Good'
    elif 13 <= DV <= 14:
        return 'Average'
    elif 15 <= DV <= 17:
        return 'Good'
    else:
        return 'Poor'
df['DV_Grade'] = df['PP'].apply(assign_grade)
grade_counts = df['DV_Grade'].value_counts()
plt.figure(figsize=(6, 6))
grade_counts.plot(kind='pie', autopct='%1.1f%%', colors=['green', 'orange', 'blue', 'red'])
plt.title("Percentage Distribution of DV Grades")
plt.ylabel("")
plt.show()
```




```
very_good_count = (df['PP'] == 'Very Good').sum()

print(f"Number of 'Very Good': {very_good_count}")
```

```
Number of 'Very Good': 0
```

```
subjects = ['DV','M2', 'PP', 'BEEE', 'FL', 'FIMS']
subset = []
for index, row in df.iterrows():
    if any(row[subject] == 20 for subject in subjects):
        subset.append(row)
subset_df = pd.DataFrame(subset)
print(subset_df)
```

```
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage  Grade  \
4       5   ALPHA  18  17  19    19  20    18    111       92.50    NaN
6       7   ALPHA  15  10  20    20  15    14     94       78.33    NaN
7       8   ALPHA  17  17  19    20  19    13    105       87.50    NaN
```

```
8       9   ALPHA  10  18   0    20  19    15     82       68.33    NaN
9      10   ALPHA  18  19  20    20  20    15    112       93.33    NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...    ...
473   474   SIGMA  20  20  20    20  20    20    120      100.00    NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50    NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17    NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00    NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33    NaN

     backlogs Coding-skills   PP_Grade   DV_Grade  skills  section
4           0     very good  Very Good  Very Good     NaN      NaN
6           0     very good  Very Good  Very Good     NaN      NaN
7           0     very good  Very Good  Very Good     NaN      NaN
8           1          poor       poor       Poor     NaN      NaN
9           0     very good  Very Good  Very Good     NaN      NaN
..        ...           ...        ...        ...     ...      ...
473         0     very good  Very Good  Very Good     NaN      NaN
476         1          good       Good       Good     NaN      NaN
477         1     very good  Very Good  Very Good     NaN      NaN
478         1          poor       poor       Poor     NaN      NaN
479         0     very good  Very Good  Very Good     NaN      NaN

