★ANSWER KEY – CONFIDENTIAL★

UIL COMPUTER SCIENCE – 2018 INVITATIONAL B

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

1) E	11) E	21) C	31) B
2) A	12) A	22) A	32) C
3) C	13) B	23) E	33) D
4) D	14) B	24) B	34) B
5) A	15) C	25) C	35) E
6) E	16) D	26) A	36) C
7) B	17) E	27) D	37) E
8) D	18) D	28) D	38) A
9) B	19) B	29) E	*39) 5
10) C	20) A	30) A	*40) –72

** 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:

<table>
<tr><td>1.</td><td>E</td><td>Cut the binary value into two four bit pieces. 1100 and 1000. Then convert those to the hexadecimal digits of the new number. $1100_2=12_{10}=C_{16}$. $1000=8_{10}=8_{16}$. Therefore $11001000_2 = C8_{16}$.</td></tr>
<tr><td>2.</td><td>A</td><td>15+((19-11)*10)-17=
15+(8*10)-17=
15+80-17=
95-17=
78</td></tr>
<tr><td>3.</td><td>C</td><td>The <code>print</code> method does not advance the cursor to the next line. <code>\n</code> is the escape sequence for a new line and <code>\t</code> is the escape sequence for a tab</td></tr>
<tr><td>4.</td><td>D</td><td>The <code>concat</code> method concatenates (adds) its arguments to the string <code>s</code>. There are no spaces in the original strings so none are added by <code>concat</code>.</td></tr>
<tr><td>5.</td><td>A</td><td>!(true&&!(false||true))=
!(true&&!true)=
!(true&&false)=
!false=
true</td></tr>
<tr><td>6.</td><td>E</td><td><code>round</code> returns a long. <code>floor</code> requires a <code>double</code> argument and returns a <code>double</code> which cannot be assigned to an <code>int</code> variable.</td></tr>
<tr><td>7.</td><td>B</td><td>8+(int)(4.25+7.60)=
8+(int)11.85=
8+11= //Casting truncates the decimal portion of the value.
19</td></tr>
<tr><td>8.</td><td>D</td><td>Java is case sensitive so the first two conditions are false. Once a condition is true, the remainder of the if/else statement is skipped.</td></tr>
<tr><td>9.</td><td>B</td><td>1 + 3 = 4
4 + 3 = 7
7 + 3 = 10 Stop before entering the loop body again.</td></tr>
<tr><td>10.</td><td>C</td><td>
<table>
<tr><td>original list</td><td>2</td><td>5</td><td>0</td><td>1</td><td>4</td><td>3</td></tr>
<tr><td><code>list[2]=list[0]</code></td><td>2</td><td>5</td><td>2</td><td>1</td><td>4</td><td>3</td></tr>
<tr><td><code>list[5]=list[2]</code></td><td>2</td><td>5</td><td>2</td><td>1</td><td>4</td><td>2</td></tr>
<tr><td><code>list[list[1]]=list[4]</code></td><td>2</td><td>5</td><td>2</td><td>1</td><td>4</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>11.</td><td>E</td><td>All of the tokens in <code>datafile.dat</code> can be interpreted as strings, integers or real numbers (double).</td></tr>
<tr><td>12.</td><td>A</td><td>
<table>
<tr><td>m</td><td>n</td><td>p</td></tr>
<tr><td>10</td><td>1</td><td>1</td></tr>
<tr><td>8</td><td>2</td><td>11</td></tr>
<tr><td>6</td><td>3</td><td>27</td></tr>
<tr><td>4</td><td>4</td><td>45</td></tr>
<tr><td>2</td><td>5</td><td>61</td></tr>
<tr><td>0</td><td>6</td><td>71</td></tr>
</table>
</td></tr>
<tr><td>13.</td><td>B</td><td>type cast then * then <= then == then | (bitwise OR)</td></tr>
<tr><td>14.</td><td>B</td><td>The size method returns the memory required to store a value of this type.</td></tr>
<tr><td>15.</td><td>C</td><td>The argument for remove refers to the index value. Therefore the 3 is removed from the list.</td></tr>
<tr><td>16.</td><td>D</td><td>The outer loop steps through each row. The inner loop traverses each row searching for the largest value and placing it into variable <code>r</code>. When the inner loop stops, <code>r</code> is added to variable <code>a</code>. When the outer loop stops, <code>a</code> (the sum) is returned.</td></tr>
<tr><td>17.</td><td>E</td><td><code>set</code> replaces the current element with the new one at the designated index value. <code>get</code> returns but does not remove the element from the list.</td></tr>
<tr><td>18.</td><td>D</td><td>The delimiter “a” is removed from the string. Where the delimiter occurs in succession, an empty string is placed in the array. Here is the contents of the array <code>t</code>:
<table>
<tr><td>Ante</td><td>ters h</td><td>te</td><td>empty string</td><td>rdv</td><td>rks</td></tr>
</table>
</td></tr>
</table>

