

Computer Science Competition

December 8, 2018

General Directions (Please read carefully!):

- 1) DO NOT OPEN EXAM UNTIL TOLD TO DO SO.
- 2) **NO CALCULATORS OF ANY KIND MAY BE USED.**
- 3) There are 40 questions on this contest exam. You have 45 minutes to complete this contest. If you are in the process of actually writing an answer when the signal to stop is given, you may finish writing that answer.
- 4) Papers may not be turned in until 45 minutes have elapsed. If you finish the test before the end of the allotted time, remain at your seat and retain your paper until told to do otherwise. You may use this time to check your answers.
- 5) All answers must be written on the answer sheet/Scantron card provided. Indicate your answers in the appropriate blanks provided on the answer sheet or on the Scantron card. Clean erasures are necessary for accurate Scantron grading.
- 6) You may place as many notations as you desire anywhere on the test paper, but not on the answer sheet or Scantron card which are reserved for answers only.
- 7) You may use additional scratch paper provided by the contest director.
- 8) All questions have ONE and only ONE correct (BEST) answer. There is a penalty for all incorrect answers. **All provided code segments are intended to be syntactically correct, unless otherwise stated. Ignore any typographical errors and assume any undefined variables are defined as used.**
- 9) A reference to commonly used Java classes is NOT provided at the end of the test, and you CANNOT use a reference sheet during the contest. There will be no reference sheets to detach from the test booklet, and DO NOT TRY TO UNTIL THE CONTEST BEGINS.
- 10) Assume that any necessary import statements for standard Java packages and classes (e.g. `.util, ArrayList, etc.`) are included in any programs or code segments that refer to methods from these classes and packages.
- 11) Correct responses are based on Java JDK v8.0, from Sun Microsystems, Inc.

Scoring:

- 1) All questions will receive **6 points** if answered correctly; **no points** will be given or subtracted if unanswered; **2 points** will be deducted for an incorrect answer.

CY WOODS UIL COMPUTER SCIENCE WRITTEN TEST

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. **For all output statements, assume that the System class has been statically imported using:**

```
import static java.lang.System.*;
```

Question 1

Which of the following is not equivalent to 420_{10} ?

A) 110100100_2

B) 12210_4

C) 644_8

D) 3142_5

E) $1A4_{16}$

Question 2

What is output by the code segment to the right?

A) 19

B) 63

C) 88

D) 53

E) No output due to an error.

```
out.println( 5 + 6 * 8 );
```

Question 3

What is output by the code segment to the right?

A) 12345

B) 1234

C) 123

D) 15

E) 17

```
String h="1-2-3-4-5";  
h = h.replace( "-", "" );  
out.println(h);
```

Question 4

What is output by the code segment to the right?

A) 2.125

B) 2.120

C) 2.13

D) 2.5

E) No output due to an error.

```
out.printf("%.2f",2.125);
```

Question 5

Which of these boolean expressions evaluate to false?

A) `true || true && false`

B) `true ^ false`

C) `!(false ^ false || false ^ true)`

D) `!false`

E) `false || true || false ^ false`

Question 6

What is output by the code segment to the right?

