

Practice Final

```
1  class Race{
2      public static final int MAX = 5;
3      public static final int MIN = 1;
4
5      private static int data=Race.MIN;
6      public static int getData(){
7          return data;
8      }
9      public static void incData() {
10         if (data < Race.MAX)
11             data++;
12     }
13     public static void foo() throws Exception{
14         while (data < Race.MAX)
15             incData();
16     }
17 }
18
19 public class Car implements Runnable {
20     public void run(){
21         Race.foo();
22     }
23     public static void main(String[] args) throws Exception{
24         Thread t1 = new Thread(new Car());
25         Thread t2 = new Thread(new Car());
26         t1.start();
27         t2.start();
28         t1.join();
29         t2.join();
30         System.out.println(Race.getData());
31     }
32 }
```

1. In the above code, where might be race condition(s) occur? Specifically which line(s) of the code ?
2. Where and how should the race condition(s) be prevented?
3. What is a deadlock? Can one occur in the above code ever? Why or why not?

```

1  class Examine{
2      static int[] data = new int[10];
3      public static void dance(int value){
4          int i=0;
5          while(i<data.length){
6              for(int j=0;j<100;j++){
7                  data[i] = value;
8              }
9          }
10         static Runnable launch(int id){
11             return new Runnable(){
12                 public void run(){
13                     dance(id);
14                 }
15             }
16         public static void main(String[] args){
17             Thread t1 = new Thread(launch(1));
18             Thread t2 = new Thread(launch(2));
19             t1.start();
20             t2.start();
21             t1.join();
22             t2.join();
23         }
24     }

```

4. In the above code is there a race condition? If yes, what is the race condition and where exactly is it (demonstrate the race via code walk thru)?
5. Would the code when run cause an Exception?

```

1  class Grain {
2      public String toString() { return "Grain"; }
3  }
4
5  class Wheat extends Grain {
6      public String toString() { return "Wheat"; }
7  }
8  class Mill {
9      Grain process() { return new Grain(); }
10 }
11 class WheatMill extends Mill {
12     Wheat process() { return new Wheat(); }
13 }
14 public class CovariantReturn {
15     public static void main(String[] args) {
16         Mill m = new Mill();
17         Grain g = m.process();
18         System.out.println(g);
19         m = new WheatMill();
20         g = m.process();
21         System.out.println(g);
22     }
23 }

```

6. Is the method "process()" in WheatMill in error?

```

1  class Egg2 {
2      protected class Yolk {
3          public Yolk() { print("Egg2.Yolk()"); }
4          public void f() { print("Egg2.Yolk.f()");}
5      }
6      private Yolk y = new Yolk();
7      public Egg2() { print("New Egg2()"); }
8      public void insertYolk(Yolk yy) { y = yy; }
9      public void g() { y.f(); }
10 }
11
12 public class BigEgg2 extends Egg2 {
13     public class Yolk extends Egg2.Yolk {
14         public Yolk() { print("BigEgg2.Yolk()"); }
15         public void f() { print("BigEgg2.Yolk.f()"); }
16     }
17     public BigEgg2() { insertYolk(new Yolk()); }
18     public static void main(String[] args) {
19         Egg2 e2 = new BigEgg2();
20         e2.g();
21     }
22 }

```

7. Give the output for the above:

```

1  class Parcel4 {
2      private class PContents implements Contents {
3          private int i = 11;
4          public int value() { return i; }
5      }
6      protected class PDestination implements Destination {
7          private String label;
8          private PDestination(String whereTo) {
9              label = whereTo;
10         }
11         public String readLabel() { return label; }
12     }
13     public Destination destination(String s) {
14         return new PDestination(s);
15     }
16     public Contents contents() {
17         return new PContents();
18     }
19 }
20 public class TestParcel {
21     public static void main(String[] args) {
22         Parcel4 p = new Parcel4();
23         Contents c = p.contents();
24         Destination d = p.destination("Tasmania");
25         Parcel4.PContents pc = p.new PContents();//ERROR
26     }
27 }

```

8. The above class has an error on the line indicated. Explain why there is an error.

```

1 public class Wrapping {
2     private int i;
3     public Wrapping(int x) { i = x; }
4     public int value() { return i; }
5 }
6
7 public class Parcel {
8     public Wrapping wrapping(int x) {
9         //return an anonymous inner class object of Wrapping type
10        //with overloaded method "public int value () { return 47*i; }"
11    }
12    public static void main(String[] args) {
13        Parcel p = new Parcel();
14        Wrapping w = p.wrapping(10);
15    }
16 }

```

9. In the above classes provide the missing code.

10. Given an ArrayList is-a List and a List is-a Collection is the following true? ArrayList<String> is-a Collection<String>

11. Given interface FooBar<X,Y> extends Silly<X> which of the following ARE subtypes of Silly<String>?

- (a) FooBar<String, String>
- (b) FooBar<String, Integer>
- (c) FooBar<Integer, String>
- (d) FooBar<String, Exception>
- (e) FooBar<Integer, Integer>
- (f) FooBar<Exception, Integer>

12. Given

```
static <T>T pick(T a, T b) return b
```

Is the following an error or not? If an error, explain why, if not give the return type.

```
Collection c = pick(new Set<String>(), new Stack<String>());
```

13. If the code below gives an error explain why, if not explain why.

```
1 public static void addNumbers(List<? super Integer> list){
2     for (int i=1; i<10; i++){
3         list.add(i);
4     }
5 }
6 // in other code:
7 addNumbers(new ArrayList<Number>());
```

