M Rohith

2211CS010342

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 (from 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
                     12
                               17
0
             ALPHA
                           0
                                      9
                                         19
                                               15
                                         18
1
        2
             ALPHA
                     19
                          12
                               16
                                    16
                                               3
2
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             ALPHA
                     18
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3
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             ALPHA
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                           9
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4
             ALPHA
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475
      476
               NaN
                     18
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476
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               {\tt NaN}
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477
      478
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478
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                                    19 18
                                               14
479
      480
               {\tt 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
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             ALPHA
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475
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476
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              ZETA
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477
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478
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              ZETA 20
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                                    19
                                               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
                               17
        1
             ALPHA
                     12
                           0
                                      9
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1
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        3
             ALPHA
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477
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                        {\tt NaN}
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478
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                                   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
            ALPHA
                    12
                          0
                             17
                                   9
                                       19
                                            15
1
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            ALPHA
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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['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
                     480 non-null
                                      int32
     DV
 3
     M2
                     480 non-null
                                      int32
```

```
PP
                     480 non-null
                                       int32
 4
 5
     BEEE
                     480 non-null
                                       int32
 6
     FL
                     480 non-null
                                       int32
 7
                                       int32
     FIMS
                     480 non-null
 8
     Total
                     480 non-null
                                       int32
 9
                     480 non-null
                                       float64
     Percentage
 10
                     0 non-null
                                       object
     Grade
                     480 non-null
 11
     backlogs
                                       int64
 12
     Coding-skills
                     480 non-null
                                       object
 13
     PP_Grade
                     480 non-null
                                       object
 14
     DV_Grade
                     480 non-null
                                       object
    skills
 15
                     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
                                                      72
                                                                60.00
        1
             ALPHA
                    12
                          0
                             17
                                    9
                                        19
                                              15
                                                                        NaN
1
        2
             ALPHA
                    19
                        12
                             16
                                   16
                                        18
                                               3
                                                      84
                                                                70.00
                                                                        NaN
2
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                                        18
                                                     102
                                                                85.00
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3
        4
             ALPHA
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                                                      94
                                                                78.33
                    15
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                                   17
4
        5
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475
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                                                      67
                                                                55.83
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476
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                    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
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                                        18
                                              14
                                                      96
                                                                80.00
                                                                        NaN
479
      480
             SIGMA
                    20
                        16
                                        20
                                              19
                                                     112
                                                                93.33
                                                                        NaN
                            18
                                    19
     backlogs Coding-skills
                                PP_Grade
                                            DV_Grade
                                                          skills section
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475
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                                     poor
479
             0
                   very good
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                                           Very Good
                                                       Very Good
                                                                     alpha
[480 rows x 17 columns]
df
     S.NO SECTION
                    \mathsf{DV}
                         M2
                                  BEEE
                                            FIMS
                                                   Total
                                                           Percentage Grade
                             PP
                                        FL
0
                                                                 60.00
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478
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     backlogs Coding-skills
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1
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2
             0
                   very good
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                   very good
3
                               Very Good
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4
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                   very good
                               Very Good
                                           Very Good
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476
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477
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478
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                         poor
479
             0
                   very good Very Good Very Good
                                                       Very Good
                                                                     alpha
[480 rows x 17 columns]
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 \
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9 19

