

# Assignment 3

27 February 2013

**due Monday 4 March 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  $X_1$ ,  $X_0$ ,  $Y_1$ , and  $Y_0$ . Each variable holds a single-digit integer.

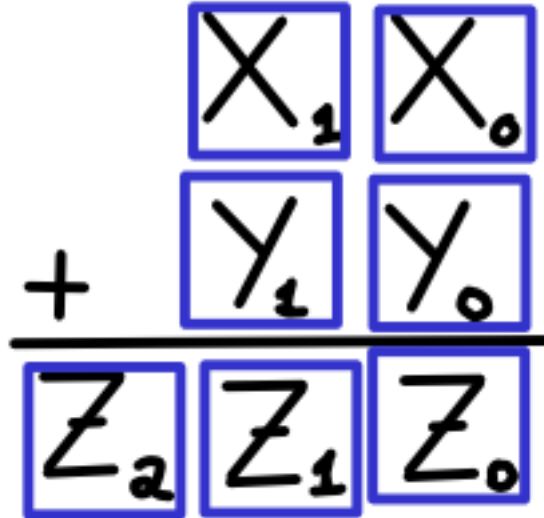


Figure 1:

When your algorithm is finished, the answer should be in the variables  $Z_2$ ,  $Z_1$ , and  $Z_0$  – each holding a single digit. For example, if I want to add  $56+94$ , the algorithm will start with

$$\begin{array}{ll} X_1 = 5 & X_0 = 6 \\ Y_1 = 9 & Y_0 = 4 \end{array}$$

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

$$Z_2 = 1 \quad Z_1 = 5 \quad Z_0 = 0$$

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[4] : carrot
C[5] : carrot
C[6] : carrot
C[7] : date
```

What is the output of the algorithm?