

# Computer Science Answer Key

## UIL District 2 2015

1) E	11) E	21) B	31) A
2) A	12) E	22) B	32) A
3) C	13) E	23) C	33) E
4) A	14) D	24) D	34) B
5) B	15) C	25) E	35) D
6) C	16) A	26) B	36) C
7) E	17) B	27) B	37) B
8) D	18) C	28) C	38) A
9) A	19) B	29) A	39) 0 (zero)
10) B	20) A	30) E	40) 3

### 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.

## Explanations:

1.  $11010001_2 - 42_{10} = 209_{10} - 42_{10} = 167_{10} = 247_8 = A7_{16} = 10100111_2$
2. Since all of these operators are of equal precedence, the evaluation simply goes from left to right:  
 $24 * 1 \% 2 / 3 = 24 \% 2 / 3 = 0 / 3 = 0$
3.  $1000 - 50 + "2" ==> 950 + "2" ==> "9502"$
4. Since the substring at 1,3 is "az", and the portion of the "jazzyjazzygirl" at position 6 to the end is "azzygirl", this statement outputs true.
5. The AND result with both p and q false, is false, therefore the NOT result of that is true.
6. The absolute value of 47.9 is 47.9.
7. To assign to a float variable, you must put an f after the value. The correct assignment is float f = 1.0f.
8. The values -30 and , -16, and -39 all make the AND conditional statement true, which when NOTed, becomes false, thus resulting in the "blue" output.
9. The loop builds up String t from the characters of String s, depleting String s one character at a time, until an "i" is encountered, at which time the loop ends. The "i" is added to t BEFORE the loop exits, resulting in the choice indicated.
10. Although the initial assignment contains integers, they are promoted to double status, and output with only one zero after the decimal point.
11. The Scanner class "lives" in the java.util package, and the File class is in the java.io package. Both must be imported for file input.
12. The sequence of values for x, y and z are: 10 50 1, 11 49 1, 13 47 2, 16 44 3, 20 40 4, 25 35 5, 31 29 6, and 31 29 7.
13. The **additive** operators (+-) are on line 4 of the chart, followed by the bitwise AND operator (&) on line 8, and bitwise OR (|) on line 10.
14. The Long data type uses 64 bits of storage.
15. The lastIndexOf method returns the position of the last instance of a value in the list, in this case, 15 before the sort, and 10 after the sort.
16. Since this is sorting in ascending order, in the first pass, the 2 is selected as the best value for position 0, and in the second pass, the 4 is moved into position 1, with the 8 moving towards the back each time. The order after the second pass is 2 4 8 7 6.
17. This is the selection sort.
18. In line 6, if (list[y] < list[b]) must be changed to if (list[y] > list[b]) to reverse the order of the sort.
19. The order of magnitude for all cases of the selection sort is  $O(N^2)$ .
20. Using the two's complement short-cut conversion process (see either 2015 Invitational Test for a complete explanation), 11011100 converts back to 00100100, which is the value 36, hence the original bit string is -36.
- 21.

$A \quad B \quad \bar{A} \quad \bar{B} \quad A * \bar{B} \quad \overline{A * B}$

0	0	1	1	1	0
0	1	1	0	0	1
1	0	0	1	0	1
1	1	0	0	0	1

The truth table above shows only one false result in the final column.

$\overline{A * B}$  simplifies to  $A + B$  using DeMorgan's law and the Double Negative Rule, showing true when either A is true or B is true, of which there are three pairs that work: (0,1), (1,0), and (1,1), with (0,0) producing the only false result.

22. Postorder traversal starts at the root of the tree (top node), and "touches right" each node along all of the branches of the tree from left to right.
23.  $0 + (9.5 - 14) ==> 0 + (-4.5) ==> -4$ . Due to autocasting, there is no error, and the decimal portion is truncated in the final operation.
24. The four popped values in sequence are 3, 9, 6, and 4, which sum to 22.
25. The sequence of s and t values is: 0 0, 0 10, 10 11, 21 12, 33 13, 33 10 43 11, 54 12, 66 13.
26. The two constructors are the default (empty parameter list), and the one with three parameters.

27. Since the toString method is hidden by the block comment symbols, the default output is provided by the compiler, as shown in choice b.
28. Now that the toString method is active, the output is customized accordingly.
29. The 8 values generated by this code range from 26 through 33.
30. There are five instances of the letter 'o' in the matrix.
31. Since the exponent goes first, it goes between the A and R, then the two \* between M and A, then between R and T, followed by the division and subtraction in the last two spots.
32. The angle whose sine is 0.5 measures 30 degrees
33.  $\bar{A} + \bar{B} * \bar{C}$  is the correct expression for this diagram.
34. The statement `Arrays.fill(list, 2, 7, 5);` fills positions 2 through 6 with the value 5.
35. A cycle is defined as a simple path (no revisited nodes in the middle) that ends where it started. ABEA is a cycle, which can also be named BEAB, or EABE. The other cycles are: ADCBEA, ADCFBEA, BECB, BECFB, and CFC.
36. Since this is a method called in a standalone statement, it is a void method, which means <term> is replaced by the word `void`.
37. Since  $10 \bmod 5$  is not equal to 1, y is assigned the value 10, producing an output of 10.  $16 \bmod 5$  is equal to 1, therefore y is assigned the value 16 times 5, which is 80, with an output of 16 80.
38. The base 4 equivalent of 22 is 112, which essentially means  $4^2$  (16) goes into 22 once, and then 4 goes into the remainder of 6 once, with a final remainder of 2.
39.  $\overline{(A+B)} + \bar{A}$  becomes  $\bar{A} * \bar{B} * A$  by DeMorgan's law on both +s, and the double negative law, which then becomes  $0 * B$  because of the complement law, and finally just 0 because of the zero identity law
- 40.

$$\begin{aligned}
 f(9) &= f(6) + 1 = 2 + 1 = 3 \\
 f(6) &= f(3) + 1 = 1 + 1 = 2 \\
 f(3) &= f(0) + 1 = 0 + 1 = 1 \\
 f(0) &= f(2) - 2 = 2 - 2 = 0 \\
 f(2) &= f(-1) + 1 = 1 + 1 = 2 \\
 f(-1) &= 1
 \end{aligned}$$