Taylor High School Computer Science Competition

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 provided at the end of the test, and you may use this reference sheet during the contest. You may detach the reference sheets from the test booklet, but DO NOT DO SO 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.

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.

Note: Correct responses are based on Java, J2sdk v 7.0, from Sun Microsystems, Inc. All provided code segments are intended to be syntactically correct, unless otherwise stated (i. e. `error` is an answer choice) and any necessary Java 2 Standard Packages have been imported. Ignore any typographical errors and assume any undefined variables are defined as used.

QUESTION 1

What is 107_8 times 34_5 ?

A. 1349_8 B. 3638_5 C. 26042_7 D. 2505_8 E. 2505_5

QUESTION 2

What is the output of the code to the right?

A. 22 B. 22.0 C. 22.2 D. 16.0 E. 16.2

```
double a = 6.2;
double b = 4.0;
a += b *4;
out.println(a);
```

QUESTION 3

What is the output of the code to the right?

A. +84969.470

B. 84969.470

C. +84969.4699

D. 84969.4699

E. 84970.0

```
double d = 84969.4699;
out.printf("%+3.3f",d);
```

QUESTION 4

What is the output of the code to the right?

A. Funnel Cakes!

B. nel Ca

C. el Cak

D. nnel C

E. nel Cak

```
String s = "Funnel Cakes!";
out.println(s.substring(3,9));
```

QUESTION 5

What is the output of the code to the right?

A. true true B. true false C. false true

D. false false E. yes no

```
boolean a = false;
boolean b = a;
out.print(a||b);
out.print(" ");
out.print(!a||b);
```

QUESTION 6

What is the output of the code to the right?

A. 20 B. 20.0 C. 2 D. 2.0 E. 200.0

```
out.println(Math.max
  (20,Math.sqrt(Math.min(4,9))));
```

QUESTION 7

What is the output of the code to the right?

A. 421 B. 426 C. 428 D. 328 E. 427

```
int x = 213;
int y = x++;
out.println((x++) + (y--));
```

QUESTION 8

What is the output of the code to the right?

A. Hello!#Good-Bye!

B. Good-Bye!

C. Hello!#

D. No output due to a syntax error

E. No output due to a runtime error

```
if(true) {
    out.print("Hello!");
    out.print("#");
}
else if(true) {
    out.print("Good-Bye!");
}
```

QUESTION 9

What is the output of the code to the right?

A. 8 6 4 2 B. 8 6 4 C. 6 4 2 D. 6 4 E. 6 4 2.5

```
int x = 8;
while(x>=3.5) {
    x-=2;
    out.print(x + " ");
}
```

QUESTION 10

What is the output of the code to the right?

A. 1 B. 4 C. 2 D. 3 E. 6

```
int[] wolf =
  {6, 4, 2, 3, 3, 0, 5, 9, 1, 2};
out.println(wolf[wolf[wolf[7]]]);
```

QUESTION 11

What is the output of the code to the right?

A. 36! B. 24! C. 16! D. 42! E. 64!

```
Scanner a = new
    Scanner("1,2\n3,4\n5,6");
a.useDelimiter("\n");
int x = 0;
while(a.hasNextLine()) {
    int y = 0;
    Scanner b = new
        Scanner(a.nextLine());
    b.useDelimiter(",");
    while(b.hasNextInt())
        y+=b.nextInt();
    x+=2*y;
}
out.println(x+"!");
```

QUESTION 12

What is the output of the code to the right?

A. 3 B. 9 C. 18 D. 24 E. 27

```
int total = 3;
for(int x = 12; x>=0; x=x-4) {
    total+=x;
}
out.println(total);
```

QUESTION 13

What is the output of the code to the right?

A. 29 B. -29 C. 18 D. -18 E. 6

```
int c = 6;
int p =-3;
out.println(c/p+p*c-p*p);
```

QUESTION 14

What is the output of the code to the right?

