



**ENGINEERING
AT ILLINOIS**

2016 Academic Challenge

COMPUTER SCIENCE TEST – REGIONAL

– This Test Consists of 30 Questions –

Computer Science Test Production Team

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GENERAL DIRECTIONS

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. One oval should be marked to answer each question. Multiple ovals will automatically be graded as an incorrect answer.

Be sure ovals are marked as  , not  ,  ,  , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

***** Time: 40 Minutes *****

DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!

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WYSE – Academic Challenge
Computer Science Test (Regional) – 2016

1. Inheritance is one of the primary principals of Object Oriented Programming (OOP). Which of the following best describes inheritance?
 - a. Hiding the data behind methods that prevent inappropriate changes to data.
 - b. Hiding the details of how the given methods are implemented.
 - c. Allowing methods to change functionality as they are used in the program.
 - d. Allowing a class to be built/constructed using methods from a base class.
 - e. All of these are examples of inheritance.

2. The standard template library (STL) in C++ or the Collection Container Framework in Java can best be described by which principal of Object Oriented Programming?

a. Encapsulation	b. Inheritance
c. Polymorphism	d. Algorithmic Symmetry
e. Least Privilege	

3. An object can access public elements of a class using which operator?

a. *	b. .	c. +	d. &&	e. All of the above.
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4. Convert the following base 10 (decimal) number into binary: 111

a. 111	b. 10010	c. 110110	d. 100010001	e. 1101111
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5. What is the Boolean expression that matches the given truth table?

	A	B	C	OUTPUT
a. A'B'	F	F	F	T
b. BC	F	F	T	T
c. BC'	F	T	F	F
d. B' or BC	F	T	T	T
e. None of the above.	T	F	F	T
	T	F	T	T
	T	T	F	F
	T	T	T	T

6. Which of the following logic gates is an OR gate?



- a. i b. ii c. iii d. iv e. v

7. Convert the following binary number into hexadecimal (base 16): 10111010101

- a. 5D5 b. 1493 c. 10111010101 d. BA5 e. None of the above.

8. Which of the following statements is true regarding a binary search of 10 data elements assuming that the item that you wish to search for may not be in the list?

- a. The minimum number of comparisons to find an element is 10.
- b. The minimum number of comparisons to find an element is 1 and the maximum is 10.
- c. The maximum number of comparisons to find an element is 3.
- d. The list does not need to be sorted to use a binary search.
- e. The maximum number of comparisons to find an element is 4.

9. Which of the following data structures is associated with Last In First Out (LIFO)?

- a. Tree b. Stack c. Queue d. Hash e. Linked List

10. For n elements, the first algorithm has a complexity of $12n^2+2$ and the second a complexity of n^3+1 . At what point does the second algorithm require more iterations than the first?

- a. Always b. Never c. $n=5$ d. $n=12$ e. $n=13$

11. How many bits are in an IPv6 address?

- a. 128 b. 256 c. 8 d. 32 e. 64

12. What is the purpose of the Dynamic Host Configuration Protocol (DHCP)?

- a. To convert host names into IP addresses.
- b. To automatically configure the Internet Protocol (IP) address and other TCP/IP settings on network computers.
- c. To provide a directory service that contains domains.
- d. All of the above.
- e. None of the above.

13. What type of encryption hides messages within another medium, e.g. hides a message within an image file?

- a. Substitution
- b. Polyalphabetic
- c. Steganography
- d. Running key
- e. One time pads

14. Which of the following is a type of biometric authentication?

- a. Password
- b. Smart card
- c. Userid
- d. Iris scan
- e. Challenge question

15. Which of the following is not an operator?

- a. ->
- b. %
- c. ?:
- d. &&
- e. ^^

Use the following code for Questions 16, 17, and 18.

```

1   int i=0, list[10] = {0};
2   for (i=1; i<10; i+=2)
3       list[i] = i*i;
4   i=0;
5   while (++i < 10)
6       cout << list[i++] << " ";
7   cout << i;
```

16. Which of the following are the contents of the list at line 4?

- a. 0 1 2 3 4 5 6 7 8 9
- b. 1 2 3 4 5 6 7 8 9 10
- c. 0 0 0 0 0 0 0 0 0 0
- d. 0 1 4 9 16 25 36 49 64 99
- e. None of the above

17. How many operators are used on line 2?

- a. 0
- b. 1
- c. 3
- d. 4
- e. None of the above.

18. What is the output displayed by the code?

- a. 1 9 25 49 81 11
- b. 0 1 4 9 16 25 36 49 64 81
- c. 1 4 9 16 25 36 49 64 81 100
- d. 1 9 25 49 81
- e. 0 0 0 0 0 0 0 0 0 10

Use the following code for Questions 19, 20, and 21.

```

1      int i, j, sum=0;
2      cin >> j;           // input data from user
3      for (i=1; i<10; i++)
4          if (i%j)
5              sum+= i/j;
6      cout << sum;       // display some results
7      cout << i;
```

19. What is the logical equivalent of the comparison on line 4?

- a. $i/j > 0$ b. $i\%j == 0$ c. $i/j < 0$ d. $i\%j \geq 0$ e. $i\%j > 0$

20. What is the output on line 6 if the user input is 5?

- a. 1 b. 2 c. 4 d. 9 e. 10

21. What is the output on line 7 if the user input is -2?

- a. 9 b. 10
 c. -2 d. The loop will execute prematurely.
 e. Cannot be determined from data provided.

Use the following code for Questions 22, 23, and 24.

```

1      double func1(double x, int n)
2      {
3          double xx = 1.0;
4          for (int i = 1; i <=n;i++)
5              xx *= x;
6          return xx;
7      }
```

22. What will be the output from the following line of code? `cout << func1(4,3);`

- a. 12 b. 16 c. 24 d. 64 e. 128

23. What is the type of the func1's return value?

- a. int b. double c. char d. float e. string

24. Given the line of code from Question 22, how many times will line 5 execute?

- a. 1 b. 2 c. 3 d. n-2 e. None of the above.

Use the following code for Questions 25, 26, and 27.

```

1   double func2(double x, int n)
2   {
3       if(n)
4           return x*func2(x,n-1);
5       else
6           return 1.0;
7   }
```

25. What will be the output from the following line of code? `cout << func2(2,5);`

- a. 2 b. 5 c. 10 d. 24 e. 32

26. What is the line number of the base case?

- a. 6 b. 1 c. 4 d. 3 e. 2

27. Given the line of code from Question 25, how many times will line 6 execute?

- a. 1 b. 2 c. 5 d. 10 e. It will never execute.

Use the following code for Questions 28, 29, and 30.

```

1   double func3(double x[], int n);
2   int main() {
3       double nums[] = {2.0, 3.0, 4.0, 5.0, 6.0};
4       cout << func3(nums,5);
5   }
6   double func3(double x[], int n)
7   {
8       double xx = 0.0;
9       for(int i = 0; i < n; i++)
10          xx += x[i];
11          return xx/n;
12 }
```

28. What will the output be from line 4?

- a. 3 b. 4 c. 5 d. 8 e. 22

29. What is the value of n on line 11 when the function is called using `func3(nums,5)`?

- a. 3 b. 4 c. 5 d. 8 e. 22

30. What is the statement on line 1?

- a. A function definition b. A function call
c. A procedure definition d. A function prototype
e. None of the above.