15

72

60.00

0

ALPHA

12

0 17

1

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70.00
1
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                                                  3
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             ALPHA
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                                                        102
                                                                   85.00
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                                     18
3
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             ALPHA
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476
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477
       478
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478
      479
             SIGMA
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479
      480
             SIGMA
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                          16
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                                                                   93.33
                                                                            NaN
     backlogs Coding-skills
                                  PP_Grade
                                              DV_Grade
                                                             skills section
0
             2
                                       Good
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478
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479
             0
                                Very Good
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                                                          Very Good
                                                                        alpha
                    very good
[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
                           0
                                          19
                                                         72
                                                                   60.00
         1
             ALPHA
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                              17
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1
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                                                        102
                                                                   85.00
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3
             ALPHA
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475
      476
             SIGMA
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476
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             SIGMA
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                              16
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                                                         87
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477
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             SIGMA
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PP_Grade
                                              DV_Grade
     backlogs Coding-skills
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                    very good
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475
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476
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                                                                       alpha
477
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478
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479
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                    very good
                                 Very Good
                                                          Very Good
[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
                          M2
                                   BEEE
                     DV
                              PP
                                          FL
                                              FIMS
                                                     Total
                                                             Percentage Grade
0
             ALPHA
                           0
                                          19
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                                                        72
         1
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2
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                                                       102
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3
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4
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475
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                                                                   55.83
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476
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                                     11
                                          20
                                                 14
                                                        87
                                                                   72.50
                                                                            NaN
477
      478
             SIGMA
                     20
                           0
                              18
                                     13
                                          20
                                                 18
                                                        89
                                                                   74.17
                                                                            NaN
478
      479
             SIGMA
                          20
                               5
                                     19
                                          18
                                                 14
                                                         96
                                                                   80.00
                                                                            NaN
479
      480
             SIGMA
                                          20
                                                                   93.33
                     20
                          16
                              18
                                     19
                                                 19
                                                       112
                                                                            NaN
     backlogs Coding-skills
                                  PP Grade
                                              DV Grade
                                                             skills section
0
             2
                          good
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
1
             1
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
                          good
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
                                                                       alpha
                    very good
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475
             2
                                      poor
                                                   Poor
                                                               Poor
                                                                       alpha
                          poor
476
             1
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
                          good
477
                    very good
             1
                                 Very Good
                                             Very Good
                                                          Very Good
                                                                       alpha
478
             1
                          poor
                                      poor
                                                   Poor
                                                               Poor
                                                                       alpha
479
                    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"</pre>
df.loc[(df['Total'] > 70) & (df['Total'] <= 90), ['Grade']] = "B+"</pre>
df.loc[(df['Total'] > 50) & (df['Total'] <= 70), ['Grade']] = "B"</pre>
df.loc[df['Total'] <= 50, ['Grade']] = "Fail"</pre>
failed_students_Total = df[df['Total'] < 50]</pre>
print("DataFrame of students who failed in subjects:")
print(failed_students_Total)
DataFrame of students who failed in subjects:
           SECTION
                     DV
                          M2 PP
                                   BEEE
                                          FL
                                              FIMS
                                                     Total
                                                             Percentage Grade
20
       21
              ALPHA
                       4
                           2
                                5
                                       3
                                                  9
                                                        39
                                                                  32.50 Fail
                                          16
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
       89
               BETA
                       2
                          17
                                       3
                                          15
                                                  2
                                                        39
                                                                  32.50
88
                                0
                                                                          Fail
147
                       9
                           5
                                6
                                                                  37.50 Fail
      148
              DELTA
                                       8
                                          13
                                                  4
                                                        45
160
      161
              DELTA
                       7
                           0
                               14
                                       5
                                          10
                                                  5
                                                        41
                                                                  34.17
                                                                          Fail
                                       2
                                                                  35.83 Fail
178
      179
              DELTA
                           0
                                3
                                          10
                                                        43
                      13
                                                 15
                                       2
180
      181
              SIGMA
                       9
                           3
                                4
                                          10
                                                 15
                                                        43
                                                                  35.83 Fail
                                1
                                       2
                                          10
                                                  9
                                                                  28.33 Fail
197
      198
           EPSILON
                      11
                           1
                                                        34
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
            EPSILON
                       8
                           0
                                3
                                       0
                                          10
                                                 14
                                                        35
                                                                  29.17
                                                                          Fail
      227
229
                           2
                                       9
                                                                  40.83 Fail
      230
           EPSILON
                      13
                                5
                                          10
                                                 10
                                                        49
235
      236
           EPSILON
                       9
                           5
                                5
                                          10
                                                        41
                                                                  34.17 Fail
                                       1
                                                 11
                                                                  40.83 Fail
255
      256
              GAMMA
                      14
                           0
                                5
                                      11
                                           8
                                                 11
                                                        49
260
      261
              GAMMA
                      12
                           2
                                6
                                       6
                                           6
                                                 11
                                                        43
                                                                  35.83 Fail
263
      264
              GAMMA
                      14
                           3
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                                       8
                                          13
                                                  6
                                                        49
                                                                  40.83 Fail
              GAMMA
278
      279
                                6
                                       7
                                          11
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                                                        45
                                                                  37.50 Fail
                      10
                           3
288
      289
              GAMMA
                      18
                           0
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                                       8
                                          17
                                                  3
                                                        49
                                                                  40.83
                                                                          Fail
298
      299
              GAMMA
                      15
                                2
                                       7
                                          10
                                                  2
                                                        37
                                                                  30.83 Fail
                           1
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
                                           7
                                                 10
                                                        36
                                                                  30.00
                                                                          Fail
                                      11
309
      310
              OMEGA
                      12
                           1
                                3
                                      10
                                          16
                                                  6
                                                        48
                                                                  40.00
                                                                          Fail
                                                                  25.83 Fail
311
      312
              OMEGA
                       6
                           0
                                1
                                      11
                                           9
                                                  4
                                                        31
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
                                2
                                                                  21.67 Fail
323
      324
              SIGMA
                       9
                           0
                                       3
                                          11
                                                  1
                                                        26
```

SIGMA

SIGMA

SIGMA

SIGMA

SIGMA

21.67 Fail

35.00 Fail

36.67 Fail

35.00 Fail

25.83 Fail

6 13

0 13

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	

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303
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309
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311
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316
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318
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324
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325
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334
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340
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359
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364
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368
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372
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380
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409
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416
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424
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430
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474
                                   poor
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                                                              alpha
                         poor
df.loc[df['Total'] > 110, ['Grade']] = "A+"
df.loc[(df['Total'] > 90) & (df['Total'] <= 110), ['Grade']] = "A"</pre>
df.loc[(df['Total'] > 70) & (df['Total'] <= 90), ['Grade']] = "B+"</pre>
df.loc[(df['Total'] > 50) & (df['Total'] <= 70), ['Grade']] = "B"</pre>
df.loc[df['Total'] <= 50, ['Grade']] = "Fail"</pre>
failed_students_Total = df[df['Total'] < 50]</pre>
print("DataFrame of students who failed in subjects:")
print(failed_students_Total)
DataFrame of students who failed in subjects:
           SECTION DV
                          M2
                             PP
                                   BEEE FL FIMS
     S.NO
                                                    Total
                                                            Percentage Grade
20
       21
              ALPHA
                           2
                                5
                                      3
                                                        39
                                                                  32.50 Fail
                                         16
                                                 9
27
       28
              ALPHA
                       5
                           4
                                3
                                     12
                                         13
                                                 5
                                                        42
                                                                  35.00 Fail
```

Poor

Poor

alpha

302

6

poor

poor

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	${\tt Coding-skills}$	${\tt PP_Grade}$	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

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361
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364
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368
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372
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378
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388
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393
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394
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457
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461
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469
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474
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                                                                alpha
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
                          0
                                                        72
                                                                            C+
         1
             ALPHA
                     12
                              17
                                      9
                                         19
                                                15
                                                                  60.00
1
         2
             ALPHA
                     19
                         12
                              16
                                         18
                                                 3
                                                        84
                                                                  70.00
                                                                             В
                                     16
                                                                  85.00
2
                                                       102
         3
             ALPHA
                     18
                         14
                              18
                                     18
                                         18
                                                16
                                                                            B+
3
         4
             ALPHA
                     15
                          9
                              19
                                     17
                                         19
                                                15
                                                        94
                                                                  78.33
                                                                             В
4
             ALPHA
                                         20
         5
                     18
                         17
                              19
                                     19
                                                                  92.50
                                                18
                                                       111
                                                                             Α
               . . .
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                                                                           . . .
475
      476
             SIGMA
                     18
                           2
                              12
                                      3
                                         17
                                                15
                                                        67
                                                                  55.83
                                                                             C
```

poor

poor

Poor

Poor

alpha

359

4

