

★ANSWER KEY – CONFIDENTIAL★

UIL COMPUTER SCIENCE WRITTEN TEST – 2016 REGION

Questions (+6 points for each correct answer, -2 points for each incorrect answer)

- | | | | |
|------------------|------------------|------------------|----------------------------|
| 1) <u> E </u> | 11) <u> A </u> | 21) <u> B </u> | 31) <u> B </u> |
| 2) <u> C </u> | 12) <u> B </u> | 22) <u> E </u> | 32) <u> A </u> |
| 3) <u> A </u> | 13) <u> D </u> | 23) <u> D </u> | 33) <u> D </u> |
| 4) <u> E </u> | 14) <u> A </u> | 24) <u> A </u> | 34) <u> C </u> |
| 5) <u> D </u> | 15) <u> C </u> | 25) <u> E </u> | 35) <u> E </u> |
| 6) <u> E </u> | 16) <u> A </u> | 26) <u> C </u> | 36) <u> B </u> |
| 7) <u> A </u> | 17) <u> D </u> | 27) <u> D </u> | 37) <u> C </u> |
| 8) <u> B </u> | 18) <u> C </u> | 28) <u> B </u> | 38) <u> A </u> |
| 9) <u> E </u> | 19) <u> A </u> | 29) <u> B </u> | * 39) <u>(A*C) + (B*D)</u> |
| 10) <u> C </u> | 20) <u> E </u> | 30) <u> E </u> | 40) <u> 58 </u> |

* See "Explanation" section below for alternate, acceptable answers.

Note: Correct responses are based on **Java SE Development Kit 8 (JDK 8)** from Sun Microsystems, Inc. All provided code segments are intended to be syntactically correct, unless otherwise stated (e.g., "error" is an answer choice) and any necessary Java SE 8 Standard Packages have been imported. Ignore any typographical errors and assume any undefined variables are defined as used.

Explanation

- 1) E $3D_{16} * 13_8 = 1010011111_2 = 22133_4 = 1237_8 = 671_{10} = 29F_{16}$
- 2) C $(0.4 + 1.2 * 8) / 2 = (0.4 + 9.6) / 2 = 10.0 / 2 = 5.0$
- 3) A "%(08d)": Negative values are to be formatted with parentheses instead of a negative sign and the parentheses count toward the 8-character field width. Number should be zero-padded to fill out the remaining field width.
- 4) E The `replace()` method creates a new `String` in which each substring that matches the literal target sequence (1st parameter) is replaced with the specified literal replacement sequence (2nd parameter). The original `String` is not modified. Hence, `mixed` is never actually modified in the code segment, `zero` is a reference to the unmodified `mixed`, and `ones` references a modification of `mixed`.
- 5) D `!(w <= x && y != z) = !(w <= x) || !(y != z)`, by DeMorgan's Law.
- 6) E `raw = -2.5; floor = 3.0; ceil = 2.0; Math.pow(3.0, 2.0) = 9.0`
- 7) A `hund = 236; ten = 23; one = 6; 23 + (10 * 6) = 83`
- 8) B $(12345 / 9) = 1371 > 1000; (12345 * 4) = 49380 < 50000$
- 9) E Variable `digits` overflows when its value exceeds 127 (i.e., `Byte.MAX_VALUE`). 128 overflows to become -128. -256 underflows to become 0. The resulting values for the variable `digits` at the start of each iteration are 1, 2, 4, 8, 16, 32, 64, -128, 0, 0, 0, 0, ... causing the output to be "1248624-80000..." (Infinitely repeating zeroes).

★ANSWER KEY – CONFIDENTIAL★

- 10) C For each index position from $i = 6$ through $i = 1$, compares values to either side of i and records in w the rightmost value if it is less than the leftmost of the pair being compared. Values for w include $-1, 5, 2, 3$. Method returns the final value of $w = 3$.

11) A The Scanner is initialized with a String literal ("seuss.txt") as the source rather than an actual File object. Parsing through the 9 characters in the String, "seuss.txt", results in only a single line of text being read and added to the List. In order for the actual file contents to be parsed, the Scanner would have needed to be initialized as new Scanner(new File("data.txt")).

12) B The contents of the eight array include [0.0, 0.125, 0.25, 0.375, 0.5, 0.625, 0.75, 0.875].

13) D ((me - ((you / us) * me)) + (you * me)) = ((5 - ((24 / 3) * 5)) + (24 * 5))

14) A public class Random extends Object implements Serializable { ... }

15) C all = [reference to some]; some = [reference to all, 0, 2]

16) A Default value for boolean primitive is false. Default value for Boolean object is null.