14. If the code below gives an error explain why, if not explain why.

```
1 void swapFirst(List<? extends Number>listA, List<? extends Number> listB){
2     Number temp = listA.get(0);
3     listA.set(0,listB.get(0));
4     listB.set(0,temp);
5 }
```

```
1 class Example{
2     public void open() throws FileNotFoundException{
3         System.out.println("attempting to open file");
4         throw new FileNotFoundException();
5     }
6     public void close() throws CloseException {
7         System.out.println("attempting to close file");
8         throw new CloseException();
9     }
10    public static void main(String[] args) throws Exception{
11        Example e = new Example();
12        try{
13            e.open();
14            System.out.println("after opening file");
15        }finally{
16            System.out.println("finally");
17            e.close();
18            System.out.println("after closing file");
19        }
20        System.out.println("end of program");
21    }
22 }
```

15. Give the output. State any exception(s) that are displayed on exit.

```

1  class LanguageException extends Exception{}
2      class JavaException extends LanguageException{}
3      public class Test {
4          public void a() throws LanguageException{
5              throw new LanguageException();
6          }
7          public void b() throws JavaException{
8              throw new JavaException();
9          }
10         public static void main(String[] args){
11             Test t = new Test();
12             try{
13                 t.a();
14                 t.b();
15             }
16             catch(LanguageException l){}
17             catch(JavaException j){}
18             System.out.println("finished main");
19         }
20     }

```

16. Give the output. State any exception(s) that are displayed on exit.

```

1  public class Out {
2      int x;
3      static class In {
4          public void setX(int value){
5              x = value;
6          }
7      }
8      public static void main(String[] args){
9          //your code goes here
10     }
11 }

```

17. What is the error in the above class? Why?

18. Give the code to create an "In" object in main()


```

1  class Cat {
2      Kitten k = new Kitten();
3      public Cat(){
4          System.out.println("cat");
5      }
6      class Kitten{
7          public Kitten(){
8              System.out.println("kitten");
9          }
10     }
11 }
12 public class Lion extends Cat {
13     public Lion(){
14         System.out.println("Lion");
15     }
16     class Kitten {
17         public Kitten(){
18             System.out.println("young Lion");
19         }
20     }
21     public static void main(String[] args){
22         new Lion();
23     }
24 }

```

19. Give the output

```

1  class Cat {
2      Kitten k;
3      public Cat(){
4          System.out.println("cat");
5      }
6      class Kitten{
7          public Kitten(){
8              System.out.println("kitten");
9          }
10     }
11     public void produce(Kitten kk){
12         k = kk;
13     }
14 }
15 public class Lion extends Cat {
16     public Lion(){
17         System.out.println("Lion");
18         produce(new Kitten());
19     }
20     class Kitten {
21         public Kitten(){
22             System.out.println("young Lion");
23         }
24     }
25     public static void main(String[] args){
26         new Lion();
27     }
28 }

```

20. Give the output or if there Is an error, fix it and give the output.

```

1  class A {
2      private int x;
3      public void setZ(int zz){
4          z = zz;
5      }
6      class B{
7          private int y;
8          class C{
9              private int z;
10             public void setX(int xx){
11                 x = xx;
12             }
13         }
14     }
15 }

```

21. Examine the code above. Is there an error? If so what is the error and why? If not, explain

```

1  class A{
2      class B{
3          class C{}
4      }
5      public static void main(String[] args){
6          //code
7      }
8  }

```

22. Give the code necessary to create a C object in main()

```

1  class X {
2      int z = 5;
3      static class Y{
4          public int getZ(){return z;}
5      }
6      public static void main(String[] args){
7          //code
8      }
9  }

```

23. What is the an error in the code above?

24. If the error was removed in the above code, give the code to create a Y object

```

1  class X{
2      int y;
3      public void foo(){
4          for(int i=0; i<10; i++){
5              if (y < 5)
6                  y++;
7          }
8      }
9  }

```

25. For the above code give the places where a race condition exists.

```

1  class A implements Runnable {
2      ReentrantLock lock = new ReentrantLock();
3      List s ;
4      public A(List store){
5          s = store;
6      }
7      public void run(){
8          for(int i=0;i<10; i++){
9              if(lock.trylock())
10                 s.add(i);
11            }
12        }
13    }
14
15    class B implements Runnable{
16        ReentrantLock lock = new ReentrantLock();
17        List s;
18        public B(List store){
19            s = store;
20        }
21        public void run(){
22            for(int x = 20; x<30; x++){
23                if(lock.tryLock())
24                    s.add(x);
25            }
26        }
27    }
28    public class Test {
29        public static void main(String[] args){
30            List store = new LinkedList();
31            A a = new A(store);
32            B b = new B(store);
33            new Thread(a).start();
34            new Thread(b).start();
35            Thread.sleep(2000);
36        }
37    }

```

26. Does the above code protect the shared List? Why or why not?

```
1 public class LTest {  
2     public static void main(String[] args){  
3         new Thread(new Runnable(){  
4             public void run(){  
5                 System.out.println("hello world!");  
6             }  
7         }).start();  
8     }  
9 }  
10 }
```

27. Write the above using a Lambda expression

```

1 public class Table{
2     enum TYPE {MULT, ADD}
3     public void display(int start, int end, TYPE t){
4         for (int i = start; i<end; i++){
5             for (int j = start; j <end; j++){
6                 if (t == TYPE.MULT)
7                     System.out.printf("%3d ",(i*j));
8                 else
9                     System.out.printf("%3d ",(i+j));
10            }
11            System.out.println("");
12        }
13    }
14    public static void main(String[] args){
15        Table t = new Table();
16        t.display(1,10,TYPE.MULT);
17    }
18 }

```

28. Modify to use a Lambda expression and give the expression to get the same output as the code above with your new display() method.