```
476
      477
             SIGMA
                                                        87
                                                                   72.50
                     20
                           6
                              16
                                     11
                                          20
                                                 14
                                                                              В
      478
477
             SIGMA
                     20
                           0
                              18
                                     13
                                          20
                                                 18
                                                        89
                                                                   74.17
                                                                              В
478
      479
             SIGMA
                     20
                          20
                               5
                                     19
                                         18
                                                 14
                                                        96
                                                                   80.00
                                                                             B+
             SIGMA
479
      480
                                         20
                                                                   93.33
                     20
                          16
                              18
                                     19
                                                 19
                                                       112
                                                                              Α
                                  PP_Grade
                                              DV_Grade
                                                             skills section
     backlogs Coding-skills
0
             2
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
                          good
1
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
             1
                          good
2
             0
                                Very Good
                                             Very Good
                    very good
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                                                                       alpha
3
             1
                                             Very Good
                                                          Very Good
                    very good
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                                                                       alpha
4
             0
                                                          Very Good
                    very good
                                Very Good
                                             Very Good
                                                                       alpha
           . . .
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475
             2
                                      poor
                                                   Poor
                                                               Poor
                                                                       alpha
                          poor
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
                    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)</pre>
df
     S.NO SECTION
                     DV
                         M2
                              PP
                                   BEEE
                                         FL
                                              FIMS
                                                     Total
                                                             Percentage Grade
0
             ALPHA
                     12
                           0
                              17
                                      9
                                         19
                                                 15
                                                        72
                                                                   60.00
                                                                             C+
         1
         2
             ALPHA
                                                 3
                                                        84
                                                                   70.00
                                                                              В
1
                     19
                          12
                              16
                                     16
                                          18
2
         3
             ALPHA
                     18
                          14
                              18
                                     18
                                          18
                                                 16
                                                       102
                                                                   85.00
                                                                             B+
3
         4
             ALPHA
                                                        94
                                                                   78.33
                     15
                           9
                              19
                                     17
                                          19
                                                 15
                                                                              В
4
         5
             ALPHA
                     18
                          17
                              19
                                     19
                                          20
                                                                   92.50
                                                18
                                                       111
                                                                              Α
       . . .
                . . .
                                                . . .
                                                                     . . .
             SIGMA
475
      476
                     18
                           2
                              12
                                      3
                                         17
                                                15
                                                        67
                                                                   55.83
                                                                              C
476
      477
             SIGMA
                     20
                           6
                              16
                                     11
                                          20
                                                 14
                                                        87
                                                                   72.50
                                                                              В
477
      478
             SIGMA
                     20
                           0
                              18
                                     13
                                          20
                                                 18
                                                        89
                                                                   74.17
                                                                              В
478
                                     19
                                          18
                                                 14
                                                                   80.00
      479
             SIGMA
                     20
                          20
                               5
                                                        96
                                                                             B+
479
      480
             SIGMA
                     20
                          16
                              18
                                     19
                                          20
                                                 19
                                                       112
                                                                   93.33
                                                                              Α
                                  PP_Grade
                                              DV_Grade
                                                             skills section
     backlogs Coding-skills
0
             2
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
                          good
1
                                      Good
                                                   Good
                                                               Good
                                                                       alpha
             1
                          good
                                             Very Good
2
             0
                                Very Good
                                                         Very Good
                    very good
                                                                       alpha
3
             1
                                Very Good
                                             Very Good
                                                          Very Good
                                                                       alpha
                    very good
4
             0
                    very good
                                 Very Good
                                             Very Good
                                                          Very Good
                                                                       alpha
                           . . .
475
             2
                          poor
                                      poor
                                                   Poor
                                                               Poor
                                                                       alpha
476
             1
                                                   Good
                                                               Good
                                                                       alpha
                          good
                                      Good
477
             1
                    very good
                                Very Good
                                             Very Good
                                                         Very Good
                                                                       alpha
478
             1
                                                               Poor
                                                                       alpha
                          poor
                                      poor
                                                   Poor
```

```
479
                   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)
1
h['SECTION'].value_counts()
SECTION
SIGMA
           73
GAMMA
           43
EPSILON
           41
OMEGA
           41
DELTA
           35
           32
BETA
ALPHA
           26
ZETA
           13
Name: count, dtype: int64
df['backlogs'] = (df[['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']] < 10).sum(axis=1)</pre>
df
     S.NO SECTION DV
                        M2
                                 BEEE FL
                                                  Total
                                                          Percentage Grade
                            PP
                                           FIMS
0
        1
             ALPHA
                    12
                          0
                                    9
                                        19
                                              15
                                                      72
                                                                60.00
                             17
1
        2
             ALPHA
                    19
                        12 16
                                        18
                                               3
                                                      84
                                                                70.00
                                                                          В
                                   16
                                                     102
                                                                85.00
2
        3
             ALPHA
                    18
                        14 18
                                   18
                                        18
                                              16
                                                                         B+
3
        4
             ALPHA
                    15
                         9 19
                                   17
                                        19
                                              15
                                                      94
                                                               78.33
                                                                          В
4
        5
            ALPHA
                    18
                        17
                            19
                                   19
                                        20
                                              18
                                                               92.50
                                                                          Α
                                                     111
. .
      . . .
              . . .
                    . .
                         . .
                             . .
                                   . . .
                                             . . .
                                                     . . .
                                                                  . . .
                                                                         . . .
            SIGMA
475
      476
                    18
                         2
                            12
                                    3
                                        17
                                              15
                                                      67
                                                                55.83
                                                                          C
476
      477
            SIGMA
                    20
                                                                72.50
                          6
                            16
                                   11
                                        20
                                              14
                                                      87
                                                                          В
477
      478
            SIGMA
                    20
                         0
                             18
                                   13
                                        20
                                              18
                                                      89
                                                                74.17
                                                                          В
478
      479
            SIGMA
                    20
                        20
                             5
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                                        18
                                              14
                                                      96
                                                                80.00
                                                                          B+
479
      480
            SIGMA
                    20
                        16
                                   19
                                        20
                                              19
                                                     112
                                                                93.33
                            18
                                                                          Α
                                            DV_Grade
     backlogs Coding-skills
                                PP_Grade
                                                          skills section
0
             2
                                     Good
                                                Good
                                                            Good
                        good
                                                                    alpha
1
            1
                        good
                                    Good
                                                Good
                                                            {\tt Good}
                                                                    alpha
2
            0
                               Very Good
                                           Very Good
                                                       Very Good
                   very good
                                                                    alpha
3
                               Very Good
            1
                   very good
                                           Very Good
                                                       Very Good
                                                                    alpha
4
            0
                   very good
                               Very Good
                                           Very Good
                                                       Very Good
                                                                    alpha
           . . .
                          . . .
                                      . . .
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                                                              . . .
```

