★ANSWER KEY – CONFIDENTIAL★

UIL COMPUTER SCIENCE – 2018 STATE

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

1) C	11) B	21) C	31) C
2) D	12) C	22) C	32) D
3) A	13) A	23) A	33) E
4) B	14) D	24) B	34) A
5) A	15) D	25) E	35) E
6) D	16) B	26) E	36) D
7) A	17) A	27) C	37) C
8) E	18) E	28) A	38) B
9) E	19) E	29) D	*39) 00001001
10) C	20) D	30) B	*40) $A * B + C \oplus \overline{D}$

** 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.	C	The leading 0b indicates that both values are binary. $10101010_2 = 170_{10}$. $00001111_2 = 15_{10}$. 170 % 15 = 5.
2.	D	5 % 4 + 8 – 2 * 3 = 1 + 8 – 6 = 9 – 6 = 3
3.	A	The format specifier %7.5s places the first five characters from the corresponding string value right justified in seven spaces.
4.	B	<table><tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr><tr><td>f</td><td>e</td><td>e</td><td>l</td><td>s</td><td></td><td>l</td><td>i</td><td>k</td><td>e</td><td></td><td>s</td><td>u</td><td>m</td><td>m</td><td>e</td><td>r</td></tr></table>The index of "u" is 12. s.substring(12) is "ummer". s.substring(1,4) is "eel". "ummer"+"eel" = "ummereel"
5.	A	(T^T)==((T||T)&&!(T&&T)) F==T&&!T F==T&&F F==F T
6.	D	Math.E returns the mathematical constant e which is an irrational number approximately equal to 2.71828. Math.round rounds its argument to the nearest whole number.
7.	A	When y is included in the expression, w, x and z are all promoted to double and the expression evaluates to a double. This value can be assigned to the double variable a. An explicit cast would be required to assign the sum to the other three variables.
8.	E	10 < - 8 && 2 == -8 / 2 False && False False Skip to the else statement. -8 <= -8 ^ 2 * 10 == 20 True ^ True False Skip to the else statement. Print "D".
9.	E	i gets 10. Throws a StringIndexOutOfBoundsException.
10.	C	<table><tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>F</td><td>T</td><td>F</td><td>T</td><td>F</td><td>T</td><td>F</td><td>T</td><td>F</td><td>T</td></tr></table>The default value for Boolean is false. The code sets every other element to true beginning with index 1 and then counts the number of true values in the array.
11.	B	The default input stream is the keyboard. The System class has been imported so it does not need to be included in the statement.
12.	C	x=20 x%3=2 x%2=0 s=0 x=19 x%3=1 x%2=1 s=19 x=18 x%3=0 x%2=0 s=1 x=17 x%3=2 x%2=1 s=18 x=16 x%3=1 x%2=0 s=18 x=15 x%3=0 x%2=1 s=18 x=14 x%3=2 x%2=0 s=18 x=13 x%3=1 x%2=1 s=31 x=12 x%3=0 x%2=0 s=19 x=11 x%3=2 x%2=1 s=30 x=10 x%3=1 x%2=0 s=30 x=9 x%3=0 x%2=1 s=30 x=8 x%3=2 x%2=0 s=30 x=7 x%3=1 x%2=1 s=37 x=6 x%3=0 x%2=0 s=31 x=5 x%3=2 x%2=1 s=36 x=4 x%3=1 x%2=0 s=36 x=3 x%3=0 x%2=1 s=36 x=2 x%3=2 x%2=0 s=36 x=1 x%3=1 x%2=1 s=37

