Student's Name:

Student's Number:

Student's CSE ID:

Student's Instructor

This exam consists of 30 multiple choice questions. Mark your answer to each question in the space provided on this page.

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Note: Only answers in the boxes above will be graded.

Make sure your name is on the page.

Do not turn this page over until told to do so.

Consider the following Java program

```
public class Silly {
 public static void main(String[] args) {
   int x =  3;
   Integer yy = new Integer(123);
   if(x < 10)
    System.out.println("Yes!");
 }
}
```

1. In Silly a complete list of the Separators is
   (a) . ;
   (b) { } ( ) [ ] ; .
   (c) , ; { } [ ] ( ) < =
   (d) { } [ ] ( ) , ; < = 123 3 10
   (e) None of the above

2. In Silly a complete list of the Operators is
   (a) =
   (b) <
   (c) = <
   (d) . = <
   (e) None of the above

3. In Silly a complete list of the the Literals is
   (a) Silly args println
   (b) 3 123 10 "Yes!"
   (c) 3 123 10
   (d) Integer String
   (e) None of the above

4. In Silly a complete list of the Identifiers is
   (a) 3 123 10
   (b) public class static void int new
   (c) Silly main String args Integer new x System out println
   (d) Silly main String args Integer new x System out println public class static void int new
   (e) None of the above

5. In Silly a complete list of the the keywords is
   (a) 3 123 10
   (b) public class static void int new if
   (c) Silly main String args Integer new x System out println
   (d) Silly main String args Integer new x System out println public class static void int new
   (e) None of the above

6. Which output best matches the following code fragment

```
int x = 2;
float y = 2.0f;
int z = x / 4 * 2;
float p =  x / 4 * 2;
float  q = y / 4 * 2;
System.out.println(z + " " + p + " " + q);
```

(a) 1 1.0 1.0
(b) 1 1 1
(c) 0 0.0 1.0
(d) 0 1.0 1.0
(e) 0 0.0 0.0

7. Which output best matches the following code fragment

```
byte x = (byte)127;
byte y = (byte)(x +256);
byte z =  (byte)(x + 1);
int x1 = 127;
int z1 = x1 + 1;
char c = (char)('a'+2);
System.out.println(y + " " + z + " " + " " + z1 + " " + c);
```

(a) 127 -128 128 a
(b) -128 -128 128 b
(c) -128 -128 128 b
(d) 383 128 128 a2
(e) 127 -128 128 c

8. Which output best matches the following code fragment

```
Integer a = new Integer(127);
Integer b = a;
Integer c = new Integer(127);
Integer d = c;
c = new Integer(127);
System.out.println((a==b) + " " + a.equals(b) + " " + (c==d) + " " + c.equals(d));
```

(a) false false false false
(b) true true true true
(c) false true false true
(d) true true false true

(e) true true true false

9. Which output best matches the following code fragment

```
int sum = 0;
for(int i=0;i<5;i++)
        for(int j=i;j<5;j++)
                sum++;
System.out.println(sum);
```

(a) 0
(b) 1
(c) 3
(d) 25
(e) 15

10. Which output best matches the following code fragment

```
int sum = 0;
for(int i=0;i<5;i++)
        for(int j=i;j<5;j++);
                sum++;
System.out.println(sum);
```