```
475
             2
                         poor
                                      poor
                                                  Poor
                                                               Poor
                                                                      alpha
476
                                                  {\tt Good}
             1
                                      Good
                                                               Good
                                                                      alpha
                         good
477
                                Very Good
                                            Very Good
                                                         Very Good
                                                                      alpha
                    very good
478
                                      poor
                                                  Poor
                                                               Poor
                                                                      alpha
             1
                         poor
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
                                         19
                                                        72
                                                                  60.00
         1
             ALPHA
                     12
                           0
                              17
                                      9
                                                15
                                                                            C+
             ALPHA
                                                        84
                                                                  70.00
1
         2
                     19
                         12
                              16
                                         18
                                                 3
                                                                             В
                                     16
2
         3
             ALPHA
                     18
                                                       102
                                                                  85.00
                         14
                              18
                                     18
                                         18
                                                16
                                                                            B+
3
         4
             ALPHA
                     15
                           9
                              19
                                         19
                                                        94
                                                                  78.33
                                                                             В
                                     17
                                                15
4
         5
             ALPHA
                     18
                         17
                              19
                                     19
                                         20
                                                18
                                                       111
                                                                  92.50
                                                                             Α
       . . .
                . . .
                     . .
                          . .
                              . .
                                         . .
                                               . . .
                                                       . . .
                                                                    . . .
. .
                                    . . .
                                                                           . . .
475
      476
             SIGMA
                     18
                           2
                              12
                                      3
                                         17
                                                15
                                                        67
                                                                  55.83
                                                                             C
476
      477
             SIGMA
                     20
                           6
                             16
                                         20
                                                        87
                                                                  72.50
                                     11
                                                14
                                                                             В
477
      478
             SIGMA
                     20
                           0
                              18
                                     13
                                         20
                                                        89
                                                                  74.17
                                                                             В
                                                18
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
                                                                             Α
     backlogs Coding-skills
                                 PP_Grade
                                             DV_Grade
                                                            skills section
0
             2
                                      Good
                                                  Good
                                                               Good
                                                                      alpha
                         good
1
                                                  Good
             1
                         good
                                      Good
                                                               Good
                                                                      alpha
                                Very Good
                                            Very Good
2
             0
                    very good
                                                         Very Good
                                                                      alpha
3
                    very good
                                Very Good
                                            Very Good
                                                         Very Good
                                                                      alpha
             1
4
             0
                    very good
                                Very Good
                                            Very Good
                                                         Very Good
                                                                      alpha
                                                   . . .
                           . . .
                                       . . .
                                                                . . .
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475
             2
                                                  Poor
                                                               Poor
                                                                      alpha
                         poor
                                      poor
476
             1
                         good
                                      Good
                                                  {\tt Good}
                                                               Good
                                                                      alpha
477
             1
                                                                      alpha
                    very good
                                Very Good
                                            Very Good
                                                         Very Good
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(less_than_10) Students with less than 10 marks in at least one subject: S.NO SECTION DV M2 BEEE PP FLFIMS Total Percentage Grade 0 1 ALPHA 12 0 17 9 19 15 72 60.00 C+ 3 70.00 В 1 2 ALPHA 19 12 16 16 18 84 3 4 ALPHA 15 9 19 17 19 15 94 78.33 В ALPHA В 5 6 17 16 18 10 15 9 85 70.83 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 20 6 16 20 14 87 72.50 В SIGMA 11 477 478 SIGMA 20 0 18 13 20 18 89 74.17 В 478 479 SIGMA 20 19 14 96 80.00 20 5 18 B+ PP_Grade DV_Grade skills section backlogs Coding-skills 0 2 good Good Good Good alpha 1 Good Good Good alpha 1 good 3 Very Good Very Good 1 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 alpha poor poor 475 2 poor poor Poor Poor alpha 476 Good Good Good alpha 1 good 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 ${\tt DV}$ M2 PP BEEE FLFIMS Total Percentage Grade 239 240 **EPSILON** 17 14 20 18 17 103 85.83 B+ 17 194 20 98 195 **EPSILON** 18 19 10 20 81.67 B+ 11 107 195 196 **EPSILON** 20 12 18 17 20 20 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 В 380 381 OMEGA 0 0 0 0 0 0.00 F 0 0 302 OMEGA 0 0 F 303 0 0 0 0 0 0.00 453 454 SIGMA 1 5 0 0 0 0 6 5.00 F 368 369 ZETA 0 0 0 0 0 0 0.00 F 461 462 SIGMA 0 0 0 0 0 0 0 0.00 F

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

```
239
                     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
                                                {\tt Good}
                                                            Good
                                                                   alpha
                        good
            0
202
                        good
                                    Good
                                                Good
                                                            Good
                                                                   alpha
. .
           . . .
                         . . .
                                     . . .
                                                . . .
                                                            . . .
380
            6
                        poor
                                    poor
                                               Poor
                                                           Poor
                                                                   alpha
302
            6
                                                Poor
                                                            Poor
                                                                   alpha
                        poor
                                    poor
            6
453
                        poor
                                    poor
                                                Poor
                                                            Poor
                                                                   alpha
368
            6
                        poor
                                    poor
                                                Poor
                                                            Poor
                                                                   alpha
461
            6
                                                Poor
                                                           Poor
                                                                   alpha
                        poor
                                    poor
[480 rows x 17 columns]
df.iloc[:, 2:] = df.iloc[:, 2:].apply(pd.to_numeric, errors='coerce')
backlog_counts = (df.iloc[:, 2:] < 10).sum()</pre>
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()</pre>
print("Number of backlogs in each subject:")
print(backlog_counts)
Number of backlogs in each subject:
DV
                   66
                  226
M2
PP
                  135
BEEE
                  127
FL
                   23
FIMS
                   86
                    9
Total
                    9
Percentage
                    0
Grade
                  480
backlogs
Coding-skills
                    0
PP_Grade
                    0
DV_Grade
                    0
skills
                    0
                    0
section
dtype: int64
import string
```

PP_Grade

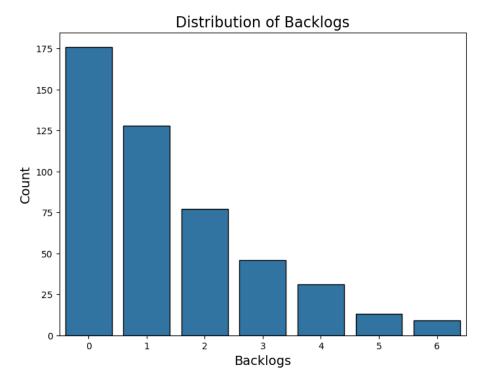
DV_Grade

skills section

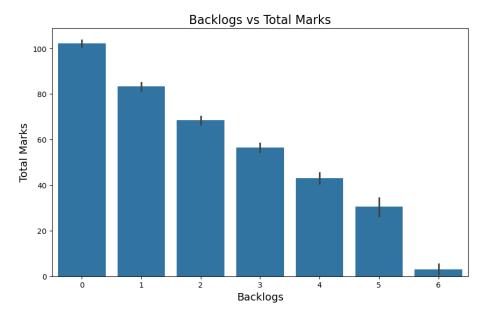
backlogs Coding-skills

```
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:
M2
                   Α
PP
                   Α
BEEE
                   Α
FL
                   Α
FIMS
                  Α
Total
                  Α
Percentage
Grade
                NaN
backlogs
                 Α
Coding-skills
                 NaN
PP_Grade
                 NaN
                 NaN
DV_Grade
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())
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()
```

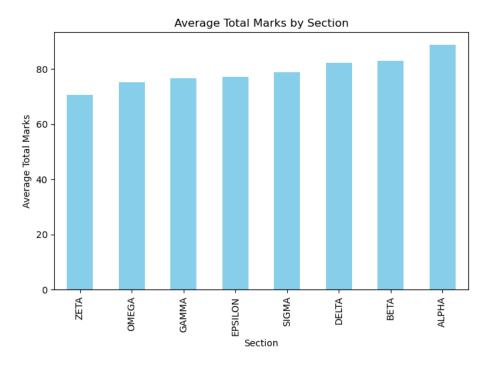
```
else:
    print("The 'Grade' column is empty or contains no valid data.")
The 'Grade' column is empty or contains no valid data.
print(df.head())
   S.NO SECTION DV
                      M2
                          PP
                               BEEE
                                                Total
                                                        Percentage Grade
                                     FL
                                          FIMS
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
          ALPHA
                  18
                                     18
                                                  102
                                                             85.00
      3
                      14
                           18
                                 18
                                            16
                                                                      NaN
3
          ALPHA
                  15
                       9
                                     19
                                                   94
                                                             78.33
      4
                           19
                                 17
                                            15
                                                                      \mathtt{NaN}
4
      5
          ALPHA
                 18
                     17
                          19
                                 19
                                     20
                                            18
                                                  111
                                                             92.50
                                                                      NaN
   backlogs Coding-skills PP_Grade DV_Grade skills section
0
                       NaN
                                 NaN
                                           NaN
                                                  NaN
                                                           NaN
                                                           NaN
1
          1
                       NaN
                                 NaN
                                                  NaN
                                           \mathtt{NaN}
2
          0
                       NaN
                                 NaN
                                           NaN
                                                  NaN
                                                           NaN
3
          1
                       {\tt NaN}
                                 NaN
                                           NaN
                                                  NaN
                                                           NaN
          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()
```



