★ANSWER KEY – CONFIDENTIAL★

UIL COMPUTER SCIENCE – 2017 STATE

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

1) D	11) C	21) A	31) A
2) B	12) B	22) E	32) C
3) B	13) C	23) A	33) D
4) B	14) A	24) D	34) B
5) A	15) E	25) D	35) E
6) C	16) E	26) B	36) B
7) D	17) D	27) C	37) A
8) B	18) B	28) B	38) C
9) D	19) C	29) E	*39) -80
10) D	20) E	30) A	*40) 66

** 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.

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Explanations:

1. D $1110_2 = 14_{10}$, $11101_2 = 29_{10}$, 14 X 29 = 406_{10}, $12110_4 = 404_{10}$,$1A6_{16} = 422_{10}$, $1120_7 = 406_{10}$, $110010111_2 = 407_{10}$
2. B 36 % -8 + -14 % 3 = 4 + (-2) = 2. Modulus with negative numbers always takes the sign of the dividend.
3. B The 0 (zero) flag places leading zeroes in the spaces not used by a number. The + flag forces the inclusion of a + or – sign for numerical output.
4. B s.indexOf(o) returns 17. s.lastIndexOf(o) returns 29. s.substring(17,29) returns a substring from character 17 to character 28.
5. A 10 == 15 || 10 >= 12 ^ 15 > 12, False || False ^ True, False || True, True
6. C Math.log10(x) returns the power of 10 equal to x as a double. $10^4 = 10000$.
7. D 0b11 is 3 decimal and 0xA is 16 decimal. 3 + 16 = 19. 19 will certainly fit within the short data type however an int type variable might store a value that exceeds the range of the short data type. Therefore there is a type mismatch error.
8. B The length of s is 8. Character.isAlphabetic(c) returns true if the character is a Unicode alphabet character, false otherwise.
9. D A for statement does not require initialization or incrementation within the statement itself. f is declared outside the scope of the for loop so it can be used in the print statement. A # is printed for each of the values 3, 4, 5, 6, 7, and 8 then f is incremented to 9 and the loop terminates.
10. D

b[a[0]]	b[3] = 0
b[a[1]]	b[0] = 1
b[a[2]]	b[1] = 2
b[a[3]]	b[4] = 3
b[a[4]]	b[2] = 4
b[a[5]]	b[5] = 5

11. C f.next returns strings between each occurrence of a lower case t, not including the t.
12. B x is counting the true values, y is counting the false values and z is the total of all values in array b.
13. C ~ is the complement operator. Add one and take the opposite and you get -19. Casting to int results in a value of 14. -19+14 = -5.
14. A The range of possible values for the byte data type is -128 to 127. When b is incremented beyond 127 the value “wraps around” and becomes -128. -128 is less than 0 so the loops stops.
15. E a.get(2) returns but does not remove 30. a.remove(3) returns and removes 40 but does not print it. After removing 40, a.indexOf(50) returns 3. 40 is no longer in the array list so s.contains(40) returns false.
16. E Answer choices A through D are all true statements about Java identifiers.
17. D b is a 3 X 3 cube. b is filled by placing characters by cell front to back (k), then by column left to right (j), and finally by row top to bottom (i). b[0][2][2] is in the first row, third column, third cell back.
18. B Although each of the data structures added to list contains several elements, each is just one element within list.
19. C The second element in list is the stack s. The Stack class contains a toString method that allows it to be printed where the top of the stack is printed last.
20. E list.get(2) returns an Object which must first be cast as follows: (Queue<Double>). There is a type mismatch.
21. A For a string to match the regular expression shown it must begin with one or more lower case letters except vowels ([a-z&&[^aeiou]]+) and be followed by zero or 1 digit (\\d?). Answer choice A ends with 2 digits.
22. E A leading zero indicates an octal number. $011_8 = 9_{10}$. 0x indicates a hexadecimal number. $0x11_{16} = 17_{10}$. 9 + 17 = 26. The print method will print a decimal number regardless of the number system used in the expression.
23. A Object a is of type A so it calls the method d from the class A which returns the value stored in field c.
24. D Field c and method d within the class B override the field and method with the same name that are inherited from class A. So method d in the class B returns the value stored in class B’s field c, which is “D”. The call to e in class B subsequently calls method d from class A which returns a “C”.
25. D Answer choice D creates a type mismatch. Elements within set s are of type Object.
26. B Math.random() returns a double value x such that 0.0<=x<1.0. To print 4 ran would have to have a value of 1.0.

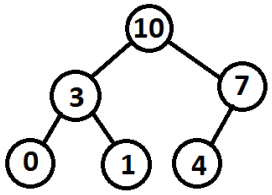
27. C The method adds one for each value of x except when x is less than zero. Here is the call stack.

```
x=4
x=3
x=2
x=1
x=0
x=-1
x=0
x=1
x=0
x=-1
x=2
x=1
x=0
x=-1
x=0
```

28. B

x=2 y=3 z=4 [0, 0, 4, 0, 2, 0, 0, 0]
x=2 y=3 z=5 [0, 0, 5, 0, 2, 2, 0, 0]
x=2 y=3 z=6 [0, 0, 5, 4, 2, 2, 2, 0]
x=2 y=3 z=7 [0, 0, 5, 5, 2, 2, 2, 2]

29. E The first while loop iterates from the front of the list until it finds a value greater than the pivot value. The second while loop iterates from the back of the list until it finds a value less than the pivot value.
30. A The salient feature of a Quicksort is two succesive recursive calls. The first with the front partition and the second with the back partition.
31. A The the base case is the condition that when true stops the execution of the method. When first equals last, last is no longer greater than first, list is completely sorted and the method terminates.
32. C
33. D (index-1)/2 will calculate the index value of a child nodes parent within the backing array. While not at the top of the heap and the child node is larger than its parent move the child up.
34. B If the top node is larger than the largest of its children, it is in its proper place and the method stop execution.
35. E A max heap is a binary tree data structure that ensures that every node is larger than each of its children and that the tree is complete. The implementation shown on the test uses an array as the backing structure. The root node is always at index 0. To calculate the index of each child use 2*index+1 and 2*index+2. Here is a diagram of the heap shown as a tree.



36. B Identity for Exclusive OR
37. A Same as (1 + 2) * 9 – 5
38. C Each recalculation of the hash value within the for loop includes modulus division by 100. Therefore the value returned by hashFun can never be greater than 99 regardless of the value of key.
39. -80 Both values are negative because their sign bits are 1. To convert to decimal take the complement, add one and convert to decimal. (-51)+(-29)=-80
40. 66 The formula to calculate edges is 1/2n(n-1). ½*12*11=66.