03-60-340-30
2016 Winter, Tues. Feb. 9, 2016 in TC 204
University of Windsor, School of Computer Science

Midterm 1 Examination

Mr. Paul Preney

Student ID:	
FIRST Name:	
LAST Name:	

"I have neither given nor received unauthorized help with this examination. Any suspicion of cheating will automatically void my mark on this examination."

_____

Signature
Unsigned examination booklets will not be graded.
Signature implies agreement with the above statement in quotes.

INSTRUCTIONS

1. You have **1 hour** maximum to complete this examination. Pace yourself accordingly.
2. Write your answers in the space provided. No additional space will be provided.
3. Do **not** remove any papers from this booklet or add new ones.
4. You may **not** use any reference material(s) **except** what has been provided within this examination booklet and the course text books *The C++ Programming Language, 4th Edition* and/or *The C++ Standard Library: A Tutorial and Reference*.
5. **You may not use the C Standard Library unless given explicit permission to do so.** C++ coding techniques and the C++ Standard Library without the C Standard Library subset must always be used.
6. **Document your code where appropriate.** Unclear answers may not receive partial marks. Ensure any written English uses proper spelling, grammar, and can be understood. Answers must be neat and legible to receive marks.
7. **Be sure** that you have printed your name and student number on all pages of this examination.
8. Ensure that you have all **10 pages** of this examination (including this page) before starting to write this exam. If you don't, bring this to the attention of the instructor immediately.
9. Ensure the proper case, spelling, syntax, grammar, and punctuation marks are correctly used in all answers involving code.

EXAMINATION MARK: _____
MAXIMUM MARK: 49

Part I: Multiple Choice and Short Answer Questions (39 marks)

For each question in this section, neatly and plainly **circle or underline** the **single** response which most correctly completes/answers the statement/question given for multiple choice or True/False questions, otherwise, write in the appropriate answer(s) in the space provided. Read carefully! Unintelligible or ambiguous responses will receive a mark of zero (0) for that question, so ensure that your answer is clear.

Q1) C++ was originally called _____.

Answer: _____ **[1 mark]**

Q2) Indicate in the appropriate cell row whether or not the year shown is a year associated with an official ISO C++ standard. **[4 marks]**

Year	Year Is Associated with Official ISO C++ Standard	Year Is Not Associated with ISO Official C++ Standard
1979		
1983		
1990		
1998		
1999		
2009		
2014		
2016		

Q3) If a C++ compiler chose to implement a variable of type **int&** as a pointer, what would the pointer variable's (exact equivalent) type be? **[1 mark]**

Answer: _____

Q4) If a C++ compiler chose to implement a variable of type **float const&** as a pointer, what would the pointer variable's (exact equivalent) type be? **[1 mark]**

Answer: _____

Q5) If a C++ compiler chose to implement a variable of type **double&&** as a pointer, what would the pointer variable's (exact equivalent) type be? **[1 mark]**

Answer: _____

Q6) Match the appropriate term with the best definition. The possible terms to choose from are:

imperative, modular, object-based, object-oriented, generic, functional **[6 marks]**

Definition	Write Term Associated With Definition In Row
Computation is defined in terms of state strongly associated with operations and the expression of the next operation to be performed it often expressed in terms of the data state.	
Computation is defined in terms of state strongly associated with operations and other hierarchically associated state.	
Computation (and state) is defined in terms of operations that have no side effects.	
Computation is defined in terms of action patterns where each occurs on common aspects of groups of types' interfaces rather than on hierarchical relationships.	
Computation is defined in terms of programming statements that describe changes in state in terms of how something is to be done.	
Computation is defined in terms of programming statements that describe changes in state with the ability for statements to be exposed of hidden to other statements in the program.	

Q7) Per ISO C++ rules, to use C's <math.h> header in a C++ program, **explain** what one has to do to #include the header in C++. **[2 marks]**

_____

_____

_____

Q8) All C Standard Library functions are contained in the **cstd** namespace. **[1 mark]**

(a) True (b) False

Q9) All C++ Standard Library functions are contained in the **cxxstd** namespace. **[1 mark]**

(a) True (b) False

Q10) Briefly, what is the **difference** between **cerr** and **clog**?

Answer: _____ **[1 mark]**

Q11) The Standard Library uses the ____ bit shift operator to write formatted data out to an ostream.

Answer: _____ **[1 mark]**

Q12) The Standard Library uses the ____ bit shift operator to read in formatted data from an istream.

