Data Science Assignment (1)

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Theoretical Group: B

1) What did you learn from the assigned reading?

e assigned reading (pages 20-45) details a critical transition from using Python for pure computation to applying it for data visualization. The summary indicates a dual focus. First, it covers advanced algebraic problem-solving, specifically teaching how to write programs to solve quadratic equations. A key takeaway is the introduction of the cmath library, which equips the programmer to handle equations that result in complex number solutions. This demonstrates Python's capacity to manage mathematical complexities that are often difficult to solve by hand.

The second, and more significant, part of the reading focuses on data visualization using the matplotlib library. The learning path here is methodical, starting with the foundational principles of the Cartesian coordinate plane. From there, it builds up to practical skills: plotting data series from lists, creating continuous line graphs, and—crucially—customizing these plots for clarity. This includes adding titles, labeling the x and y axes, and applying colors. The summary culminates with a real-world application of these skills by plotting and analyzing the average annual temperatures in New York City. This example bridges the gap between abstract data and tangible insights, concluding with the practical step of saving the generated graphs for use in reports or presentations.

2) Can your learning help you solve real-life problems?

A) If yes, describe how (Write approximately 200–300 words):

Yes, the skills learned from this reading are directly applicable to solving a wide range of real-life problems. The core of the learning is not just about math, but about data interpretation and communication. In almost every field—business, science, finance, engineering, and even personal life—we are surrounded by raw data that, in its numerical form, is difficult to understand.

The ability to solve complex equations using cmath is invaluable in specialized fields like physics or electrical engineering, where complex numbers are fundamental to describing phenomena like AC circuits or wave mechanics.

However, the more universally applicable skill is data visualization with matplotlib. This skill empowers you to transform abstract spreadsheets or lists of numbers into clear, insightful visual narratives. For example, a business manager could plot monthly sales data to instantly identify seasonal trends or the impact of a marketing campaign. A scientist could plot data from an experiment to visualize a correlation between two variables. A person trying to manage their finances can plot their monthly expenses to see where their money is going and identify trends. The reading's example of plotting temperature data is a perfect illustration of this: it turns a list of temperatures into a visual trend, making it easy to discuss and analyze topics like climate change. In essence, this learning provides the tools to move from simply having data to understanding and acting on it.

B) If you are able to answer question A, provide an example with a clear explanation and include Python code to support your answer.

Problem: A person wants to track their personal fitness progress to see if their new workout plan is effective. They have been tracking their weight (in kg) at the beginning of each week for the past 12 weeks.

Explanation: The list of 12 numbers is just data. It's hard to tell at a glance if the trend is consistently downward, fluctuating, or staying flat. By using the matplotlib skills from the reading, we can create a simple line graph. This graph will provide an immediate and clear visual answer. We can plot the weeks on the x-axis and the weight on the y-axis. Adding a title like "Weekly Weight Progress" and axis labels "Week" and "Weight (kg)" makes the chart instantly understandable. This visual tool transforms their list of weights into a motivational and analytical tool, allowing them to see their progress and make informed decisions about their fitness plan.

```python
import matplotlib.pyplot as plt
import numpy as np
weeks = list(range(1, 13))

weights = [80.0, 79.5, 79.8, 79.0, 78.5, 78.2, 78.0, 77.5, 77.0, 77.2, 76.5, 76.0]

plt.plot(weeks, weights, marker='o', linestyle='-')

plt.title("Weekly Weight Progress")

plt.xlabel("Week")
```

```python
plt.ylabel("Weight (kg)")

plt.xticks(weeks)

plt.grid(True)

plt.savefig("weekly_weight_progress.png")

print("Plot saved as 'weekly_weight_progress.png'")
```