[185 rows x 17 columns]
```

```
df.info()
```

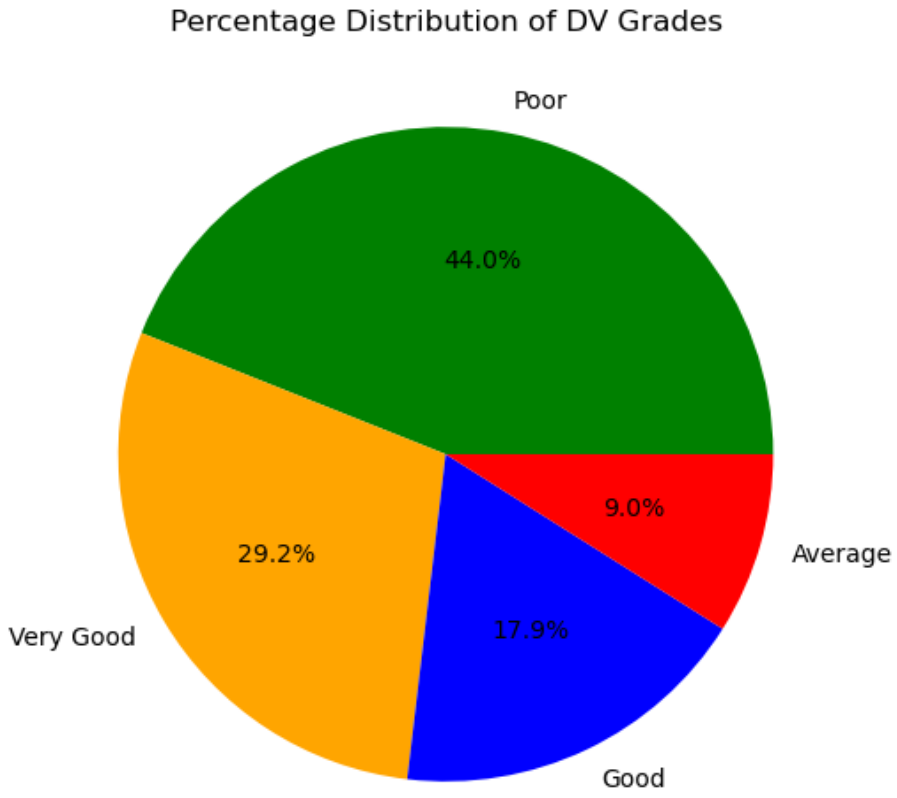
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 480 entries, 0 to 479
Data columns (total 17 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   S.NO           480 non-null    int64
 1   SECTION        480 non-null    object
 2   DV             480 non-null    int32
 3   M2             480 non-null    int32
 4   PP             480 non-null    int32
 5   BEEE           480 non-null    int32
 6   FL             480 non-null    int32
 7   FIMS           480 non-null    int32
 8   Total          480 non-null    int32
 9   Percentage     480 non-null    float64
 10  Grade          0 non-null      object
 11  backlogs       480 non-null    int64
 12  Coding-skills  480 non-null    object
 13  PP_Grade       480 non-null    object
 14  DV_Grade       480 non-null    object
 15  skills         0 non-null      object
```

```
 16  section        0 non-null      object
dtypes: float64(1), int32(7), int64(2), object(7)
memory usage: 50.8+ KB
```

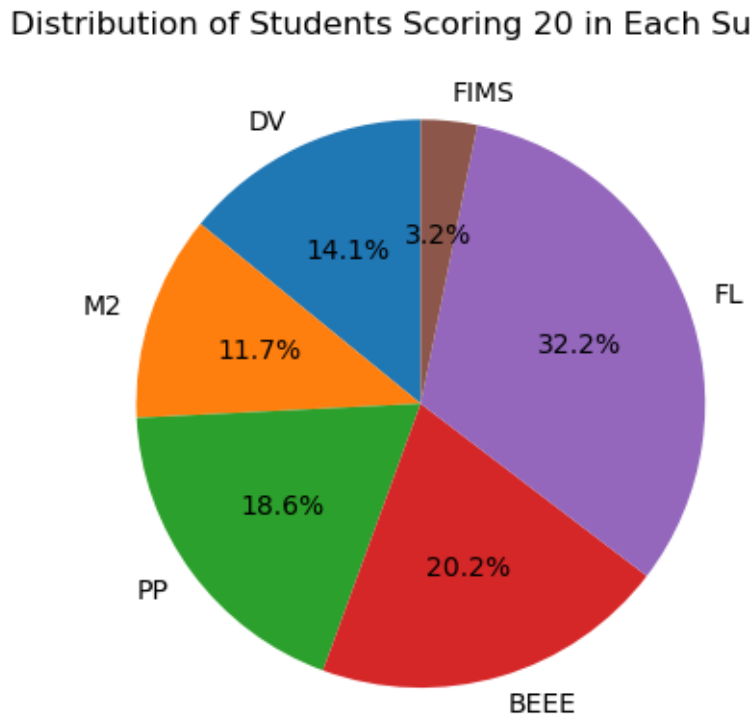
```
subjects = ['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']
subset = df[df[subjects].eq(20).any(axis=1)]
print("Subset of students who scored 20 in any subject:")
print(subset)
for subject in subjects:
    count_20 = (df[subject] == 20).sum()
    print(f"Students who scored 20 in {subject}: {count_20}")
```

```
Subset of students who scored 20 in any subject:
     S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percentage Grade  \