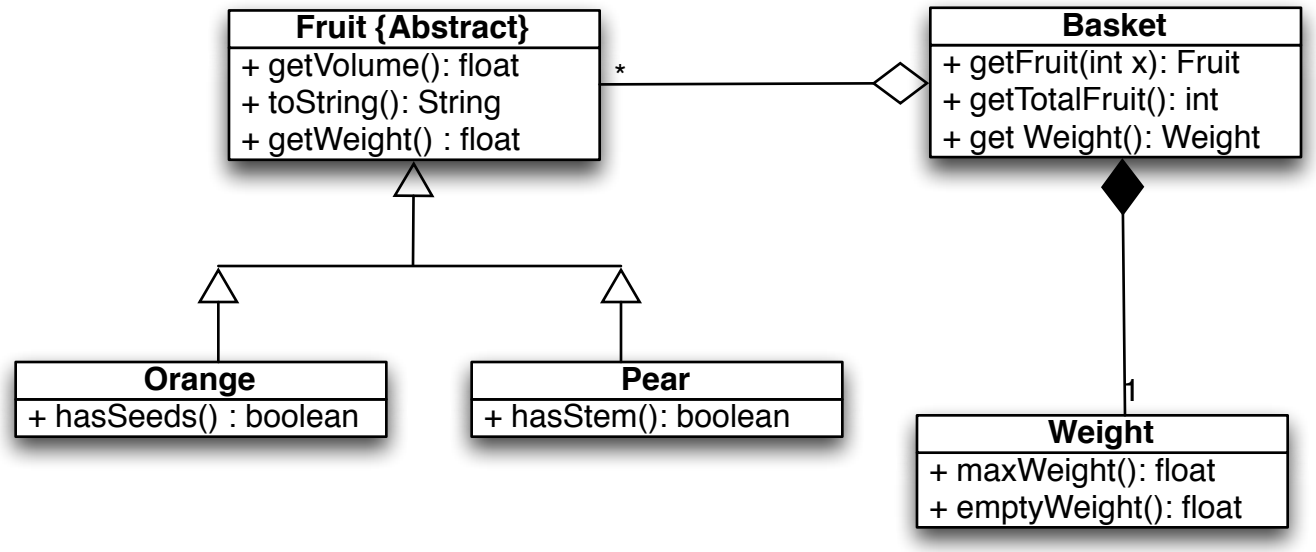
(a) 0
(b) 1
(c) 3
(d) 25
(e) 15

11. Which output best matches the following code fragment

```
int sum = 0;
for(int i=0;i<5;i++)
        if((i / 2) == 1)
                sum++;
System.out.println(sum);
```

(a) 0
(b) 1
(c) 2
(d) 25
(e) 15

Consider the following UML diagram that describes part of a grocery experience. A Basket contains Fruit. The methods getFruit(int x) and getTotalFruit() provide an iteration mechanism over the collection of Fruit in the Basket. Each instance of Fruit has an individual weight (accessible via getWeight()).



12. According to the UML diagram, what methods exist on elements of the class Fruit

(a) getVolume(), toString(), hasSeeds(), hasStem()
(b) getVolume(), toString(), hasSeeds(), hasStem(), getIterator()
(c) getVolume(), toString();
(d) Fruit is an instance, not a class
(e) None of the above

13. According to the UML diagram, how many and which classes are associated with a basket

(a) One Fruit and one Weight
(b) An equal number of Orange and Pear (0 or more of each) and one Weight
(c) An Aggregation of zero or more Fruit and a Composition of one Weight
(d) A Composition of zero or more Fruit and Weight
(e) An Aggregation of zero of more Fruit and Weight

14. According to the UML diagram,

I. It is not possible to create instances of Fruit directly
II. Oranges may have seeds and Pears may have stems
III. Baskets have both a maximum and empty weight
IV. When considered as Fruit, both Oranges and Pears have a volume and weight
V. It is not possible to create an instance of Orange or Pear directly

(a) All of I through V are true
(b) I, II, III and IV only are true
(c) None of I through V are true
(d) I, II, III and V only are true
(e) I, III and V only are true

15. Given the above UML diagram, and a pre-existing Basket b, what does the following code snippet output?

```
float q = 0.0f;
int o = 0;
int p = 0;

for(int i=0;i<b.getTotalFruit();i++) {
        Fruit f = b.getFruit(i);
        q += f.getWeight();
        if(f instanceof Orange)
                o++;
        if(f instanceof Pear)
                p++;
}
System.out.println(q + "  " + o + "  " + p + "  " + (b.getTotalFruit()-o-p));
```

(a) The weight of the empty basket followed by the number of Orange's, number of Pear's, and number of Fruit that are neither Orange or Pear
(b) The weight of the Fruit in the basket followed by the number of Orange's, number of Pear's, and number of Fruit that are neither Orange or Pear
(c) This code makes absolutely no sense in terms of the UML diagram
(d) The weight of the Orange's in the basket followed by the number of Orange's, number of Pears and number of Fruit that are neither Orange or Pear
(e) The weight of the Pear's in the basket followed by the number of Orange's, number of Pear's and number of Fruit that are neither Orange or Pear

16. Consider the following program snippet which is a function of some input n

```
float q = 6;
for(int i=0;i<n*n*n;i++)
        q = q * q * 0.05f - q;
for(int j=0;j<10000*n;j++)
        q = q * q * 0.05f - q;
for(int j=0;j< 10000000.0/n;j++)
        q = q * q * 0.05f - q;
```

The big-O running time of this snippet is given by

(a) O(1/n)
(b) O(n)
(c) O(n^3)
(d) O(log(n))
(e) It is not possible to tell.

17. If a program takes 0.0001 * 2^n + 10 * n^2 + 10000 * log(n) + 10000000 steps to complete, then the big-O running time of the program is

(a) O(2^n)
(b) O(n^2)
(c) O(log(n))
(d) O(1)
(e) It is not possible to tell.

