Exam Sets 27E Revised
AP Computer Science A

Name ____ Period__________ Class (Check) ☐AP ☐ECS

1. Refer to the code below,

```
public class Phone {
        private int areaCode;
        private int prefix;
        private int lineNumber;
        public Phone(int ac, int p, int ln) {
                areaCode = ((ac > 0 && ac < 1000) ? ac : 555);
                prefix = ((p > 0 && p < 1000) ? p : 555);
                lineNumber = ((ln > 0 && ln < 10000) ? ln : 5555);
        }
        public String makeCall(Phone p) {
                return "Dialing " + p.toString();
        }
        public String toString() {
                return "" + areaCode + "-" + prefix + "-" + lineNumber;
        }
}

public class CellPhone extends Phone {
    private double longitude;
    private double latitude;
    public CellPhone(int ac, int p, int ln, double lat, double lng) {
        super(ac, p, ln);
        latitude = lat;
        longitude = lng;
    }
    public void updateLocation() {
        // uses GPS to get the updated values for longitude and latitude
    }
    public double getLongitude() {
        return longitude;
    }
    public double getLatitude() {
        return latitude;
    }
    public String toString() {
        String s = super.toString();
        return s + "; (" + longitude + ", " + latitude + ")";
    }
}
```

```
public class PayPhone extends Phone {
    private double cost;
    protected double moneyInserted;
    public PayPhone(int ac, int p, int ln, double c) {
        super(ac, p, ln);
        cost = ((c >= 0) ? c : 0);
    }
    public void insertMoney(double money) {
        moneyInserted += money;
    }
    public String makeCall(Phone p) {
        if (moneyInserted >= cost) {
            moneyInserted -= cost;
            return super.makeCall(p);
        }
        return "Please insert more money to place a call";
    }
}
```

(a) What is/are the parent class(es) associated with the PayPhone class?

Object, Phone

/1

(b) For each of the following (i) Indicate whether the statement is valid (V) or invalid (I) (ii) If the statement is not valid, indicate why.

Statement	V/I	If "I", indicate why.
`Object o = new Phone(317, 555, 1000);`	**V**	
`CellPhone cp = new Phone(459, 555, 1022);`	**I**	**A Phone is not necessarily a CellPhone**
`PayPhone pph = new CellPhone(333, 555, 4242, 23.423, 54.343);`	**I**	**A PayPhone is not a CellPhone**
`Phone ph = new CellPhone(888, 555, 6642, 78.44, 66.3);`	**V**	
`Object o = new PayPhone(954, 555, 4242, .25);`	**V**	
`PayPhone pph = new PayPhone(123, 555, 5555, 28.44, 45.6);`	**I**	**Wrong parameters**

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(c) What is the value of s after the code block below? Do not include quotes in your answer.

```
Phone ph = new CellPhone(444, 555, 6666, 1.2, 2.4);
String s = ph.toString();
```

444-555-6666; (2.4,1.2)

/1

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(d) What is the value of s after the code block below? Do not include quotes in your answer. If an error occurs write "ERROR" AND indicate why the error occurs.

```
PayPhone pph = new PayPhone(311, 555, 6464, .25);
Phone ph = pph;
ph.insertMoney(.50);
System.out.print(pph.moneyInserted)
```

ERROR; insertMoney is not in Phone

/2

(e) Refer to the code block below to indicate what is printed for each of the following statements. If an error occurs write "ERROR" AND indicate why the error occurs.

```
Phone p = new Phone(765,999,1234);
CellPhone cp = new CellPhone(858,346,6430, 40.427437, -86.916979);
PayPhone pp = new PayPhone(212,840,9623,0.5);
```

(i) `System.out.println(p);`

765-999-1234

(ii) `Sysem.out.println(cp);`

858-346-6430; (-86.916979, 40.427437)

(iii) `System.out.println(pp);`

212-840-9623

(iv) `System.out.println(p.makeCall(cp));`

Dialing 858-346-6430

(v) `System.out.println(cp.makeCall(p));`

Dialing 765-999-1234

(vi) `System.out.println(pp.makeCall(p));`

Please insert more money to place a call

(vii)
```
pp.insertMoney(0.5);
System.out.println(pp.makeCall(p));
```

Dialing 765-999-1234

(viii) `System.out.println(cp.latitude);`

ERROR: java: latitude has private access in CellPhone

Score ___________/32

(ix)
```
System.out.println(cp.getLatitude());
```

40.427437

(x)
```
p = cp;
System.out.println(p);
```

858-346-6430

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2. Refer to the code below,

```
class A {
    public A() {
        System.out.println("Inside A's constructor");
    }
}
class B extends A {
    public B() {
        System.out.println("Inside B's constructor");
    }
}
class C extends B {
    public C() {
        System.out.println("Inside C's constructor");
    }
}
public class Inheritance {
    public static void main(String[] args) {
        /** Statements for questions go here **/
    }
}
```

(a) After executing the statement B b = new B();, what is output by the program?

