Mathematical Review
Base 10

Overview:
- The human hand has ten digits, which are also known as fingers.
- There are ten digits in the Base 10 numbering system.
- We have all learned to count in Base 10.
- As humans, we are comfortable in performing mathematical operations in base 10.

In COMP122, we will be learning about computer architecture and assembly languages. A key component in using these systems is knowing various numbering systems and data representations. For example, we will be learning about base 2, base 8, base 16, and base 64 within this class.

On a computer system, we need to perform basic mathematical operations. The operations are not performed in base 10, but in base 2. That is to say that a computer system uses binary numbers in all of its computations. Moreover, we are limited in the size of the numbers that can be used within our calculations.

In this assignment, you are to perform a number of simple mathematical operations in Base 10. The purpose of this assignment is to have you review the fundamentals of these operations and to prepare you to perform the same types of operations using binary numbers (that is to say, using Base 2 computations).

While completing this exercise pay attention to the algorithm or process you use to solve each problem. Show all of your work in the space provided. Notice that you are limited to numbers in the range of 0 .. 9,999.   Perhaps, there might be a problem or two in which you will not be able to solve given the space. When such an exception occurs, simply denote you were not able to solve that problem.
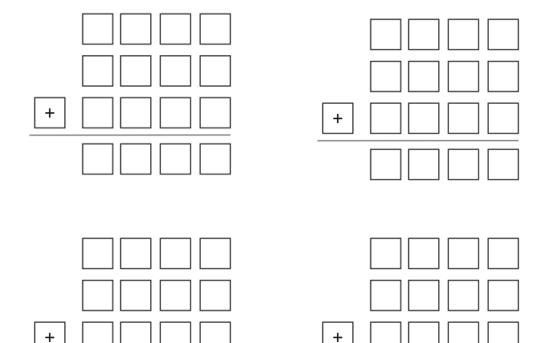
Directions:
1. **Print** this document.
2. Solve each of the mathematical problems in Section 1.
3. Answer each of the questions within Section 2.
4. Scan this document to produce a PDF file.
5. Submit your work as a PDF file via email to steve@my.csun.edu.

Section I:

Set 1: Addition of Whole Numbers
- Perform the following additions: 13 + 5, 13 + 8, 1345 + 655, 5676 + 4334.
- Show your work in the space provided.

Set 2: Addition of Fix Point Numbers
- Perform the following additions: 13.25 + 5.0, 45.67 + 0.8, 134.5 + 0.655, 6.76 + 4334.0
- Show your work in the space provided following the pattern provided.

Set 3: Ten's complement. (Also known as the *radix complement* for Base 10.)

> *Complement: a thing that completes or brings to perfection*

In mathematics, two numbers are said to be complements if by adding them together you obtain a number that is a power of ten, e.g., 0, 10, 100, 1000, etc. For example, the ten's complement of 25 with respect to 100 is 75 (25 + 75 = 100).

1. Calculate the complement of the following numbers <u>with respect to 10</u>:
    a. 3: _____
    b. 5: _____
    c. 6: _____
    d. 9: _____

2. Calculate the complement of the following numbers <u>with respect to 100</u>:
    a. 33: _____
    b. 65: _____
    c. 82: _____
    d. 3: _____

3. Calculate the complement of each of the following numbers:
    a. 23: _____
    b. 345: _____
    c. 3453: _____
    d. 5638: _____

When we are not given the sum of the two numbers, it is defined to be the smallest power of 10 larger than both of the complements. For example, when providing the complement of 654, we can presume that this is <u>with respect to 1000</u>.

Set 4: Nine's complement. (Also known as the *diminished radix complement* for Base 10.)

The nines' complement of a decimal digit is the number that must be added to it to produce 9; Whereas the nine's complement of a three digit number is the number that must be added to it to produce 999.

1. Provide the 9's complement of the following numbers:
    a. 3: _____
    b. 5: _____
    c. 6: _____
    d. 9: _____

2. Provide the 9's complement of the following numbers:
    a. 33: _____
    b. 65: _____
    c. 82: _____
    d. 3: _____

3. Provide the 9's complement of the following numbers:
    a.   23: _____
    b.   345: _____
    c. 3453: _____
    d. 5638: _____

Set 2: Multiplication
   ● Show our work to solve the following two equations:
       ○   13 * 111 = _____
       ○ 345 * 242 = _____

Section 2:

1. Did you read the overview of this assignment?

2. Why was this exercise assigned to you by your Professor?

3. What is a natural number?

4. What is a whole number?

5. What is an integer?

6. What is a real number?

7. What is a complement?

8. What is a carry?

9. What is overflow?

10. What is an exception?

Appendix:
- Example additions of 961 + 921 and 7236 + 4216
- Note that it is not possible to add 7236 and 4216 together with the space provided.

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  1   0   0   □              0   0   1   □
  □   9   6   1              7   2   3   6
+ □   9   2   1            + 4   2   1   6
─────────────            ─────────────
  1   8   8   2              1   4   5   2
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