Restrictions on generics

1. Primitive types cannot be used generically. `Pair<int, char>` doesn’t work. That’s why Java has the wrapper classes and does automatic boxing an unboxing.

2. A generic class cannot extend class Throwable. The following two declarations are syntactically incorrect.

   ```java
   class C<T> extends Throwable { … }
   class C<T> extends Exception { … }
   ```

3. A catch clause cannot catch an instance of a Type parameter. The following is syntactically incorrect:

   ```java
   public static <T extends Exception> void m(...) {
      try { … }
      catch (T e) { … }
   }
   ```

4. An instance of a type parameter cannot be created. The code to the right is syntactically incorrect. This is because of type erasure. Before compiling, all type parameters are removed, so how can an instance of E be created? There are work-arounds for this, which we don’t go into.

   ```java
   ArrayList<Integer>[] al = new ArrayList[2];
   ```

5. Arrays of parameterized types may not be created. The following expression is syntactically incorrect and won’t be compiled.

   ```java
   new ArrayList<Integer>[][2];
   ```

6. Static fields of type parameters are not allowed. Consider the class to the right and these two declaration/assignments:

   ```java
   Watch<Apple> iwatch = new Watch<>();
   Watch<Samsung> swatch = new Watch<>();
   ```

   Static field os is shared by iwatch and swatch. What is its type? It can’t be both Apple and Samsung. Therefore, static fields of type parameters are not allowed.

7. The expression `ob instanceof T` is not allowed if `T` is a parameterized type. For example, `ob instanceof Array<Integer>` is syntactically incorrect. This is because of type erasure. Parameterized types are removed before a syntactically correct program is compiled.

8. A method name cannot be overloaded if type erasure leads to the same raw type. Consider the two procedures declared below. Erase the parameterized type and they have the same signature. Therefore, this overloading is not allowed.

   ```java
   public void print(ArrayList<Integer> p) { … }
   public void print(ArrayList<Double> p) { … }
   ```

   ```java
   /** Create a new E and append it to b. */
   public static <E> void append(ArrayList<E> b) {
      E e = new E(); // compile-time error
      b.add(e);
   }
   ```