Inside A's constructor
Inside B's constructor

/1

(b) After executing the statement A a = new C();, what is ouptut by the program?
Inside A's constructor
Inside B's constructor
Inside C's constructor

/1

(c) What is the output of the following statement? System.out.println((new B()) instanceof A);

Inside A's constructor
Inside B's constructor
true

/1

(d) What is the output of the following statement? System.out.println((new C() instanceof A);

Inside A's constructor
Inside B's constructor
Inside C's constructor
true

/1

3. The `Parrot` class represents a parrot with an age in years and the ability to learn sounds which it can repeat back when asked to speak. The declaration of the `Parrot` class is shown below.

```
public class Parrot
{

 /** Constructs a new Parrot object */
 public Parrot(String name)
 { /* implementation not shown */ }

 /** @return the age of the parrot in years */
 public int getAge()
 { /* implementation not shown */ }

 /** Adds sound to the list of sounds the parrot can make
 *  @param sound the sound to add */
 public void train(String sound)
 { /* implementation not shown */ }

 /** @return a random sound that the parrot can make */
 public String speak()
 { /* implementation not shown */ }

 // There may be instance variables, constructors, and methods that are
not shown.
}
```

A pirate parrot is a type of parrot. A pirate parrot knows how to make the sound "Polly want a cracker" immediately upon birth. A pirate parrot can also steal souls whose age becomes part of the pirate parrot's age. A pirate parrot is represented by the PirateParrot class, which you will write.

Assume that the following code segment appears in a class other than `PirateParrot`. The code segment shows an example of using the `PirateParrot` class.

```
PirateParrot polly = new PirateParrot("Polly");

System.out.println(polly.getAge()); // prints 0
/* code to increase Polly's age by 5 years */
System.out.println(polly.getAge()); // prints 5

polly.stealSoul(5);
polly.stealSoul(10);
System.out.println(polly.getAge()); // prints 20

polly.train("Walk the plank");
polly.train("Off with his head");
```

```
// Polly retires from his life as a pirate to a cushy life as a pet

Parrot myPetPolly = polly;
System.out.println(myPetPolly.getAge()); // prints 20
myPetPolly.train("Time for bed");
System.out.println(myPetPolly.speak());

/* prints one of the following, chosen at random:
 * Polly want a cracker
 * Walk the plank
 * Off with his head
 * Time for bed
 */
```

(a) Write the PirateParrot class. Your code must produce the indicated results when invoked by the code given above.

```
public class PirateParrot extends Parrot
{
 /** The total number of years the pirate parrot has stolen */
 private int yearsStolen = 0;

 public PirateParrot(String name)
 {
  super(name);
  train("Polly want a cracker");
 }

 public int getAge()
 {
  return super.getAge() + yearsStolen;
 }

 public void stealSoul(int soulAge)
 {
  yearsStolen += soulAge;
 }
}
```

You must store only the information specific to a pirate parrot as your state. Class Parrot already stores the parrot's natural age and the list of sounds it can make. Specifically, you must store the number of additional years obtained by stealing souls rather than the pirate parrot's total age.

You must specify method stealSoul to keep track of the sum of the ages of all stolen souls.

You must override method getAge, which is public in Parrot, to include the additional years obtained by stealing souls.

You must specify a constructor that accepts a String parameter. Since there is no visible default constructor for Parrot, you must explicitly run the constructor that accepts a String parameter. The call to the superclass constructor must be the first line in your constructor. Your constructor must run the train method from Parrot so the pirate parrot will be able to make the required sound immediately after construction.

You should not override method speak since a pirate parrot speaks as a parrot. You would lose points on the exam for overriding method speak to do anything other than returning super.speak.

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Score ___________/32

Score __________/32