Introduction to Scientific and Engineering Computation

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1. Consider the following piece of program:

```
i = -1;
while (x >= 1) {
    i++;
    y[i] = x % 8;
    x /= 8;
}
for (j = i; j >= 0; j--)
    cout << y[j];
```

i	y	x	j	output
-1	[ ]	115		

   (a) Assuming that the initial value for x is 115, fill out the table above with the values that variables take at each step.

   (b) Draw the flowchart for this piece of program.

2. For the "Pascal's triangle" given below, the entries (called the binomial coefficients) can be computed as follows:

	0	1	2	3	4
0	1				
1	1	1			
2	1	2	1		
3	1	3	3	1	
4	1	4	6	4	1

$$binom_{i,j} = \begin{cases} 1 & j = 0 \vee j = i \\ binom_{i-1,j-1} + binom_{i-1,j} & otherwise \end{cases}$$

where i is the row index and j is the column index. Note that the column index for the ith row takes on values between 0 and i.
The coefficients will be represented by a matrix variable defined as

```
int binom[50][50];
```

(a) Write the piece of program that will compute $binom_{i,j}$, assuming that $binom_{i-1,j-1}$ and $binom_{i-1,j}$ has already been computed.

(b) Write the piece of program that will compute the first 50 lines of the triangle.

3. Write a complete program that reads in a string from the user and creates a new string that has all 'u' symbols removed if they follow 'q' symbols. For instance, if the user has typed "you must be quick", the new string has to be "you must be qick". The program should print both the original and the new string at the end. (You can assume that the first letter of the string is not 'u').