# CMPT 135 Midterm Exam

## Name: _____

## Student Number: _____

## Signature: _____

# Instructions

1.   **Fill in your Name, Student Number, and signature above.**

2.   **This is a closed book Exam. No electronic or paper aids permitted.**

3.   **Leave all your electronic devices inside your backpacks or bags and leave the backpacks or bags on the floor. You cannot wear any earphones. Turn your cell phones and any electronic devices off.**

4.   **Once you leave the room unattended, you must hand in your test and you cannot reenter the room until the exam is over.**

5.   **Do not open this test booklet until instructed to do so.**

6.   **Clearly indicate if some part of your work is not to be marked. Add as many comments as needed to provide a clear response.**

7.   **You may answer the questions in any order you want.**

8.   **Raise your hand if you have a question. The instructor will come over to assist you.**

9.   **Copying from or communicating with a neighbor or with anyone directly or electronically will result in both students receiving a zero and may result in further disciplinary action by the school and or university administration.**

10.  **The total number of points for this midterm is 100.**

11.  **You may use the attached Operator Precedence chart and Syntax chart**

12.  **You will have <u>50 minutes</u> to complete this Midterm.**

13.  **When you are finished, bring your paper and student card to the front of the room where you will hand in your test.**

*Good luck!*

**Total = _____ / 100**

| Question | Max Mark | Actual Mark |
|----------|----------|-------------|
| 1 | 5 | |
| 2 | 5 | |
| 3 | 5 | |
| 4 | 4 | |
| 5 | 6 | |
| 6 | 15 | |
| 7 | 20 | |
| 8 | 20 | |
| 9 | 20 | |
| Total | 100 | |

**1. Identify with check marks which of the following are valid C++ _expressions_. Choose all that apply. Assume the variables are defined appropriately.　　　　　　　　　　　　　　　　5 Marks**

☐ `if (x < y) cout << "x is smaller";`

☐ `(x || y)`

☐ `++(a+b)`

☐ `while (a < 10) {cout << a++ << " ";}`

☐ `(a > b) ? a : b`

**2. Write a Boolean expression that evaluates to true if and only if one of A, B, or C are true and the others are false.　　　　　　　5 Marks**

_____

**3. Briefly describe the difference between a Class and an Object.　5 Marks**

_____

_____

_____

**4. Briefly describe the difference between a struct and class.        4 Marks**

_____

_____

_____

**5. Match the different types of software testing activities with the descriptions by placing the correct letter A to F in front of the matching description.        6 Marks**

**Software Testing Types：**
```
A.Unit Testing
B.Integration Testing
C.System Testing
D.Regression Testing
E.White-Box Testing
F.Black-Box Testing
```

\_\_\_\_\_ **Tests observable functionality of one or more classes with no regard to internal implementation details**

\_\_\_\_\_ **Verifies that an individual Class and its methods function correctly given a set of sample inputs and expected outputs**

\_\_\_\_\_ **Tests both external and internal interfaces using implementation knowledge to verify correctness of all internal logic paths**

\_\_\_\_\_ **Test performed after software have been modified, that uses a small subset of existing testcases to verify that the software continues to function correctly.**

\_\_\_\_\_ **Tests that the product satisfies customer requirements and meets specific quality objectives and often includes regression testcases**

\_\_\_\_\_ **Verifies that several software components, packages, or classes produced by several teams work together as expected.**

**6.   What is the output from the following program fragment?        15 Marks**

```cpp
void helper (int x, int& y, int* z) {
    x    = 100;
    y    = 201;
    z[2] = 301;
}

int main(){
  int a    = 0;
  int b    = 1;
  int c[5] = {5, 6, 7};

  helper(a,b,c);

  cout << " a = " << a      << endl;
  cout << " b = " << b      << endl;
  cout << " c = ";
  for(int i=0; i<5; i++)
     cout << c[i] << " ";
  cout << endl;
}
```

(Write the output from executing the program here)

## 7.  Find the Max                                                      20 Marks

Write a function `findMax` that takes two parameters: the first parameter is an int array that contains positive integers, and the second is the number of int elements in the array to search. The function should return the value of the largest element in the array.