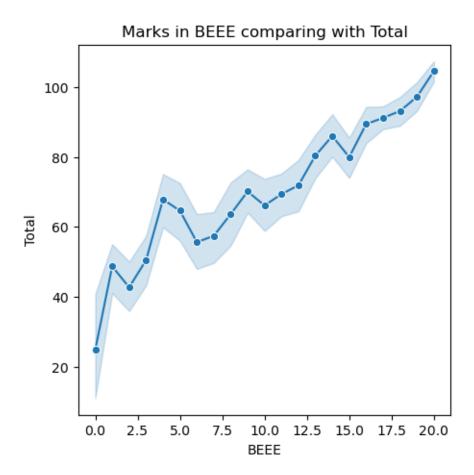
```
plt.figure(figsize=(10, 6))
sns.barplot(x='backlogs', y='Total', data=df)
plt.title('Backlogs vs Total Marks', fontsize=16)
plt.xlabel('Backlogs', fontsize=14)
plt.ylabel('Total Marks', fontsize=14)
plt.show()
```



```
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()
```

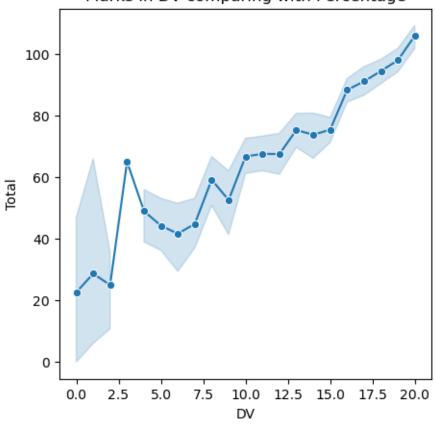


```
plt.figure(figsize=(5, 5))
sns.lineplot(x="BEEE", y="Total", data=df, marker="o")
plt.xlabel("BEEE")
plt.ylabel("Total")
plt.title("Marks in BEEE comparing with Total")
plt.show()
```



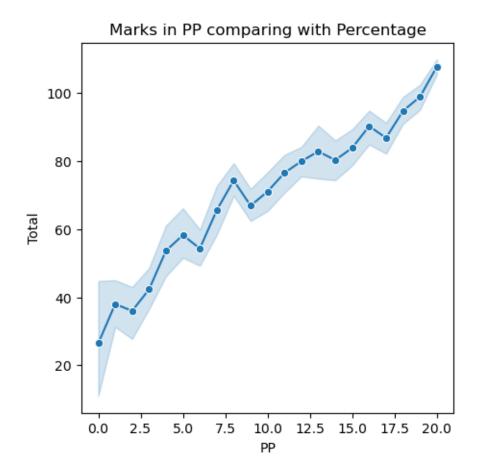
```
df.sort_values(["Total"], ascending=True)
plt.figure(figsize=(5, 5))
sns.lineplot(x="DV", y="Total", data=df, marker="o")
plt.xlabel("DV")
plt.ylabel("Total")
plt.title("Marks in DV comparing with Percentage")
plt.show()
```

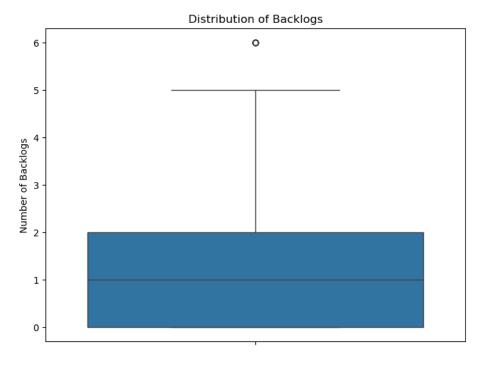




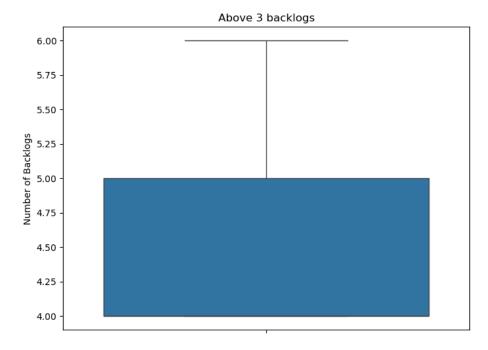
```
plt.figure(figsize=(5, 5))
sns.lineplot(x="PP", y="Total", data=df, marker="o")
plt.xlabel("PP")
plt.ylabel("Total")
plt.title("Marks in PP comparing with Percentage")

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()
```

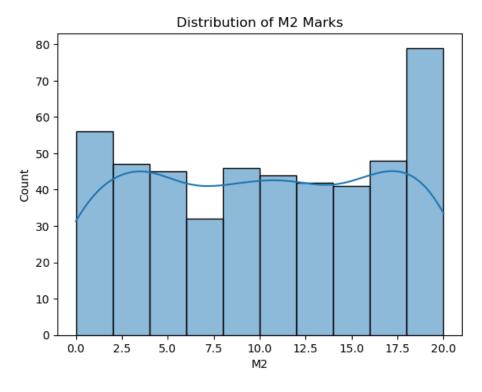




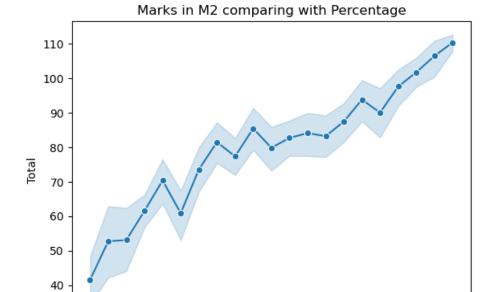
```
filtered_df = df[df['backlogs'] > 3]
plt.figure(figsize=(8, 6))
sns.boxplot(y=filtered_df['backlogs'])
plt.title("Above 3 backlogs")
plt.ylabel("Number of Backlogs")
plt.show()
```



