

PROGRAMMING PROBLEMS (25 points each)

- 1) Use nested loops to display a “Postcard from Gizah”. The height of the triangle should vary from 1 to 9. Don't output hard – coded strings such as “tab” or “\t”; use nested loops instead.

```
Pyramid height = 1
      *           *           *
    ***         ***         ***

Try again? [y/n]: y
Pyramid height = 2
      *           *           *
    ***         ***         ***

Try again? [y/n]: y
Pyramid height = 4
      *           *           *
    * *         * *         * *
  *   *       *   *       *   *
*****       *****       *****

Try again? [y/n]: y
Pyramid height = 5
      *           *           *
    * *         * *         * *
  *   *       *   *       *   *
*     *     *     *     *     *
*****       *****       *****

Try again? [y/n]: y
Pyramid height = 8
      *           *           *
    * *         * *         * *
  *   *       *   *       *   *
*     *     *     *     *     *
*     *     *     *     *     *
*     *     *     *     *     *
*     *     *     *     *     *
*****       *****       *****

Try again? [y/n]: y
Pyramid height = 9
      *           *           *
    * *         * *         * *
  *   *       *   *       *   *
*     *     *     *     *     *
*     *     *     *     *     *
*     *     *     *     *     *
*     *     *     *     *     *
*     *     *     *     *     *
*****       *****       *****

Try again? [y/n]: n
```

2) Create a code to determine if a matrix is symmetric or not. A matrix (two – dimensional array) is symmetric if:

- It is a square matrix (sides are equal)
- In linear algebra, a symmetric matrix is a square matrix that is equal to its transpose.

Formally, matrix A is symmetric if $A = A^T$.

```
How many columns? 3
How many rows? 3
Populating matrix. Enter a number: 1
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 1
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 1
Matrix contents:
1 2 3
2 1 2
3 2 1
The matrix is symmetric
```

```
How many columns? 3
How many rows? 3
Populating matrix. Enter a number: 1
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 1
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 4
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 1
Matrix contents:
1 2 3
2 1 2
4 2 1
The matrix is not symmetric
```

```
How many columns? 3
How many rows? 3
Populating matrix. Enter a number: 1
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 4
Populating matrix. Enter a number: 5
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 5
Populating matrix. Enter a number: 8
Matrix contents:
1 2 3
2 4 5
3 5 8
The matrix is symmetric
```

```
How many columns? 3
How many rows? 3
Populating matrix. Enter a number: 3
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 5
Populating matrix. Enter a number: 2
Populating matrix. Enter a number: 5
Populating matrix. Enter a number: 4
Populating matrix. Enter a number: 5
Populating matrix. Enter a number: 4
Populating matrix. Enter a number: 7
Matrix contents:
3 2 5
2 5 4
5 4 7
The matrix is symmetric
```

- 3) Write a program to find the longest "palindromic substring" of a given string.
- The longest palindromic substring is the maximum-length contiguous substring of a given string that is also a palindrome.
 - For example, the longest palindromic substring of "bananas" is "anana". The longest palindromic substring is not guaranteed to be unique; for example, in the string "abracadabra", there is no palindromic substring with length greater than three, but there are two palindromic substrings with length three, namely, "aca" and "ada".

```
Enter a word: noon
Longest palindrome substring is: noon
Length is: 4

Do you want to try again? [y/n]y
Enter a word: mommy
Longest palindrome substring is: mom
Length is: 3

Do you want to try again? [y/n]y
Enter a word: racecar
Longest palindrome substring is: racecar
Length is: 7

Do you want to try again? [y/n]y
Enter a word: referee
Longest palindrome substring is: refer
Length is: 5

Do you want to try again? [y/n]y
Enter a word: statistics
Longest palindrome substring is: tat
Length is: 3

Do you want to try again? [y/n]n
```

- 4) There are N players which are playing a tournament. We need to find the maximum number of games the winner can play. In this tournament, two players are allowed to play against each other only if the difference between games played by them is not more than one.

Example:

Input : N = 3

Output : 2

Maximum games winner can play = 2

Assume that player are P1, P2 and P3

First, two players will play let (P1, P2)

Now winner will play against P3,

making total games played by winner = 2

Input : N = 4

Output : 2

Maximum games winner can play = 2

Assume that player are P1, P2, P3 and P4

First two pairs will play lets (P1, P2) and

(P3, P4). Now winner of these two games will

play against each other, making total games

played by winner = 2

Enter the number of players (N): 2

Maximum games winner can play = 1

Do you want to try again? [y/n] :y

Enter the number of players (N): 3

Maximum games winner can play = 2

Do you want to try again? [y/n] :y

Enter the number of players (N): 4

Maximum games winner can play = 2

Do you want to try again? [y/n] :y

Enter the number of players (N): 5

Maximum games winner can play = 3

Do you want to try again? [y/n] :y

Enter the number of players (N): 6

Maximum games winner can play = 3

Do you want to try again? [y/n] :y

Enter the number of players (N): 7

Maximum games winner can play = 3

Do you want to try again? [y/n] :y

Enter the number of players (N): 8

Maximum games winner can play = 4

Do you want to try again? [y/n] :n