Sample Midterm Exam
CSE 232 (Introduction to Programming II)
Summer 2019

VERSION 1

Full Name: ............................................................

PID: .................................................................

Instructions:
• DO NOT START/OPEN THE EXAM UNTIL TOLD TO DO SO.
• You may however write and bubble in your name, PID and form number (with a #2 pencil) on the front of the printed exam and bubble sheet prior to the exam start.
• Present your MSU ID (or other photo ID) when returning your bubble sheet and printed exam.
• Only choose one option for each question.
• Assume any needed #includes and using std::...; namespace declarations are performed for the code samples.
• Questions 1-50 are regular questions, questions 51-55 are replacement bonus questions. Correctly answering bonus questions will replace a incorrectly answered regular question. There is no penalty for incorrect bonus questions.
• Each question is worth the same amount of points.
• No electronics are allowed to be used or worn during the exam. This means smart-watches, phones and headphones need to be placed away in your bag.
• The exam is open note, meaning that any paper material (notes, slides, prior exams, assignments, books, etc.) are all allowed. Please place all such material on your desk prior to the start of the exam, (so you won’t need to rummage in your bag during the exam).
• If you have any questions during the exam, please raise your hand and a proctor will assist you.

Figure 1: http://xkcd.com/499/
1. What is \( x \) in this declaration?
   \[
   \text{const string * x;}
   \]
   (a) A constant pointer to a constant string  
   (b) A constant pointer to a string  
   (c) Syntax Error  
   (d) A pointer to a constant string  
   (e) A pointer to a string  
   (f) None of the above  

2. Which of the following namespace techniques is disallowed by this course?
   (a) `std::cout << "Hi";`  
   (b) `using std::cout; cout << "Hi";`  
   (c) `using namespace std; cout << "Hi";`  
   (d) None of the above  

3. Is the variable name `milesPerHour` allowed?
   (a) No, it is an illegal name.  
   (b) No, it violates the style guide.  
   (c) No, variable names shouldn’t include full words.  
   (d) Yes, it is legal and correctly styled.  
   (e) None of the above are true.  

4. What is the type of \( x \) in:
   \[
   \text{string str = "hi";} \\
   \text{auto x = str.size();}
   \]
   (a) `string::size_type`  
   (b) `unsigned int`  
   (c) 2  
   (d) `int`  
   (e) `size_t`  
   (f) 3  
   (g) `long`  
   (h) None of the above  

5. Which of the following are true about templated functions?
   (a) It is itself not a function, but a way to create a function  
   (b) It contains the keyword `template`  
   (c) It makes use of a template parameter to represent a calling type.  
   (d) All of the above  
   (e) None of the above  

6. Which of the following is NOT a legal infinite loop?
   (a) `while (7) {...}`  
   (b) `for (;-1;){...}`  
   (c) `for (;;){...}`  
   (d) `while (True) {...}`  
   (e) All of the above are legal infinite loops  

7. For the range-based for loop below, what type can `xs` be?
   \[
   \text{for (auto x : xs) ...}
   \]
   (a) `vector<int>`  
   (b) `vector<vector<char>>`  
   (c) `string`  
   (d) `int`  
   (e) All of the above  
   (f) (a) and (b)  
   (g) (a) and (c)  
   (h) (a), (b) and (c)  

8. What will occur if two header guards use the same variable name?
   (a) Only one of the two headers will be included.  
   (b) Both headers will be included.  
   (c) Neither header will be included.  
   (d) Either (a), (b), or (c) will randomly occur.  
   (e) None of the above.
9. Is '9' + 1; legal?
   (a) No, because you can’t add a letter to a digit.
   (b) No, because addition is not an expression.
   (c) Yes, because both operands are digits.
   (d) Yes, because both operands are integral types.
   (e) No, because you can’t add a char to an int.

10. Which of the cause a string to be copied (presuming y is a string)?
    (a) const string * x = y;
    (b) const string * const x = y;
    (c) const string & x = y;
    (d) string & x = y;
    (e) string * x = y;
    (f) None of the above

11. Which is the result of:
    int x = 4; y = 0;
    if ((x = 0) && (y = 10)) {...}
    (a) x is 4 and y is 0
    (b) x is 0 and y is 0
    (c) x is 4 and y is 10
    (d) x is 0 and y is 10
    (e) Syntax Error
    (f) Undefined
    (g) None of the above.

