

ASSIGNMENTS

Problem Solving and Program Design Using C (CSE 3941)



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Assignment - 2

1. Write a program to model a simple calculator. Each data line should consist of the next operation to be performed from the list below and the right operand. Assume the left operand is the accumulator value (initial value of 0). You need a function **scan_data** with two output parameters that returns the operator and right operand scanned from a data line. You need a function **do_next_op** that performs the required operation. **do_next_op** has two input parameters (the operator and operand) and one input/output parameter (the accumulator). The valid operators are:

+ add
- subtract
* multiply
/ divide
^ power (raise left operand to power of right operand)
q quit

Your calculator should display the accumulator value after each operation. A sample run follows.

```
+ 5.0
result so far is 5.0
^ 2
result so far is 25.0
/ 2.0
result so far is 12.5
q 0
final result is 12.5
```

2. The table below shows the normal boiling points of several substances. Write a program that prompts the user for the observed boiling point of a substance in °C and identifies the substance if the observed boiling point is within 5% of the expected boiling point. If the data input is more than 5% higher or lower than any of the boiling points in the table, the program should output the message Substance Unknown.

Substance	Normal boiling point (°C)
Water	100
Mercury	357
Copper	1187
Silver	2193
Gold	2660

Your program should define and call a function `within_x_percent` that takes as parameters a reference value `ref`, a data value `data`, and a percentage value `x` and returns 1 meaning true if data is within `x %` of `ref`—that is, $(\text{ref} - x\% * \text{ref}) \leq \text{data} \leq (\text{ref} + x\% * \text{ref})$. Otherwise `within_x_percent` would return zero, meaning false. For example, the call `within_x_percent(357, 323, 10)` would return true, since 10% of 357 is 35.7, and 323 falls between 321.3 and 392.7.

3. Write a function that will merge the contents of two sorted (ascending order) arrays of type double values, storing the result in an array output parameter (still in ascending order). The function should not assume that both its input parameter arrays are the same length but can assume that one array does not contain two copies of the same value. The result array should also contain no duplicate values.

