

Final Exam*Algorithmic and Data Structure*

Date: 12/01/2024

First Name: _____ Last Name: _____ Group _____

Part 1: QUESTIONS (10 points)

Q.1. (1.25 points) Compute the values of the following C expressions assuming that **b, s, e, m** and **k** are integer variables, **z** and **t** are *float* variable as declared below.

int b = 1, s = 3, e = 5, m = 4, k = 10; float z = 2.0, t = 5.5;

a) $z = b + k * z / m \% e - 1$ b) $e \% s * m > z \ || \ k \% s * b < t$ c) $(b < s) \% s + 1$ d) $++b \ \&\& \ s--$ e) $m = --b? -e: ++e$

0
1
2
1
6

Q.2. (1.25 points) Find the output of the following C program and write the output into the given box:

```
#include <stdio.h>int
```

```
main()
```

```
{ int NUM=0, x=1;
```

```
  while(NUM<=8)
```

```
  { switch (NUM)
```

```
    { case 0:
```

```
      x = 0;
```

```
      printf("%d\n", x);
```

```
    case 1:
```

```
      NUM += 1;
```

```
      break;
```

```
    case 2:
```

```
      x = 2;
```

```
      printf("%d\n", x);
```

```
    case 3:
```

```
      printf("%d\n", x * 2);
```

```
    case 4:
```

```
      x = x + 1;
```

```
      NUM=NUM+5;
```

```
      printf("%d\n", x);break;
```

```
    default:
```

```
      NUM = NUM * 2;
```

```
      printf("%d\n", NUM);
```

```
  }
```

```
}
```

```
return 0; }
```

0

2

4

3

14

Q.3. (1 point) Consider the given *while* loop below:

```
i = 1;
```

```
while ( i <= 10)
```

```
{
```

```
  printf ("hello\n");i=i+2;
```

```
}
```

i) Rewrite the code above using a **for loop**

```
for(i=1; i<=10; i=i+2)

    printf("hello\n");
```

ii) Rewrite the code above using a **do-while loop**

```
i=1;

do

{ printf("hello\n");

    i=i+2;

} while (i<=10);
```

Q.4 (2.5 points)

In the following C program, there are total of **10 errors** in different lines. In the provided table, indicate the line numbers which error occurred and write your correction in front:

1:	#include (stdio.h)
2:	#Define PI 3.14
3:	int main
4:	{
5:	Int rad, base, height;
6:	Float area, ci;
7:	
8:	printf("\nEnter radius of circle: ");
9:	scanf("%d", rad);
10:	
11:	area = PI * rad * rad;
12:	printf("\nArea of circle : %d ", area);
13:	
14:	ci = 2 * PI * rad;
15:	printf("\nCircumference : %f ", ci)
16:	
17:	printf("\nEnter the base of Right Angle Triangle : ");
18:	scanf("%d", &base);
19:	
20:	printf("\nEnter the height of Right Angle Triangle : ");
21:	scanf("%d", &height);
22:	
23:	area = 0.5 * base * height;
24:	printf("\nArea of Right Angle Triangle : %f", area);
25:	Return 0;
26:	

Line number	Correction
1	#include <stdio.h>
2	#define PI 3.14
3	int main()
5	int rad, base, height;
6	float area, ci;
9	scanf("%d", &rad);
12	printf("\nArea of circle : %f", area);
15	printf("\nCircumference : %f", ci);
25	return 0;
26	}

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Q.5.(1.5 points) Write a C function that models the following mathematical function.
For example, $f(-3.2)$ returns $-3.2 + 2 = -1.2$. Assume that x is a float type variable.

$$f(x) = \begin{cases} x + 2, & x < -1 \\ x^2, & -1 \leq x \leq 1 \\ -x + 2, & x > 1 \end{cases}$$

```
float f(float x)
{
    if (x < -1)

        return x + 2;

    else if ((x >= -1) && (x <= 1))

        return x * x;

    else if (x > 1) // <--- optional

        return -x + 2
}
```

