Information units

1 bit – elementary unit
1B (Byte) = 8 bits
1KB (KiloByte) = 2^{10} B (1024 B)
1MB (MegaByte) = 2^{10} KB (1024 KB)
1GB (GigaByte) = 2^{10} MB (1024 MB)
1TB (TeraByte) = 2^{10} GB (1024 GB)

Conversion table

octal	binary
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

HTML codes for Romanian letters:

Letter	Ă	ă	Â	â	Î	î	Ş	ş	Ţ	ţ
Code	&#258	&#259	&Acirc	&acirc	&Icirc	&icirc	&#350	&#351	&#354	&#355

Table of powers of number 2

$2^0 = 1$		
$2^1 = 2$	$2^9 = 512$	$2^{-1} = 0,5$
$2^2 = 4$	$2^{10} = 1024$	$2^{-2} = 0,25$
$2^3 = 8$	$2^{11} = 2048$	$2^{-3} = 0,125$
$2^4 = 16$	$2^{12} = 4096$	$2^{-4} = 0,0625$
$2^5 = 32$	$2^{13} = 8192$	$2^{-5} = 0,03125$
$2^6 = 64$	$2^{14} = 16384$	$2^{-6} = 0,015625$
$2^7 = 128$	$2^{15} = 32768$	$2^{-7} = 0,0078125$
$2^8 = 256$	$2^{16} = 65536$	$2^{-8} = 0,00390625$

Conversion table

hexadecimal	binary	hexadecimal	binary
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

- At the item 5 perform the proposed tasks for the studied programming language: **Pasca**l or **C/C++**
- For the items 4, 6,7 check the programing language which you will use to perform the proposed problems:
  - ❑ **Pascal** ❑ **C/C++**

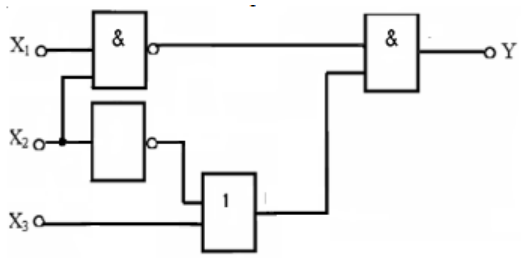
<table>
<tr><th>Nr</th><th>Item</th><th colspan="2">Score</th></tr>
<tr><td>1</td><td>The video camera of a smartphone can shoot color video clips. Each frame of the clip contains 192 KB of information.

a) Determine the amount of information (in KB) contained in 5 frames filmed with the given phone and write the result in the space reserved for the answer.
Write the used formulas and the calculations: Answer: _____ KB

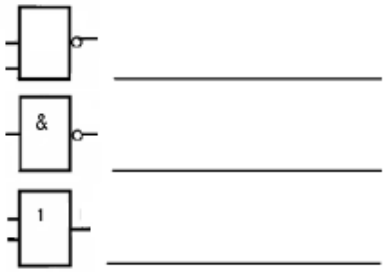
b) Determine the amount of information (in MB) which is contained in a video clip recorded with the given phone with the duration of 32 seconds and a frequency of 30 frames per second. Write the result in the space reserved for the answer.
Write the used formulas and the calculations: Answer: _____ MB</td><td>L
0
1
2
3
4
5</td><td>L
0
1
2
3
4
5</td></tr>
<tr><td>2</td><td>a) Check in the list below the numbering system with the smallest base in which the spelling of the number (381,04)_x is correct: ❑ 2 ❑ 8 ❑ 10 ❑ 16

b) Convert the number (5E4,C8)₁₆ from the hexadecimal numbering system to the binary numbering system and write the result in the space reserved for the answer:
Answer: (_____)₂

c) Convert the number (532,14)₈ from the octal numbering system to the decimal numbering system and write the result in the space reserved for the answer:
Answer: (_____)₁₀
Write the calculations:

d) Check the truth value of the statement “The basis of a positional numbering system is defined by its number of digits.”: ❑ True ❑ False</td><td>L
0
1
2
3
4
5
6</td><td>L
0
1
2
3
4
5
6</td></tr>
<tr><td>3</td><td>Let the logic circuit be given:
 

a) Write the logic function that is represented by this given logic circuit:
Y= _____
b) Determine and write the value of the function
Y(1,0,0) = _____

c) Write in the reserved spaces the names of the elementary logic gates:
 

d) Check the type of the computer's internal memory resource:
❑ software (programming resource)
❑ hardware (technical resource)</td><td>L
0
1
2
3
4
5
6</td><td>L
0
1
2
3
4
5
6</td></tr>
</table>

<table>
<tr>
<td>4</td>
<td colspan="2">Write a function FN, with two integer parameters x (1≤x≤1000) and y (1≤y≤1000). If the values of the parameters x and y are two consecutive integer numbers then the function will return the value x + y, otherwise the function will return the value 0.

