Assignment 1: Python Logic & Problem Solving

📋 Administrative Details

- **Weight:** 8%
- **Due:** March 8th, 2026, @ Midnight
- **Submission:** A single `.zip` file named `FirstNameLastName_ass1.zip`.
- **Late Penalty:** 10% per day (max 3 days).

⚠️ Submission Rules

- Use the provided starter `.py` files.
- **Do not** change the provided variable names in the templates.
- Ensure your output matches the **Expected Output** exactly.
- Use `math` module functions where specified.

Exercise 1: Debugging (1 pt)

Fix the syntax and type errors in `exercise1.py`. **Expected Output Example:**

```
Hello Alex you are 20 years old.
The area is: 50
The Laptop costs 999.99
```

Exercise 2: Smartphone Battery Planner (2 pts)

Calculate the energy needs for a 12-hour video marathon.

- **Battery:** 4,500 mAh
- **Usage:** 425 mAh / hour
- **Goal:** Find total power, deficit after 1 charge, number of full recharges needed, and the leftover power required.

1. Find Total Power (Energy) Needed To find the total power required for the marathon, multiply the hourly usage by the total duration.
2. Find Deficit After 1 Charge The deficit is the amount of energy needed beyond the capacity of the first full charge.
3. Number of Full Recharges NeededA "full recharge" provides $4,500\ \text{mAh}$. Since the deficit ($600\ \text{mAh}$) is less than the capacity of a single battery, you do not need any additional full recharges to complete the 12-hour session (you only need a partial charge).
4. Leftover Power Required This is the remaining energy needed to reach the total goal after any full recharges are accounted for.

Output Exmaple:

```
| Item                    | Result   |
| ------------------------| -------- |
| Total Power             | 5100 mAh |
| Deficit after 1 Charge | 600 mAh  |
| Full Recharges Needed  | 0        |
| Leftover Power Required| 600 mAh  |
```

Exercise 3: The Backyard Deck (2.5 pts)

You are building a **40m²** deck. Calculate how many bulk packages to buy.

Item	Requirement/m²	Bulk Size
Planks	6	Bundle of 15
Screws	45	Box of 200
Stain	0.8L	5L Can
Sandpaper	2 sheets	Pack of 10

> 📌 **Note:** Use `math.ceil()` to ensure you never run out of materials!

Exercise 4: Satellite Physics (2.5 pts)

Calculate the orbital mechanics for a satellite 400km above Earth. Earth Radius (R_E): 6 371 km Standard Gravitational Parameter (μ): $\approx 3.986 \times 10^{14}\ \mathrm{m}^3/\mathrm{s}^2$

1. **Total Radius ():**
2. **Velocity ():**
3. **Horizon Distance ():**

Expected Output:

```
Total Orbital Radius: 6771 km
Orbital Velocity: 7.67 km/s
Distance to Horizon: 2292.8 km
```