A) 10.0

B) 64.0

C) 128.0

D) 180.0

E) 32.0

```
out.println(Math.pow(2,5));
```

<p>Question 7</p> <p>What is output by the code segment to the right?</p> <p>A) 20 B) 17 C) 71 D) 18 E) 72</p>	<pre>int x=17; int y=70; int z= y++ + x%2; out.println(z);</pre>
<p>Question 8</p> <p>What is output by the code segment to the right?</p> <p>A) yeet B) yeet212 C) yeetnope212 D) yeet7<212nope212 E) There is no output due to a syntax error.</p>	<pre>int h=23; switch(h) { case 23:out.print("yeet"); case 34:out.print("7<212"); default:out.print("nope"); } out.print(212);</pre>
<p>Question 9</p> <p>What is output by the code segment to the right?</p> <p>A) 10 B) 11 C) 9 D) 1 E) 20</p>	<pre>String h=""; for(int y=0;y<10;y++) h += "*"; out.println(h.length());</pre>
<p>Question 10</p> <p>What is output by the code segment to the right?</p> <p>A) 70 B) 71 C) 420 D) 421 E) 212</p>	<pre>int[]h= {17, 212, 420, 70, 666}; h[1]=h[3]; h[4]=h[3]; h[2]=h[1]; h[1]++; out.println(h[2]);</pre>
<p>Question 11</p> <p>What is output by the code segment to the right?</p> <p>A) 66 B) 7 C) 63 D) 78 E) There is no output due to an error.</p>	<pre>String s="12 3 63 7 12 5 7 -1 3 -2 -2"; Scanner sc=new Scanner(s); sc.nextInt(); sc.nextInt(); out.print(sc.nextInt());</pre>
<p>Question 12</p> <p>What is output by the code segment to the right?</p> <p>A) 5 B) 10 C) 15 D) 20 E) 25</p>	<pre>int y = 0; while(y < Short.SIZE) { y += 5; } out.println(y);</pre>
<p>Question 13</p> <p>What is the correct order of precedence for the operations to the left?</p> <p>A) I, III, V, II, IV B) I, III, IV, II, V C) III, II, V, I, IV D) I, II, V, III, IV E) III, I, V, II, IV</p>	<p>I. new (object creation) II. ++ (pre increment) III. ++ (post increment) IV. + (additive) V. + (unary)</p>

<p>Question 14</p> <p>What is output by the code segment to the right?</p> <p>A) -212 B) -211 C) 212 D) 211 E) -213</p>	<pre>out.println(~212);</pre>
<p>Question 15</p> <p>What is output by the line marked //1 in the code segment to the right?</p> <p>A) [212, 17, 81, 3, 2] B) [212, 17, 81, 2, 3] C) [212, 17, 4, 81, 3] D) There is no output due to a syntax error. E) There is no output due to a runtime error.</p>	<pre>ArrayList<Integer>a; a=new ArrayList<Integer>(); a.add(212); a.add(17); a.add(81); a.add(3); a.add(a.size(), 2); out.println(a); //1</pre>
<p>Question 16</p> <p>Assuming any error above has been corrected, what is output by the line marked //2 ?</p> <p>A) [212, 17, 81, 3] B) [212, 81, 3, 2] C) [212, 17, 3, 2] D) There is no output due to a syntax error. E) There is no output due to a runtime error.</p>	<pre>a.remove(new Integer(2)); out.println(a); //2</pre>
<p>Question 17</p> <p>What is output by the code segment to the right?</p> <p>A) [2, 3, 5, 7, 12, 9, 0, 6] B) [2, 5, 3, 7, 12, 9, 0, 6] C) [2, 3, 5, 7, 9, 12, 0, 6] D) [2, 5, 3, 7, 9, 12, 0, 6] E) There is no output due to a syntax error.</p>	<pre>int[]a= {2,5,12,3,7,9,0,6}; Arrays.sort(a,1,5); out.println(Arrays.toString(a));</pre>
<p>Question 18</p> <p>What is output by the code segment to the right?</p> <p>A)6, 5, 7, 13 8, 11, 11, 15 14, 14, 15, 15 7, 3, 9, 14</p> <p>B)1, 5, 9, 13 2, 6, 10, 14 3, 7, 11, 15 4, 8, 12, 16</p> <p>C)6, 8, 14, 7 5, 11, 14, 3 7, 11, 15, 9 13, 15, 15, 14</p> <p>D)15, 10, 7, 4 6, 10, 8, 8 15, 10, 8, 11 12, 8, 12, 11</p> <p>E)5, 6, 3, 5 5, 11, 7, 3 15, 11, 14, 6 13, 14, 15, 3</p>	<pre>int[][]mat= { {1, 2, 3, 4}, {5, 6, 7, 8}, {9, 10, 11, 12}, {13, 14, 15, 16}}; for(int r=0;r<4;r++) for(int c=0;c<4;c++) { if(mat[r][c]%2==0) mat[r][c]=mat[4-c-1][3*2%4]; else mat[c][r]=mat[(r+13)%4][c/2+1]; } for(int i=0;i<4;i++) { String s=""; for(int j=0;j<4;j++) { s+=mat[j][i]+", "; } out.println(s.substring(0,s.length()-2)); }</pre>