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()
```

5.0

7.5

10.0

М2

12.5

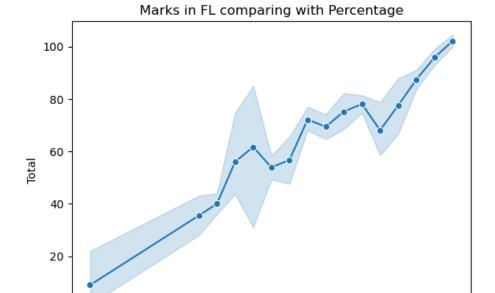
15.0

17.5

20.0

2.5

0.0



```
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()
```

5.0

2.5

0.0

7.5

12.5

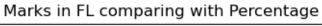
15.0

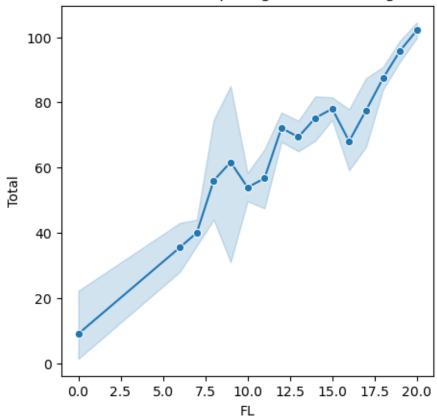
17.5

20.0

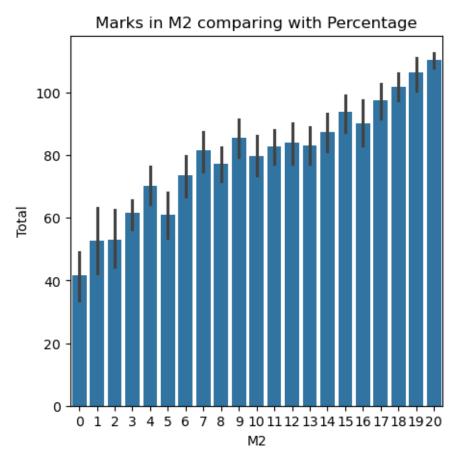
10.0

FL

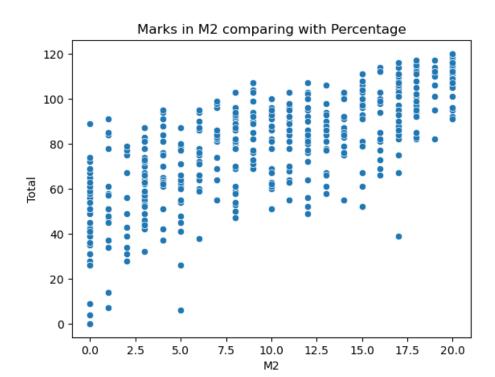




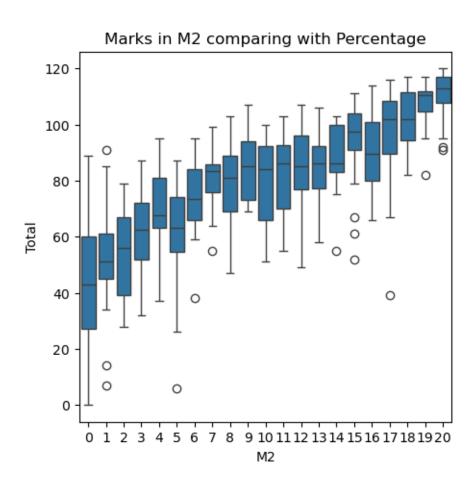
```
plt.figure(figsize=(5, 5))
sns.barplot(x="M2", y="Total", data=df)
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```



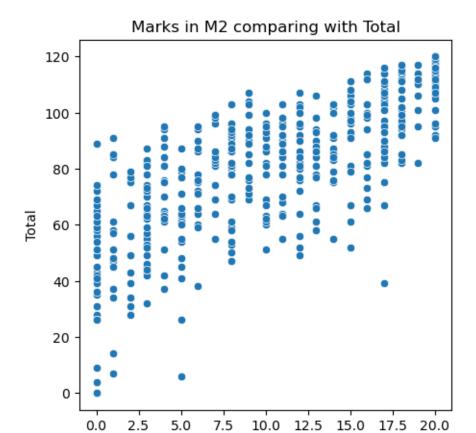
```
sns.scatterplot(x="M2", y="Total", data=df, marker="o")
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Percentage")
plt.show()
```



```
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()
```

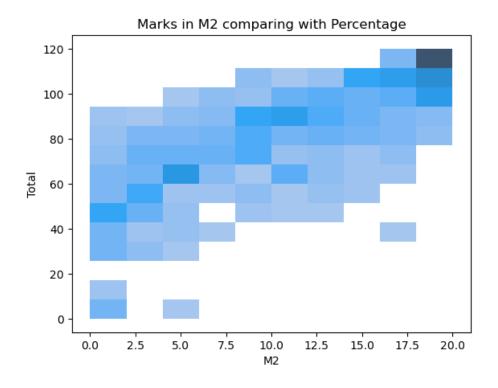


```
plt.figure(figsize=(5, 5))
sns.scatterplot(x="M2", y="Total", data=df, marker="o")
plt.xlabel("M2")
plt.ylabel("Total")
plt.title("Marks in M2 comparing with Total")
plt.show()
```



Μ2

```
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
                                                           Percentage Grade
                         M2
                             PP
                                  BEEE
                                        FL
                                            FIMS
                                                   Total
0
        1
             ALPHA
                    12
                          0
                             17
                                     9
                                        19
                                               15
                                                       72
                                                                 60.00
                                                                          NaN
        2
                                                3
                                                                 70.00
             ALPHA
                    19
                         12
                                    16
                                        18
                                                       84
                                                                          NaN
1
                             16
2
        3
                         14
                                                      102
                                                                          NaN
             ALPHA
                    18
                             18
                                    18
                                        18
                                               16
                                                                 85.00
3
        4
             ALPHA
                    15
                                                       94
                                                                 78.33
                                                                          NaN
                          9
                             19
                                    17
                                        19
                                               15
                    18
4
        5
             ALPHA
                             19
                                        20
                                                                 92.50
                         17
                                    19
                                               18
                                                      111
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               . . .
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475
      476
             SIGMA
                    18
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                             12
                                     3
                                        17
                                                                 55.83
                                                                          NaN
                                               15
                                                       67
476
      477
             SIGMA
                    20
                          6
                             16
                                    11
                                        20
                                               14
                                                       87
                                                                 72.50
                                                                          NaN
477
      478
             SIGMA
                    20
                          0
                                    13
                                        20
                                                       89
                                                                 74.17
                            18
                                               18
                                                                          NaN
```

```
478
      479
                                                                    80.00
             SIGMA
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                          20
                                5
                                      19
                                          18
                                                 14
                                                         96
                                                                             NaN
      480
479
             SIGMA
                     20
                          16
                              18
                                      19
                                          20
                                                 19
                                                        112
                                                                    93.33
                                                                             NaN
     backlogs Coding-skills PP_Grade DV_Grade skills section
0
                          good
                                      NaN
                                                NaN
                                                        NaN
1
             1
                                      NaN
                                                NaN
                                                        NaN
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                          good
2
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                    very good
3
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4
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                    very good
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                          good
477
                                      NaN
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                                                        NaN
                                                                 NaN
             1
                    very good
478
                                      NaN
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             1
                          poor
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
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                                                                    60.00
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1
         2
             ALPHA
                     19
                                          18
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                          12
                               16
                                      16
                                                         84
2
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         3
             ALPHA
                     18
                          14
                               18
                                      18
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                                                 16
                                                        102
                                                                             NaN
3
         4
             ALPHA
                           9
                                                                    78.33
                     15
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                                      17
                                          19
                                                 15
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         5
4
             ALPHA
                     18
                          17
                               19
                                      19
                                          20
                                                 18
                                                                    92.50
                                                                             NaN
                                                        111
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475
      476
             SIGMA
                     18
                           2
                               12
                                          17
                                                         67
                                                                    55.83
                                       3
                                                 15
                                                                             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
             SIGMA
                     20
                          16
                                      19
                                          20
                                                 19
                                                                    93.33
      480
                              18
                                                        112
                                                                             NaN
     backlogs Coding-skills
                                  PP_Grade DV_Grade skills section
0
             2
                                       Good
                                                  NaN
                                                                    NaN
                          good
                                                          NaN
1
             1
                                       Good
                                                  NaN
                                                          NaN
                                                                    NaN
```

