

4. Give a simple example of a program that can be solved using a recursive function, write the recursive function for solving the problem, pointing out in a comment the base case for the recursion.

5. Write code that reads a positive integer n , and then prints a row of n stars, followed by a row of $n - 1$ stars, and so on, until it has printed n rows with each row having one less star than the previous. For example, if $n = 4$ is entered by the user, the program prints

```
* * * *
* * *
* *
*
```

6. Write code that reads in a positive integer n , and then prints an increasing sequence of consecutive multiples of 3 in the pattern of the triangle of problem 1. For example, if $n = 4$ is entered, then the program prints the pattern

```
3   6   9   12
15  18  21
24  27
30
```

The numbers do not have to be lined up neatly in columns, but they should be separated by some spaces.

7. Suppose that you have available to you a function

```
int partition(int arr[], int lower, int upper)
```

that rearranges the portion of the array in positions `lower` through `upper` and returns a index `p` in that range such that

$$\text{arr}[k] < \text{arr}[p] \text{ for all } k < p;$$

and

$$\text{arr}[k] \geq \text{arr}[p] \text{ for all } k > p.$$

Using this function (you are not being asked to write the `partition` function in this problem) write a function

```
void Quicksort(int arr[], int lower, int upper)
```

that will sort the portion of the array between `lower` and `upper`.

8. Write a function

```
bool hasOddDigits(int number)
```

that returns **true** if the number passed as parameter has at least one odd digit in its string representation, and **false** if the number has no odd digits. For example 2842 has no odd digits, but 4964 does have an odd digit.

9. Write a function that takes a string as parameter and determines whether it is a palindrome. The function returns true if the string is a palindrome and false otherwise.

```
bool isPalindrome(string str)
```

If you want to use recursion, then you can write a second function

```
bool isPalindrome(string str, int lower, int upper)
```

and you can have the first function call the second.

6. You have been given a square matrix

```
int matrix[SIZE][SIZE]
```

that is already filled with values. Write code that prints the “border” of this matrix, in the sense that it prints all entries in the first row, then all entries in the last column, and then all entries in the last row (in decreasing order of columns) and all entries in the first column (in decreasing order of rows).

Entries should be printed without repetition.

For example, if the matrix contains the values

```
10  20  30  40
50  60  70  80
90 100 120 130
140 150 160 170
```

The your program prints

```
10 20 30 40 80 130 170 160 150 140 90 50
```