12. What is a recursive function?
    (a) A function that calls itself.
    (b) An iterable function.
    (c) A function that doesn’t use loops.
    (d) A function that can be used with different number of arguments.
    (e) A function that returns the same value, if called with the same arguments.
    (f) None of the above

13. When must a vector’s capacity be greater than its size?
    (a) Multiple of the above will must result in a capacity greater than its size.
    (b) Never, the size is always greater-than or equal to the capacity.
    (c) After a call of the append method.
    (d) When the reserve method has been called with a value greater than its size.
    (e) When the default constructor is invoked.
    (f) After a call to push_back.

14. How many different kinds of comments are there in C++?
    (a) There are no comments in C++
    (b) 1 kind
    (c) 2 kinds
    (d) 3 kinds

15. What is the result of (cin >> x)?
    (a) x
    (b) cin
    (c) >>
    (d) Depends on if the insertion was successful.

16. What is the result of static_cast<long>(10.7)?
    (a) 11
    (b) 10
    (c) 10.7
    (d) Depends on if the long is signed.

17. Which of the following is illegal?
    (a) int *ip;
    (b) string s, *sp = 0;
    (c) int i; double* dp = &i;
    (d) int *pi = 0;
    (e) All of the above
    (f) None of the above
18. What is the output of this program?
   void func (int *b) {
       *b = 1;
   }
   int main () {
       int *a;
       int n;
       a = &n;
       *a = 0;
       func(a);
       cout << *a << endl;
   }

   (a) 1
   (b) Run-time error
   (c) 0
   (d) Compile-time error
   (e) The address of a
   (f) The address of n
   (g) The address of b
   (h) None of the above

19. Which of the following is a runtime error?

   (a) Using postfix increment when prefix was needed
   (b) Redeclaring a variable
   (c) Casting an int to a double
   (d) Forgetting a semicolon ;
   (e) Assigning a string to an int variable

20. Does C++ support default values for function arguments?

   (a) No, but operator overloading can achieve the same effect.
   (b) Yes, but they must be specified in the implementation file.
   (c) Yes, but they must be specified in the header file.
   (d) No, all parameters must be matched to arguments.

21. What is the output of this program?
   void func(int &a, int &b) {
       int c = a;
       a = b;
       b = c;
       cout << "In func " << a << b << endl;
   }
   int main() {
       int a = 5, b = 10;
       func(a, b);
       std::cout << "In main " << a << b << endl;
       return 0;
   }

   (a) Compile-time error
   (b) In func 105 In main 105
   (c) Run-time error
   (d) In func 510 In main 105
   (e) In func 510 In main 510
   (f) In func 105 In main 510
   (g) None of the above

22. What is the output from the following code:
   int x = 3;
   do
       cout << x;
   while (x--);

   (a) No output generated
   (b) 33333
   (c) 3210
   (d) 3210-1
   (e) 333
   (f) 321
   (g) Compile-time error
   (h) 3333
   (i) None of the above
23. Why is a full namespace merge a bad idea?
   (a) Because it makes it difficult to determine where a name came from.
   (b) Because it makes compilation slower
   (c) Because it slows down programmer productivity by requiring more inventive names
   (d) Because it forces the compilation of the entire STL
   (e) All of the above.

24. How many labs can be missed without failing the course?
   (a) 4
   (b) 3
   (c) 2
   (d) 1
   (e) 0

25. What is the best reason to obey a style guide?
   (a) Because it makes your code faster to run
   (b) Because it makes your code easier to read
   (c) Because it makes your code easier to debug
   (d) Because it makes your code easier to write
   (e) Because it makes your code faster to compile

26. How long is the regrade request period for this course?
   (a) 1 day
   (b) 4 days
   (c) 1 week
   (d) 4 weeks
   (e) Until the last day of class
   (f) Forever

27. What is the result of 3 / 4.0?
   (a) 1
   (b) 0.75
   (c) 0
   (d) None of the above

28. How large is an int?
   (a) 1 byte
   (b) 2 bytes
   (c) 4 bytes
   (d) 8 bytes
   (e) Depends on the system

29. Which of the follow is FALSE about C++ streams?
   (a) The clear method returns the stream to a good state, but leaves the buffer unchanged.
   (b) endl both inserts a newline character and flushes the buffer.
   (c) std::skipws only works on cin not ifstream.
   (d) The cin stream has a eof (end-of-file) method.
   (e) fstreams must be constructed with a file path.
   (f) Flushing the buffer forces the buffer to be emptied prior to moving to the next action.