good

```
3
                                                   NaN
                                                           NaN
                                                                    NaN
             1
                                 Very Good
                    very good
4
             0
                    very good
                                 Very Good
                                                   NaN
                                                           NaN
                                                                    NaN
                            . . .
                                                   . . .
                                                                    . . .
475
             2
                          poor
                                       poor
                                                   NaN
                                                           NaN
                                                                    NaN
476
                                                                    NaN
             1
                                       Good
                                                   NaN
                                                           NaN
                          good
477
                                                                    NaN
             1
                    very good
                                 Very Good
                                                   NaN
                                                           NaN
478
                                                                    {\tt NaN}
                                                   NaN
                                                           NaN
             1
                          poor
                                       poor
479
             0
                    very good
                                                   NaN
                                                           NaN
                                                                    NaN
                                 Very Good
[480 rows x 17 columns]
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
                          M2
                                    BEEE
                                          FL
                                                      Total
                     DV
                               PP
                                               FIMS
                                                              Percentage Grade
0
             ALPHA
                     12
                           0
                                       9
                                          19
                                                  15
                                                          72
                                                                    60.00
                                                                             NaN
         2
             ALPHA
                                                  3
                                                         84
                                                                    70.00
                                                                             NaN
1
                     19
                          12
                               16
                                      16
                                          18
2
         3
             ALPHA
                     18
                          14
                               18
                                          18
                                                  16
                                                        102
                                                                    85.00
                                                                             NaN
                                      18
3
         4
             ALPHA
                     15
                           9
                               19
                                      17
                                           19
                                                  15
                                                         94
                                                                    78.33
                                                                             NaN
4
             ALPHA
         5
                     18
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                               19
                                      19
                                          20
                                                 18
                                                        111
                                                                    92.50
                                                                             NaN
                . . .
                                                                             . . .
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                                     . . .
                                           . .
                                                 . . .
                                                         . . .
                                                                       . . .
. .
475
      476
             SIGMA
                     18
                           2
                               12
                                       3
                                          17
                                                 15
                                                                    55.83
                                                                             NaN
                                                         67
                     20
                           6
                               16
                                          20
476
      477
             SIGMA
                                      11
                                                  14
                                                         87
                                                                    72.50
                                                                             NaN
477
      478
             SIGMA
                     20
                           0
                               18
                                      13
                                          20
                                                  18
                                                         89
                                                                    74.17
                                                                             NaN
478
      479
                                                         96
             SIGMA
                     20
                          20
                                5
                                      19
                                          18
                                                  14
                                                                    80.00
                                                                             NaN
479
      480
             SIGMA
                     20
                          16
                               18
                                      19
                                          20
                                                  19
                                                        112
                                                                    93.33
                                                                             NaN
                                               DV_Grade skills section
     backlogs Coding-skills
                                  PP_Grade
0
             2
                                       Good
                                                    Good
                                                             NaN
                                                                      NaN
                          good
                                                                      {\tt NaN}
1
             1
                          good
                                       Good
                                                    Good
                                                             NaN
2
             0
                                 Very Good
                                                             NaN
                                                                      NaN
                    very good
                                              Very Good
3
             1
                    very good
                                 Very Good
                                              Very Good
                                                             NaN
                                                                      {\tt NaN}
4
             0
                    very good
                                 Very Good
                                              Very Good
                                                             NaN
                                                                      NaN
                                                             . . .
                                                                       . . .
                            . . .
475
             2
                          poor
                                       poor
                                                    poor
                                                             NaN
                                                                      NaN
476
             1
                                                             NaN
                                                                      NaN
                          good
                                       Good
                                                    Good
```

2

0

very good

Very Good

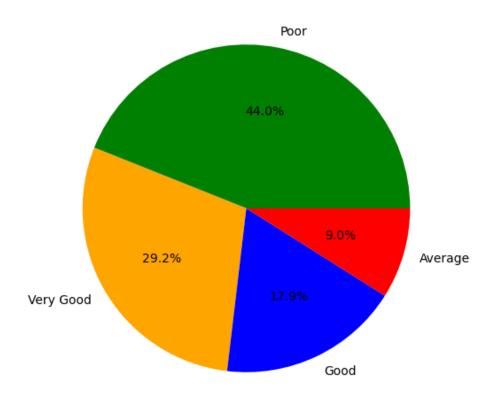
NaN

NaN

NaN

```
477
                  very good Very Good Very Good
                                                       {\tt NaN}
                                                               {\tt NaN}
478
                                              poor
                                                       NaN
                                                               NaN
            1
                       poor
                                   poor
479
                                                       NaN
                                                               NaN
            0
                  very good Very Good Very Good
[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()
```