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
6       7   ALPHA  15  10  20    20  15    14     94       78.33   NaN
7       8   ALPHA  17  17  19    20  19    13    105       87.50   NaN
8       9   ALPHA  10  18   0    20  19    15     82       68.33   NaN
9      10   ALPHA  18  19  20    20  20    15    112       93.33   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
473   474   SIGMA  20  20  20    20  20    20    120      100.00   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade skills section
4           0     very good  Very Good  Very Good    NaN     NaN
6           0     very good  Very Good  Very Good    NaN     NaN
7           0     very good  Very Good  Very Good    NaN     NaN
8           1          poor       poor       Poor    NaN     NaN
9           0     very good  Very Good  Very Good    NaN     NaN
..        ...           ...        ...        ...    ...     ...
473         0     very good  Very Good  Very Good    NaN     NaN
476         1          good       Good       Good    NaN     NaN
477         1     very good  Very Good  Very Good    NaN     NaN
478         1          poor       poor       Poor    NaN     NaN
479         0     very good  Very Good  Very Good    NaN     NaN

[185 rows x 17 columns]
Students who scored 20 in DV: 53
Students who scored 20 in M2: 44
Students who scored 20 in PP: 70
Students who scored 20 in BEEE: 76
Students who scored 20 in FL: 121
Students who scored 20 in FIMS: 12
```

