The following exam is pledged. All answers are to be given on the provided answer sheet. The test is closed book and closed note. For objective questions, if you believe more than one answer is acceptable, choose the most encompassing answer. *YOU MUST HAND IN ALL COPIES OF THE TEST AND THE ANSWER SHEET.*

PART I: True/False questions

1. Computers use the binary number system. A single binary digit is called a byte.

2. Object-oriented design and programming is a paradigm of programming in which a software system is modeled as a set of objects that interact with each other.

3. The manipulator `endl` inserts a `'\n'` in the output stream. In addition, it forces all the output that has been sent to the stream to be written to the corresponding device.

4. The expression `"abc"` is a legal value for a `char` object.

5. C++ names are case sensitive. The names `Temp` and `temp` refer to two different objects.

6. The assignment operator has higher precedence than the arithmetic operators.

7. The following code fragment is legal.

```
const float PayRate = 6.50;
float OldSalary = PayRate * 40;
PayRate = 7.25;
float NewSalary = Payrate * 40;
```

8. A logical expression is true if the value of the expression evaluates to either a nonzero integer value or the value `true`.

9. The operators `==` and `!=` have different precedence than the operators `<`, `<=`, `>`, and `>=`.

10. A logical expression that is being evaluated is subject to the short-circuit rule. This rule states that once the overall value of an expression is known, evaluation ceases. For example, if `P` is true, then the term `Q` is not evaluated in `P || Q` because the overall expression is true.

11. According to the C++ standard, an object defined in the *ForInit* section of a for loop can be used only in that loop.

12. Because a while test expression can be initially false, it is possible for the body of a while loop not to be executed.

PART II: Fill in the blank

13. We use a _____ directive to include the `iostream` library.

14. The C++ stream operator $<<$ is called the _____ operator.

15. Standard C++ programs begin executing in function _____ ().

16. The input stream _____ normally corresponds to the keyboard.

17. In a mixed-mode arithmetic expression, the _____ operand is converted to the type of the floating-point operand.

18. A return value of _____ indicates that function `main()` ran successfully.

19. The length of the string `"wahoo\n"` is _____.

20. The _____ class is designed for storing and manipulating sequences of characters.

PART III: Multiple choice questions

21. A CPU
    (a) Fetches, decodes and executes instructions
    (b) Performs Boolean and arithmetic operations
    (c) Issues input and output instructions
    (d) (a), (b), and (c)
    (e) (a) and (c)

22. What is the output of the following code segment?

```
int R = 10;
int S = 20;
int Z = 15;
if (R < S) {
   Z = R;
}
else {
   Z = S;
}
cout << Z;
```

    (a) 10
    (b) 20
    (c) 15
    (d) There is no about because the segment contains a syntax error
    (e) "S"

23. Which is true about compilers and operating systems?
    (a) Compilers translate programs to executable form, operating systems link programs;
    (b) Compilers are the IDE, operating systems link programs.
    (c) Compilers translate programs to executable form, operating systems manage system resources;
    (d) Compilers translate programs to executable form and link them for execution, operating systems manage system resources;
    (e) Compilers link programs, operating systems are the IDE

24. Evaluate the following code segment to determine the initial value of Z.

```
int  R = 6;
bool S = true;
bool T = false;
bool Z = !(S || !T) || (R <= 7);
```

   (a) 6
   (b) `true`
   (c) `false`
   (d) Cannot be determined without parentheses to establish evaluation order.
   (e) 7

25.   Fill in the "not (P and Q)" column in the following truth table:

P	Q	not (P and Q)
false	false	
false	true	
true	false	
true	true	

   Now count the number of trues and the number of falses in the last (not (P and Q)) column of this table.

   (a) There are more true entries than false entries
   (b) There are more false entries than true entries
   (c) The number of true and false entries is equal
   (d) There are no true entries or false entries in the last column
   (e) Can't be determined because we don't know the value of P or the value of Q.

