

WYSE – Academic Challenge
Computer Science Test (Regional) – 2012
Solution Set

1. Correct Answer: B.

Source: NIST Special Publication 800-146

2. Correct Answer: D.

Spell checking is done by an application. An operating system manages the computer's resources, provides an interface for the user, and runs applications.

3. Correct Answer: E.

A flash drive and a SD card are both solid state. A hard drive is not solid state.

4. Correct Answer: C.

The correct ordering of storage prefixes is: kilo, mega, giga, tera, peta, exa, zetta

5. Correct Answer: A.

$$\begin{aligned} 179 &= 1 \cdot 128 + 0 \cdot 64 + 1 \cdot 32 + 1 \cdot 16 + 0 \cdot 8 + 0 \cdot 4 + 1 \cdot 2 + 1 \cdot 1 \\ &= 1 \cdot 2^7 + 0 \cdot 2^6 + 1 \cdot 2^5 + 1 \cdot 2^4 + 0 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 \\ &= 10110011 \end{aligned}$$

6. Correct Answer: D.

x must be greater than 65 AND x must be less than 85, answer d.

- a) (x < 85) || (x > 65) // This is always true.
b) (x < 65) && (x > 85) // This is never true.
c) (x > 65) || (x < 85) // This is the same answer as a.

7. Correct Answer: B.

A	B	C	A'C'	BC'	(AC)'	a)	b)	c)	d)	ANSWER
F	F	F	T	F	T	T	T	T	T	T
F	F	T	F	F	T	T	F	T	T	F
F	T	F	T	T	T	T	T	T	T	T
F	T	T	F	F	T	T	F	T	T	F
T	F	F	F	F	T	F	F	T	T	F
T	F	T	F	F	F	F	F	F	F	F
T	T	F	F	T	T	T	T	T	T	T
T	T	T	F	F	F	F	F	F	T	F

8. Correct Answer: E.

(A OR C') AND (B AND C') if C is FALSE
(A OR FALSE') AND (B AND FALSE')

Insert FALSE

(A OR TRUE) AND (B AND TRUE)
(TRUE) AND (B)
B

Invert FALSE to TRUE
Identities: TRUE or y = TRUE, TRUE and y = y
Same as identity on line above

9. Correct Answer: E.

(A AND B) OR (B' AND C)
(A AND FALSE) OR (FALSE' AND C)
FALSE OR (TRUE AND C)
FALSE OR (C)
C

Rewrite circuit as an equation
Insert FALSE for B
Invert FALSE and identity: FALSE and y = FALSE
Identity: TRUE and y = y
Identity: FALSE or y = y

10. Correct Answer: D.

A linked list uses pointers and can grow dynamically by using the new keyword to create new items for the list. It is easy to insert items into a list or delete items from a list as only pointers have to be renamed. Inserting in the middle of an array or deleting from the front will cause all the other items that follow to be shifted in the array, which can take significant time. For a normal singly linked list, the list must be traversed following the pointers in order to find a particular item. When using an array, the programmer can jump directly to the item.

11. Correct Answer: C.

A binary search of a sorted list cuts down the number of possibilities by 2 at each comparison.

Number of Comparisons	Items left to check (worst case)
0	200
1	100
2	50
3	25
4	12
5	6
6	3
7	1
8	0 (found it or it is not in list)

12. Correct Answer: B.

A stack is a LIFO structure, a queue is a FIFO (First In First OUT) structure. Trees, hash tables and linked lists can insert or delete items from anywhere in the structure.

13. Correct Answer: B.

char c = 'X', d = '1', *c_ = &d;
c is of type char, while c_ is a pointer variable as designated by the *. The & operator before the d returns the memory location of d, which is stored into the pointer variable c_, which points to type char.

14. Correct Answer: A.

See above answer.

15. Correct Answer: D.

<u>CODE</u>	<u>OUTPUT</u>
c = 'y';	
cout << *c_ << *c_ << endl;	11(with a return)
c = 'Y';	
cout << *c_;	1(no return)
c_ = &c;	
d = 'Z';	
cout << *c_ << *c_ << *c_ << endl;	YYY(with a return)

The output will then look like the following:

11
1YYY

16. Correct Answer: A.

See above answer.

