Practice Final

```
class Race{
        public static final int MAX = 5;
        public static final int MIN = 1;

        private static int data=Race.MIN;
        public static int getData(){
                return data;
        }
        public static void incData() {
                if (data < Race.MAX)
                        data++;
        }
        public static void foo() throws Exception{
                while (data < Race.MAX)
                        incData();
        }
}

public class Car implements Runnable {
        public void run(){
                Race.foo();
        }
        public static void main(String[] args) throws Exception{
                Thread t1 = new Thread(new Car());
                Thread t2 = new Thread(new Car());
                t1.start();
                t2.start();
                t1.join();
                t2.join();
                System.out.println(Race.getData());
        }
}
```

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?

```
class Examine{
        static int[] data = new int[10];
        public static void dance(int value){
                int i=0;
                while(i<data.length){
                        for(int j=0;j<100;j++);
                                data[i] = value;
                }
        }
        static Runnable launch(int id){
                return new Runnable(){
                        public void run(){
                                dance(id);
                        }
                };
        }
        public static void main(String[] args){
                Thread t1 = new Thread(launch(1));
                Thread t2 = new Thread(launch(2));
                t1.start();
                t2.start();
                t1.join();
                t2.join();
        }
}
```

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?

```
class Grain {
        public String toString() { return "Grain"; }
}

class Wheat extends Grain {
        public String toString() { return "Wheat"; }
}
class Mill {
        Grain process() { return new Grain(); }
}
class WheatMill extends Mill {
        Wheat process() { return new Wheat(); }
}
public class CovariantReturn {
        public static void main(String[] args) {
                Mill m = new Mill();
                Grain g = m.process();
                System.out.println(g);
                m = new WheatMill();
                g = m.process();
                System.out.println(g);
        }
}
```

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

```
class Egg2 {
        protected class Yolk {
                public Yolk() { System.out.println("Egg2.Yolk()"); }
                public void f() { System.out.println("Egg2.Yolk.f()");}
        }
        private Yolk y = new Yolk();
        public Egg2() { System.out.println("New Egg2()"); }
        public void insertYolk(Yolk yy) { y = yy; }
        public void g() { y.f(); }
}

public class BigEgg2 extends Egg2 {
        public class Yolk extends Egg2.Yolk {
                public Yolk() { System.out.println("BigEgg2.Yolk()"); }
                public void f() { System.out.println("BigEgg2.Yolk.f()"); }
        }
        public BigEgg2() { insertYolk(new Yolk()); }
        public static void main(String[] args) {
                Egg2 e2 = new BigEgg2();
                e2.g();
        }
}
```

7. Give the output for the above:

```
class Parcel4 {
        private class PContents implements Contents {
                private int i = 11;
                public int value() { return i; }
        }
        protected class PDestination implements Destination {
                private String label;
                private PDestination(String whereTo) {
                        label = "whereTo";
                }
                public String readLabel() { return label; }
        }
        public Destination destination(String s) {
                return new PDestination(s);
        }
        public Contents contents() {
                return new PContents();
        }
}
public class TestParcel {
        public static void main(String[] args) {
                Parcel4 p = new Parcel4();
                Contents c = p.contents();
                Destination d = p.destination("Tasmania");
                Parcel4.PContents pc = p.new PContents();//ERROR
        }
}
```

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

```
public class Wrapping {
        private int i;
        public Wrapping(int x) { i = x; }
        public int value() { return i; }
}

public class Parcel {
        public Wrapping wrapping(int x) {
        //return an anonymous inner class object of Wrapping type
        //with overloaded method "public int value (){ return 47*i;}"
        }
        public static void main(String[] args) {
                Parcel p = new Parcel();
                Wrapping w = p.wrapping(10);
        }
}
```

9. In the above classes provide the missing code.

10. Given an ArryList 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.

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

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

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

```
class Example{
        public void open() throws FileNotFoundException{
                System.out.println("attempting to open file");
                throw new FileNotFoundException();
        }
        public void close() throws CloseException {
                System.out.println("attempting to close file");
                throw new CloseException();
        }
        public static void main(String[] args) throws Exception{
                Example e = new Example();
                try{
                        e.open();
                        System.out.println("after opening file");
                }finally{
                        System.out.println("finally");
                        e.close();
                        System.out.println("after closing file");
                }
                System.out.println("end of program");
        }
}
```

