

Ejercicio 27. Explique los siguientes conceptos:

1. Prueba de caja blanca: es la estructura de control del programa.
2. Prueba de caja negra: son los requisitos funcionales.
3. Prueba unitaria: es una pieza de código escrita por un desarrollador que ejercita una pequeña y específica área de funcionalidad del código desarrollado
4. Prueba de integración: verifica la estructura del programa y aumenta la interacción. Los errores son fáciles de encontrar y corregir.
5. Prueba de sistema: se realizan pruebas de recuperación, seguridad, resistencia y rendimiento.
6. Prueba de aceptación: son dos tipos de pruebas las Alfas llevadas a cabo en el lugar de desarrollo y las Betas llevadas a cabo por el cliente.

Ejercicio 29. El propósito del presente ejercicio es aprender a utilizar la biblioteca JUnit para implementar pruebas unitarias de software. Se pide llevar a cabo los siguientes apartados:

1. Cree un proyecto Maven.

```
mvn archetype:generate -DgroupId=org.pr2 -DartifactId=matematicas -DarchetypeGroupId=org.apache.maven.archetype -DarchetypeArtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=false
```



```
MINGW64 C:\Users\jta8_
jta8_R00K0T0P-RT01P7 MINGW64 --
$ mvn archetype:generate -DgroupId=org.pr2 -DartifactId=matematicas -DarchetypeGroupId=org.apache.maven.archetype -DarchetypeArtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=false
[INFO] Scanning for projects...
[INFO] --- org.apache.maven:standalone-pom:1.0:generate-sources @ standalone-pom ---
[INFO] Building Maven Stub Project (No POM) 1
[INFO] --- [pom] ---
[INFO] --- archetype:1.4:generate (default-cli) @ standalone-pom ---
[INFO] --- archetype:1.4:generate (default-cli) < generate-sources @ standalone-pom ---
[INFO] --- archetype:1.4:generate (default-cli) < generate-sources @ standalone-pom ---
[INFO] --- archetype:1.4:generate (default-cli) @ standalone-pom ---
[INFO] Generating project in Batch mode
[INFO]
[INFO] Using following parameters for creating project from Archetype: maven-archetype-quickstart:1.4
[INFO]
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: packageInPathFormat, Value: org/pr2
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Project created from Archetype in dir: C:\Users\jta8_\.matematicas
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 2.189 s
[INFO] Finished at: 2024-03-28T16:02:27+01:00
[INFO]
jta8_R00K0T0P-RT01P7 MINGW64 --
$
```

2. Entre el directorio matematicas.
cd matematicas

```
MINGW64 C:\Users\jta8\_matematicas

jta8_RDESKTOP-RTCI9P7 MINGW64 ~
$ mvn archetype:generate -DgroupId=org.pr2 -DartifactId=matematicas -DarchetypeA
rtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=fa
lse
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.apache.maven:standalone-pom >-----
[INFO] Building Maven Stub Project (No POM) 1
[INFO] -----[ pom ]-----
[INFO]
[INFO] >>> archetype:3.2.1:generate (default-cli) > generate-sources @ standalone
-pom >>>
[INFO] <<< archetype:3.2.1:generate (default-cli) < generate-sources @ standalone
-pom <<<
[INFO]
[INFO] --- archetype:3.2.1:generate (default-cli) @ standalone-pom ---
[INFO] Generating project in Batch mode
[INFO]
[INFO] Using following parameters for creating project from Archetype: maven-arc
hetype-quickstart:1.4
[INFO] -----
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: packageInPathFormat, Value: org/pr2
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Project created from Archetype in dir: C:\Users\jta8\_matematicas
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.189 s
[INFO] Finished at: 2024-03-28T16:02:27+01:00
[INFO] -----

jta8_RDESKTOP-RTCI9P7 MINGW64 ~
$ cd matematicas
jta8_RDESKTOP-RTCI9P7 MINGW64 ~/matematicas
$
```

