



Level: 1st year Mathematics

Date: 14/01/2026

Module: Algorithmic and Data Structures 1

Duration: 1h30m

Exam

Exercise n°1

(6 points)

Consider the following part of the program:

```
int i=1, s=0;
while (i≤5){
    for (j←0, j<5; j++)
        i++;
    printf("%d", @i);
    s=s+i;
    i=s/2;
}
```

1. Correct the four syntax errors that exist in the code.
2. How many times is the instruction "printf(...);" executed?
3. What is the value of "s" at the end of the execution?

Exercise n°2

(6 points)

Write an algorithm that displays the maximum decimal number in an integer given by the user.

Example: 8 is the maximum decimal number in 2138570.

Exercise n°3

(8 points)

Write a permutation algorithm or C program that:

1. Read a square matrix $M(n, n)$ of integers.
2. Next, it prompts the user to enter a number "k".
3. It swaps the values in row "k", if it exists, with the values in column "k".
4. It displays the resulting matrix.

Good luck



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Typical solution

Exercise n°1

(6 points)

Soit la partie du programme suivante :

```
int i=1, s=0;
while (i<=5) {
    for (j=0; j<5; j++)
        i++;
    printf("%d", i);
    s=s+i;
    i=s/2;
}
```

0.5

- 2 times (2 pts)
- s=14 (2 pts)

Exercise n°2

(6 points)

Algorithm max_decimal;

Variables N,T,r,max: integer; (1 p)

Begin

Write(" Give a number:");

Read (N); (0.5 p)

$T \leftarrow N$;

$\text{max} \leftarrow T \bmod 10$;

$T \leftarrow T \text{ div } 10$;

(0.5 p)

While ($T \neq 0$) (3 p)

$r \leftarrow T \bmod 10$;

If ($r > \text{max}$) **then**

$\text{max} \leftarrow r$;

End if

$T \leftarrow T \text{ div } 10$;

Endwhile

Write (max," is the maximum decimal number in ",N); (1 p)

END.

Exercise n°3 (8 points)

```
#include <stdio.h>main( ){
    int i ,j,n, k ,x;
    int M[50][50]; (1 pts)
    do{
        printf ( "Give the dimension of the matrix \n");
        scanf ( "%d",&n );
    } while ((n<=0)|| (n>50)); (1 pts)
    printf ( "Enter the elements of the matrix:\n",);

    for (i=0;i<n;i++){
        for (j=0;j<n;j++){
            scanf ("%d",& M[i][j]);}

    for (i=0;i<n;i++){
        printf ("\n");
        for (j=0;j<n;j++){
            printf (" %d  ",M[i][j]);} (1 pts)

    //enter a number "k"

    printf ( "Give k:");

    scanf ( "%d",&k); (1 pts)

    // swaps the values in row "k", if it exists, with the values in column "k".

    if ((k>1)&&(k<n )){

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

        x=M[i][k];

        M[i][k] =M[k][i];

        M[k][i] = x;

    }

    }

    (3 pts)

    // displays the resulting matrix

    printf ( " the resulting matrix is:\n",);

    for (i=0;i<n;i++){
        printf ("\n");
        for (j=0;j<n;j++){
            printf (" %d  ",M[i][j]);
        } (1 pts)
```