Exercise 3

Given the dataset of 30 students' study hours and exam scores, how would you build a linear regression model to predict exam scores? Describe the steps you would take to diagnose the regression model, including checking assumptions, identifying outliers, and handling influential points. Finally, evaluate the model's performance and discuss any insights gained.

In [71]:
```
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.metrics import r2_score, mean_squared_error
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

In [72]:
```
df = pd.read_csv("student_data.csv")
df.head()
```

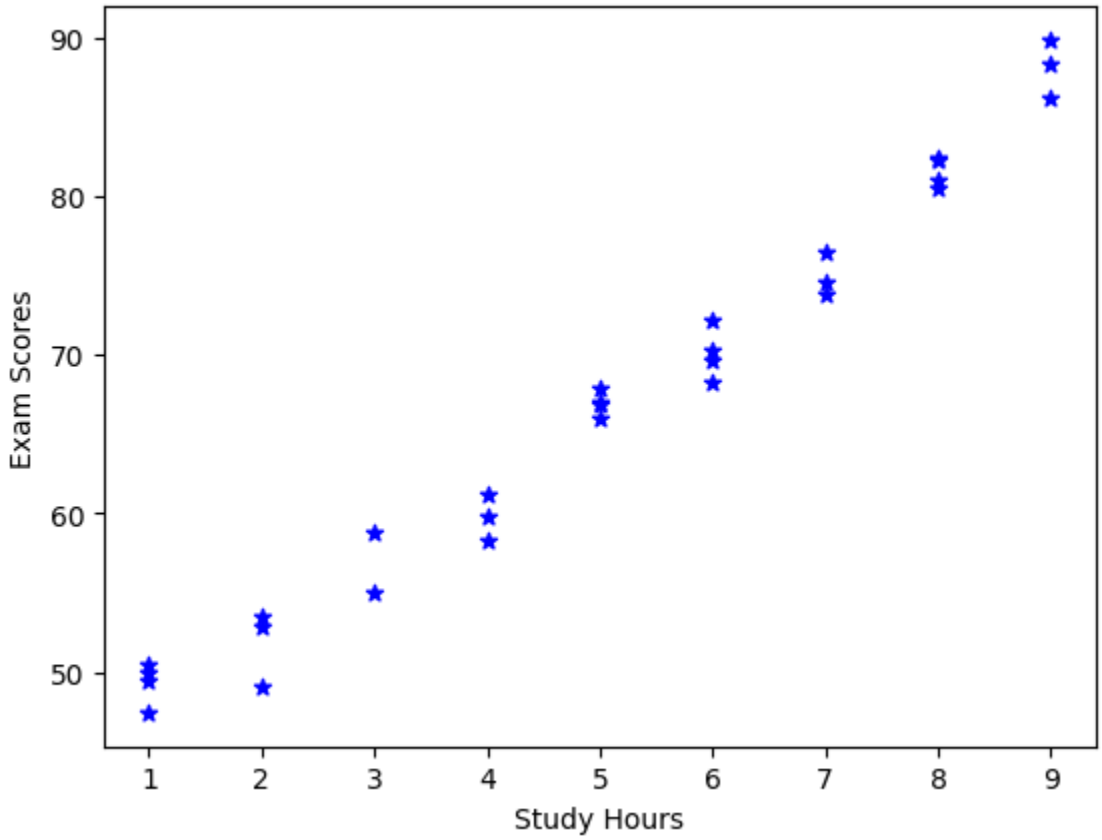
Out[72]:

	StudyHours	ExamScore
0	5	66.938936
1	3	58.791081
2	7	73.818557
3	4	59.844898
4	6	69.690213

In [73]:
```
X = df[['StudyHours']]
y = df['ExamScore']

plt.scatter(X, y, color="b", marker="*")
plt.xlabel("Study Hours")
plt.ylabel("Exam Scores")
```

Out[73]:
```
Text(0, 0.5, 'Exam Scores')
```



In [74]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=42,
test_size=0.25)
```