Percentage Distribution of DV Grades



```
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
       7
6
           ALPHA 15
                                                94
                                                         78.33
                                                                  NaN
                     10 20
                               20 15
                                         14
7
           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()

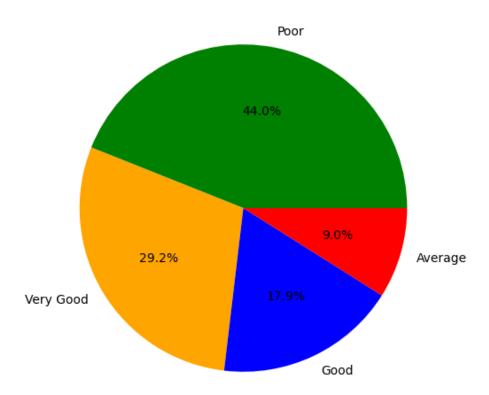
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 480 entries, 0 to 479
Data columns (total 17 columns):

#	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
        5
                        17
                                                               92.50
4
             ALPHA
                    18
                             19
                                   19
                                       20
                                              18
                                                     111
                                                                        NaN
                             20
                                   20
6
        7
             ALPHA
                    15
                        10
                                       15
                                              14
                                                      94
                                                               78.33
                                                                        NaN
7
                                                               87.50
        8
             ALPHA
                    17
                        17
                             19
                                   20
                                        19
                                              13
                                                     105
                                                                        NaN
8
        9
             ALPHA
                    10
                        18
                              0
                                   20
                                        19
                                              15
                                                      82
                                                               68.33
                                                                        NaN
9
                                        20
       10
             ALPHA
                    18
                        19
                             20
                                   20
                                              15
                                                     112
                                                               93.33
                                                                        NaN
               . . .
                                                                  . . .
                                                                        . . .
473
      474
             SIGMA
                    20
                        20
                             20
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                                        20
                                              20
                                                     120
                                                              100.00
                                                                        NaN
476
      477
             SIGMA
                    20
                         6
                             16
                                        20
                                              14
                                                      87
                                                               72.50
                                                                        NaN
                                   11
477
      478
             SIGMA
                    20
                         0
                             18
                                   13
                                        20
                                              18
                                                      89
                                                               74.17
                                                                        NaN
478
      479
             SIGMA
                        20
                                                      96
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                    20
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                                   19
                                       18
                                              14
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479
      480
             SIGMA
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                        16
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                                                     112
                                                               93.33
                                                                        NaN
                            18
     backlogs Coding-skills
                                PP Grade
                                            DV Grade skills section
                   very good
4
             0
                               Very Good
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                                                         NaN
                                                                  NaN
6
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473
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478
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             1
                        poor
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479
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                   very good Very Good
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                                                                  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
```

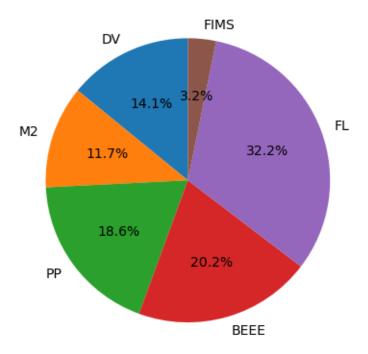
```
def assign_grade(DV):
    if 18 <= DV <= 20:
       return 'Very Good'
    elif 13 <= DV <= 14:
       return 'Average'
    elif 15 <= DV <= 17:
       return 'Good'
    else:
        return 'Poor'
df['DV_Grade'] = df['PP'].apply(assign_grade)
grade_counts = df['DV_Grade'].value_counts()
plt.figure(figsize=(6, 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()
```

Percentage Distribution of DV Grades



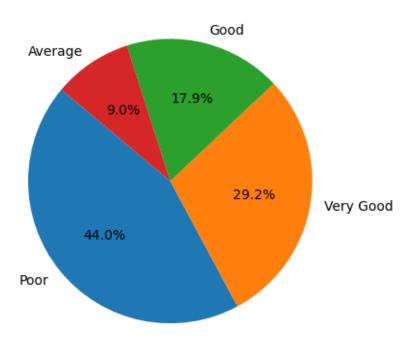
```
subjects = ['DV', 'M2', 'PP', 'BEEE', 'FL', 'FIMS']
counts = [(df[subject] == 20).sum() for subject in subjects]
plt.pie(counts, labels=subjects, autopct='%1.1f%%', startangle=90)
plt.title('Distribution of Students Scoring 20 in Each Subject')
plt.show()
```

Distribution of Students Scoring 20 in Each Subject



```
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()
```

Skill Distribution



skills

 Poor
 211

 Very Good
 140

 Good
 86

 Average
 43

Name: count, dtype: int64

df.describe()

\

```
66.470313
mean
        13.645833
                      79.764583
                                                 1.38125
                                   20.603304
                      24.723878
                                                 1.50103
std
         4.716115
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
                                                 2.00000
                                   81.670000
         20.000000
                    120.000000
                                  100.000000
                                                 6.00000
max
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
               88.850000
Total
Percentage
               74.041167
backlogs
                0.716667
dtype: float64
df.info
                                                                               FIMS Total Percen
<bound method DataFrame.info of</pre>
                                        S.NO SECTION DV
                                                            M2
                                                                PP BEEE FL
0
        1
             ALPHA 12
                          0
                             17
                                     9
                                        19
                                               15
                                                       72
                                                                 60.00
                                                                          NaN
        2
             ALPHA
                         12
                                                                 70.00
                                                                          NaN
1
                    19
                             16
                                    16
                                        18
                                                3
                                                       84
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
             ALPHA
                             19
        5
                    18
                         17
                                    19
                                        20
                                                                 92.50
                                               18
                                                      111
                                                                          NaN
               . . .
                     . .
                                         . .
                                                                   . . .
. .
      . . .
                         . .
                              . .
                                   . . .
                                              . . .
                                                      . . .
                                                                          . . .
             SIGMA
475
      476
                    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
                                    19
                                        20
                                               19
                                                                 93.33
                                                                          NaN
                             18
                                                      112
     backlogs Coding-skills
                                 PP_Grade
                                             DV_Grade
                                                           skills section
0
             2
                         good
                                     Good
                                                 Good
                                                              Good
                                                                     alpha
                         good
1
             1
                                     Good
                                                 Good
                                                              Good
                                                                     alpha
2
             0
                   very good
                                            Very Good
                                                        Very Good
                                                                     alpha
                                Very Good
3
             1
                   very good
                                Very Good
                                            Very Good
                                                        Very Good
                                                                     alpha
```

Very Good

. . .

Poor

Very Good

. . .

 ${\tt Poor}$

alpha

alpha

. . .

Very Good

. . .

poor

4

. .

475

0

2

. . .

very good

. . .

poor

```
476
                   good
                             Good
                                      Good
                                               Good
                                                      alpha
477
                                                      alpha
          1
               very good Very Good Very Good
478
                                      Poor
                                                      alpha
                   poor
                             poor
479
          0
               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	١
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
       8
61
62
       12
63
       11
64
       12
65
        9
66
       12
67
       12
       16
68
69
       20
70
        4
71
       17
       7
72
73
       10
74
       17
75
       5
76
       17
77
       13
78
       19
79
       19
80
       19
81
       18
82
        2
83
       10
84
       12
        3
85
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
       12
117
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
      16
47
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
        2
82
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
        8
96
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:</pre>
   print('Dependent (reject H0)')
else:
    print('Independent (HO holds true)')
p value is 2.3496708155645757e-05
Dependent (reject H0)
```

OBSERVATION