19.	B	The statement is equivalent to:
		`if(f%2>e/90)`
		`  g=e%2;`
		`else`
		`  g=f/90;`

20.	A	`mid` represents the middle element of each segment of the array to be searched.
21.	C	At this point the element being searched for has been found at `list[mid]`.
22.	A	Run time efficiency of a binary search is O(log n). More specifically, $\log_2 n$. Because the list is cut in half with each pass. $\log_2 n=1024$ which means n=10 because $2^{10}=1024$. Another way to look at it is two see how many times 1024 can be divided by 2. 1024 | 512 | 1 256 | 2 128 | 3 64 | 4 32 | 5 16 | 6 8 | 7 4 | 8 2 | 9 1 | 10
23.	E	If ????? is replaced with `ArrayList` and the `java.util` package is imported the line with the missing code will compile, however, the lines that follow that contain the `add` method will not compile because they have a string argument.
24.	B	`ds` is a stack, which means the last element placed into `ds` will be the first one to come out. The call to `remove` pops "dust" off of the stack. `next` returns, but does not remove, the item that is on top of the stack which in this case is "hail"
25.	C	Since `ds` is a stack, elements are removed in a first in, last out fashion.
26.	A	`isEmpty` returns true when no elements are left in `ds`.
27.	D	See #24 and #25.
28.	D	`public` is a reserved word (keyword).
29.	E	Constructor methods do not have a return type. Answers A, C, and D will not compile. Answer choice B will compile if used but the method will no longer serve as a constructor if it has a return type.
30.	A	To instantiate an object there must be a call to a constructor. Choice A is the only answer choice that includes a call to the `Student` class constructor.
31.	B	s1 and s2 refer to two different objects even though each object's instance variables contain the same values.
32.	C	x | y | z 25 | 12 | 2 23 | 11 | 3 20 | 6 | 4 16 | 4 | 5 12 | 2 | 6 10 | 1 | 7
33.	D	During each pass of a selection sort the smallest element (in this case) is selected from the list and swapped with the first element. Then the index number of the first element is icremented to account for those elements that have already been placed in order.
34.	B	Bit shift operators are done left to right. 2<<3>>4= $(2*2^3)/2^4$= 2*8/16= 16/16= 1
35.	E	The `sort` method within the `Collections` class requires that the collection to be sorted contain objects that are derived from a class that implements the `Comparable` interface and subsequently have a `compareTo` method.

36.	C	<table><tr><th>A</th><th>B</th><th>A*B+A</th></tr><tr><td>T</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>T</td></tr><tr><td>F</td><td>T</td><td>F</td></tr><tr><td>F</td><td>F</td><td>F</td></tr></table> <table><tr><th>A</th><th>B</th><th>A*B⊕A</th></tr><tr><td>T</td><td>T</td><td>F</td></tr><tr><td>T</td><td>F</td><td>T</td></tr><tr><td>F</td><td>T</td><td>F</td></tr><tr><td>F</td><td>F</td><td>F</td></tr></table> <table><tr><th>A</th><th>B</th><th>A+B⊕A</th></tr><tr><td>T</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>T</td></tr><tr><td>F</td><td>T</td><td>T</td></tr><tr><td>F</td><td>F</td><td>F</td></tr></table> <table><tr><th>A</th><th>B</th><th>A⊕B⊕A</th></tr><tr><td>T</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>F</td></tr><tr><td>F</td><td>T</td><td>T</td></tr><tr><td>F</td><td>F</td><td>F</td></tr></table> <table><tr><th>A</th><th>B</th><th>A+B*A</th></tr><tr><td>T</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>T</td></tr><tr><td>F</td><td>T</td><td>F</td></tr><tr><td>F</td><td>F</td><td>F</td></tr></table>
37.	E	Each node contains the element and a reference variable that points to the next node in the list.
38.	A	15 4 2 * 3 5 + / - 15 (4*2) (3+5) / - 15 ((4*2) / (3+5)) - 15 - 4*2 / (3+5)
39.	5	A pair of vertices are adjacent if they are connected by an edge.
40.	-72	We know the decimal value is negative since the left most bit is one. Start by taking the complement (flip the bits) which gets 01000111. Then add one to get 01001000. Convert to decimal to get 72 and we know it is negative so the answer is -72.