A. tocking

B. tockleing

C. booming

D. tickleing

E. No output due to a runtime error

```
int x = Integer.MAX_VALUE+1;
int y = Integer.MIN_VALUE-1;
int i = y+1;
int a = Integer.MAX_VALUE;
int b = Integer.MIN_VALUE;
if(x==b&&y==a)
    out.print("tick");
else if(x==b)
    out.print("tock");
else
    out.print("boom");
if(i==-i&&i!=0)
    out.println("leing");
else out.println("ing");
```

QUESTION 15

What is the output of the code to the right?

A. [[1, 2], [2, 4]]

B. [[2, 2], [2, 2]]

C. [[1, 2], [2, 1]]

D. [[4, 2], [2, 1]]

E. No output due to a syntax error

```
ArrayList<ArrayList<Integer>> a;
a = new
    ArrayList<ArrayList<Integer>>();
for(int x = 0; x < 2; x++) {
    a.add(new ArrayList<Integer>());
    for(int y = 1; y <= 2; y++)
        a.get(x).add(y*(x+1));
}
out.println(a);
```

QUESTION 16

What is the output of the code to the right ?

A. 512 B. 511 C. 1000 D. 1024 E. 1001

```
int x = 1;
for(;x<=1000;) { x*=2; }
System.out.println(x);
```

QUESTION 17 Questions 17 – 19 refer to the following class.

What is the output of the following client code?

```
System.out.println(new WrittenTest());
```

A. 0

B. 1

C. 13.37

D. There is no output due to a runtime error.

E. There is no output due to a syntax error.

QUESTION 18

What is the output of the following client code?

```
WrittenTest hard = new WrittenTest(1);
hard.setD(2);
out.print(hard.getD()*(WrittenTest.b()/2));
```

A. 13.37 B. 6.685 C. 26.74

D. No output due to a syntax error

E. No output due to a runtime error

QUESTION 19

What is the output of the following client code?

```
int x = 0;
WrittenTest a = new WrittenTest(13);
WrittenTest b = new WrittenTest(13);
if((a==b||a.equals(b))&&++x==1337)
    out.print("based");
out.println(String.format("%(-3d",(x+419)));
```

A. based420

B. based64

C. 64

D. 420

E. 419

```
class WrittenTest {
        private int d;
        private final static double
            wow = 13.37;
        public WrittenTest(int d) {
            d = this.d = d;
        }
        public void setD (int d) {
            this.d = d;
        }
        public int getD () {
             return d;
        }
        public static double b() {
             return wow;
        }
}
```

QUESTION 20

What is the output of the following function call?

```
out.println(wot(5,0,wot(4,2,0)-3));
```

A. 13 B. 128 C. 127 D. 32 E. 31

```
int wot(int x, int y, int z) {
    return x==y?z:wot(x, y+1, 2*z+1);
}
```

QUESTION 21

What is the output of the code to the right?

A. `wawaweewa`

B. `wewawawee`

C. `wewewewoo`

D. `wawaweewo`

E. `wewawawee`

```
StringBuffer b = new
    StringBuffer("waw"+"a");
b=new StringBuffer(b+"wee");
b.append("wa");
int x = b.length();
out.println(b.replace(x-2,x,"wo"));
```

QUESTION 22

What is the output of the following client code?

```
String a = "up ", b = "7urn ", c = "#y0";
a = hi(b, b=a);
c=c.concat("l0");
out.println(a+b+c);
```

A. `7urn up #y0l0`

B. `up 7turnl0#y0`

C. `#y0l0up 7urn`

D. No output due to a syntax error

E. No output due to a runtime error

```
static String hi(Object a, Object b)
{
    return (String)a+" ";
}
```

QUESTION 23

What is the output of the code to the right?