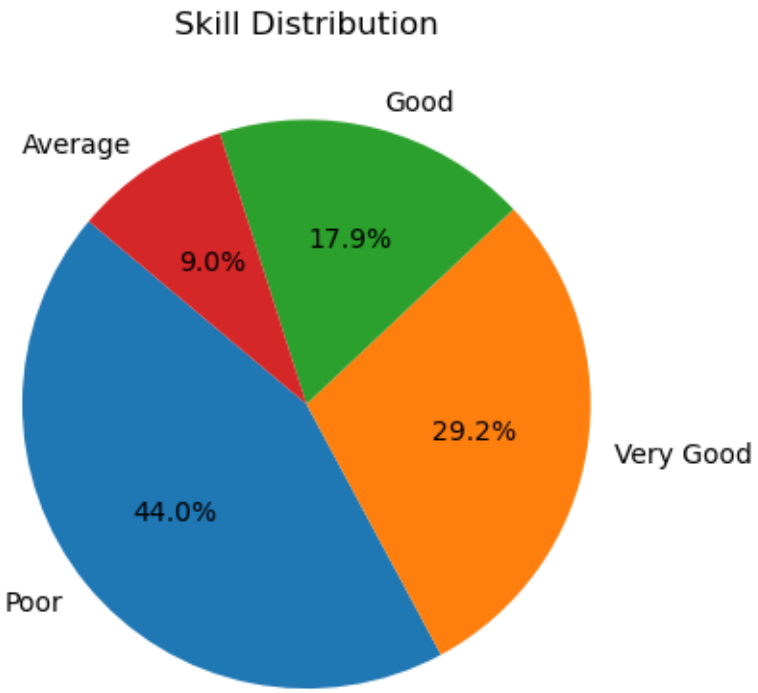
```
def assign_grade(DV):
    if 18 <= DV <= 20:
        return 'Very Good'
    elif 13 <= DV <= 14:
        return 'Average'
    elif 15 <= DV <= 17:
        return 'Good'
    else:
        return 'Poor'
df['DV_Grade'] = df['PP'].apply(assign_grade)
grade_counts = df['DV_Grade'].value_counts()
plt.figure(figsize=(6, 6))
grade_counts.plot(kind='pie', autopct='%1.1f%%', colors=['green', 'orange', 'blue', 'red'])
plt.title("Percentage Distribution of DV Grades")
plt.ylabel("")
plt.show()
```



```
subjects = ['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']
counts = [(df[subject] == 20).sum() for subject in subjects]
plt.pie(counts, labels=subjects, autopct='%1.1f%%', startangle=90)
plt.title('Distribution of Students Scoring 20 in Each Subject')
plt.show()
```




```
df['skills'] = df['PP'].apply(assign_grade)
skill_counts = df['skills'].value_counts()
plt.pie(skill_counts, labels=skill_counts.index, autopct='%1.1f%%', startangle=140)
plt.title('Skill Distribution')
plt.show()
df.skills.value_counts()
```




```
skills
Poor         211
Very Good    140
Good          86
Average       43
Name: count, dtype: int64
```

```
df.describe()
```

```
              S.NO          DV          M2          PP        BEEE          FL  \
count   480.000000  480.000000  480.000000  480.000000  480.000000  480.000000
mean    240.500000   14.383333   10.093750   12.885417   13.220833   15.535417
std     138.708327    4.644674    6.433664    5.874238    5.904351    4.279728
min       1.000000    0.000000    0.000000    0.000000    0.000000    0.000000
25%     120.750000   12.000000    4.000000    9.000000    9.000000   13.000000
50%     240.500000   15.500000   10.000000   14.000000   15.000000   15.000000
75%     360.250000   18.000000   16.000000   18.000000   18.000000   20.000000
max     480.000000   20.000000   20.000000   20.000000   20.000000   20.000000

              FIMS       Total  Percentage   backlogs
count   480.000000  480.000000  480.000000  480.00000
```

```
mean    13.645833   79.764583   66.470313    1.38125
std      4.716115   24.723878   20.603304    1.50103
min      0.000000    0.000000    0.000000    0.00000
25%     11.000000   64.000000   53.330000    0.00000
50%     15.000000   83.000000   69.170000    1.00000
75%     17.000000   98.000000   81.670000    2.00000
max     20.000000  120.000000  100.000000    6.00000
```

```
df["section"] = "alpha"
```

```
df[df["SECTION"] == "ALPHA"].mean(numeric_only=True)
```

```
S.NO          30.500000
DV            14.033333
M2            13.733333
PP            16.066667
BEEE          15.616667
FL            16.550000
FIMS          12.850000
Total         88.850000
Percentage    74.041167
backlogs       0.716667
dtype: float64
```

```
df.info
```

```
<bound method DataFrame.info of      S.NO SECTION  DV  M2  PP  BEEE  FL  FIMS  Total  Percer
0       1   ALPHA  12   0  17     9  19    15     72       60.00   NaN
1       2   ALPHA  19  12  16    16  18     3     84       70.00   NaN
2       3   ALPHA  18  14  18    18  18    16    102       85.00   NaN
3       4   ALPHA  15   9  19    17  19    15     94       78.33   NaN
4       5   ALPHA  18  17  19    19  20    18    111       92.50   NaN
..    ...     ...  ..  ..  ..   ...  ..   ...    ...         ...   ...
475   476   SIGMA  18   2  12     3  17    15     67       55.83   NaN
476   477   SIGMA  20   6  16    11  20    14     87       72.50   NaN
477   478   SIGMA  20   0  18    13  20    18     89       74.17   NaN
478   479   SIGMA  20  20   5    19  18    14     96       80.00   NaN
479   480   SIGMA  20  16  18    19  20    19    112       93.33   NaN

     backlogs Coding-skills   PP_Grade   DV_Grade     skills section
0           2          good       Good       Good       Good   alpha