30. What does it mean to have an overloaded operator?
   (a) It means the operator’s behaviour is undefined under certain circumstances.
   (b) It means the operator can be used with multiple types.
   (c) It means the operator is used by the iostream library to output values.
   (d) It means the operator is heavily used.
   (e) None of the above.
31. Which of the following is NOT a legal initialization?

(a) int x = {1};
(b) int x = 01;
(c) int x(1);
(d) int x; x = 1;
(e) int x = 1;
(f) int x = 0xA;

32. Which of the following operators have side-effects?

(a) The extraction operator.
(b) The postfix increment operator.
(c) The insertion operator.
(d) The assignment operator.
(e) All of the above.

33. What is the output of this program?

```cpp
void wth(int i, int &k) {
    i = 1;
    k = 2;
}
int main () {
    int x = 0;
    wth(x, x);
    cout << x << endl;
    return 0;
}
```

(a) wth
(b) Run-time error
(c) 0
(d) 2
(e) Compile-time error
(f) 1
(g) None of the above

34. Can you declare a reference?

(a) Depends on if the reference is const
(b) Depends on if the reference is for a fundamental type
(c) No
(d) Yes

35. What is the output of this program?

```cpp
int a = 9;
int &aref = a;
a++;
aref++;
std::cout << a;
```

(a) 12
(b) Run-time error
(c) Compile-time error
(d) 10
(e) 9
(f) 11
(g) None of the above

36. Which of the following is NOT a preprocessor statement?

(a) #pragma once
(b) #include <iostream>
(c) #ifndef SOME_NAME
(d) #define SOME_NAME
(e) All of the above are preprocessor statements

37. Which is x after int y = 8; int x = y++;?

(a) 7
(b) 8
(c) y
(d) Undefined
(e) 9
(f) None of the above.

38. How many statements compose the body of an if statement?

(a) 1 or more
(b) 0 or more
(c) 0
(d) 1
(e) 1 (but it must be a block statement)
(f) None of the above.
39. Which is b after:
   ```
   int x = -7;
   bool b = (0 <= x <= 9);
   ```

   (a) Undefined
   (b) false
   (c) true
   (d) -7
   (e) Syntax Error
   (f) None of the above.

40. Why are copies generally bad?

   (a) Because they limit the ability to modify the original variable.
   (b) Because they require more memory.
   (c) Because copying takes additional time.
   (d) All of the above.

41. What is NOT included when initializing a variable?

   (a) The variable’s value
   (b) The variable’s type
   (c) The variable’s name
   (d) None of the above

42. When is a pointer better than a reference?

   (a) When you are writing C++17 code.
   (b) When you need to do pointer arithmetic.
   (c) When a copy needs to be avoided.
   (d) When you need many names for the same variable.
   (e) None of the above.

43. Which of the following is a NOT good reason to use the unsigned integer type in C++?

   (a) Because a function returns it.
   (b) Because you will need to perform bitwise operations.
   (c) Because you need the expected overflow/underflow behaviour.
   (d) Because a value can never be negative.
   (e) All of the above are valid
   (f) None of the above are valid

44. Which is the result of (true + 4)?

   (a) 5
   (b) 4
   (c) Syntax Error
   (d) Undefined
   (e) None of the above

45. Why is it important to frequently compile and test your code?

   (a) To prevent compiler errors from becoming runtime errors
   (b) To reduce the time between adding a bug and finding it
   (c) To ensure that your work is being saved
   (d) To enable the compiler to optimize your code

46. What is the name of the :: operator?

   (a) The Scope Resolution Operator
   (b) The Namespace Operator
   (c) The Within Operator
   (d) None of the above
47. Which of the following types is largest?
   (a) bool
   (b) char
   (c) short
   (d) int
   (e) long
   (f) long long
   (g) Multiple types are tied for largest.
   (h) Depends on compiler/OS.