Q.6 (0.5 points)

What does the following instruction mean? Give equivalent instruction

#define NUMER_OF_STUDENT 50;

Answerconstant declaration, `const int NUMER_OF_STUDENT=50;`**Q.7 (0.5 points)**

What is the difference between the two instructions:

Instruction1: `char chaine[]="azerty";`*Instruction2:* `char chaine[]={ 'a','z','e','r','t','y'};`**Answer** In memory allocation**Instruction 1**

[0]	[1]	[2]	[3]	[4]	[5]	[6]
a	z	e	r	t	y	\0

Instruction 2

[0]	[1]	[2]	[3]	[4]	[5]	[6]
a	z	e	r	t	y	

Q.8 (1 pts) The volume of a sphere with radius r is $\frac{4}{3}\pi r^3$. Complete the program below so that it prompts the user to enter the radius of a sphere and prints out the volume of that sphere, to two decimal places.

#include <stdio.h>

#define PI 3.14159265

float vsphere, r;

int main() {

scanf("%d", &r);

vsphere=4/3*PI*r*r*r;

printf("the volume of that sphere is %.2f", vsphere);

return 0; }

Q.9 (0.5 points) If $s1$ and $s2$ are two string variables, and i is an integer variable; which of the following lines is NOT a valid use of string functions?

- A. `strcmp(i, s1);`
- B. `strcpy(s2, s1);`
- C. `strcat(s1, s2+i);`
- D. `i = strlen(s1);`

Solution: A. We cannot compare a string with an integer.

Part 2: EXERCISES (10 points)

Exercise 1 (05 points)

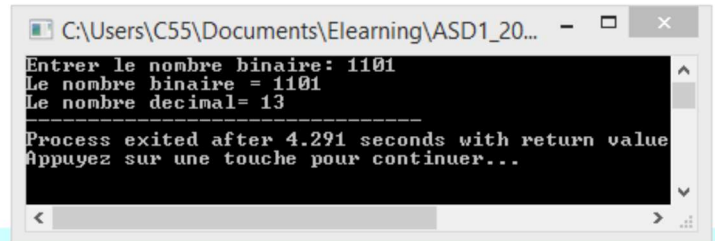
Write a C program that asks the user to enter a binary number N and converts it to a decimal number. (Note: XY in C is written in the form `pow(X, Y)` which can be found in the `math.h` library).

Example: Input: N: 1011 Output: The decimal number: 11

```

1  #include <stdio.h>
2  #include <math.h>
3  #define BASE 2
4
5  int main()
6  {
7      int binaire, decimal=0, temp;
8      int N=0;
9
10     printf("Entrer le nombre binaire: ");
11     scanf("%d", &binaire);
12
13     temp = binaire;
14     while(temp !=0)
15     {
16         /* si le chiffre courant est égal à 1 */
17         if(temp % 10 == 1)
18         {
19             decimal += pow(BASE, N);
20         }
21         N++;
22         temp /= 10;
23     }
24
25     printf("Le nombre binaire = %d\n", binaire);
26     printf("Le nombre decimal= %d", decimal);
27
28     return 0;
29 }

```



Exercise 2 (05 points)

Write a C program that asks the user to enter grades for a class and then calculates and displays the percentage of grades above the class average.

```

#include<stdio.h>
main(){
    int i, n, c = 0;
    float m, s = 0, p, T[30];
    printf("Entrer la taille du tableau : ");
    scanf("%d",&n);
    for(i=0; i<n; i++){
        printf("Entrer l'element %d :", i+1);
        scanf("%f",&T[i]);
        s = s + T[i];
    }
    m = s / n;
    for(i=0; i<n; i++){
        if(T[i] >= m){
            c = c + 1;
        }
    }
    p = ((float)c / n) * 100;
    printf("Le pourcentage de notes superieurs a la moyenne %.2f est : %.2f%% ", m, p);
}

```