A. `@@@` B. `[[[` C. `BID`

D. No output due to a runtime error

E. Output varies every run

```
byte[] B = {13};
int[] I = {1337};
double[] D = {13.37};
String s = B.toString().charAt(1)+"";
s+=I.toString().charAt(B[0]-12);
s+=D.toString().charAt(1);
out.println(s);
```

QUESTION 24

What is the output of the following client code?

```
int[] a = {5,91,49,89,21};
int b = a.length-1;
bb(a,0,b-1);
out.println(Arrays.toString(a));
```

A. `[91, 89, 49, 21, 5]`

B. `[5, 21, 49, 89, 91]`

C. `[5, 91, 49, 89, 21]`

D. `[5, 49, 89, 91, 21]`

E. `[21, 5, 49, 89, 91]`

```
static void bb(int[] x, int f, int l)
{
    if(f<l&&l>0){
        if(x[f]>x[f+1]) {
            x[f]=x[f]+x[f+1];
            x[f+1]=x[f]-x[f+1];
            x[f]=x[f]-x[f+1];
        }
        bb(x,f+1,l);
        bb(x,f,l-1);
    } else return;
}
```

QUESTION 25

What is the output of the code to the right?

A. `[R, a, l, p, h, i, e]`

B. `['R', 'a', 'l', 'p', 'h', 'i', 'e']`

C. `Ralphie`

D. No output due to a syntax error

E. Output varies every run

```
char[] a =
    {'R','a','l','p','h','i','e'};
out.println(a);
```

QUESTION 26

What is the output of the code to the right?

A. `Based Mathematician`

B. `Child Prodigy`

C. `true`

D. `false`

E. No output due to a syntax error

```
int bauss = 100;
int answer = bauss*(bauss+1);
answer/=2;
int wow = 0;
for(;bauss>=1;bauss--) wow+=bauss;
String b = "Based Mathematician";
String c = "Child Prodigy";
out.println(!(wow==answer)?b:c);
```

QUESTION 27

What is the output of the code to the right?

A. `bcpk` B. `back` C. `bk` D. `kappa` E. `bpak`

```
String[] a = {"a","b","c","d"};
String[] b = {"k","a","p","p","a"};
TreeMap<String,String> c = new
TreeMap<String,String>();
for(int d = 0; d < a.length; d++) {
    String e = a[d/2+1];
    c.put(e,b[-(-a.length+1+d)]);
}
for(String s:c.keySet())
    out.print(s+c.get(s));
```

QUESTION 28

What is the output of the code to the right?

A. `Java 9 Arrow Notation is #1`

B. `Java 8 Arrow Notation is #1`

C. `Java 7 Arrow Notation is #1`

D. No output due to a syntax error

E. No output due to a runtime error

```
int x = 16;
for (;x --> 8;);
out.print("Java ");
out.print(x+" Arrow Notation ");
out.println("is #"+1);
```

QUESTION 29

What is the output of the code to the right?

A. `-0+(0)=-0`

B. `0+(0)=-0`

C. `-0+-0=-0`

D. `0+-0=-0`

E. `0+0=-0`

```
String s = String.format("%(1d",-0);
out.println((-0)+"+"+s+"=-0");
```

QUESTION 30

What is the output of the code to the right?

A. `B52` B. `N63` C. `L51` D. `N64` E. `L54`

```
int[][][] oculus = {
    {{1,2},{3,4}}, {{5,6},{7,8}}
};
char a = 'A';
a+=oculus[1][1][1]+oculus[1][0][0];
String b =
oculus[1][0][1]+""+oculus[0][1][0];
out.println(a+""+b);
```

QUESTION 31

What is the complexity of the following code assuming the final variable `LEN` is the length of the array and equal to `N`?

Choose the most restrictive and correct answer.

A. $O(1)$ B. $O(N^2)$ C. $O(N^3)$

D. $O(N \log N)$ E. $O(N^2 \log N)$

```
int[] a = new int[LEN];
int c = a.length;
for(int x = 0; x < c; x++)
    for(int b = 0; b < c; b++)
        for(int y = 0; y < c; y*=2)
            a[x]+=y;
```

QUESTION 32

What is the output of the code to the right?

A. `[48, 12, 42, 63, 6]`

B. `[12, 6, 48, 42, 63]`

C. `[1, 63, 6, 5, 48]`

D. `[48, 5, 6, 63, 1]`

E. `[6, 12, 42, 63, 48]`

```
PriorityQueue<Integer> a = new
PriorityQueue<Integer>();
a.add(1);
a.add(63);
a.add(42);
a.remove();
a.add(6);
a.add(5);
a.add(12);
a.remove();
a.add(48);
out.println(a);
```

QUESTION 33

What is the output of the code to the right?