<p>Question 19</p> <p>What is output by the code segment above //comment 1 to the right?</p> <p>A) 1 B) 3 C) 2 D) 12 E) There is no output due to syntax error.</p>	<pre>class Shroud{ int _17; public Shroud(int v) {_17=v;} } static boolean one(Shroud a,Shroud b) { a._17+=4; b._17+=7; return a._17<b._17; } static boolean two(Shroud a,Shroud b) { a._17+=2; return b._17<=a._17; }</pre>
<p>Question 20</p> <p>Assuming any above error has been corrected, what is output by the code segment above //comment 2 to the right?</p> <p>A) 26 B) 20 C) 17 D) 24 E) There in no output due to a syntax error.</p>	<pre>////client code//////////////////////////////////// Shroud a=new Shroud(9); Shroud b=new Shroud(6); if(one(a,b) && two(b,a)) out.println(1); else out.println(2); //comment 1 one(b,b); out.println(b._17); //comment 2</pre>
<p>Question 21</p> <p>What is output by the code segment to the right?</p> <p>A) 110111 B) 110101 C) 011010 D) 101010 E) There is no output due to a runtime error.</p>	<pre>int y=212>>2; String k=Integer.toBinaryString(y); out.println(k);</pre>
<p>Question 22</p> <p>What is output by the code segment to the right?</p> <p>A) True B) False C) true D) false E) There is no output due to a syntax error.</p>	<pre>out.println(212 > 7);</pre>
<p>Question 23</p> <p>What is output by the line marked //1 code segment to the right?</p> <p>A) [3, 4, 212, 8, 5] B) [17, 212, 5, 8, 5] C) [4, 17, 5, 8, 5] D) [5, 5, 8, 17, 212] E) There is no output due to syntax error.</p>	<pre>Stack<Integer>s=new Stack<Integer>(); s.push(3); s.push(4); s.push(17); s.pop(); s.push(212); s.push(5); s.pop(); s.add(8); s.push(5);</pre>
<p>Question 24</p> <p>Assuming an above error has been corrected, what is output by the line marked //2 code segment to the right?</p> <p>A) 3 B) 212 C) 2 D) -1 E) There is no output due to a syntax error.</p>	<pre>out.println(s); //1 out.println(s.search(212)); //2</pre>

Question 25

Which of the following can replace **<blank>** in the code segment to the right so that the code runs without error?

- A) <Double, String>
- B) <>
- C) <String, String>
- D) <Map>
- E) A and B only

```
Map<Double, String> m;
m = new TreeMap <blank> ();
m.put(3.4, "dog");
m.put(4.4, "pig");
m.put(5.4, "ant");
```

Question 26

Assuming **<blank>** is filled correctly, what is output by line **//1** in the code segment to the right?

- A) dog
- B) pig
- C) false
- D) null
- E) There is no output due to a syntax error.

```
System.out.println(m.put(3.4, "cat")); //1
```

Question 27

Which of the following can replace **<blank>** in the code segment to the right so that the code runs without error?

- A) name=n; super.y=a;
- B) this(a,n);
- C) Wildcat(a,n);
- D) super(a,n);
- E) More than one of the above.

```
class Wildcat{
private int y;
String name;
public Wildcat(int a,String n) {
    y=a;
    name=n;
}
public int get() {
    return y;
}
}
```

Question 28

Assuming **<blank>** is filled correctly, what is output by the client code to the right?

- A) 7
- B) 6
- C) 14
- D) 12
- E) Output cannot be determine until runtime.

```
class Hyena extends Wildcat{
private int y;
public Hyena(int a,int b,String n) {
    <blank>
    y=b;
}
}
```

Question 29

What is output by client code if the block comments in class Hyena are removed?