Consider the following definition of the classes Foo and Bar and what values their methods return

```
public class Foo {
        public Foo(); // default constructor
        public static int red();  // returns 2
        public int blue(); // returns 3
        public int violet(Bar x); // returns 0
        public int green;
        public static int orange;
        public int purple;
}

public class Bar extends Foo {
        public Bar(); // default constructor
        public static int red(); // returns 3
        public int blue(); // returns 6
        public int violet(Foo x); // returns 1
        public int violet(Bar x); // returns 2
        public int green;
        public static int orange;
        public int yellow;
        public static final int V = 42;
}
```

For each of the following questions treat the question in isolation and select the output that would be generated by the code fragment

18.

```
Foo f = new Foo();
f.orange = 3;
Foo g = new Foo();
g.orange =  4;
System.out.println(f.orange == g.orange);
```

(a) true
(b) false
(c) The code is invalid as the expression f.orange is invalid
(d) The code is invalid as the expression g.orange is invalid
(e) The code is invalid as you cannot make two instances of Foo

19.

```
Foo f = new Foo();
f.green = 3;
Foo g = new Foo();
g.green =  4;
System.out.println(f.green == g.green);
```

(a) true
(b) false
(c) The code is invalid as the expression f.green is invalid
(d) The code is invalid as the expression g.green is invalid
(e) The code is invalid as you cannot make two instances of Foo

20.

```
Bar f = new Bar();
f.green = 3;
Foo g = f;
g.green =  4;
System.out.println(f.green + " " + g.green
                                + " " + ((Foo) f).green  + " " + ((Bar) g).green);
```

(a) 3 4 4 4
(b) 3 4 3 4
(c) 3 4 4 3
(d) 3 4 3 3
(e) None of the above.

21.

```
Bar f = new Bar();
f.orange = 3;
Foo g = f;
g.orange =  4;
System.out.println(f.orange + " " + g.orange + " "
                                    + ((Foo) f).orange + " " + ((Bar) g).orange);
```

(a) 3 4 4 4
(b) 3 4 3 4
(c) 3 4 4 3
(d) 3 4 3 3
(e) None of the above.

22.

```
Bar f = new Bar();
Foo g = f;
System.out.println(f.red() + " " + g.red() + " "
                                + ((Foo) f).red() + " " + ((Bar) g).red());
```

(a) 2 3 2 3
(b) 3 3 3 3
(c) 3 2 2 3
(d) 3 2 3 2
(e) None of the above.

23.

```
Foo f = new Bar();
Bar g = (Bar) f;
System.out.println(f.red() + " " + g.red() + " "
                                + ((Foo) f).red() + " " + ((Bar) g).red());
```

(a) 2 3 2 3
(b) 3 3 3 3
(c) 3 2 2 3
(d) 3 2 3 2
(e) None of the above.

24.

```
Bar f = new Bar();
```

```
Foo g = f;
System.out.println(f.blue() + " " + g.blue() + " "
                                + ((Foo) f).blue() + " " + ((Bar) g).blue());
```

(a) 6 3 3 6
(b) 6 3 6 3
(c) 6 6 6 6
(d) 6 3 3 3
(e) None of the above.

25.

```
Foo f = new Bar();
System.out.println(f.violet(new Bar()) + " "
                            + ((Bar) f).violet(new Bar()) + " " + ((Bar) f).violet(new Foo()));
```

(a) 1 2 0
(b) 2 2 0
(c) 2 2 2
(d) 2 2 1
(e) None of the above.

26.

```
Bar f = new Bar();
f.V = 44;
System.out.println(f.V);
```

(a) 44
(b) 42
(c) It is not possible to know
(d) The program will not compile
(e) None of the above.

27. Which output best matches the following code fragment

```
Set<String> set = new TreeSet<String>();
String s = “ILLUSIONS”;
for(int i = 0; i < s.length() ;i++)
        set.add((new Character(s.charAt(i))).toString());
Iterator<String> it = set.iterator() ;
while(it.hasNext())
        System.out.print(it.next());
System.out.println();
```

(a) ILLUSIONS
(b) ILNOSU
(c) ILUSIO
(d) USONLI
(e) None of the above.

28. Which output best matches the following code fragment

```
try {
   System.out.print("A");
   throw new RuntimeException("argh");
 } catch(Exception err) {
   System.out.print("C");
 }
 System.out.println("D");
```

(a) AarghCD
(b) AD
(c) ACD
(d) AarghCD
(e) None of the above.

29. Which output best matches the following code fragment

```
List<String> set = new ArrayList<String>();
String s = "MADAMIMADAM";
for(int i = 0 ;i < s.length();i++)
   set.add((new Character(s.charAt(i))).toString());
Iterator<String> it = set.iterator();
String v = "";
while(it.hasNext())
   v = it.next() + v;
System.out.println(v + " " + v.equals(s));
```

(a) MADAMIMADAM true
(b) MADI false
(c) Bus error, core dumped
(d) I false
(e) None of the above.

30. Which output best matches the following code fragment

```
String s = "Ypu hbvf sebciee uhf fne pf tie eyan";
String v = "";
for(int i=0;i<s.length();i++) {
```

```
        char c =  s.charAt(i);
        if(c == ' ')
            v = v + c;
        else
           v =  v + (char)(c - (i % 2));
    }
    System.out.println("" + v.charAt(0) +  v.charAt(4) + v.charAt(9) + v.charAt(17));
```

(a) Yz68
(b) FoBa
(c) 04917
(d) Yhrt
(e) None of the above.