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Choose from (a), (b), (c), (d) or (e) to select your answer to the given problem.

Review of Computer Programming Essentials

- (1) The computer numerical (real number) expression $30 / 2 * (2 + 3)$ would evaluate to _____ .
(a) false (b) 8 (c) 20 (d) 3 (e) 75
- (2) Using a statement at the wrong time or with an inappropriate object generally creates a(n) _____ error.
(a) syntax (b) logic (c) user (d) run - time (e) Both (a) and (b)
- (3) Calculations, within a computer program, are normally performed in a(n) _____ statement.
(a) comment (b) assignment (c) declaration (d) true (e) block comment
- (4) A structure that repeats actions as long as some condition continues is called a(n) _____ control structure.
(a) selection (b) assignment (c) looping (d) decision (e) sequence
- (5) The first step in writing a computer program is to _____ .
(a) understand the problem (b) develop an algorithm
(c) test the algorithm (d) code the algorithm
- (6) A(n) _____ situation exists when two conditions must both be true before any action can be taken.
(a) NOT (b) OR (c) AND (d) if - then (e) XOR
- (7) The following flowchart symbol represents material or information entering or leaving the system, such as customer order (input) or a product (output).



- (a) True (b) False
- (8) A computer program is written to calculate commissions based on sales. If the salesperson's total sales are over \$ 50,000 , the commission rate is 10 % ; if the total sales are \$ 50,000 or less, the commission rate is 5 % . What control structure is used to calculate the correct commissions?
(a) sequence control structure
(b) iteration control structure
(c) decision control structure
(d) while loop
(e) do until loop
- (9) Opening a file in an Output mode means that _____ .
(a) data may be stored onto the disk.
(b) data may be read from the disk.
(c) anything that appears as output on the screen is written to the disk.
(d) data may be read from and stored onto the disk.
(e) data written to the file are added at the end of the file.
- (10) For zero indexed arrays, the indexes of an array always start with 0 and end with the integer that is
(a) one less than the size of the array.
(b) one greater than the size of the array.
(c) the actual size of the array.
(d) twice the size of the actual array.
(e) None of the above

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Review of Computer Programming Essentials with C++

- (11) Given the following program segment, what value does the output statement display?
- ```
int count = 5;
++count;
cout << 3 * ++count + 5 << "\n";
```
- (a) 13      (b) 29      (c) 23      (d) 26      (e) 14
- (12) The expression  $5 + 11 \% 4 * 3$  evaluates to which of the following?
- (a) 0      (b) 14      (c) 3      (d) 24      (e) 16
- (13) The result of the execution of the following three statements would be that  $x$  is equal to:
- ```
x = 1;
x += x + 2;
x *= x * 3;
```
- (a) 12 (b) 9 (c) 27 (d) 48 (e) 32
- (14) The default clause of a `switch` statement is required.
- (a) True (b) False
- (15) Which of the following would be used in a statement and between two logic comparison expressions such that the statement would return FALSE if one or more of the logic comparisons are FALSE?
- (a) `->` (b) `||` (c) `%` (d) `!` (e) `&&`
- (16) In the following code, the variable y in `main` would represent what type of scope?
- ```
int square(int x);
int main() {
 int y;
 for (y = 1; y < 10; y++)
 cout << square(y);
 return 0;
}

int square(int x) { return x * x; }
```
- (a) automatic   (b) static   (c) local      (d) global      (e) file
- (17) Which of the following is NOT a legal C++ identifier?
- (a) `TwoDay`  
(b) `_blank`  
(c) `daysPerWeek`  
(d) All of these  
(e) None of these
- (18) The following is a legal comment:
- ```
double salesTax = 0.06; //sales tax for the state of Ohio\\
double amount = initial * (1.0 + salesTax);
```
- (a) True (b) False

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- (19) Fill in keyword that needs to appear to make this a constant declaration:

```
_____ int NUMBER_OF_PEOPLE = 10;
```

(a) double (b) const (c) static (d) new (e) char

- (20) When using a post - test looping structure, the body of the loop will always be executed at least one time.