13.	A	~ - ++ (-5) = ~ - (-4) = ~ 4 = - 5
14.	D	Character.SIZE returns the number of bits used to represent a char value in unsigned binary form, which is 16.
15.	D	a.remove(1) removes the string "Dumas" from the arraylist. An attempt to remove a non-existent object using a.remove("Dumas") returns false.
16.	B	Classes, methods and fields can all be declared as final. A constructor cannot be declared to be final.
17.	A	r.nextInt(10) returns a random whole number between 0 (inclusive) and 10 (exclusive). Adding 10 yields a value between 10 and 19 (inclusive). Multiplying by 2 gives just the even numbers between 20 and 38 (inclusive). A Set does not allow duplicates so there will be at most 10 values in the set since there are on 10 even numbers between 20 and 38 (inclusive).
18.	E	I. Euclid's algorithm using division. II. Euclid's algorithm using subtraction. III. Brute force method checking every possible divisor.
19.	E	next() returns a string and therefore will not compile. Answer choices A, B and D are each auto un-boxed and will compile.
20.	D	".+" matches any character one or more times → true "\\S{3}.\\D+@[a-z]+.\\w{3}" matches exactly 3 non whitespace characters, any character, one or more non-digits, a @, one or more lower case letters, any character, and exactly 3 word characters. → true "uil\\.?\\S*@+uiltexas.org" matches uil, a period once or not at all, a non-whitespace character zero or more times, a @ one or more times, followed by uiltexas.org. → true
21.	C	Objects instantiated from an immutable class cannot be changed. The rules for creating an immutable class are: • There should be no setter methods. • All fields should be final and private. • The class should be declared as final. • Do not return a reference to a mutable object In answer choice A the class and the fields are not final. Answer choice B has public fields, the class is not final and it contains setter methods. Answer choice D returns a reference to a mutable object.
22.	C	Declaring i as the loop control variable creates a duplicate identifier because i has already been used as a name for one of the parameters of the method.
23.	A	A map uses keys and entries. In tm.put(225, 1), 225 is the key and 1 is the entry. A TreeMap stores its data sorted on the keys.
24.	B	ceilingEntry returns "a key-value mapping associated with the least key greater than or equal to the given key, or null if there is no such key". The smallest key value greater than 300 is 312. The entry value associated with 312 is 3.
25.	E	Here is a printout of the call stack: n=4 5 n=3 5 n=2 5 n=1 1 n=0 1 n=1 1 n=2 5 n=1 1 n=0 1 25
26.	E	At a minimum, an interface must only present the signatures of those methods that must be implemented in any classes that implement the interface.
27.	C	No class, abstract or not, can extend more than one other class.

<table>
<tr><td>28.</td><td>A</td><td>Outer loop executes ¼ n times. Inner loop executes $\log_3(n)$ times. Ignore the constant ¼ and the base 3 to get O(n log n).</td></tr>
<tr><td>29.</td><td>D</td><td>3 + 1 + 6 + 4 + 8 + 2 + 8 + 3 = 35</td></tr>
<tr><td>30.</td><td>B</td><td>Let n = 4.
Let m = 15.
15 % 4 = 3
15 & (4 – 1) = 15 & 3
$1111_2 = 15_{10}$
$0011_2 = 3_{10}$
1111 & 0011 = 0011
$0011_2 = 3_{10}$</td></tr>
<tr><td>31.</td><td>C</td><td>This is a selection sort. The loop begins at the first element of the unsorted portion of the list and searches for the smallest element left in the remainder of the list. When the loop terminates the smallest remaining element is swapped with the first element in the unsorted portion of the list and the starting place is incremented by one. This particular implementation makes a recursive call until there is only one element left in the unsorted portion of the list.</td></tr>
<tr><td>32.</td><td>D</td><td>The recursive call to sort passes the partially sorted list and increments the starting point.</td></tr>
<tr><td>33.</td><td>E</td><td>See #31.</td></tr>
<tr><td>34.</td><td>A</td><td>Comparable is an interface. Interfaces must be implemented.</td></tr>
<tr><td>35.</td><td>E</td><td>Sorts alphabetically from right most character to the left. Remember, B comes before a.</td></tr>
<tr><td>36.</td><td>D</td><td>A postorder traversal of this tree yields A B C + * which is a postfix expression.</td></tr>
<tr><td>37.</td><td>C</td><td>This is an adjacency edge list. For each vertex there is a list of edges. A new ArrayList must be added for each vertex where all of the edges associated with that vertex may be stored.</td></tr>
<tr><td>38.</td><td>B</td><td>Answer choices A, C, D and E all show an edge from D to F. There is never a D to F Edge object instantiated in the client code.</td></tr>
<tr><td>39.</td><td>00001001</td><td>
<table>
<tr><td></td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>~</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>+</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>=</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>=</td><td>-19</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>~</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>+</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>=</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>=</td><td>-28</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
-19 – (-28) = -19 + 28 = 9 = 00001001

Answer must contain 8 bits.</td></tr>
<tr><td>40.</td><td>$\underline{A * B + C \oplus \overline{D}}$</td><td>Also accept $C \oplus \overline{D} + A * B$. Do not accept any Java operators.</td></tr>
</table>