Example: The values 3 and 4 are consecutive. The values 5 and 4 are consecutive. The values 5 and 3 are not consecutive.</td>
<td>L
0
1
2
3
4
5</td>
<td>L
0
1
2
3
4
5</td>
</tr>
<tr>
<td>5</td>
<td>The following Pascal program is given:
<pre>
Program prog5;
 type t=array[1..5] of integer;
 var x:t;
     s:string;
     i,n :integer;

 function tab(k:integer):
integer;

 begin
    tab:= n div k;
 end;

 procedure sir(a:t; s:string);
  var j:integer;

  begin
    for j:=1 to 4 do
      write(s[x[j]]);
    writeln;
  end;

begin
  s:= 'INFORMATICA';
  n:=length(s);

  for i:=1 to 4 do
  begin
  x[i]:=tab(i);
  write(x[i] ,' ');
  end;
  writeln;

  sir(x,s);
end.
</pre></td>
<td>Perform the following tasks for the program prog5:

a) Write the name of the global variables of structured data type: _____.

b) Write the name of the subprogram, which does not return any value by its name: _____.

c) Underline in the text of the program prog5 the operator which assigns a value to the component i of the array x.

d) Write the name of the subprogram, which uses the global variables for communication: _____.

e) Write the name of the standard function used in the program prog5: _____.

f) Write what will be displayed as a result of running the program prog5:

_____

_____</td>
<td>L
0
1
2
3
4
5
6
7</td>
<td>L
0
1
2
3
4
5
6
7</td>
</tr>
</table>

The following C++ program is given:

```
//prog5
#include <iostream>
#include <string.h>
using namespace std;

int x[5];
char s[50];
int i, n;

int tab(int k) {
      return n / k;
}

void sir (int a[5], char s[50])
{
      int j;

      for (j = 1; j <= 4; j++) {
            cout<<s[x[j]-1];
      }
      cout<<"\n";
}

int main() {
      strcpy(s, "INFORMATICA");
      n = strlen(s);

      for(i = 1; i <= 4; i++) {
            x[i] = tab(i);
            cout<<x[i]<<" ";
      }
      cout<<"\n";

      sir(x, s);

    return 0;
}
```

Perform the following tasks for the program **prog5**:

a) Write the name of the global variables of structured data type: _____

b) Write the name of the function, which does not return any value by its name: _____.

c) Underline in the text of the program **prog5** the operator which assigns a value to the component **i** of the array **x**.

d) Write the name of the function, which uses the global variables for communication: _____.

e) Write the name of the standard function used in the program **prog5**: _____.

f) Write what will be displayed as a result of running the program **prog5**:

_____

_____

L 0 1 2 3 4 5 6 7

L 0 1 2 3 4 5 6 7

6

A string of the English alphabet chars is called a "pseudopalindrome" if the first character in the string is the same as the last. For example, "bob" , "anaconda". A file contains n strings, one per line.

Task: Write a program to calculate how many of the strings in the file are "pseudopalindromic". The program will contain a subprogram named **PP**, which will receive a string as a parameter and will return the value **1** if the string is "pseudopalindromic" and **0** - otherwise.

Input: The text file siruri.in contains in the first line an integer **N** (**1≤N≤20**) - the number of strings in the file. Each of next **N** lines contains a separate string, formed from lowercase English letters, with a length which will not exceed 100 chars.

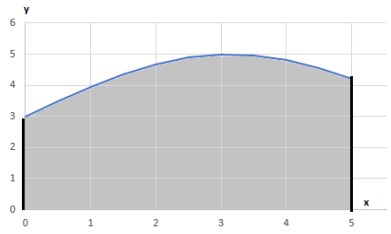
Output: The text file siruri.out contains an integer – the number of "pseudopalindroms" from the input file.

