

Full name: \_\_\_\_\_

Student ID #: \_\_\_\_\_

## CS 161 Exam I Winter 2020

1. Please put your **full name and ID number** on the top right. Ensure they are readable.
2. No devices, calculators, notes, books, Internet access, or collaboration are permitted.
3. If you need scratch paper, raise your hand and we will bring it to you. You must turn in any scratch paper you use (it will not contribute to your grade).

### I affirm that:

- (1) My answers on this exam are my own original work, without assistance from other students.
- (2) I have not given, nor will I give, assistance to other students for this exam.
- (3) I will not look at nor copy from other students' exams.

\_\_\_\_\_  
(Sign here to agree to the above statement. **Unsigned exams will not be graded.**)

**You have 50 minutes to finish the exam. Good luck!**

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Part I: True (T) or False (F). Write T or F on the line. (18 pts, 2 pts each)

- T   1. A variable's value can be changed any time it is within scope, unless it is declared to be `const`
- T   2. This expression evaluates to true: `!(10 < 7)`
- F   3. The `*` operator has higher precedence than the `++` operator
- T   4. The expression `r /= 3` is the same as `r = r / 3`
- F   5. To check whether a variable named `s` has the value 3, use `if (s = 3) ...`
- F   6. This expression generates a random number between 4 and 8: `rand() % 4 + 8`
- T   7. When a variable is “shadowed”, it means that its value is not visible at that point in the program due to another variable with the same name
- F   8. A `for` loop performs selection, and an `if-then` statement performs repetition
- F   9. If a C++ program compiles with no errors, it will run correctly
- 

Part II: Multiple Choice. Write your answer on the line. (21 pts, 3 pts each)

- C   1. What is the output of the following C++ statement:  
`cout << 47 / 9 << endl;`  
A. 6  
B. 5.2  
C. 5  
D. 47 / 9
- B   2. In Linux, how do you rename `file1` to `file2`?  
A. `move file1 file2`  
B. `mv file1 file2`  
C. `rn file1 file2`  
D. `rm file1 file2`
- C   3. Which of the following is NOT true of the `||` operator?  
A. It is a binary operator.  
B. It is the logical OR operator.  
C. It has higher precedence than the `&&` operator.  
D. It returns true if either operand is true.
- C   4. The largest value that can be stored in an unsigned int (32 bits) is:  
A.  $2^{32}$   
B.  $2^{31}$   
C.  $2^{32} - 1$   
D.  $2^{31} - 1$

C 5. After the following code executes, what is the value of `val` if the user enters 7?

```
int val;
cin >> val;
if (val > 1)
    val = val + 5;
else if (val > 4)
    val = val + 10;
else
    val = val + 20;
```

A. 27  
B. 17  
C. 12  
D. 7

D 6. What is the output of the following segment of code if the user enters **b**?

```
char c;
int num = 0;
cout << "Enter a character from a to z: ";
cin >> c;
switch (c) {
    case 'a':
    case 'b':    num = 5;
    case 'd':    num += 7;
    default:    num = 33;
}
cout << num << endl;
```

A. 0  
B. 5  
C. 12  
D. 33  
E. 45  
F. Error

D 7. Given the same code as above, what is the output if the user enters **c**?

- A. 0  
B. 5  
C. 12  
D. 33  
E. 45  
F. Error

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### Part III: Short Answer. (61 pts)

1. (2 pts) Write C++ code to **initialize** a variable named `month` to "January".

`string month = "January";`

2. (2 pts) Name **two** primitive (built-in, not from a library) C++ data types.

Pick 2 from: `bool`, `char`, `short`, `int`, `long`, `float`, `double`

3. (2 pts) Name the Linux command used to create a new directory.

`mkdir`

4. (2 pts) A variable declared as `short` uses 16 bits.

5. (2 pts) The number of values that can be stored using  $b$  bits is (equation):  $2^b$

6. (3 pts) What data type would you use to store the number of steps you take each day? Explain/justify your choice.