(a) True (b) False

Review of Data Structures with C++

- (21) What is the output produced by the following program segment?

```
#include <iostream>
using namespace std;

int prod(int);
int sum(int);

int main()
{
    cout << prod(3) << sum(3) << sum(prod(2)) << prod(sum(2));
    return 0;
}
```

```
int prod(int x) { return 2 * x; }
```

```
int sum(int x) { return 2 + x; }
```

(a) 2 * x (b) 5658 (c) 6568 (d) 6586 (e) 6856

- (22) What is the output given the following program segment?

```
int main() {
    for(int i = 0; i < 8; i++)
        if (i % 2 == 0) cout << i + 1 << " ";
        else if (i % 3 == 0) cout << i * i << " ";
        else if (i % 5 == 0) cout << 2 * i - 1 << " ";
        else cout << i << " ";
    cout << " " << endl;
}
```

(a) 1 1 3 9 5 9 7 7

(b) 1 3 9 5 9 7 7 3

(c) 1 2 3 9 5 9 7 7

(d) 1 3 9 9 5 7 7 3

(e) 1 1 3 5 9 9 7 7

- (23) How many disk moves are made by a program called **Towers**, which is the solution to the Towers of Hanoi problem, where there are four disks on the source peg?

(a) 12 (b) 7 (c) 8 (d) 15 (e) 16

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- (24) Consider the following code.

```
//this program sorts thru the array a
const int SIZE = 5;
int a[SIZE] = { 6,3,4,8,5 };
int temp;

for (int pass = 0; pass < SIZE - 1; pass++) //passes

for (int index = 0; index < SIZE - 1; index++)//comparisons

    if (a[index] > a[index + 1])    {
        temp = a[index + 1];        //one swap
        a[index + 1] = a[index];
        a[index] = temp;            }
```

At the beginning of the second pass of the outer loop, how would array a be sorted?

- (a) 3 4 5 6 8 (b) 3 4 6 5 8 (c) 4 3 5 6 8 (d) 3 4 6 4 8 (e) 3 4 8 4 6
- (25) Given this recursive function, what value would be returned by the call of $f(3)$?

```
int f(int a)
{
    if (a == 0)
        return 1;
    else
        return 2 * f(a - 1) + 1;
}
```

- (a) 15 (b) 31 (c) 8 (d) 16 (e) 7

Match each glossary term with its correct definition.

- | | |
|------------------------------------|---|
| (26) _____ internal sort algorithm | (a) describes order of magnitude of search algorithms |
| (27) _____ one - dimensional array | (b) a variable whose value cannot be further subdivided or separated into a legitimate data type |
| (28) _____ binary search | (c) a list of related values of the same data type that is stored using a single group name |
| (29) _____ scalar (atomic) | (d) used when the data list is not too large and the complete list can be sorted within the computer's memory, usually in an array (example, a bubble sort) |
| (30) _____ big O notation | (e) a method whereby the list must be in sorted order |

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Objects and Algorithms with C++**(31)** Which of the following is NOT an example of an algorithm?

- (a) a flowchart of a computer program.
- (b) a recipe for a Greek pastry.
- (c) a computer program.
- (d) a photograph of an automobile.
- (e) an operations manual for a DVD player / recorder.

(32) What is the run - time complexity of this algorithm?

```
void main()
{
    int n;
    cout << "please enter number of items:";
    cin >> n;

    for (int i = 0; i < n; i++)
    {
        cout << (n * n);
    }
}
```

- (a) 1 (b) $O(\log_2 n)$ (c) $O(n^2)$ (d) $O(n)$ (e) $O(\log_{10} n)$

(33) What is the run - time complexity of this algorithm?

```
void main()
{
    int n;
    cout << "please enter number of items:";
    cin >> n;

    for (int i = 0; i < n; i++)
    {
        for (int j = 0; j < n - 1; j++)
        {
            cout << (n * n);
        }
        cout << "done with stuff for j = " << j << endl;
    }
}
```

- (a) 1 (b) $O(\log_2 n)$ (c) $O(n^2)$ (d) $O(n)$ (e) $O(\log_{10} n)$

(34) Suppose you wanted to sum all the prime numbers from 1 to 100, i.e. $2 + 3 + 5 + \dots + 97$. How many addition operations will be required to complete this task?

- (a) 20 (b) 23 (c) 24 (d) 22 (e) 21

(35) If a 2 row by 3 column matrix is multiplied by a 3 row by 2 column matrix, _____ total addition operations will be required and the product matrix will possess _____ elements.

