Exercise paper#4

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1 Exercise 1

Predict the output of the following (meaningless) code.

```
using namespace std;


int B(int a, int b, int c){
        return (a+b+c)/3;
}


void C(const string& input){
        cout<<"OUTPUT 2: "<<input<<endl;
}

void A(int a, int b){
        cout<<"OUTPUT 1: "<<a<<" - "<<b<<endl;

        int value = a+B(50, 20, 33);

        C("Hello World");

        cout<<"OUTPUT 3: value="<<value<<" b="<<b<<endl;
}


int main(){
    A(5, 2);
    return 0;
}

```

2 Exercise 2

Write a function named *sommaDiDueArray* which takes as arguments two arrays of length 5 and computes an array which is the sum of the two arrays passed as arguments.
Given two arrays A and B of length 5 their sum is defined as follows:
the result is an array C such that:

C[i] = A[i] + B[i] $\forall i \in [0, 4]$

Look at this example to better understand the context:

int A[5]={1, 2, 3, 4, 5};
int B[5]={-1, 1, -1, 1, -1};

The sum A+B is an array C with the following elements: C = {0, 3, 2, 5, 4}

3 Exercise 3

Two children are at home due to a lockdown forced by the government as a result of a global pandemic. Somehow they are trying to enjoy their time in this strange situation. They have invented a way to communicate messages secretly with each other. They encode the text of the messages as follows:

- They take a plain text P and, using their algorithm, they encode it with an encoded message C.
- Both P and C are written always in capital letters.
- P and C are composed only of letters belonging to the set {A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z}. To encode a message they unintentionally use the encryption technique known in the literature as Caesar cipher encryption technique `https://en.wikipedia.org/wiki/Caesar_cipher`. In other words, they replace each letter of the plain text with another letter according to the following table:

Plain	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Cipher	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W

Example:

```
Plaintext:  THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
Ciphertext: QEB NRFZH YOLTK CLU GRJMP LSBO QEB IXWV ALD
```

Write a function *childrenChipher* which takes an input plain text string C and produces a chipertext P according to the rules explained above.

4 Exercise 4

Lets define a new mathematical operation called "*stefenizzazione*". The result of a "*stefenizzazione*" applied on a given matrix of integers M are as follows:

- The output of the operation is a matrix O
- For each entry (i, j) of the matrix $O[i][j] = 0 \iff M[i][j]$ is an even number
- For each entry (i, j) of the matrix $O[i][j] = 1 \iff M[i][j]$ is an odd number

Write a function ***void*** *matrixFunction* which operates as follows:

- INPUT: a 5x5 matrix of integers
- The function has to calculate the result of applying *stefenizzazione* on the input matrix
- Please notice that ***void*** *matrixFunction* does not return anything. It simply prints the result on the console (use cout).

Example:

Applying a *stefanizzazione* on this matrix:

$$\begin{bmatrix} 1 & 2 & 3 & 3 & 3 \\ 23 & 33 & 46 & 83 & 33 \\ 12 & 22 & 73 & 33 & 33 \\ 11 & 26 & 33 & 23 & 133 \\ 12 & 62 & 63 & 13 & 13 \end{bmatrix}$$

We obtain the following matrix as a result:

$$\begin{bmatrix} 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix}$$