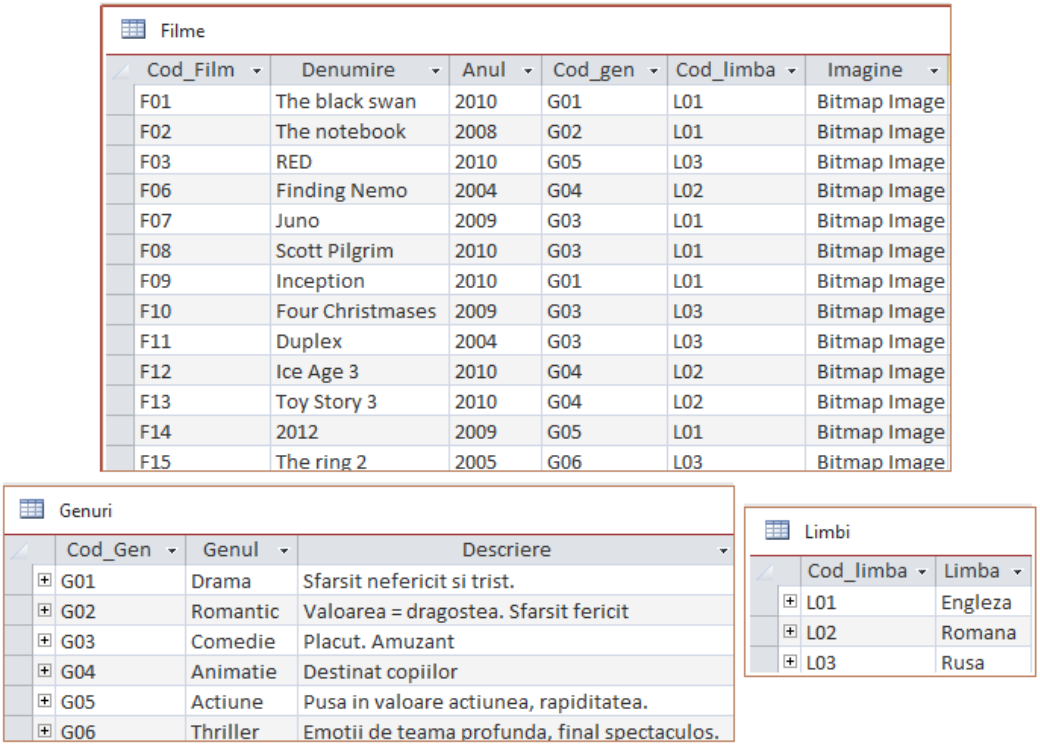
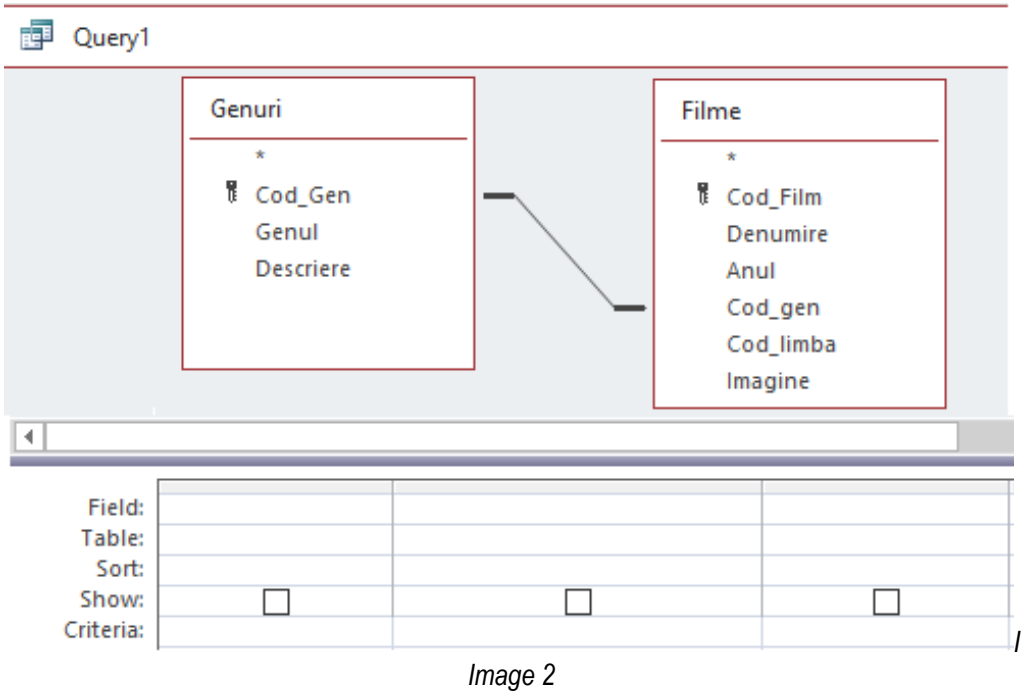
Example:

siruri.in	siruri.out	**The solution will be appreciated for**: types and variable declarations; operations with the text files; reading and writing data; algorithm organization.
5 brad copac sos zero scurs	3	

