Computer Science Contest #1415-06 Key

November 15, 2014

1) A
2) C
3) A
4) A
5) C
6) C
7) D
8) A
9) A
10) D

11) D
12) A
13) C
14) A
15) D
16) B
17) E
18) A
19) D
20) E

21) C
22) A
23) D
24) E
25) D
26) C
27) C
28) D
29) E
30) C

31) B
32) B
33) D
34) E
35) A
36) A
37) E
38) B
39) AB or A&&B
40) 1100 1000

Note to Graders:

- All provided code segments are intended to be syntactically correct, unless otherwise stated (e.g. error is an answer). **Ignore any typographical errors.**
- Any necessary Standard Java 2 Packages are assumed to have been imported as needed.
- Assume any undefined (undeclared) variables have been defined as used.

Brief Explanations:

1. 101101_2 + $1E_{16}$ -> 101101 + 11110 -> 1001011 -> 64+8+2+1 -> 75_{10}
2. 3+6*6/3-3 -> 3+36/3-3 -> 3+12-3 -> 12
3. %5d sets aside 5 spaces to put the value num, right justified. %5s sets aside 5 spaces for the String list, however list is bigger and will get printed.
4. Strings are immutable, so there is no change to the String
5. the && occurs before the ||, hence you are dealing with A||B||C, which means all have to be false
6. The range would be from the largest low end of each variable to the largest high end of each variable. Arguably, there will be more numbers near 5 then there would be near 14.
7. 6+10+8%5 -> 6+10+3 -> 19
8. There is no else statements and the increase always lifts it to the next level, so 75 is added to 37.
9. The if statement will rotate from +0,-1,+2,-3,+4,-5,+6,-7,+8,-9
10. list[5]->0, list[0]->2, list[2]->8.
11. Scanner can connect a stream to a String, it will only read a stream.
12. This accumulation is actually changing the iterator which will be 17 because x at 14 becomes 17.
13. http://introcs.cs.princeton.edu/java/11precedence/ , postfix has a higher precedence than prefix while additive takes a backseat.
14. an Integer's max value is 2^{31}-1 which is roughly 2 billion and change. This is because an Integer is a signed int and half of the values must be negatives and zero is counted as a positive number.
15. The <> in the instantiation is fine, Java 7 allows you to do this.
16. a modifier method should be public, can be a return type (but you better do a return).
17. the answer B is not an accessor method because at no time does it access a private member of the class.
18. the rows and the columns start at index 0, so it is the 3rd row and the 2nd column
19. There are four 4s that will cause the j to do an extra step, so it is 20 steps + 4 steps = 24 steps. The postfix on j does not cause an index out of bounds error.
20. 20 & 47 >> 1 | 17 & 20 >> 1. >> means divide by 2^x. So, 20&47/2 | 17&20/2 = 20&23 | 17&10 = 10100&10111 | 10001&01010 = 10100 | 00000 = 101000 = 20.
21. looking at the true conditional branch, you must make r>=3 and c >= 2 in order not to go out of bounds.
22. mat[0][0] will first decrease to 0 when it is first used, and then changed to mat[3][2], which is 4.
23. R is a P, but I does not necessarily have a P in it (I is a P, but you cannot assume it has a P).
24. X does not overriding the original method in W, and so p will call the parents x and not the childs.
25. Y overrides the original method in W, and so p will call the childs x and not the parents, however super.p will call the original p.
26. the sum = 37+5+7+7+5=61.
27. A priority queue is held as a min heap binary balanced tree, so every child is greater than its parent. It doesn't print out sorted, but rather where each parent is greater than both children and based on the order it is entered.
28. m(abcde)=cde+m(cde)=cde+e+m(e)=cde+e+e=cdeee
29. m(sturges) = turges+m(turges) = turges+urges+m(urges) = turges+urges+ges+m(ges) = turges+urges+ges+ges = turgesurgesgesges
30. The equation is the same as saying 145|x.
31. The pre-order traversal will print the node, then go left, then go right.

32. Every time a value is less than peek, the stack will pop off the values greater than the values and put them into a ArrayList that is behaving like a queue. This means that whatever is getting popped off is getting reversed when it is put back on. That is why it is not quite sorted.
33. I would prefer to use "\\|" but when I tried to write the distractor "[|]" I found it worked as well, so I went with that.
34. the keyset is TreeSet that will only list the key values in alpha order.
35. In a directional graph, the number of edges is the number of unique arrows pointing at another node. If you look at the code, each edge is described, 13 lines of code = 13 edges.
36. A simple path in a graph is a path that can trace from one point in the graph to another along its edges without repeat. If there are repeats, then it is just a path.
37. here is the truth table:

A	B	C	B||C	!(B||C)	A&&!(B||C)
0	0	0	0	1	0
0	1	0	1	0	0
1	0	0	0	1	1
1	1	0	1	0	0
0	0	1	1	0	0
0	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	0

38. E-A*(A+F-B)*(D+B)/(C-B)
    E-A*(-+AFB)*(+DB)/(-CB)
    E-(/**A-+AFB+DB-CB)
    -E/**A-+AFB+DB-CB
39. ABC+AB => AB(C+1) => AB(1) => AB
40. To find -56 as a byte, you must use two's compliment.
    56 -> 00111000
    flip -> 11000111
    add 1-> 11001000 => -56