A. `[5, 4, 3, 2, 1]`

B. `[1, 2, 3, 4, 5]`

C. `[6, 5, 4, 3, 2, 1]`

D. `[1, 2, 3, 4, 5, 6]`

E. `[5, 4, 3, 2, 1, 1]`

```
TreeSet<Integer> groot;
groot = new TreeSet<Integer>(
    new Comparator<Integer>() {
        public int compare(Integer a,
Integer b) {
        return -(a.compareTo(b));
    }
});
groot.add(1);
for(int x = 1; x < 6; x++)
    groot.add(x);
out.println(groot);
```

QUESTION 34

What is the output of the code to the right?

A. `a feeling hooked on`

B. `on a feeling hooked`

C. `feeling on a hooked`

D. `hooked on a feeling`

E. `feeling a hooked on`

```
String[] hiss = {"hooked", "on", "a",
"feeling"};
ArrayList<String> starlord = new
ArrayList<String>() {
    public boolean add(String s) {
        this.add(0,s);
        return true;
    }
};
for(String boo:hiss)
    starlord.add(boo);
Collections.reverse(starlord);
for(String yes:starlord)
     out.print(yes+" ");
```

QUESTION 35

What is the output of the code to the right?

A. `1.0` B. `0.0e+00` C. `0.0^0`

D. `3.14^0` E. `1.0e+00`

```
double[] unitCircle =
    {Math.PI/3, Math.PI/6};
double knowIt =
    Math.sin(unitCircle[1]);
knowIt+=Math.cos(unitCircle[0]);
out.printf("%.1e%n", knowIt);
```

QUESTION 36

What is the output of the following client code?

```
out.println(Arrays.toString(lol(10,9001,10,9001)));
```

A. `[true, true]` B. `[true, false]`

C. `[false, true]` D. `[false, false]`

E. No output due to a syntax error

```
static boolean lol(Integer x, Integer
y, Integer a, Integer b)[] {
    return new boolean[]{x==a, y==b};
}
```

QUESTION 37

What is the output of the following client code?

```
try {
    Bar[] foo = new Bar[19];
    out.print(foo[10].rab+" ");
} catch(NullPointerException e) {
    out.print("NPE_WOW ");
} finally {
    try {
        Baz i = new Baz();
        out.println(i.lol());
    } catch(Exception e) {
        out.println("NPE_WOW");
    }
}
```

A. `null NPE_WOW` B. `NPE_WOW NPE_WOW` C. `19 1`

D. `19 NPE_WOW` E. `0 NPE_WOW`

```
class Foo {
    Integer id = null;
    public Integer getId() {
        return id;
    }
}
class Bar extends Foo {
    static final int rab = 19;
}
class Baz extends Foo {
    public Integer lol() {
        Foo item = new Foo();
        return
           item==null?1:item.getId();
    }
}
```

QUESTION 38

What is the output of the following client code?

```
Elite l33t = new Elite();
```

A. No output due to a `StackOverflowError`

B. `yolo_null_crew_$`

C. `_$_yolo_swag_crewthis_is_$`

D. `this_is_$_yolo_swag_crew_$`

E. No output due to a syntax error

```
class Elite {
    static {
        out.print("this_is");
    }
    Elite() { out.print("_$");}
    static String a = "_yolo_";
    static Elite instance =
initInstance();
    static final String b = "swag";
    static final String c = "_crew";
    static Elite initInstance() {
        Elite instance = new Elite();
        out.print(a+b+c);
        return instance;
    }
}
```

QUESTION 39

OPEN ENDED QUESTION – Find the answer and write it on your scantron at the bottom of the section. 58

What is the prefix notation expression for the following postfix notation expression?

`AAB+CAB/-/*`

QUESTION 40

OPEN ENDED QUESTION – Find the answer and write it on your scantron at the bottom of the section.

What are the leaves of the binary search tree if the following numbers were inserted in the order that they appear? Write each number separated by a comma in numerical order.

`133742080085311`