Name _____ Section _____

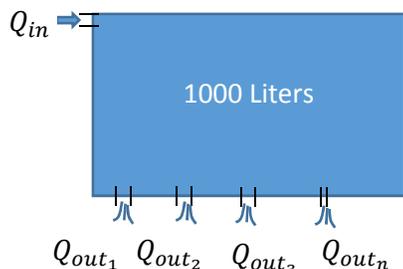Practice for the 2<sup>nd</sup> exam – Extra credit points towards assignments

_____ (20pts) **Answer the 5 multiple choice questions online.** Log it ERNIE, click on the class, then Exams.

**Problem: Will the tank be empty?**

$Q_{in}$ →
1000 Liters

$Q_{out_1}$  $Q_{out_2}$  $Q_{out_3}$  $Q_{out_n}$

A tank of 1000 liters has a number of known leaks at the bottom. Therefore, it constantly needs to be filled at the top at a rate of $Q_{in}$ expressed in liters/seconds. It also has 3 additional unknown leaks at the bottom, for which the rate will need to be randomized. You need to leave for 10minutes. Will the tank be empty when you come back?

The time it takes for the tank to become empty is easily calculated as:

$$t = \frac{Volume}{(Q_{out_1} + Q_{out_2} + Q_{out_3} + \cdots + Q_{out_n}) - Q_{in}}$$

(Note that if $t$ is negative, the tank will always be full.)

Requirements for the program (not necessarily in order) – Whatever is not indicated is up to you (within taught limits..)!
-   Prompt the user for the input rate $Q_{in}$ and how many known leaks are at the bottom. Trap when either is invalid.
-   Using a loop, prompt the user for the flow rates of each leak ($Q_{out_k}$) in liters/seconds. Assume those values are valid.
-   To handle the three unknown leaks, generate a vector of 3 random floats between 0 and 10 liters per seconds. Show the user these values (Liters/second).
-   Calculate the time it takes for that tank to become empty. Omit the semi-colon.
-   Conclude: After the user leaves for 10minutes, will the tank be empty or not?

For example:
    Assuming $Q_{in}$ = 15 Liters/s
        There are 2 known leaks: $Q_{out_1} = 2\frac{Liters}{s}$, and $Q_{out_2} = 4\frac{Liters}{s}$.
        The additional random leaks are:  0.5, 12, and 2.3 liters per seconds.

    Solve

$$t = \frac{1000}{(2 + 4 + .5 + 12 + 2.3) - 15}$$
$$t = 172.42 \; seconds$$

    That's 2.87 minutes... oops, the tank will be empty when the user comes back!

Step 7a) 7b) 7c) are to be in the script file. Submit script file before the timed deadline.

*Rubric for Script file:*

| | | | | |
|---|---|---|---|---|
| *Intro* | *5pts* | | *Prompts* | *5pts* |
| *Clean up* | *5pts* | | *Validity* | *10pts* |
| *Comments/algorithm* | *5pts* | | *Loops* | *5pts* |
| *Spacing* | *5pts* | | *Known leaks* | *5pts* |
| *Indentation* | *5pts* | | *Random leaks* | *10pts* |
| | | | *Calculation* | *10pts* |
| | | | *Proper displays* | *5pts* |
| | | | *Conclusion* | *5pts* |
| | | | *Testing* | *7pts* |
| | | | *Other* | *8pts* |