1           1          good       Good       Good       Good   alpha
2           0     very good  Very Good  Very Good  Very Good   alpha
3           1     very good  Very Good  Very Good  Very Good   alpha
4           0     very good  Very Good  Very Good  Very Good   alpha
..        ...           ...        ...        ...        ...     ...
475         2          poor       poor       Poor       Poor   alpha
```

```
476         1          good       Good       Good       Good   alpha
477         1     very good  Very Good  Very Good  Very Good   alpha
478         1          poor       poor       Poor       Poor   alpha
479         0     very good  Very Good  Very Good  Very Good   alpha

[480 rows x 17 columns]>
```

```
df.groupby("SECTION")[df.select_dtypes(include=["number"]).columns].mean()
```

```
               S.NO         DV         M2         PP       BEEE         FL  \
SECTION
ALPHA     30.500000  14.033333  13.733333  16.066667  15.616667  16.550000
BETA      90.500000  12.083333  13.683333  15.666667  12.716667  15.833333
DELTA    150.500000  13.483333  11.466667  15.016667  11.050000  15.916667
EPSILON  214.816667  14.333333   9.716667  12.750000   9.700000  14.566667
GAMMA    270.500000  15.933333   7.616667   9.400000  14.866667  15.716667
OMEGA    369.833333  14.600000   8.000000  10.216667  14.900000  15.350000
SIGMA    404.069307  15.683168   8.178218  12.534653  13.504950  15.376238
ZETA     370.000000  13.263158   8.736842   9.052632  13.210526  14.105263

              FIMS      Total  Percentage  backlogs
SECTION
ALPHA    12.850000  88.850000   74.041167  0.716667
BETA     12.983333  82.966667   69.138500  1.150000
DELTA    15.350000  82.283333   68.570000  1.216667
EPSILON  16.116667  77.183333   64.318833  1.416667
GAMMA    13.050000  76.583333   63.818833  1.550000
OMEGA    12.066667  75.133333   62.611000  1.716667
SIGMA    13.603960  78.881188   65.734257  1.564356
ZETA     12.157895  70.526316   58.773158  2.052632
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 480 entries, 0 to 479
Data columns (total 17 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   S.NO           480 non-null    int64
 1   SECTION        480 non-null    object
 2   DV             480 non-null    int32
 3   M2             480 non-null    int32
 4   PP             480 non-null    int32
 5   BEEE           480 non-null    int32
 6   FL             480 non-null    int32
 7   FIMS           480 non-null    int32
 8   Total          480 non-null    int32
 9   Percentage     480 non-null    float64
```

```
 10  Grade          0 non-null      object
 11  backlogs       480 non-null    int64
 12  Coding-skills  480 non-null    object
 13  PP_Grade       480 non-null    object
 14  DV_Grade       480 non-null    object
 15  skills         480 non-null    object
 16  section        480 non-null    object
dtypes: float64(1), int32(7), int64(2), object(7)
memory usage: 50.8+ KB
```

```
from scipy.stats import ttest_ind
```

```
df[df['SECTION']=='BETA']['DV']
```

```
60     19
61      8
62     12
63     11
64     12
65      9
66     12
67     12
68     16
69     20
70      4
71     17
72      7
73     10
74     17
75      5
76     17
77     13
78     19
79     19
80     19
81     18
82      2
83     10
84     12
85      3
86     17
87     13
88      2
89     10
90     17
91     14
92     11
```

```
93     14
94     12
95     16
96      8
97      8
98      6
99      9
100    10
101    13
102    10
103    11
104    17
105    12
106     9
107    11
108    10
109    13
110     8
111    10
112    16
113    15
114    11
115    20
116    13
117    12
118     9
119    15
Name: DV, dtype: int32
```

```
from scipy.stats import ttest_ind
df[df['SECTION'] == 'ALPHA']['DV']
```

```
0     12
1     19
2     18
3     15
4     18
5     17
6     15
7     17
8     10
9     18
10    17
11    20
12    16