For example, if `arr` is initialized to {1,4} and `arrLen` is 2, then the function should return the value 4. If there are no elements in the array, then return zero.

```
int findMax(int arr[], int arrLen) {
        (Write the function implementation here)












































}
```

## 8. Data Flow Diagrams                                                   20 Marks

Implement the Coin class shown in the Data Flow Diagram below. Use encapsulation to ensure that its member variable is private. The Coin class will need a default constructor plus one public method for flipping the coin. The flip() method returns a bool representing heads or tails. The value of the last flip should be stored as a private member variable called heads of type bool.
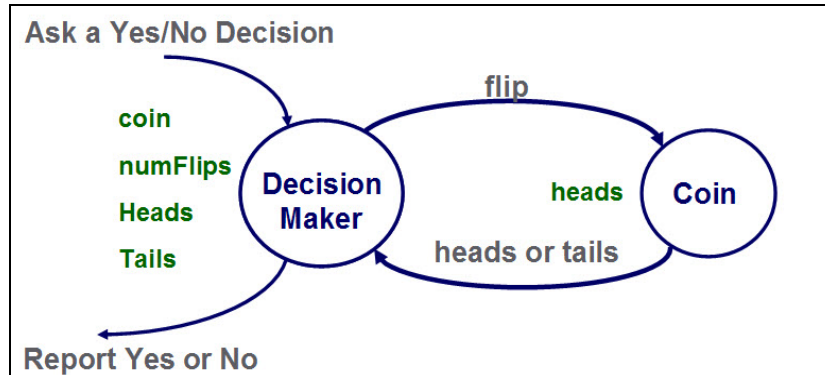


The flip method must use a random number to determine if a head or tail was flipped with equal probability. Use the rand() function. Seed the random number generator using srand() and time() within the constructor. You may assume the necessary #includes have already been done.

Complete the Coin class declaration, constructor, and flip method code below:

```
class Coin {
    public:   // Public  member declarations go here



    private: // Private member declarations go here


}
// Constructor definition goes here




// Method definition goes here



```

## 9.  Output a Bar Graph                                    20 Marks

Write a procedure called `BarGraph` that takes three parameters: the output stream, an int array called `Production`, and the number of elements in the array.

For each element in the array, BarGraph must display the element number followed by ": " followed by a line of asterisks. Each asterisk represents 10 units of production, rounded to the nearest 10. Recall that values whose last digit is below 5 are rounded down, and values that end with 5 or more are rounded up.

For example, if `Production` contains {22, 35, 27}, then function `BarGraph` should output the following to outStream:
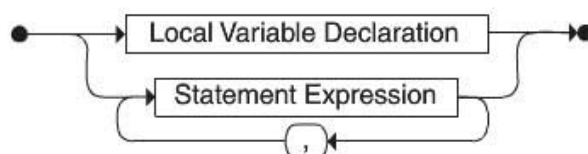
```
0: **
1: ****
2: ***
```

```
void BarGraph(ostream& outStream, int Production[], int prodLen) {
   (Write the code to implement BarGraph here)
```




























```
}
```

## C++ Operator Precedence – Appendix 2

| | |
|---|---|
| :: scope resolution operator | *Highest precedence (done first)* |
| . dot operator<br>-> member selection<br>[] array indexing<br>( ) function call<br>++ postfix increment operator (placed after the variable)<br>-- postfix decrement operator (placed after the variable) | |
| ++ prefix increment operator (placed before the variable)<br>-- prefix decrement operator (placed before the variable)<br>! not<br>- unary minus<br>+ unary plus<br>* dereference<br>& address of<br>*new*<br>*delete*<br>*delete[]*<br>*sizeof* | |
| * multiplication<br>/ division<br>% remainder (modulo) | |
| + addition<br>- subtraction | |
| << insertion operator (output)<br>>> extraction operator (input) | |
| < less than          <= less than or equal<br>> greater than      >= greater than or equal | |
| == equal<br>!= not equal | |
| && and | |
| \|\| or | |
| = assignment<br>+= add and assign        -= subtract and assign<br>*= multiply and assign<br>/= divide and assign        %= modulo and assign | *Lowest precedence (done last)* |

**C++ Syntax Subset**

**If Statement**



**Switch Statement**
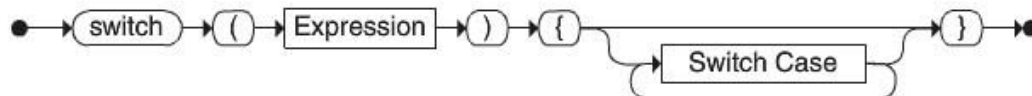


**Switch Case**
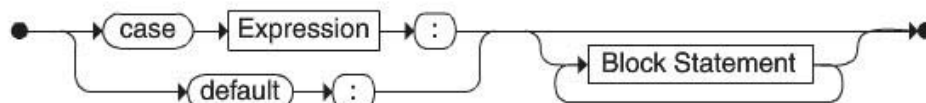


**While Statement**



**Do Statement**



**For Statement**



**For Init**



**For Update**