**Worksheet 3** Check: ___ **Name:** _____

1. Complete the test suite for the **External Documentation** for the `Savings` program in Lab 3. Select amounts and interest rates that will test the correctness of your program. Determine the correct answers using a calculator.

   **Problem Statement**: *Given a dollar amount and annual interest rate from the user, determine the balance of a savings account at the end of one and two years, assuming annual compounding of interest.*

   **Specifications**:

   (a) INPUT: `Amount` — `double`, non–negative; `InterestRate` — `double`, non–negative

   (b) OUTPUT: `Balance_1` — `double`, non–negative; `Balance_2` — `double`, non–negative

   **Test Suite**:

| Amount | Interest Rate | Year 1 | Year 2 |
|---|---|---|---|
| 6000 | 4.25 | 6255.0 | 6520.8375 |
| 10000 | 6.75 | | |
| | | | |
| | | | |
| | | | |

   **General Algorithm**:

   - *Prompt for and get data*
   - *Calculate and display balance for first year*
   - *Calculate and display balance for second year*

   **Detailed Algorithm**:

   - *Prompt for and get data*
     - Prompt for and get Amount
     - Prompt for and get Interest Rate
     - Change Interest Rate into decimal equivalent
   - *Calculate and display balance for first year*
     - Determine Interest for first year, add to Amount
     - Display balance after first year
   - *Calculate and display balance for second year*
     - Determine Interest for second year (based on updated value), add to Amount
     - Display balance after second year

2. Complete the External Documentation for the `CylinderVolume` program from Lab 3 by filling in the Problem Statement, Test Suite table, and Detailed Algorithm. You may wish to refer to the External Documentation given to you for the previous problem. Select various radii and heights to test the correctness of your program. Use a calculator to determine the volumes in the test suite. Recall cylinder volume is calculated with the formula: $\pi \times \text{radius}^2 \times \text{height}$.

(a) **Problem Statement**:

(b) **Specifications**:

i. INPUT: `Radius` — `double`, non–negative; `Height` — `double`, non–negative

ii. OUTPUT: `Volume` — `double`, non–negative

(c) **Test Suite**:

| Radius | Height | Volume |
|---|---|---|
| 10.0 | 10.0 | 3141.59 |
| 3.0 | 7.1 | |
| | | |
| | | |
| | | |

(d) **General Algorithm**:

- Prompt for and get Radius and Height of Cylinder
- Calculate Volume
- Display Volume

(e) **Detailed Algorithm**: (*Since this is a very simple program, just give the Java statements you plan to use.*)

- Prompt for and get Radius and Height of Cylinder

- Calculate Volume

- Display Volume

3. Brats are sold 8 to a package, while the buns I want are sold in packages of 10. I'm planning a cookout for a large number of people, and want to buy only what is needed at County Market. If I need 50 brats, how many (whole) packages of brats do I need? If I want enough buns for ***every*** brat I buy, how many packages of buns do I need?

   (a) What are you being asked to find (problem statement)?

   (b) What information (data) is needed to find the answer (input)?

   (c) What process or formulas can you use to get from the input to an answer (algorithm)?

   (d) If you have enough information to find the answer (output), give one; otherwise, explain:

4. Without using a formula, find the sum of the squares of the first $n$ integers greater than zero.

   (a) What are you being asked to find (problem statement)?

   (b) What information (data) is needed to find the answer (input)?

   (c) What process can you use to get from the input to an answer (algorithm)?

   (d) If you have enough information to find the answer (output), give one; otherwise, explain:

5. This problem is similar to the `Spiral` problem from lab 3, but here you need only find the *coordinates* (relative to the graphics window) of the endpoints of the legs of a spiral. Instead of the first leg being parallel to the left–hand side of the window, however, make it parallel to the top of the window. Assume point `A` is at the origin, but point `B` will be to `A`'s right (not below it). Then `C` will occur below `B`; `D` to `C`'s left; `E` above `D`; and finally, `F` will be to the right of `E`. For this problem, assume an initial length of 128 units, a scaling factor of 50%, and that `A` is located at the graphic window's origin (margins are zero).

   (a) Draw a useful sketch of the spiral and label endpoints. What are you being asked to find (problem statement)? Include an answer to the question: Of what will a correct answer consist?

   (b) What information (data) is needed to find the answer (input)?

   (c) What process or formula can you use to get from the input to an answer (algorithm)?

| **If the next point is:** | **then change:** |
|---|---|
| **to the right** | |
| | |
| | |
| | |

   (d) If you have enough information to find the answer (output), give one; otherwise explain: