In [1]:

```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error

# Step 1: Load the Data
df = pd.read_csv('weather.csv')

# Step 2: Data Exploration
print(df.head())
print(df.info())
print(df.describe())

# Step 3: Data Visualization
sns.pairplot(df[['MinTemp', 'MaxTemp', 'Rainfall']])
plt.show()

# Step 4: Feature Engineering (if needed)

# Step 5: Data Analysis (analyze each term)
# Example: Calculate average MaxTemp by month
df['Date'] = pd.to_datetime(df['Date'])
df['Month'] = df['Date'].dt.month
monthly_avg_max_temp = df.groupby('Month')['MaxTemp'].mean()

# Step 6: Data Visualization (Part 2)
plt.figure(figsize=(10, 5))
plt.plot(monthly_avg_max_temp.index, monthly_avg_max_temp.values, marker='o')
plt.xlabel('Month')
plt.ylabel('Average Max Temperature')
plt.title('Monthly Average Max Temperature')
plt.grid(True)
plt.show()

# Step 7: Advanced Analysis (e.g., predict Rainfall)
# Prepare the data for prediction
X = df[['MinTemp', 'MaxTemp']]
y = df['Rainfall']

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Create and train a linear regression model
model = LinearRegression()
model.fit(X_train, y_train)

# Make predictions and calculate the Mean Squared Error
y_pred = model.predict(X_test)
mse = mean_squared_error(y_test, y_pred)
print(f'Mean Squared Error for Rainfall Prediction: {mse}')

# Step 8: Conclusions and Insights (analyze each term)
# Example: Identify the highest and lowest rainfall months
highest_rainfall_month = monthly_avg_max_temp.idxmax()
lowest_rainfall_month = monthly_avg_max_temp.idxmin()
print(f'Highest rainfall month: {highest_rainfall_month}, Lowest rainfall month: {lowest_rainfall_month}')
```

```
   MinTemp  MaxTemp  Rainfall  Evaporation  Sunshine WindGustDir  \
0      8.0     24.3       0.0          3.4       6.3          NW   
1     14.0     26.9       3.6          4.4       9.7         ENE   
2     13.7     23.4       3.6          5.8       3.3          NW   
3     13.3     15.5      39.8          7.2       9.1          NW   
4      7.6     16.1       2.8          5.6      10.6         SSE   

   WindGustSpeed WindDir9am WindDir3pm  WindSpeed9am  ...  Pressure9am  \
0           30.0         SW         NW           6.0  ...       1019.7   
1           39.0          E          W           4.0  ...       1012.4   
2           85.0          N        NNE           6.0  ...       1009.5   
3           54.0        WNW          W          30.0  ...       1005.5   