26. What are the characteristics of an object in general?
   (a) It has a name and properties
   (b) It has a name, properties and behaviors
   (c) It can act on receiving a message
   (d) (a) and (c)
   (e) (b) and (c)

27. Why is object-oriented programming useful?
   (a) It supports good software engineering practices
   (b) It promotes thinking about software in a way that models the way we think and interact naturally
   (c) It supports code reuse
   (d) (a) and (b)
   (e) (a), (b) and (c)

28. In C++, what are the contents in memory of a variable that has not been initialized?
    (a) Its value is undetermined
    (b) Zero
    (c) The last value assigned to it in a preceding program
    (d) False
    (e) '\0'

29. What would happen if you tried to store a number in an integer variable, that was larger than the maximum storable number in that integer?
    (a) If you tried to store a number larger than this number in an integer, the computer would not be able to store it properly. The assignment would work, but when you try to access the variable and evaluate its value, it would be incorrect.
    (b) When evaluated, the value of the variable would be negative
    (c) The variable stored in memory after the integer variable would be corrupted.
    (d) (a) and (b)
    (e) (a), (b) and (c)

30. Would the expression ('ab' == "ab") be true in C++?
    (a) No, because the ASCII doesn't match
    (b) No because == should be =
    (c) No because an expression like this wouldn't compile
    (d) Yes
    (e) No, because 'ab' and "ab" need to be given initial values.

31. Carefully consider the following code:
```
int Count1 = 1;
int Count2 = 2;
if (Count1 == Count2)
   ++Count2;
else
   ++Count1;
   ++Count2;
cout << Count1 << '\t' << Count2 << endl;
```
What is the output of this code fragment?
    (a) 1   3
    (b) 1   4
    (c) 2   3
    (d) 2   2
    (e) No output; any program containing this code would have a compiler error.

32. Consider:

```
for (int i = 1;  i <= 100;  i++) {
   int count = 0;
   if ( (i % 2) == 0 ) {
      count++;
   }
}
cout << count << endl;
```

What is the output of this code fragment?

   (a)   0

   (b)   1

   (c)   50

   (d)   100

   (e)   No output; any program containing this code would have a compiler error.

Use the following definitions for Questions 33 - 37.

```
char a;
int q = 7;
int r = 7;
float s = 7.5;
int t = 15;
bool u = true;
bool v = false;
```

For each of the following, indicate whether v would be true or false after executing the statement(s).

33. v = u;

34. if (s == t/2) {
       v = true;
    }

35. t = s;
    v = (r == t);

36. v = (r < t) && (t < r) || u && v;

37. while (cin >> a) {
     if (a == '\n') {
       v = true;
     }
    }

38. Consider the correctness of the following as names in C++:

```
_my_variable
9section
```

- (a) Both are OK, but discouraged
- (b) Names can't start with an underscore, but `9section` is OK
- (c) Names can't start with a digit, `_my_variable` is OK, but discouraged.
- (d) Neither is acceptable to the compiler
- (e) `_my_variable` is too long for C++

39. Consider

```
const int TableSize = 10;
int i;
long value = 1;
cout << "i" << "\t\t" << "3 ** i" << endl;
for (int i = 0; i <= TableSize; ++i) {
   cout << i << "\t\t" << value << endl;

   _____
}
```

The goal is to output a table of powers of three. What should replace the _____ entry?

- (a) `value++;`
- (b) `value *= 3;`
- (c) `value *= 3 * value;`
- (d) `value = 3 * i * value;`
- (e) `value += 3 * i;`

PART IV: Single-statement Code writing

40. Write a single C++ statement that causes a `SimpleWindow` object named `S` to be made visible on your console.

41. Write a single C++ statement that causes a `RectangleShape` object named `R` to be made visible on your console.

42. Write a single C++ statement that causes `int` object `n` to have the whole number part of `float` object `x`. For example, if `x` has the value 123.45, then n's value should become 123.

43. Suppose water costs 0.021 cents per 100 gallons. Write a single C++ statement that defines a single-precision floating point value `Total` that is initialized to the cost of buying `n` gallons of water.

44. Write a single C++ statement that causes `float` object `y` to have the fractional part of `float` object `x`. You may assume that `int` object `n` contains the whole number part of `x`.