13    17
14    19
```

```
15    13
16    15
17    11
18    14
19    19
20     4
21    14
22    17
23    20
24    15
25     6
26    17
27     5
28    19
29     8
30    11
31    12
32    17
33    14
34    17
35     8
36    11
37    15
38    19
39    20
40    18
41    16
42    16
43    11
44    18
45    11
46    14
47    16
48    16
49    15
50     1
51     6
52    17
53     8
54    14
55    15
56    10
57     2
58    10
59    19
Name: DV, dtype: int32
```

```
df[df['SECTION'] == 'BETA']['DV']
```

```
60     19
61      8
62     12
63     11
64     12
65      9
66     12
67     12
68     16
69     20
70      4
71     17
72      7
73     10
74     17
75      5
76     17
77     13
78     19
79     19
80     19
81     18
82      2
83     10
84     12
85      3
86     17
87     13
88      2
89     10
90     17
91     14
92     11
93     14
94     12
95     16
96      8
97      8
98      6
99      9
100    10
101    13
102    10
103    11
```

```
104    17
105    12
106     9
107    11
108    10
109    13
110     8
111    10
112    16
113    15
114    11
115    20
116    13
117    12
118     9
119    15
Name: DV, dtype: int32
```

```
ttest_ind(df[df['SECTION'] == 'ALPHA']['DV'] , df[df['SECTION'] == 'BETA']['DV'])
```

```
TtestResult(statistic=2.3418185924318102, pvalue=0.020866453244001094, df=118.0)
```

```
from scipy.stats import ttest_rel
ttest_rel(df[df['SECTION'] == 'ALPHA']['DV'] , df[df['SECTION'] == 'BETA']['DV'])
```

```
TtestResult(statistic=2.3172456109384103, pvalue=0.023979527821469917, df=59)
```

```
ALPHA_DV = df[df["SECTION"] == "ALPHA"]['DV'].dropna()
BETA_DV = df[df["SECTION"] == "BETA"]['DV'].dropna()
ttest_ind(ALPHA_DV,BETA_DV)
```

```
TtestResult(statistic=2.3418185924318102, pvalue=0.020866453244001094, df=118.0)
```

```
from scipy.stats import chi2_contingency
```

```
df.DV.mean()
```

```
14.383333333333333
```

```
df[df['SECTION']=='ALPHA'].DV.mean()
```

```
14.033333333333333
```

```
import scipy.stats as stats
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'BETA']['PP'], popmean=14.41)
print(t_statistics, p_value)
```

```
1.8778523020441942 0.06534654049350333
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'BETA']['DV'], popmean=14.41)
print(t_statistics, p_value)
```

```
-4.035751834264198 0.0001588940914138618
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'ALPHA']['DV'] ,df.DV.mean())
print(t_statistics, p_value)
```

```
-0.5825263515793191 0.5624319157350715
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'GAMMA']['DV'] ,df.DV.mean())
print(t_statistics, p_value)
```

```
5.436735948684493 1.087970538399695e-06
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'DELTA']['DV'] ,df.DV.mean())
print(t_statistics, p_value)
```

```
-1.6332146803454848 0.10774976960815406
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'SIGMA']['DV'] ,df.DV.mean())
print(t_statistics, p_value)
```

```
2.6489850039194636 0.009384060119324023
```

```
t_statistics, p_value = stats.ttest_1samp(df[df['SECTION'] == 'EPSILON']['DV'] ,df.DV.mean()
print(t_statistics, p_value)
```

```
-0.09486832980504935 0.9247408819314669
```

```
sample_alpha = df[df["SECTION"] == "ALPHA"]["DV"]
sample_beta = df[df["SECTION"] == "BETA"]["DV"]
t_statistic, p_value = stats.ttest_ind(sample_alpha, sample_beta)
print("T-statistic:", t_statistic)
print("P-value:", p_value)
```

```
T-statistic: 2.3418185924318102
P-value: 0.020866453244001094
```

```
from scipy.stats import chi2_contingency
```

```
data = [df[df["SECTION"] == "ALPHA"]['DV'],df[df["SECTION"] == "BETA"]['DV']]
stat, p, dof, expected = chi2_contingency(data)
alpha = 0.05
print("p value is " + str(p))
if p <= alpha:
    print('Dependent (reject H0)')
else:
    print('Independent (H0 holds true)')
```

```
p value is 2.3496708155645757e-05
Dependent (reject H0)
```

OBSERVATION