4           50.0        SSE        ESE          20.0  ...       1018.3   

   Pressure3pm  Cloud9am  Cloud3pm  Temp9am  Temp3pm  RainToday  RISK_MM  \
0       1015.0         7         7     14.4     23.6         No      3.6   
1       1008.4         5         3     17.5     25.7        Yes      3.6   
2       1007.2         8         7     15.4     20.2        Yes     39.8   
3       1007.0         2         7     13.5     14.1        Yes      2.8   
4       1018.5         7         7     11.1     15.4        Yes      0.0   

   RainTomorrow                     Date  
0           Yes   Saturday, January 1, 2000  
```

```
1           Yes     Sunday, January 2, 2000
2           Yes     Monday, January 3, 2000
3           Yes    Tuesday, January 4, 2000
4            No  Wednesday, January 5, 2000

[5 rows x 23 columns]
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 366 entries, 0 to 365
Data columns (total 23 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   MinTemp        366 non-null    float64
 1   MaxTemp        366 non-null    float64
 2   Rainfall       366 non-null    float64
 3   Evaporation    366 non-null    float64
 4   Sunshine       363 non-null    float64
 5   WindGustDir    363 non-null    object 
 6   WindGustSpeed  364 non-null    float64
 7   WindDir9am     335 non-null    object 
 8   WindDir3pm     365 non-null    object 
 9   WindSpeed9am   359 non-null    float64
 10  WindSpeed3pm   366 non-null    int64  
 11  Humidity9am    366 non-null    int64  
 12  Humidity3pm    366 non-null    int64  
 13  Pressure9am    366 non-null    float64
 14  Pressure3pm    366 non-null    float64
 15  Cloud9am       366 non-null    int64  
 16  Cloud3pm       366 non-null    int64  
 17  Temp9am        366 non-null    float64
 18  Temp3pm        366 non-null    float64
 19  RainToday      366 non-null    object 
 20  RISK_MM        366 non-null    float64
 21  RainTomorrow   366 non-null    object 
 22  Date           366 non-null    object 
dtypes: float64(12), int64(5), object(6)
memory usage: 65.9+ KB
None
          MinTemp     MaxTemp    Rainfall  Evaporation    Sunshine  \
count  366.000000  366.000000  366.000000   366.000000  363.000000   
mean     7.265574   20.550273    1.428415     4.521858    7.909366   
std      6.025800    6.690516    4.225800     2.669383    3.481517   
min     -5.300000    7.600000    0.000000     0.200000    0.000000   
25%      2.300000   15.025000    0.000000     2.200000    5.950000   