- (a) 12; 4 (b) 5; 4 (c) 5; 5 (d) 8; 4 (e) 4; 4

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- (36) In mathematical statistics, the harmonic mean of two numbers is defined as the reciprocal of the arithmetic mean (average) of the reciprocals of the two numbers. For example, the harmonic mean of 60 and 120 is 80.
Which of these algorithms can be used to compute the harmonic mean of two numbers m and n ?
- add the two numbers and take the reciprocal of this sum
 - add the reciprocals of the numbers and take the reciprocal of this sum
 - take the average of the numbers and take the reciprocal of this average
 - add the reciprocals of the numbers and divide this sum into $1/2$
 - add the reciprocals of the numbers and divide this sum into two
- (37) If $f(n) = O(g(n))$ then _____ .
- $f(n) > c \cdot g(n)$, for some $n \geq n_0$
 - $f(n) \geq c \cdot g(n)$, for some $n \geq n_0$
 - $f(n) < c \cdot g(n)$, for some $n \geq n_0$
 - $f(n) \leq c \cdot g(n)$, for some $n \geq n_0$
 - $f(n) = c \cdot g(n)$, for some $n \geq n_0$
- (38) Which of the sentences below does NOT apply to the definition of algorithms?
- perform finite set of steps
 - execute unambiguous instructions
 - obtain the required output
 - work on legitimate inputs
 - None of the above
- (39) Once a linked list is created, we have to first allocate space for the number of nodes that we will need.
- True
 - False
- (40) Given the head of a non - empty list, write the correct `while` condition to traverse the list and find the last node. (assume that node properties `next` and `value` are visible)
- ```
Node temp = head; //temp points to head
while (_____) {
 temp = tempNext;
}
```
- `temp -> next = NULL`
  - `temp -> next != NULL`
  - `temp -> NULL != next`
  - `next -> temp = NULL`
  - `next -> temp != NULL`
- (41) Deleting a node from a list simply requires us to make the previous node's "next pointer" NULL.
- True
  - False
- (42) Assuming a non - empty list with a pointer to the head node named `first`, the following is a correct algorithm to insert a new node into the second spot in the list.
- ```
Node newNode = new Node();
head.Next = newNode;
newNode.Next = (head.Next).Next;
```
- True
 - False

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For questions (43) through (46), refer to the following declaration(s):

```
struct rank
{
    int class_rank;
    double GPA;
    apstring name;
    rank *nextaddr;
};
```

- (43) Which of the following properly declares linked lists variables of type rank called current, previous, first and newpt?
- (a) rank current*, previous*, first *, newpt*
 - (b) rank current, previous, first, newpt;
 - (c) rank *current, *previous, *first, *newpt;
 - (d) rank current*, previous*, first*, newpt*;
 - (e) rank current, previous, newpt, first
- (44) Which of the following commands creates a new item in the linked list of type rank named newpt?
- (a) rank new newpt;
 - (b) newpt = new rank;
 - (c) rank = new newpt;
 - (d) new = rank newpt;
 - (e) newpt = new *rank;
- (45) The value NULL is _____ .
- (a) is stored in the data in the first position of the linked list
 - (b) is stored in the data in the last position of the linked list
 - (c) is stored in the pointer field of the first position of the linked list
 - (d) is stored in the pointer field of the last position of the linked list
 - (e) is stored anywhere in the linked list
- (46) Which of the following would delete a student from the middle of the list, assuming that current is pointing to the student to be deleted?
- (a) previous = current;
 - (b) current = previous;
 - (c) first = current;
 - (d) previous-> nextaddr = current-> nextaddr;
 - (e) current-> nextaddr = previous-> nextaddr;
- (47) A pointer variable _____ .
- (a) contains the data stored at the location in memory being used
 - (b) can be used in read statements, but not in write statements
 - (c) contains the address of the memory location to be used
 - (d) can be used in calculations and assignments only
 - (e) can only be used to access numerical information
- (48) Pointer variables are declared using the symbol _____ .
- (a) &
 - (b) #
 - (c) *
 - (d) @
 - (e) ->

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(49) The symbol used to access one of the fields of a component of a linked list is _____ .

- (a) -> (b) * (c) & (d) @ (e) #

(50) Each item in a linked list is called a(n) _____ .

- (a) stack (b) pointer (c) queue (d) node (e) address