3. Realice la siguiente creación de directorio
md src/main/java/org/pr2/matematicas

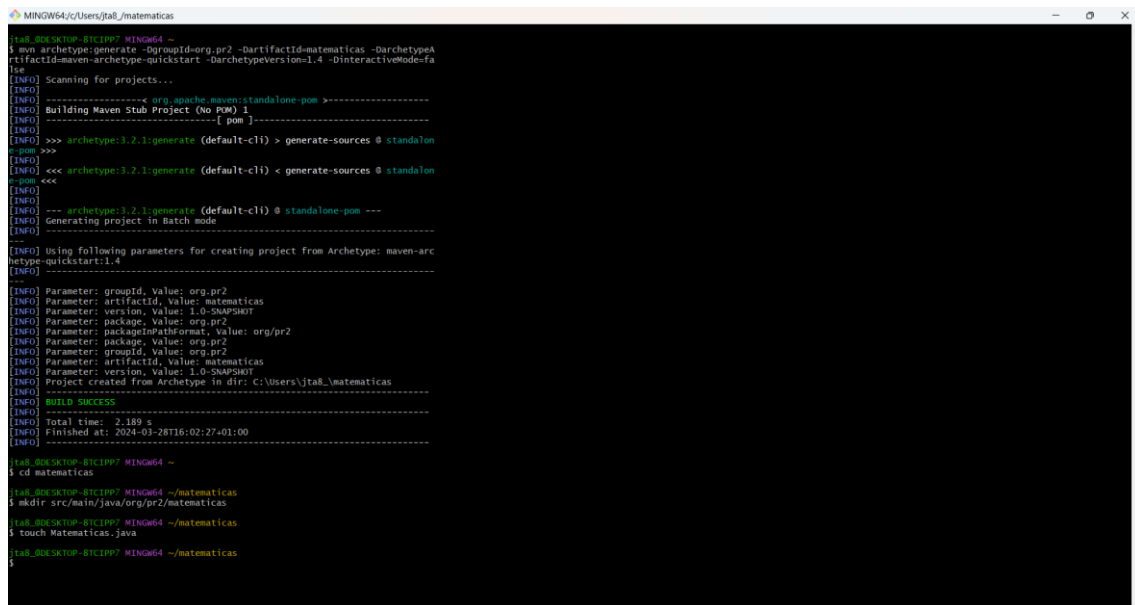
```
MINGW64 C:\Users\jta8\_matematicas

jta8_RDESKTOP-RTCI9P7 MINGW64 ~
$ mvn archetype:generate -DgroupId=org.pr2 -DartifactId=matematicas -DarchetypeA
rtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=fa
lse
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.apache.maven:standalone-pom >-----
[INFO] Building Maven Stub Project (No POM) 1
[INFO] -----[ pom ]-----
[INFO]
[INFO] >>> archetype:3.2.1:generate (default-cli) > generate-sources @ standalone
-pom >>>
[INFO] <<< archetype:3.2.1:generate (default-cli) < generate-sources @ standalone
-pom <<<
[INFO]
[INFO] --- archetype:3.2.1:generate (default-cli) @ standalone-pom ---
[INFO] Generating project in Batch mode
[INFO]
[INFO] Using following parameters for creating project from Archetype: maven-arc
hetype-quickstart:1.4
[INFO] -----
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: packageInPathFormat, Value: org/pr2
[INFO] Parameter: package, Value: org.pr2
[INFO] Parameter: groupId, Value: org.pr2
[INFO] Parameter: artifactId, Value: matematicas
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Project created from Archetype in dir: C:\Users\jta8\_matematicas
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 2.189 s
[INFO] Finished at: 2024-03-28T16:02:27+01:00
[INFO] -----

jta8_RDESKTOP-RTCI9P7 MINGW64 ~
$ cd matematicas
jta8_RDESKTOP-RTCI9P7 MINGW64 ~/matematicas
$ mkdir src/main/java/org/pr2/matematicas
jta8_RDESKTOP-RTCI9P7 MINGW64 ~/matematicas
$
```

4. Dentro del directorio recién creado cree el fichero Matematicas.java con
el siguiente contenido:
package org.pr2.matematicas;
public class Matematicas{
public static int sumaNumeros(int n){
if (n < 0) throw new ArithmeticException("La suma
hasta el n-esimo numero natural no es aplicable a
un n menor que 0");
return n == 0?0:n + sumaNumeros(n - 1);

```
}  
}
```



```
MINGW64 C:\Users\jta8\matematicas  
jta8_DESKTOP-RTCI9P7 MINGW64 ~  
$ mvn archetype:generate -DgroupId=org.pr2 -DartifactId=matematicas -DarchetypeA  
rtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=fa  
lse  
[INFO] Scanning for projects...  
[INFO] -----< org.apache.maven:standalone-pom >-----  
[INFO] Building Maven Stub Project (No POM) 1  
[INFO] -----[ pom ]-----  
[INFO] >>> archetype:3.2.1:generate (default-cli) > generate-sources @ standalone  
-pom >>>  
[INFO] <<< archetype:3.2.1:generate (default-cli) < generate-sources @ standalone  
-pom <<<  
[INFO] --- archetype:3.2.1:generate (default-cli) @ standalone-pom ---  
[INFO] Generating project in Batch mode  
[INFO] -----  
[INFO] Using following parameters for creating project from Archetype: maven-arc  
hetype-quickstart:1.4  
[INFO] -----  
[INFO] Parameter: groupId, Value: org.pr2  
[INFO] Parameter: artifactId, Value: matematicas  
[INFO] Parameter: version, Value: 1.0-SNAPSHOT  
[INFO] Parameter: package, Value: org.pr2  
[INFO] Parameter: packageInPathFormat, Value: org/pr2  
[INFO] Parameter: package, Value: org.pr2  
[INFO] Parameter: groupId, Value: org.pr2  
[INFO] Parameter: artifactId, Value: matematicas  
[INFO] Parameter: version, Value: 1.0-SNAPSHOT  
[INFO] Project created from Archetype in dir: C:\Users\jta8\matematicas  
[INFO] -----  
[INFO] BUILD SUCCESS  
[INFO] -----  
[INFO] Total time: 2.188 s  
[INFO] Finished at: 2024-03-28T16:02:27+01:00  
[INFO] -----  
jta8_DESKTOP-RTCI9P7 MINGW64 ~  
$ cd matematicas  
jta8_DESKTOP-RTCI9P7 MINGW64 ~/matematicas  
$ mkdir src/main/java/org/pr2/matematicas  
jta8_DESKTOP-RTCI9P7 MINGW64 ~/matematicas  
$ touch Matematicas.java  
jta8_DESKTOP-RTCI9P7 MINGW64 ~/matematicas  
$
```

