Badji Mokhtar Annaba university
Bachelor Of Computer Science - First Year - S1 Academic Year 2023/2024
First Mid-Term Exam in Algorithmics and Data Structures

Duration : 1h30 **date: 21-01-2024**

Note:

1- Answers can be provided in either Algorithmics or C language; both are acceptable.
2- The algorithms or C programs written must include the variable declaration section.

Exercise 1: (5 pts)

Write an algorithm/C program that displays the biggest and the smallest divisors of a given number. (Example: biggest and smallest divisor of **10** are respectively **5** and **2**, the number itself and the number 1 are not included).

Solution

```
#include <stdio.h>
int main() {                                          (0.5pt)
   int number, smallest, biggest;

   // Input the number
   printf("Enter a number: ");                        (1pt)
   scanf("%d", &number);

   smallest = number;
   biggest = 1;

   // Find the divisors
   for (int i = 2; i <= number / 2; i++) {            (1pt)
      if (number % i == 0) {                          (0.5)
         smallest = i;                                (0.5)
         biggest = number / i;                        (0.5)
         break;
      }
   }
   if (smallest!=1)
{    printf("The smallest divisor of %d is: %d\n",     (0.5)
number, smallest);
   printf("The biggest divisor of %d is: %d\n",        (0.5)
number, biggest);
}
else  printf("No divisors other than the number
1 and the number itself ");
   return 0;
}
```

Exercise 2: (5 pts)

- Write an algorithm/C program that:
    1- Asks the user if he wants to calculate the area of a circle or a rectangle.
    2- Allows the user to input data, including the width and length for a rectangle, and the radius for a circle.
    3- Displays the result.
- Provide a solution using a flowchart.

Solution

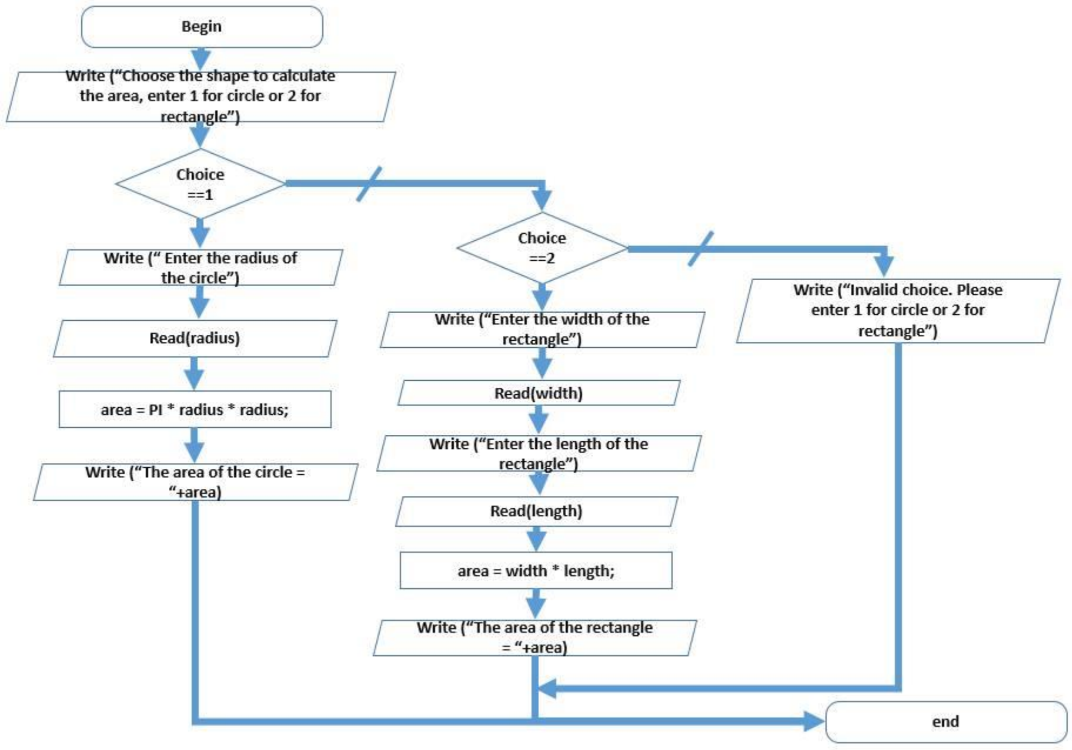
```
#include <stdio.h>

int main() {
   int choice;
   printf("Choose the shape to calculate the area:\n");
   printf("1. Circle\n");
   printf("2. Rectangle\n");                                    (0.5pt)
   printf("Enter your choice (1 or 2): ");
   scanf("%d", &choice);

   if (choice == 1) {
      float radius, area;
      const PI=3.14;
      printf("Enter the radius of the circle: ");               (1pt)
      scanf("%f", &radius);
      area = PI * radius * radius;
      printf("The area of the circle with radius %.2f is: %.2f\n", radius,
area);
   } else if (choice == 2) {
      double width, length, area;
      printf("Enter the width of the rectangle: ");             (1pt)
      scanf("%f", &width);
      printf("Enter the length of the rectangle: ");
      scanf("%f", &length);
      area = width * length;
      printf("The area of the rectangle with width %.2f and length %.2f is:
%.2f\n", width, length, area);
   } else {
```

```
        printf("Invalid choice. Please enter 1 for circle or 2 for rectangle.\n");
    }
    return 0;
}
```
	(0.5pt)

(2pts)


Begin
Write ("Choose the shape to calculate the area, enter 1 for circle or 2 for rectangle")
Choice ==1
Write (" Enter the radius of the circle")
Read(radius)
area = PI * radius * radius;
Write ("The area of the circle = "+area)
Choice ==2
Write ("Enter the width of the rectangle")
Read(width)
Write ("Enter the length of the rectangle")
Read(length)
area = width * length;
Write ("The area of the rectangle = "+area)
Write ("Invalid choice. Please enter 1 for circle or 2 for rectangle")
end

Exercise 3: (5 pts)

Write an algorithm/C program that calculates the number of ‘0’ (zeros) in the lower part of a square matrix regarding its first diagonal.

Solution

```
#include <stdio.h>

int main() {
   int n=5;
   int matrix[n][n];
   int zeroCount = 0;

   for (int i = 1; i < n; i++) {
      for (int j = 0; j < i; j++) {
         if (matrix[i][j] == 0) {
            zeroCount++;
         }
      }
   }
   printf("Number of '0' in the lower part regarding the first diagonal: %d\n", zeroCount);

   return 0;
}
```

Badji Mokhtar Annaba university
Bachelor Of Computer Science - First Year - S1 Academic Year 2023/2024
First Mid-Term Exam in Algorithmics and Data Structures

Exercise 4: (5 pts)

Write an algorithm/C program that:

1- Search for a given letter in one dimension array.
2- Move all its occurrences to the left and shift the others to the right.

```
#include <stdio.h>

int main() {

  int n, i, j;

  char target;

  char arr[n];

Partie declaration bien faite : 0.5

    printf("Enter the target letter to search for: ");    0.5

  scanf(" %c", &target);

  for (i = 0; i < n; i++) {

    if (arr[i] == target) {

      // Shift elements to the right    1pt

      for (j = i; j > 0; j--) {

        arr[j] = arr[j - 1];

      }  2 pts

      arr[0] = target;  0.5

    }

  }

  return 0;

}
```

L'agencement 0.5

Remarque : L'enchainement est important, c'est-à-dire une instruction mal placée n'est pas comptabilisée.