17) D max = 2147483647; min = -2147483648. Due to overflow, -min = -2147483648 as well.

18) C Answer choice A produces random integers from the set of [0, 1, 2]. Answer choices B and D produce random integers from the set of [-1, 0].

19) A morse = ".-.-.-.-.-". String is split using the regular expression, ".", which splits on any single character ("." = regex wildcard pattern character) and would produce an array of 15 empty strings, However, split() does not include trailing empty strings in the resulting array, leaving dashes as an empty array.

20) E Sequential search finds index of last occurrence of item in data.

21) B Strings are removed from the PriorityQueue in ascending, lexicographic order. '2' = 50, 'F' = 70, 'T' = 84, 'f' = 102.

22) E After bitshifting 31 by 2 places to the left, scan = 01111100₂ = 124₁₀.

23) D 52₁₅ = 77₁₀

24) A Sums up the total number of positions each items are shifted during each insertion. The 'E' is shifted by 0 positions. 'G' is shifted by 1 position. 'I' is shifted by 2 positions. 'O' and 'N' are each shifted by 3 positions. 0 + 1 + 2 + 3 + 3 = 9.

25) E The resulting array is sorted in descending Unicode order.

26) C Removes and inserts each item in the list into descending order.

27) D Insertion sort yields O(N²) performance in the average and worst cases

28) B The regular expression requires the string to end with a non-digit character (e.g., [^0-9]).

29) B Returns a post-order traversal of the heap rooted at index n, where index [1] of String src represents the root of the overall heap.

30) E Throws a StringIndexOutOfBoundsException when n = src.length().

31) B Any value XOR'ed with its bitwise complement will result in a value containing all 1 bits (i.e., 2's complement representation of -1).

32) A base references the head (node [1]) of a bi-directional, linked list consisting of Disc objects numbered as follows:
{WEST} null ← [1] ↔ [7] ↔ [6] ↔ [5] ↔ [4] ↔ [3] ↔ [2] → null {EAST}

33) D base references the head (node [1]) of a bi-directional, linked list consisting of Disc objects numbered as follows:
{WEST} null ← [1] ↔ [7] ↔ [6] ↔ [3] ↔ [2] → null {EAST}

34) C Since the initial state of node [3] is false, its state and the state of node [6] (to the west of node [3]) are each inverted to true (producing an output of "H" for each of those 2 nodes).

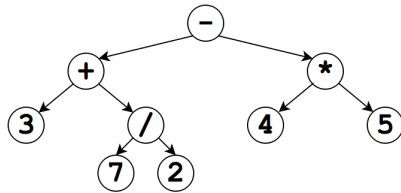
35) E Traversing east from node [4] leads to node [3] and node [2], but traversing west from node [2] leads to node [3], node [6], node [7], and node [1].

36) B Each Disc object is a node in a bi-directional, linked list of Disc objects.

37) C Paths: AGD, ABCGD, AFECGD

★ANSWER KEY – CONFIDENTIAL★

- 38) A RPN is the post-order traversal of the following expression tree:



- 39) Any answer that equivalently expresses "(A Logical-AND C) Logical-OR (B Logical-AND D)" is acceptable (use of parentheses for correctly enforcing order of operations is *optional*):

(AC) + (BD)
 (A * C) + (B * D)
 (A && C) || (B && D)
 (A and C) or (B and D)

(CA) + (BD)
 (C * A) + (B * D)
 (C && A) || (B && D)
 (C and A) or (B and D)

(AC) + (DB)
 (A * C) + (D * B)
 (A && C) || (D && B)
 (A and C) or (D and B)

(CA) + (DB)
 (C * A) + (D * B)
 (C && A) || (D && B)
 (C and A) or (D and B)

(BD) + (AC)
 (B * D) + (A * C)
 (B && D) || (A && C)
 (B and D) or (A and C)

(DB) + (AC)
 (D * B) + (A * C)
 (D && B) || (A && C)
 (D and B) or (A and C)

(BD) + (CA)
 (B * D) + (C * A)
 (B && D) || (C && A)
 (B and D) or (C and A)

(DB) + (CA)
 (D * B) + (C * A)
 (D && B) || (C && A)
 (D and B) or (C and A)

- 40) $11011101_2 = -35$; $01011101_2 = 93$; $-35_{10} + 93_{10} = 58_{10}$