17. Correct Answer: C.

The trace of the code follows.

<u>Variables</u>						<u>Action</u>
i	j	e[0]	e[1]	e[2]	e[3]	
?	0	?	?	?	?	initially only j has a value of 0
0	0	?	?	?	?	for loop starts
0	0	0	?	?	?	set e[0]
1	0	0	?	?	?	i++
1	0	0	0	?	?	set e[1]
2	0	0	0	?	?	i++
2	0	0	0	0	?	set e[2]
3	0	0	0	0	?	i++
3	0	0	0	0	0	set e[3]
4	0	0	0	0	0	i++, first for loop stops, after executing 4 times
4	1	0	0	0	0	pre-increment j
4	1	0	1	0	0	set e[1] to 1
4	2	0	1	0	0	pre-increment j
4	2	0	1	2	0	set e[2] to 2
4	2	0	1	3	0	set e[2] to 3
4	3	0	1	3	0	post-increment j
4	3	0	1	3	4	set e[3] to 4

The trace of the second for loop follows the first, i starts at 0 and stops at 4, executing for i values of 0 through 3, each time displaying the value in the appropriate item in the array for output of:
0134

18. Correct Answer: B.

See trace above for the four elements of the array.

19. Correct Answer: B.

The first element of the array is set to zero. That is the only change.

20. Correct Answer: A.

See trace of code above.

21. Correct Answer: C.

The array is two dimensional.

22. Correct Answer: E.

The while loop counter *i* is initialized to 0. It is incremented once inside the loop and will execute 7 times until *i* equals 7. The for loops are discussed below.

for (<i>i</i> =0; <i>i</i> <=7;++ <i>i</i>)	This executes 8 times, not 7.
for (<i>i</i> <7)	This is not valid syntax.
for (<i>i</i> =1; <i>i</i> <7; <i>i</i> ++)	<i>i</i> is initialized to 1 not 0.
for (<i>i</i> =0; <i>i</i> <=7; <i>i</i> ++)	This also executes 8 times, not 7.
for (<i>i</i> =0; <i>i</i> <7; <i>i</i> ++)	Correct.

23. Correct Answer: C.

As an array, the elements are listed in 7 rows and 10 columns below. The `\0` is considered one character and is used to indicate the end of a string. The post-increment for *i*, occurs after the `cout` statement, so the first item displayed is `days[0][0]`, the second `days[1][1]`, etc. The items that are displayed are highlighted.

```
days[7][10] = Sunday\0???  
              Monday\0???  
              Tuesday\0??  
              Wednesday\0  
              Thursday\0?  
              Friday\0???  
              Saturday\0?
```

24. Correct Answer: D.

The statement will output Wednesday. Character arrays may be printed without the use of a loop by the `cout` statement, which prints until it encounters a `\0`, string terminator.

25. Correct Answer: A.

a is string of characters. In this case, it is a constant and may not be changed in the function.

26. Correct Answer: A.

`\0` is the NULL character which is used to terminate the string or character array.

27. Correct Answer: E.

"Hello" is a string value. Values cannot be changed by the program.

28. Correct Answer: D.

The function counts the number of characters in the string that it is passed. It terminates counting when it encounters the '\0'. As there are 5 characters prior to the '\0' in the string "Hello", the program will output 5.

29. Correct Answer: C.

Examine a thru d individually.

a) `age = 18; name = "Joe";`

Incorrect as age and name are only accessible within the class.

b) `P.age = 18; P.name = "Joe";`

Illegal as age and name are private members of the class.

c) `P.setAge(18); P.setName("Joe");`

Legal.

d) `P = "Joe" + 18;`

Illegal, as accessor methods setAge and setName must be used to modify age and name.

30. Correct Answer: A.

Providing code to overload the use of operators for a given class is known as operator overloading.