- A) 14
- B) 7
- C) 12
- D) 6
- E) There is no output due to a syntax error.

```
/*
public int get() {
    return y*2;
}
*/

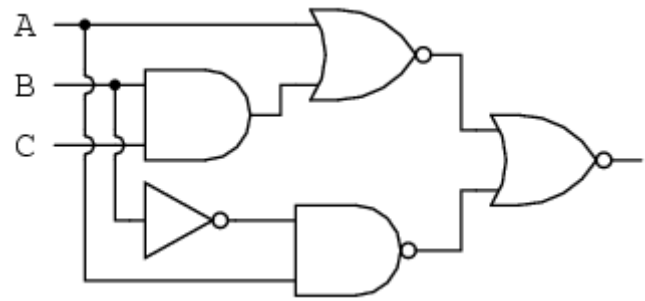
public int fun() {
    return get();
}
}

////////////////////////////////////
////////////////////////////////////client code////////////////////////////////////
Hyena c=new Hyena(6,7,"Heath");
out.println(c.fun());
```

Question 30

What is equivalent to the Boolean logic circuit to the right?

- A) $!(!(A || B \& \& C) || !(B \& \& A))$
- B) $(A || B \& \& C) || (B \& \& C)$
- C) $!(!(A \& \& (B || C)) \& \& !(B || C))$
- D) true
- E) $!(A || B || C) \& \& !(C \& \& B \& \& A) || !C$



Question 31

What is output by the line marked **//q31** code segment to the right?

- A) 10
- B) 11
- C) 12
- D) 13
- E) There is no output due to a runtime error.

```
public static int recur(int y,int x) {
    if(y==x)
        return 1;
    if(y>x)
        return 1+recur(y-x,x+2);
    return 2+recur(x-y,y+2);
}
```

Question 32

What is output by the line marked **//q32** code segment to the right?

- A) 12
- B) 13
- C) 14
- D) 15
- E) There is no output due to a runtime error.

```
////////////////////////////////////
////////////////////////////////client code////////////////////////////////
out.println(recur(20, 6)); //q31
out.println(recur(30, 7)); //q32
```

Question 33

What is the most restrictive runtime of the Quicksort algorithm when given an array where all values are identical?

- A) $O(n \log n)$
- B) $O(n)$
- C) $O(n^2)$
- D) $O(1)$
- E) $O(\log n)$

Question 34

What could replace **<blank>** in the code segment to the right so the output will be true?

- A) "el yeet el Dud3!!"
- B) "(\d) | (\D) "
- C) "[0-a]+"
- D) ".{16}"
- E) More than one of the above.

```
String s= <blank>;
String h="el yeet el Dud3!!";
out.println(h.matches(s));
```

Question 35

What is output by the code segment to the right?

- A) 5
- B) 147
- C) 7
- D) 212
- E) 149

```
String s="212";
int sum=0;
for(char c:s.toCharArray())
    sum+=c;
out.println(sum);
```

<p>Question 36</p> <p>What is output by the code segment to the right?</p> <p>A) [-1, 4, 2, 7, 6, 8, 5] B) [2, 5, 4, 8, 6, 7, 5] C) [2, 4, 5, 5, 6, 7, 8] D) [7, 5, 6, -1, 2, 4, 5] E) There is no output due to a runtime error.</p>	<pre>PriorityQueue<Integer> pq; pq=new PriorityQueue<Integer>(); pq.add(5);pq.add(6); pq.add(7);pq.add(8); pq.add(2);pq.add(4); pq.add(5);pq.add(-1); pq.poll(); out.println(pq);</pre>
<p>Question 37</p> <p>What is the last value popped from the queue pseudocode to the right (pop=dequeue, push=enqueue)?</p> <p>A) 9 B) 8 C) 17 D) 3 E) 212</p>	<pre>Push 5 Push 1 Push 7 Push 8 Push 9 Pop X Push 9 Pop X Push 3 Pop X Push 8 Pop X Push 212 Push 17 Pop X</pre>
<p>Question 38</p> <p>What is the next value to be popped from the queue pseudocode to the right (pop=dequeue, push=enqueue)?</p> <p>A) 212 B) 17 C) 9 D) 3 E) 8</p>	
<p>Question 39</p> <p>What is the value of the following postfix expression?(use Integer division)</p> <p>5 4 * 6 7 + 2 3 / - * 5 21 + 17 - +</p>	
<p>Question 40</p> <p>What is the level-order traversal of the binary search tree created by inserting the following values in order with duplicates going to the left?</p> <p>4 6 2 212 17 420 70 -2 4 1 0</p>	