

## Module 16.5: Practice Day

### Custom Dataset Generator

```
import numpy as np
import pandas as pd
rng = np.random.default_rng(42)

def generate_students(n=200, seed=42):
    rng = np.random.default_rng(seed)
    hours_studied = rng.normal(5, 2, n).clip(1, 10)
    marks = (hours_studied * rng.uniform(8, 12, n) + rng.normal(0, 5, n)).clip(30, 100)
    gender = rng.choice(['Male', 'Female'], n)
    subject = rng.choice(['Math', 'Science', 'English', 'History'], n)
    study_method = rng.choice(['Solo', 'Group'], n, p=[0.6, 0.4])
    attempts = rng.integers(1, 4, n)
    return pd.DataFrame({
        'hours_studied': hours_studied.round(2),
        'marks': marks.round(2),
        'gender': gender,
        'subject': subject,
        'study_method': study_method,
        'attempts': attempts
    })

def generate_daily_sales(n=60, seed=42):
    rng = np.random.default_rng(seed)
    base = pd.date_range(start='2024-01-01', periods=n, freq='D')
    trend = np.linspace(50, 80, n)
    season = 8 * np.sin(np.linspace(0, 3*np.pi, n))
    noise = rng.normal(0, 3, n)
    sales = (trend + season + noise).round(2)
    return pd.DataFrame({'date': base, 'sales': sales})

# Example usage
# students = generate_students(220)
# sales = generate_daily_sales(90)
```

### Problems

1. Using **sales**, draw a **lineplot** of **date** vs **sales**.
2. From **students**, plot **hours\_studied** vs **marks** and color by **gender**.
3. Create a grid of scatterplots (**hours\_studied** vs **marks**) faceted by **subject**.
4. Plot a histogram of **marks** with a KDE overlay.
5. Show the KDE curve for **hours\_studied**.
6. Display the count of records per **subject**.
7. Draw a regression line for **hours\_studied** and **marks**.
8. Create a pairplot and a jointplot for **students**' dataset.
9. Make a scatter plot of **hours\_studied** vs **marks** using Plotly, colored by **gender**.
10. Draw a line chart of **sales** over **date** and a histogram of **marks** using Plotly.