5. Cree un directorio para las pruebas para el paquete matematicas:

```
md src/test/java/org/pr2/matematicas
```

6. Dentro del directorio creado, cree el fichero MatematicasTest.java con el siguiente contenido, y explíquelo:

```
package org.pr2.matematicas;
```

```
import org.junit.Test;
```

```
import static org.junit.Assert.*;
```

```
public class MatematicasTest{
```

```
@Test
```

```
public void sumaCero(){
```

```
assertEquals(0, Matematicas.sumaNumeros(0));
```

```
}
```

```
@Test
```

```
public void sumaPositivo(){assertEquals(6, Matematicas.sumaNumeros(3));
```

```
}
```

```
@Test(expected = ArithmeticException.class)
```

```
public void sumaNegativo(){
```

```
Matematicas.sumaNumeros(-1);
```

```
}
```

```
}
```

Para que el test sumaCero sea correcto el resultado de sumaNumeros para $n = 0$ tiene que ser 0. En el test sumaPositivo, para que sea correcto el resultado de sumaNumeros para $n = 3$ tiene que ser 6. Por último, en el test sumaNegativo, para que sea correcto el resultado de sumaNumeros para $n = -1$ tiene que tirar la excepción ArithmeticException.class.

7. Ejecute los tests:

```
mvn test
```

Para que sólo ejecute los tests de la clase Matematicas.java, puede ejecutar `mvn -Dtest=MatematicasTest test`

```
MINGW64~/c:/Users/jta/_matematicas
$ mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] ----- org.pr2.matematicas >-----
[INFO] Building matematicas 1.0-SNAPSHOT
[INFO] from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- resources:3.0.2:resources (default-resources) @ matematicas ---
[INFO] using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory C:\Users\jta\_matematicas\src\main\r
resources
[INFO]
[INFO] --- compiler:3.8.0:compile (default-compile) @ matematicas ---
[INFO] Changes detected - recompiling the module!
[INFO] Compiling 1 source file to C:\Users\jta\_matematicas\target\classes
[INFO]
[INFO] --- resources:3.0.2:testResources (default-testResources) @ matematicas -
-
[INFO] using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory C:\Users\jta\_matematicas\src\test\r
resources
[INFO]
[INFO] --- compiler:3.8.0:testCompile (default-testCompile) @ matematicas ---
[INFO] Changes detected - recompiling the module!
[INFO] Compiling 1 source file to C:\Users\jta\_matematicas\target\test-classes
[INFO]
[INFO] --- surefire:2.22.1:test (default-test) @ matematicas ---
[INFO]
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/
surefire/surefire-junit4/2.22.1/surefire-junit4-2.22.1.pom
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/s
urefire/surefire-junit4/2.22.1/surefire-junit4-2.22.1.pom (3.1 kB at 11 kB/s)
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/
surefire/surefire-providers/2.22.1/surefire-providers-2.22.1.pom
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/s
urefire/surefire-providers/2.22.1/surefire-providers-2.22.1.pom (2.5 kB at 78 kB
/s)
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/
surefire/surefire-junit4/2.22.1/surefire-junit4-2.22.1.jar
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/s
urefire/surefire-junit4/2.22.1/surefire-junit4-2.22.1.jar (85 kB at 1.3 MB/s)
[INFO]
[INFO] ----- T E S T S -----
[INFO] Running org.pr2.AppTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.015 s -
- in org.pr2.AppTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] ----- BUILD SUCCESS -----
[INFO]
[INFO] Total time: 6.485 s
```