48. What is wrong with the following line?
   ```
   string x = 'c';
   ```
   (a) There is a syntax error.
   (b) There is a name error.
   (c) Strings cannot be initialized.
   (d) There is a type error.
   (e) Nothing is wrong.

49. The correct statement for a function declaration that takes a const pointer to a string that needs to be revised (in the body of this function, the pointer will be be used to modify its pointed at string, but cannot be pointed at a different object), a pointer to an int, and returns a reference to an int is:
   (a) int & fun(string * const, int *)
   (b) int & fun(const string *, int *)
   (c) & int fun(const * string, * int)
   (d) & int fun(const * string const, * int)
   (e) int & fun(const string * const, int *)
   (f) Multiple answers are correct

50. For loops have three parts (here named a, b, c, d in for (a; b; c) {d}). For a loop that iterates twice over its body, what is the order of execution of a, b, c and d?
   (a) a → b → d → c → b → d → c → b → d
   (b) a → b → d → c → b → d → c
   (c) a → b → d → c → b → d
   (d) a → b → d → c → b → d → c → b → d
   (e) a → b → d → c → a → b → c → b → d
   (f) a → b → d → c → b → d → c → b
   (g) None of the above

51. What is the name of the ampersand (&) operator?
   (a) The address-of operator
   (b) The and operator
   (c) The pointer operator
   (d) The dereference operator
   (e) None of the above

52. Which of the following is the Insertion Operator?
   (a) <<
   (b) >>
   (c) ::
   (d) +=
   (e) None of the above

53. Which of the following operators are right-associative?
   (a) The insertion operator.
   (b) The assignment operator.
   (c) The extraction operator.
   (d) The postfix increment operator.
   (e) None of the above.
54. If you declare a string, what is its initial value?
   (a) Empty
   (b) 0
   (c) Undefined
   (d) false
   (e) None of the above.

55. Can two functions have the same name?
   (a) No, only methods and operators can have the same names, not functions.
   (b) Yes, but only if they have different names of parameters.
   (c) No, C++ doesn’t support function overloading.
   (d) Yes, but only if they have different types of parameters.
   (e) Yes, but only if they have a different number of parameters.
   (f) None of the above

56. When will the string’s length and size methods return different results?
   (a) When the strings capacity is different from its size
   (b) When the string has been appended to
   (c) Never, they always are the same
   (d) When the string hold UTF8 characters
   (e) When the string has been passed by reference to a function
   (f) When the string has been initialized
   (g) When the string is empty

57. If you declare a int, what is its initial value?
   (a) Undefined
   (b) 0
   (c) Empty
   (d) false
   (e) None of the above.

58. If you got a zero on the midterm, how many points would you need on the final to pass the class?
   (a) 150 of 200
   (b) 0 of 200
   (c) It is impossible to pass the class with a zero on the midterm.
   (d) 100 of 200
   (e) None of the above

59. If cin >> x; fails, what happens to x?
   (a) Undefined behaviour (i.e. it can be changed to a random value).
   (b) It becomes a -1 (or -1.0 for floating point numbers).
   (c) It is left unchanged.
   (d) It becomes a 0.
   (e) None of the above.

60. What is the purpose of header guards?
   (a) To allow for default argument values and function overloading.
   (b) To stop private functions from being accessed publicly.
   (c) To ensure that all headers are included by the needed implementation files.
   (d) To ensure that every function is declared prior to invocation.
   (e) To prevent re-declaration by ensuring a header is only included once.
   (f) To allow for optimized compilation speeds.
61. What is the output of this program?
```cpp
int a = 9;
int *aptr = &a;
aptr++;  // Incorrect, should be `aptr = &a;`
aptr++;  // Incorrect, should be `aptr = &a;`
std::cout << a;
```

(a) 12  
(b) 11  
(c) 9   
(d) Run-time error  
(e) 10  
(f) Compile-time error  
(g) None of the above

62. Which of the following Unix command line commands will copy a file?

(a) cp  
(b) mv  
(c) cp  
(d) cat  
(e) c  
(f) copy_file  
(g) copy

63. When should you use string::npos?

(a) When every you need the largest positive value an int can hold.  
(b) It is needed to convert strings to ints.  
(c) To indicate that you want to refer to past the end of a string.  
(d) When you need a very large integer.  
(e) None of the above.

