Assignment 6 – pseudo-code

due in class on Mon 21 Oct (40 points)

This assignment is an individual activity. It asks you to interpret and write algorithms using the **pseudo-code** notation we have studied in class.

1. Read the pseudo-code below and answer the questions that follow.

   ```
   step 1. let Y be X + 5
   step 2. if Y > 0 then set X to Y * 2
   step 3. set X to X * 3
   step 4. output X
   ```

   a. Does this algorithm contain a **conditional** statement? If so, which one?

   b. Does this algorithm contain **iteration**? If so, which steps repeat?

   c. Trace the algorithm with the input X = 4. What does it output?

   d. Trace the algorithm with the input X = -3. What does it output?

   e. Trace the algorithm with the input X = -7. What does it output?
2. In this problem, you will write down an algorithm to add two-digit numbers in base ten. As shown in the figure, your input variables are X₁, X₀, Y₁, and Y₀. Each variable holds a single-digit integer.

When your algorithm is finished, the answer should be in the variables Z₂, Z₁, and Z₀ – each holding a single digit. For example, if I want to add 56+94, the algorithm will start with

\[
\begin{align*}
X₁ &= 5 & X₀ &= 6 \\
Y₁ &= 9 & Y₀ &= 4
\end{align*}
\]

and in the end, the Z variables will have the result:

\[
\begin{align*}
Z₂ &= 1 & Z₁ &= 5 & Z₀ &= 0
\end{align*}
\]

Your algorithm should work for any single-digits provided in the input variables.
3. Here, C refers to a sequence of variables (an array), and the notation C[I] uses the value of I to determine which C to access.

   step 1. set K to C[1]
   step 2. set N to 1
   step 3. set I to 2
   step 4. if I > 7 then output N then K and stop
   step 5. if C[I] = K then set N to N+1 and go to step 9
   step 6. output N then K
   step 7. set K to C[I]
   step 8. set N to 1
   step 9. set I to I+1
   step 10. go back to step 4.

Below are the initial values of the array, and other variables you will use.

   K :
   N : 
   I :
   C[1] : apple
   C[2] : apple
   C[3] : banana
   C[5] : carrot
   C[7] : date

What is the output of the algorithm?