Examples:

- `unsigned short` - since steps cannot be negative and I expect to walk for fewer than 65,535 steps
- `unsigned int` - since steps cannot be negative but should be whole numbers (not decimals) and a realistic total number of steps per day can fit in the size of an int
- `short` - I want to allow negative steps (going "backwards") and do not expect more than 32,767 steps per day

7. (2 pts) What is the output of the following code?

```
if (6 > 9 || 'r' < 'z')
{
    cout << "You win!" << endl;
}
else
{
    cout << "You lose." << endl;
}
```

You win!

8. (2 pts) What is the output of the following code?

```
cout << 9 - 2 + 9 % 2 << endl;    /* remember operator precedence */
```

8

9. (3 pts) What is the output of the following code?

```
int x = 3;
if (x < 5)
{
    int x = 2;
    cout << x << " ";
}
cout << x << endl;
```

2 3

10. (3 pts) What is the output of the following code?

```
for (int x = -9; x < 0; x = x / 3)
{
    cout << x << " ";
}
```

-9 -3 -1

11. (6 pts) Fill in the blanks in this `for` loop to output every even number starting from 5 and going up to and including 10.

```
for ( __int x = 5 __; __x <= 10 __; __x++ __)
{
    if ( __x%2 == 0 __ )
    {
        cout << x << endl;
    }
}
```

12. (3 pts) What is the output of the following code?

```
for (char c = 'r'; c > 'm'; c--)
{
    cout << c << ", ";
}
```

r,q,p,o,n,

13. (3 pts) What is the output of the following code?

```
for (long x = -3; x < 10; x += 3)
{
    if (x > 3)
        break;
    cout << x << " ";
}
```

-3 0 3

14. (4 pts) Imagine you are writing a program to scan tickets for people coming to see a play. What kind of loop (for, while, or do-while) would you use, and why?

Examples:

- while loop that keeps iterating until there are no more people
- do-while loop that processes each person's ticket, assuming at least one person comes
- for loop: given number of total tickets sold, loop while there are unused tickets

15. (4 pts) What is the output of the following code?

```
for (int a = -2; a < 0; a++)
{
    for (int b = 0; b < 3; b++)
    {
        cout << a << ", " << b << " ";
    }
    cout << endl;
}
```

-2,0 -2,1 -2,2

-1,0 -1,1 -1,2

16. (3 pts) Name or describe the 3 parts of a Design Document.

Understanding the problem, design a solution (flowchart, pseudo-code), test cases

17. (3 pts) Describe or give an example of C++ code that contains a syntax error.

Examples:

- Missing semi-colon at the end of a line, `#include <iostream>`, or `main()`
- Use of undeclared identifier
- Missing or extra `{}`, `""`, `()`
- Use of single quotes around a string

18. (6 pts) Create 3 test cases (input and expected output) for a program that prompts the user to enter an integer and prints the number of zeros contained in the integer. If the user entered something invalid (other than an integer), the program prints "Not an integer."

	User input	Expected output
Good case (normal/valid input)	3	0
Good case with different output	101	1
Bad case (invalid input)	3.5	Not an integer

19. (4 pts) What is the output of the following code?

```
int m;
int num = 10;
for (m = 4; m >= 1; m--)
{
    ++num;
    cout << num << " ";
}
cout << m << endl;
```

11 12 13 14 1

20. (2 pts) Write down a **question (and its answer)** that you studied for but did not appear on this exam. Questions will be judged by **relevance** to course content, and answers will be graded by their **accuracy**.

Extra Credit: (4 pts, 2 pts each)

1. Rewrite the code in Part 3, Question 11, to achieve the same goal without using a conditional statement.

```
for (int x=6; x <= 10; x+=2)
{
    cout << x << endl;
}
```

2. What will the following code print?

```
char c = 's';
if (c < 'n')
{
    char c = 'c';
    cout << --c << endl;
}
for (char c = 'a'; c <= 'b'; c++)
    cout << c << endl;
```

a  
b  
s