50%      7.450000   19.650000    0.000000     4.200000    8.600000   
75%     12.500000   25.500000    0.200000     6.400000   10.500000   
max     20.900000   35.800000   39.800000    13.800000   13.600000   

       WindGustSpeed  WindSpeed9am  WindSpeed3pm  Humidity9am  Humidity3pm  \
count     364.000000    359.000000    366.000000   366.000000   366.000000   
mean       39.840659      9.651811     17.986339    72.035519    44.519126   
std        13.059807      7.951929      8.856997    13.137058    16.850947   
min        13.000000      0.000000      0.000000    36.000000    13.000000   
25%        31.000000      6.000000     11.000000    64.000000    32.250000   
50%        39.000000      7.000000     17.000000    72.000000    43.000000   
75%        46.000000     13.000000     24.000000    81.000000    55.000000   
max        98.000000     41.000000     52.000000    99.000000    96.000000   

       Pressure9am  Pressure3pm    Cloud9am    Cloud3pm     Temp9am  \
count   366.000000   366.000000  366.000000  366.000000  366.000000   
mean   1019.709016  1016.810383    3.890710    4.024590   12.358470   
std       6.686212     6.469422    2.956131    2.666268    5.630832   
min     996.500000   996.800000    0.000000    0.000000    0.100000   
25%    1015.350000  1012.800000    1.000000    1.000000    7.625000   
50%    1020.150000  1017.400000    3.500000    4.000000   12.550000   
75%    1024.475000  1021.475000    7.000000    7.000000   17.000000   
max    1035.700000  1033.200000    8.000000    8.000000   24.700000   

          Temp3pm     RISK_MM  
count  366.000000  366.000000  
mean    19.230874    1.428415  
std      6.640346    4.225800  
min      5.100000    0.000000  
25%     14.150000    0.000000  
50%     18.550000    0.000000  
75%     24.000000    0.200000  
max     34.500000   39.800000  
```

```
C:\Users\bhara\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is depr
ecated and will be removed in a future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\bhara\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWarning: use_inf_as_na option is depr
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  with pd.option_context('mode.use_inf_as_na', True):
```

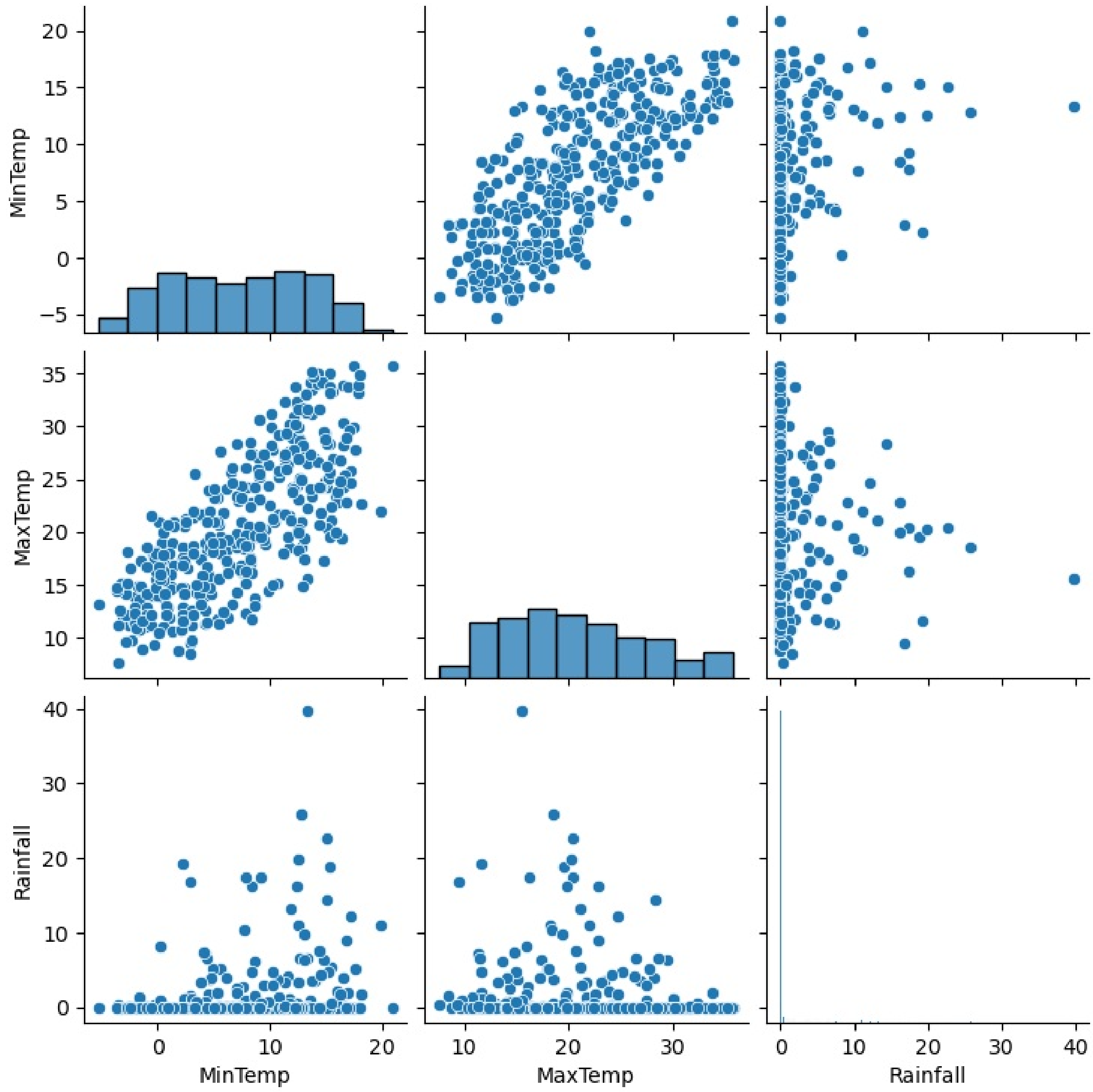

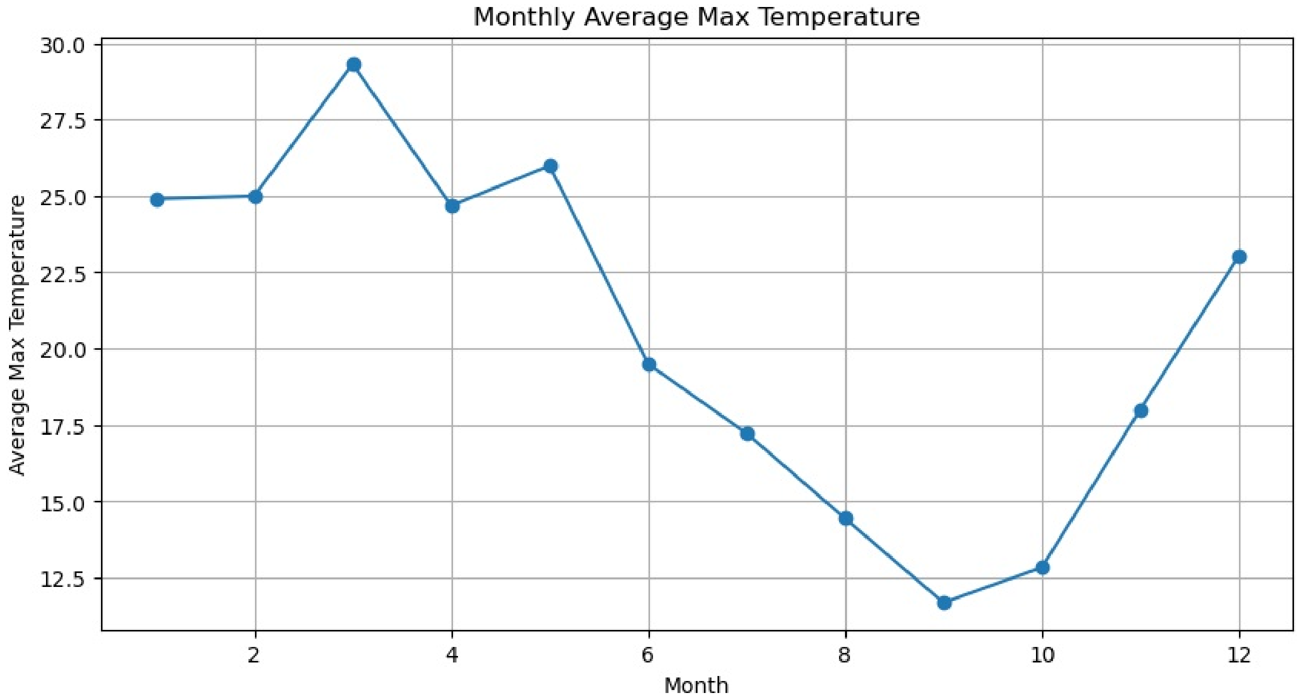

```
Mean Squared Error for Rainfall Prediction: 37.0768456005826
Highest rainfall month: 3, Lowest rainfall month: 9
```

In [ ]:

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