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

```
class LanguageException extends Exception{}
class JavaException extends LanguageException{}

public class Test {
        public void a() throws LanguageException{
                throw new LanguageException();
        }
        public void b() throws JavaException{
                throw new JavaException();
        }
        public static void main(String[] args){
                Test t = new Test();
                try{
                        t.a();
                        t.b();
                }
                catch(LanguageException l){}
                catch(JavaException j){}
                System.out.println("finished main");
        }
}
```

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

```
public class Out {
        int x;
        static class In {
                public void setX(int value){
                        x = value;
                }
        }
        public static void main(String[] args){
                //your code goes here
        }
}
```

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

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

```
class Cat {
        Kitten k = new Kitten();
        public Cat(){
                System.out.println("cat");
        }
        class Kitten{
                public Kitten(){
                        System.out.println("kitten");
                }
        }
}
public class Lion extends Cat {
        public Lion(){
                System.out.println("Lion");
        }
        class Kitten {
                public Kitten(){
                        System.out.println("young Lion");
                }
        }
        public static void main(String[] args){
                new Lion();
        }
}
```

19. Give the output

```
class Cat {
        Kitten k;
        public Cat(){
                System.out.println("cat");
        }
        class Kitten{
                public Kitten(){
                        System.out.println("kitten");
                }
        }
        public void produce(Kitten kk){
                k = kk;
        }
}
public class Lion extends Cat {
        public Lion(){
                System.out.println("Lion");
                produce(new Kitten());
        }
        class Kitten {
                public Kitten(){
                        System.out.println("young Lion");
                }
        }
        public static void main(String[] args){
                new Lion();
        }
}
```

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

```
class A {
        private int x;
        public void setZ(int zz){
                z = zz;
        }
        class B{
                private int y;
                class C{
                        private int z;
                        public void setX(int xx){
                                x = xx;
                        }
                }
        }
}
```

21. Examine the code above. Is there an error? If so what is the error and why? If not, explain. (On a pas corrigé celle là non plus mais je pense que c'est ça)

```
class A{
        class B{
                class C{}
        }
        public static void main(String[] args){
                //code
        }
}
```

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

```
class X {
        int z = 5;
        static class Y{
                public int getZ(){return z;}
        }
        public static void main(String[] args){
                //code
        }
}
```

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.

```
class X{
        int y;
        public void foo(){
                for(int i=0; i<10; i++){
                        if (y < 5)
                                y++;
                }
        }
}
```

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

```
class A implements Runnable {
        ReentrantLock lock = new ReentrantLock();
        List s ;
        public A(List store){
                s = store;
        }
        public void run(){
                for(int i=0;i<10; i++){
                        if(lock.trylock())
                                s.add(i);
                }
        }
}

class B implements Runnable{
        ReentrantLock lock = new ReentrantLock();
        List s;
        public B(List store){
                s = store;
        }
        public void run(){
                for(int x = 20; x<30; x++){
                        if(lock.tryLock())
                                s.add(x);
                }
        }
}
public class Test {
        public static void main(String[] args){
                List store = new LinkedList();
                A a = new A(store);
                B b = new B(store);
                new Thread(a).start();
                new Thread(b).start();
                Thread.sleep(2000);
        }
}
```

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

```
public class LTest {
        public static void main(String[] args){
                new Thread(new Runnable(){
                        public void run(){
                                System.out.println("hello world!");
                        }
                }).start();

        }
}
```

27. Write the above using a Lambda expression.

```
public class Table{
        enum TYPE {MULT, ADD}
        public void display(int start, int end, TYPE t){
                for (int i = start; i<end; i++){
                        for (int j = start; j <end; j++){
                                if (t == TYPE.MULT)
                                        System.out.printf("%3d ",(i*j));
                                else
                                        System.out.printf("%3d ",(i+j));
                        }
                        System.out.println("");
                }
        }
        public static void main(String[] args){
                Table t = new Table();
                t.display(1,10,TYPE.MULT);
        }
}
```

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.