64. What is printed by the following code?
```cpp
int x = 3;
if (!x)  
if (x = 4)
cout << "AAA";  
else  
cout << "BBB";
```

(a) AAABBB  
(b) BBBAAA  
(c) BBB  
(d) AAA  
(e) Compile-time error  
(f) No output generated  
(g) None of the above

65. Why is it important to flush a stream?

(a) Because it aids in debugging by combining cerr with cout.  
(b) Because it forces the program to wait until the buffer is cleared.  
(c) Because without flushing, no output is shown.  
(d) Because it ensures the stream is open and able to accept data.  
(e) None of the above.

66. Assuming s is a string, which of the following statements results in an infinite loop?

(a) for(auto i=s.size()-1; i>0; i--)  
(b) for(auto i=0; i<s.size(); i++)  
(c) for(auto i=s.size()-1; i>=0; i--)  
(d) for(auto i=0; i<s.size()-1; i++)  
(e) All of the above  
(f) None of the above
67. Which of the following are **NOT** integral (integer-like) literals?
   
   (a) 0x34a
   (b) 0
   (c) 12
   (d) '3'
   (e) 054
   (f) All of the above are integral types

68. After the following statements, which option changes the value of i to 143?
   
   ```
   int *p;
   int i, k;
   i = 142;
   k = i;
   p = &i;
   ```
   
   (a) k = 143;
   (b) *k = 143;
   (c) p = 143;
   (d) *p = 143;
   (e) Both (a) and (c)
   (f) Both (a) and (d)
   (g) None of the above

69. At the command line, the Unix command "cd .." does what?
   
   (a) Changes the permissions of the current directory
   (b) Copies all of the children of the current directory into the cd directory
   (c) Changes the current working directory to be the parent directory.
   (d) Copies the contents of the current working directory into the child's directory
   (e) Prints the working directory

70. Which of the following statements about `int` and `long` is true?
   
   (a) `int` is larger than `long`
   (b) `int` is smaller than `long`
   (c) `int` is smaller or equal in size to `long`
   (d) `int` is larger or equal in size to `long`
   (e) None of the above

71. When should you use `x.at(1)` instead of `x[1]` to access the second character of the string `x`?
   
   (a) When you need an error if `x` is shorter than two characters.
   (b) When you need the fastest performance.
   (c) They are the same, so either is always fine.
   (d) When you need to be able to assigned to the resulting rvalue.
   (e) None of the above.

72. What line number is causing the syntax error in:
   
   ```
   02.1-numericTypes.cpp:8:39:
   error: expected ')'
   ```
   
   (a) 1
   (b) 2
   (c) 8
   (d) 39

73. Who invented C++?
   
   (a) Doug Kirkpatrick
   (b) IBM
   (c) Josh Nahum
   (d) Bjarne Stroustrup
   (e) Guido van Rossum
   (f) C++ itself
   (g) Atra Akandeh
   (h) None of the above
74. What is **NOT** a benefit of statically typed languages (like C++)?

(a) The compiler can check for type correctness
(b) The programmer is explicit about the type of each variable
(c) The code is more flexible
(d) It allows the code to be optimized for speed
(e) None of the above

75. What does this declaration declare?

```cpp
string* x, y, z;
```

(a) x is a pointer to a string, y is a string, z is a string
(b) x and y are pointers to a string, z is a string
(c) Run-time Error
(d) x, y and z are pointers to string types
(e) Compile-time Error
(f) None of the above

76. What is the result of `(3 / 4)`?

(a) 0.75
(b) 0
(c) 1
(d) Depends on the variable it is assigned to.

77. What will happen in this code?

```cpp
int a = 100, b = 200;
int *p = &a, *q = &b;
p = q;
```

(a) Compile-time error
(b) Run-time error
(c) p now points to b
(d) p now points to a
(e) a is assigned to b
(f) q now points to a
(g) a and b have been swapped
(h) b is assigned to a
(i) None of the above
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