L 0 1 2 3 4 5 6 7 8 9

L 0 1 2 3 4 5 6 7 8 9

7	On the field, delimited by: • straights **x=0** and **x=5;** • the graph of the function **f(x)=2sin(x/2)+3**; • ***ox*** axe, will be built a park. Different trees will be planted in this park. For each tree, 8 units of surface are reserved. Develop a program that calculates the number of trees needed to be planted in the given park. The area of the park is determined by calculating the integral $\int_a^b f(x)dx$ by ***the right rectangles method*** for a number of divisions of the segment **[a;b]** known in advance **n=50**. **Input**: The values of the extremities of the integration segment **[0;5]** and the number of divisions **n** are set directly in the program code. **Output**: An integer number - the number of trees needed to be planted in the given park - is displayed on the screen.  **The following algorithm can be used to calculate the area:** **Step 1:** Set the values of the integration segment's extremeties **a**, **b** and the number of divisions **n**. **Step 2:** Calculate the length of the elementary segment $h = \frac{\lvert b-a \rvert}{n};\quad S \Leftarrow 0;$ **Step 3:** For all **i** from **1** to **n**: a) Calculate the value: $x_i \Leftarrow a + ih;$ b) Calculate the area of the elementary rectangle: $S_i = h \times f(x_i)$ c) The calculated area is added to the previous calculated areas: $S \Leftarrow S + S_i$	L 0 1 2 3 4 5 6	L 0 1 2 3 4 5 6

8	A database was created in MS Access. The current content of the database tables is presented in *Image 1:*  Filme Cod_Film | Denumire | Anul | Cod_gen | Cod_limba | Imagine F01 | The black swan | 2010 | G01 | L01 | Bitmap Image F02 | The notebook | 2008 | G02 | L01 | Bitmap Image F03 | RED | 2010 | G05 | L03 | Bitmap Image F06 | Finding Nemo | 2004 | G04 | L02 | Bitmap Image F07 | Juno | 2009 | G03 | L01 | Bitmap Image F08 | Scott Pilgrim | 2010 | G03 | L01 | Bitmap Image F09 | Inception | 2010 | G01 | L01 | Bitmap Image F10 | Four Christmases | 2009 | G03 | L03 | Bitmap Image F11 | Duplex | 2004 | G03 | L03 | Bitmap Image F12 | Ice Age 3 | 2010 | G04 | L02 | Bitmap Image F13 | Toy Story 3 | 2010 | G04 | L02 | Bitmap Image F14 | 2012 | 2009 | G05 | L01 | Bitmap Image F15 | The ring 2 | 2005 | G06 | L03 | Bitmap Image Genuri Cod_Gen | Genul | Descriere G01 | Drama | Sfarsit nefericit si trist. G02 | Romantic | Valoarea = dragostea. Sfarsit fericit G03 | Comedie | Placut. Amuzant G04 | Animatie | Destinat copiilor G05 | Actiune | Pusa in valoare actiunea, rapiditatea. G06 | Thriller | Emotii de teama profunda, final spectaculos. Limbi Cod_limba | Limba L01 | Engleza L02 | Romana L03 | Rusa *Image 1* Using the data from the database tables: a) Fill in, in the image *Image 2,* all the necessary elements, including the relations between the tables and define in *Design View* a parameter query which displays 3 fields - ***Denumire***, ***Genul*** and ***Anul***. The query displays data about the movies (***Denumire*** field) that are part of the *Comedy* or *Animation* genres (***Genul*** fieldl, ***Comedie*** or ***Animatie*** values) and were released in the year indicated as a parameter (***Anul*** field, **[*An*:]** parameter). The records are displayed in the ascending order of the values in the ***Denumire*** field.  Query1 Genuri * Cod_Gen Genul Descriere Filme * Cod_Film Denumire Anul Cod_gen Cod_limba Imagine Field: Table: Sort: Show: Criteria: *Image 2*	L 0 1 2 3 4 5 6 7 8 9	L 0 1 2 3 4 5 6 7 8 9

	b) Check in the list below the relationship between the tables ***Genuri*** and ***Limbi***: ❑ 1 → 1 ❑ 1 → ∞ ❑ ∞ → ∞ c) Check in the list below the type of the ***Imagine*** field: ❑ `Yes/No` ❑ `Ole Object` ❑ `Hyperlink` d) A field in the ***Filme*** table is required to be filled in. Write its name: _____		
9	Write a fragment of HTML code, which will display in the browser window the information similar to the one from the *Image 3*. **Note**: • The table has the title `Municipiul Chişinău` of `h3` level heading and the border width of 3 pixels. • The HTML code contains an ordered list. • The image, which is saved in the file **`stema.png`**, and the HTML code are stored in the same folder. The dimensions of the image are not described. **Municipiul Chişinău** Prima atestare 17 iulie 1436 1. Suprafaţa 123 km^2 2. Densitatea 5576 loc./km^2 *Image 3*	L 0 1 2 3 4 5 6 7 8 9	L 0 1 2 3 4 5 6 7 8 9