

# ★ ANSWER KEY – CONFIDENTIAL ★

## UIL COMPUTER SCIENCE – 2017 REGION

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

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

Explanations:

1. B  $100_8=64_{10}$ ,  $40_{16}=64_{10}$ ,  $01001000_2=72_{10}$ ,  $98_{16}=152_{10}$ ,  $01000000_2=64_{10}$
2. E  $8+5\%4-3.0 = 8+1-3.0 = 9-3.0 = 6.0$
3. E `%12.2f` means a decimal number, right justified in 12 spaces and rounded to two decimal places.
4. C `s.substring(0, 1)` returns a **g**. `s.substring(s.length()-1)` returns a **t**. Therefore, we are going to replace all of the g's with t's.
5. B
 

a	b	c	d	$a    b \& c \wedge d$
F	F	T	F	F
T	F	F	F	T
F	T	T	T	F
6. E `Math.round` returns a long which can not be assigned to an int type variable.
7. C `m` is decremented **before** it is multiplied times `n`. `n` is incremented **after** the multiplication. The result of the multiplication is 32.832. Casting to an int then truncates the result to 32 which is then promoted back to a double with assignment leaving 32.00.
8. D When a switch statement encounters an empty case statement it will fall through to the next case statement. The values for `x` are 1, 2, 3, 5 then 6.
9. E Begins with the last letter in the string (`i=s.length()-1`), moves backwards printing every other letter (`i-=2`). Stops before the first letter (`i>0`).
10. C The for loop takes each value in the array `a`, starting at the back, and places it into array `b`, starting at the back, but stops before the zero (0) index is reached therefore `b[0]` is unassigned. The default value is 0 (zero).
11. A The Scanner method `next()` returns a String which cannot be added to or assigned to a double type variable.
12. D Answer A creates an inaccurate count of the values because `b` is initialized to 1. Answer B never increments variable `b`. In answer C, variable `b` finds the sum of the values instead of the count.
13. C Subtraction comes before bit shifting in the order of operations.  $\gg$  is division by a power of 2.  $16 \gg 4 - 2 = 16 \gg 2 = 16/2^2 = 16/4 = 4$ .
14. A Add one (1) and change the sign.
15. D The set method **replaces** the element at the specified position.
16. E Any class that contains an abstract method must also be abstract.
17. B The odometer field is a private field within the Vehicle class and can not be directly access from within the Electric class.
18. B The default Gas class constructor does not make an explicit call to a super constructor. Therefore, there is an implicit call to the default Vehicle constructor before the output statement is executed.
19. D Objects may not be instantiated from abstract classes.
20. E The method `charge()` is undefined for the type Vehicle.
21. C Match any capital letter once followed by any lower case letter one or more times followed by a comma then a space followed by any capital letter once followed by any lower case letter one or more times.
22. A Elements in a Map are stored in ascending order of the key values, in this case, locker numbers.
23. E The put method replaces the value for that key. The get method returns the value associated with the designated key but does not remove it.
24. D The code finds the product of matrices `a` and `b`.

$$\begin{bmatrix} 2 & -1 \\ 0 & 3 \\ 1 & 0 \end{bmatrix} \times \begin{bmatrix} 0 & 1 & 4 & -1 \\ -2 & 0 & 0 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 2 \times 0 + (-1) \times (-2) & 2 \times 1 + (-1) \times 0 & 2 \times 4 + (-1) \times 0 & 2 \times (-1) + (-1) \times 2 \\ 0 \times 0 + 3 \times (-2) & 0 \times 1 + 3 \times 0 & 0 \times 4 + 3 \times 0 & 0 \times (-1) + 3 \times 2 \\ 1 \times 0 + 0 \times (-2) & 1 \times 1 + 0 \times 0 & 1 \times 4 + 0 \times 0 & 1 \times (-1) + 0 \times 2 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 2 & 8 & -4 \\ -6 & 0 & 0 & 6 \\ 0 & 1 & 4 & -1 \end{bmatrix}$$

25. D s2 contains [fil, , ditproj, ct]

0	1	2	3
"fil"	" "	"ditproj"	"ct"

26. B All classes inherit from the Object class. Object is the cosmic super class.

27. D While it is counter intuitive to sort a Stack, any class that implements the List interface may be sorted using Collections.sort.

28. C Merging is the last step in the algorithm.

29. E

30. E The merge sort has  $O(n \log n)$  complexity in all situations, best, worst, and average.

31. A Determines if x is even or odd. Answer choice A is an illustration of the call stack where # is the bottom and ^ is on top.

32. B The values of m and n never change in the client code because they are passed by value to the method.

m=20 n=2 c=22 d=40

m=22 n=3 c=22 d=37

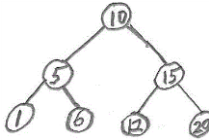
m=25 n=4 c=22 d=33

m=29 n=5 c=22 d=28

m=34 n=6 c=22 d=22

84 20 2

33. C Preorder traversal visits node, left then right.



34. D Same as:

```

int x;
if(s1.length()>s2.length())
    x=s1.length();
else
    x=s1.length();
  
```

35. A Bit shift before bitwise AND.  $5*8/4=10$ .  $10\&17=0$ .

	0	1	0	1	0
&	1	0	0	0	1
	0	0	0	0	0

36. E \* is AND,  $\oplus$  is XOR, and the over bar means NOT. Same as  $A \& \overline{B} \wedge C$ .

37. C

10101101	11011001	11111111	00000101	00010011
-83	-39	-1	5	19

38. B C contains the correct number of edges but they connect to different nodes. D contains too many edges. A is a directed graph and would have half as many connections. Therefore, C is correct.

39. Also accept  $A \parallel \neg(B \& C)$ ; A or not (B and C);  $A \parallel (B \& C)$ ;  $\neg(B \& C) \parallel A$ ;  $\neg(C \& B) \parallel A$ ;  $A \parallel \neg(BC)$ .

40. Linked lists do not allow for direct access via an index, so  $O(n)$ .