In [75]:
```
model = LinearRegression()

model.fit(X_train, y_train)
```

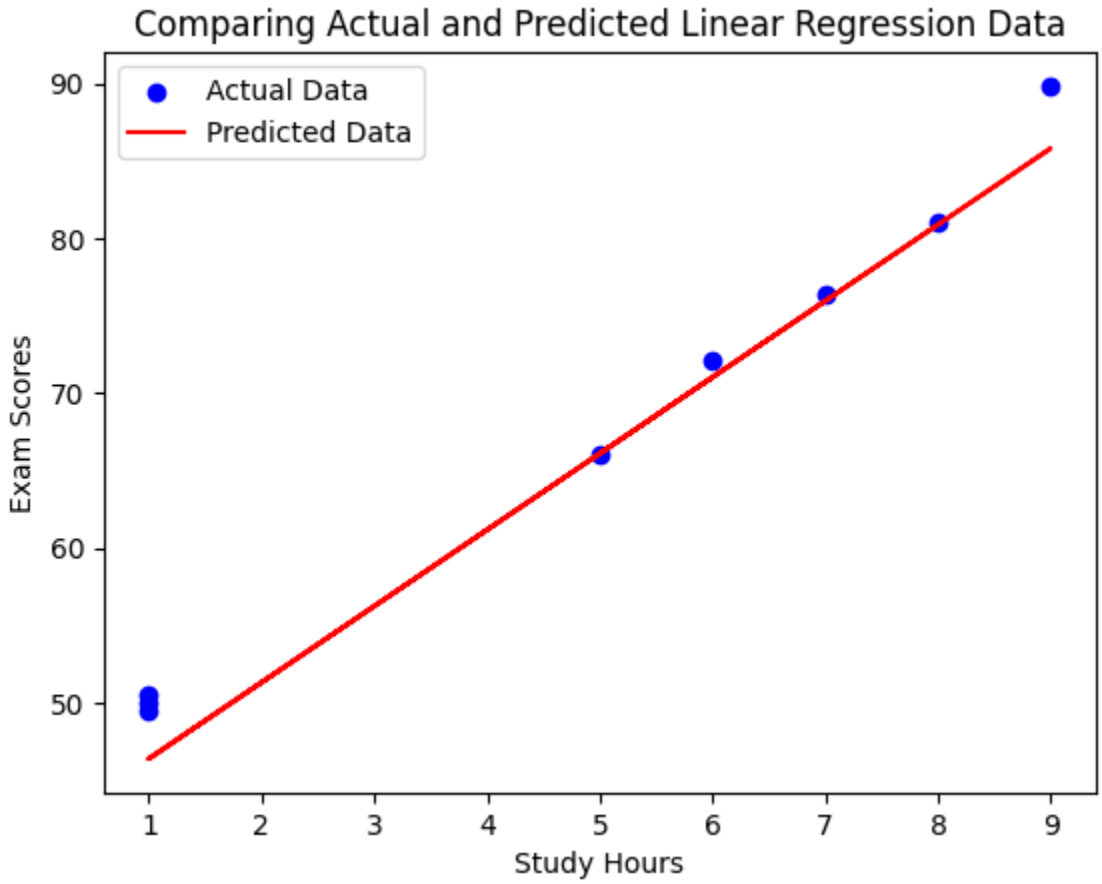
Out[75]:
```
▾ LinearRegression i ?

LinearRegression()
```

In [76]:
```
y_pred = model.predict(X_test)
```

In [77]:
```
plt.title("Comparing Actual and Predicted Linear Regression Data")
plt.xlabel("Study Hours")
plt.ylabel("Exam Scores")
plt.scatter(X_test, y_test, color="b", label="Actual Data")
plt.plot(X_test, y_pred, color="r", label="Predicted Data")
plt.legend()
```

Out[77]:
```
<matplotlib.legend.Legend at 0x7cb01a7ae0d0>
```



In [78]:
```
r2 = r2_score(y_pred, y_test)
mse = mean_squared_error(y_pred, y_test)

print(f"Mean Squared Error = {mse}\nr^2 = {r2}")
```

```
Mean Squared Error = 7.148419001716639
r^2 = 0.9696208656224866
```