Answer: _____ **[1 mark]**

Q13) The Standard Library's IOStream classes (e.g., istream and ostream) support the ability to throw exceptions but such is disabled by default. **[1 mark]**

(a) True (b) False

Q14) Originally in C++, the **auto** keyword prefixed in front of a variable declaration in a function meant that the variable was automatically placed on the heap. **[1 mark]**

(a) True (b) False

Q15) In the current C++ standard, using the **auto** keyword to declare a variable allows a programmer to do what in C++? **[1 mark]**

_____

_____

Q16) Using the current C++ standard, will writing **auto i;** in **main()** compile? Answer yes or no. If no, explain why it will not compile. **[2 marks]**

_____

_____

_____

Q17) Rewrite the function **int foo(char c) { return 3; }** to use the new C++ function suffix declarator syntax. (Hint: Think "suffix" and know you need to use -> .) **[2 marks]**

_____

_____

_____

Q18) Rewrite the function **int foo(char c) { return 3; }** to to be a C++ lambda function. **[2 marks]**

_____

_____

_____

Q19) Explain what the expression **decltype(foo('a')) value = foo('a');** does and what is the type of value? **[2 marks]**

_____

_____

_____

Q20) For each table row, indicate if the run-time type result of the expression is a lvalue (L), rvalue (R), or a syntax error (E). **[5 marks]**

C++ Expression	**lvalue (L), rvalue (R), error (E)**
int{};	
decltype(x+y) z;	
auto x = 5;	
q += 5;	
++a; (a is an int variable.)	
b++; (b is an int variable.)	
int&& q = 56;	
double&& r = z;	
int& s = 56;	
double& t = z;	

Q21) Prof. Preney communicated in class there is a simple way to determine if a variable is considered to be an lvalue or an rvalue. In C++, a variable is an **lvalue** if it _____. **[1 mark]**

Answer: _____

Q22) Prof. Preney communicated in class there is a simple way to determine if a variable is considered to be an lvalue or an rvalue. In C++, a variable is an **rvalue** if it _____. **[1 mark]**

Answer: _____

Part II: General Questions (10 Marks)

Answer all parts of each question in the space provided below each question. The number of marks assigned to each question is indicated at the end of each question. You are expected to answer questions using complete sentences and proper grammar. If the answer is program code, simply write the code fragment that answers the question **unless you are explicitly asked to write a full-and-complete program**.

Q23) Your boss has asked you to convert his C99 program into either a C++11 or C++14 program as specified below. Although the C99 program:

- reads the data into an array, you must read all data into a linked list (i.e., use std::list),
- reads up to 5 elements into the data array, you must read in as many elements as possible from standard input,
- uses pointers with the bubble_sort function, you must change bubble sort to use iterators instead of pointers, i.e., the prototype for your bubble_sort() will become:
  - template <typename Iter>
    void bubble_sort(Iter first, Iter last);
  - NOTE: You are not allowed to called std::swap() in bubble_sort(). You are also not allowed to use std::list::sort() in main() --bubble_sort() must be preserved and implemented.

You must preserve all remaining aspects of program logic converting C99 code to use appropriate equivalent C++ language constructs and C++ Standard Library functions where possible. You don't need to rewrite any comments in your answer –just translate the code.

```
#include <stddef.h>   // For size_t
#include <stdio.h>

void bubble_sort(int* first, int* last)
{
  bool swapped;
  do
  {
    swapped = false;

    int *prev = first;
    int *cur = first; ++cur; // cur is one ahead of prev

    for (; cur != last; ++prev, ++cur)
    {
      if (*cur < *prev)
      {
        int tmp = *cur; *cur = *prev; *prev = tmp; // Swap values
        swapped = true;
      }
    }
  }
  while (swapped);
}

int main()
{
  // Declare the data container...
  int data[5];
  size_t num_read_in = 0;

  // Read in the data...
  for (int i; scanf("%i", &i) == 1 && num_read_in < 5; ++num_read_in)
    data[num_read_in] = i;

  // Sort the data...
  bubble_sort(data, data+num_read_in);
```

```
  // Output the data...
  for (size_t i=0; i != num_read_in; ++i)
    printf("%i ", data[i]);
  printf("\n");

  return 0;
}
```

Important:

- You cannot use the C Standard Library at all in your answer unless there is no C++ equivalent for such.
- You need to replace everything that can be to a suitable C++ language or C++ Standard Library construct –provided it is semantically correct to do so and it simplifies the code/syntax unless otherwise instructed.
- Except when implementing the required changes, the steps the code performs else must remain as-is or be equivalent to the original program code, i.e., don't transform the program logic to use different algorithms, optimize the code, or "make the program better", etc.

Your answer must be a **full and complete valid C++11 or C++14 program. [10 marks]**

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