MIDTERM EXAM

EMPLID

CSCI 135

NAME: FIRST LAST

1 Write a function: `bool equals(char* a, int a_size, char* b, int b_size)` that checks whether two `char` arrays are of equal length and have the same characters in the same order.

2 Write a function: `void bar_chart(int* value_array, int size)` that displays a bar chart of the values in `value_array`, using asterisks and dashes as below. Your function must first check that all values in `value_array` are positive and no larger than 40. If a value falls outside of this range, no line should be printed for that value (not even blank one).

```
**********----------
*
**********----------
*
**********----------
*
**********----------
*
```

3 Write a function that finds the first occurrence of a value in a two-dimensional array. Return an **`int`** array of length **`2`** with the indices of the row and column, or null if the value was not found. !!! Make sure that this returned array persists beyond the scope of your function without using global or static variables.

4 Design a simple class **`Person`** that contains (or "has") the **`name`** of a person and two pointers: to the person's father and mother. Write statements that define a objects for yourself and your parents, correctly establishing the pointer links. Use **`nullptr`** for your parents' parents.

Variable and Constant Definitions

```
int cans_per_pack = 6;

const double CAN_VOLUME = 0.335;
```

Type, *Name*, *Initial value*

Mathematical Operations

```
#include <cmath>
```

`pow(x, y)`	Raising to a power x^y
`sqrt(x)`	Square root $\sqrt{x}$
`log10(x)`	Decimal log $\log_{10}(x)$
`abs(x)`	Absolute value $\lvert x \rvert$
`sin(x)`, `cos(x)`, `tan(x)`	Sine, cosine, tangent of x (x in radians)

Selected Operators and Their Precedence

(See Appendix B for the complete list.)

`[]`	Array element access
`++ -- !`	Increment, decrement, Boolean *not*
`* / %`	Multiplication, division, remainder
`+ -`	Addition, subtraction
`< <= > >=`	Comparisons
`== !=`	Equal, not equal
`&&`	Boolean *and*
`||`	Boolean *or*
`=`	Assignment

Loop Statements

Condition

```
while (balance < TARGET)
{
   year++;
   balance = balance * (1 + rate / 100);
}
```

Executed while condition is true

Initialization, *Condition*, *Update*

```
for (int i = 0; i < 10; i++)
{
   cout << i << endl;
}
```

Loop body executed at least once

```
do
{
   cout << "Enter a positive integer: ";
   cin >> input;
}
while (input <= 0);
```

Conditional Statement

Condition

```
if (floor >= 13)
{
   actual_floor = floor - 1;
}
else if (floor >= 0)
{
   actual_floor = floor;
}
else
{
   cout << "Floor negative" << endl;
}
```

Executed when condition is true

Second condition (optional)

Executed when all conditions are false (optional)

String Operations

```
#include <string>
string s = "Hello";
int n = s.length(); // 5
string t = s.substr(1, 3); // "ell"
string c = s.substr(2, 1); // "l"
char ch = s[2]; // 'l'
for (int i = 0; i < s.length(); i++)
{
   string c = s.substr(i, 1);
   or char ch = s[i];
   Process c or ch
}
```

Function Definitions

Return type, *Parameter type and name*

```
double cube_volume(double side_length)
{
   double vol = side_length * side_length * side_length;
   return vol;
}
```

Exits function and returns result.

Reference parameter

```
void deposit(double& balance, double amount)
{
   balance = balance + amount;
}
```

Modifies supplied argument

Arrays

Element type, *Length*

```
int numbers[5];
int squares[] = { 0, 1, 4, 9, 16 };
int magic_square[4][4] =
{
   { 16, 3, 2, 13 },
   { 5, 10, 11, 8 },
   { 9, 6, 7, 12 },
   { 4, 15, 14, 1 }
};

for (int i = 0; i < size; i++)
{
   Process numbers[i]
}
```