Nolix Tests

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1 Tests

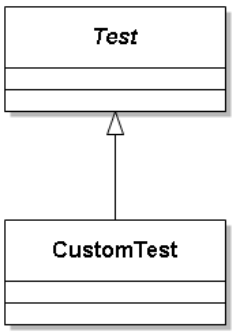
1.1 What a Nolix test is

The Nolix test classes are base classes for custom unit tests and integration tests.

test unit	An object whose creation or methods are tested.
test method	A method that tests the creation or a method of a test unit.
test / test class	A class whose purpose is, and only is, to contain test methods. The test units of a test should be all of the same type.

1.2 How a custom test is defined

A custom test can be defined by inheriting from the test class. A test is empty at the beginning.




```
import ch.nolix.core.test2.test;

public class CustomTest extends Test {

}
```

The test class can be found in the package ‘ch.nolix.core.test2’.

1.3 How test methods are added to a test

To a test, an arbitrary number of test methods can be added. A test method always must be public. All public methods are test methods.

Lets add a first test method to our custom test. This test method tests a certain case of the length method of a string.

```
import ch.nolix.core.test2.Test;

public class CustomTest extends Test {

     //test method
     public void test_length() {

          //setup
          var testUnit = “Hello!”;

          //execution
          var length = testUnit.length();

          //verification
          expect(length).isEqualTo(6);
     }
}
```

The output of the execution of this test is:

```
   PASSED: testLength (0ms)
 = CustomTest: 1/1 test methods passed (0ms)
```

1.4 How a test is created and run

To run a test, an instance of it must be created and its run method must be called.

```
var test = new CustomTest();
test.run();
```

This can be done in 1 line.

```
new CustomTest().run();
```

The run method runs all test methods of a test for 1 time. The test methods of a test are run in alphabetic order.

1.5 What the output of a test is

When a test is run, the following output is produced:

- The running duration of all test methods.
- The number of the passed test methods.
- The total running duration of the test.
- All errors of all failed test methods.

The running duration is always shown in milliseconds (ms).

The following is the output of a test of a Matrix class. One test method of the test failed.

```
   PASSED: loopTest_createIdendityMatrix (0ms)
   PASSED: loopTest_getRank (0ms)
-->FAILED: loopTest_getTrace: (0ms)
   #1 1.0 was expected, but 0.0 was received.
   (ch.nolix.coreTest.mathematicsTest.MatrixTest.java:69)
   #2 2.0 was expected, but 0.0 was received.
   (ch.nolix.coreTest.mathematicsTest.MatrixTest.java:69)
   #3 3.0 was expected, but 0.0 was received.
   (ch.nolix.coreTest.mathematicsTest.MatrixTest.java:69)
   #4 4.0 was expected, but 0.0 was received.
   (ch.nolix.coreTest.mathematicsTest.MatrixTest.java:69)
   #5 5.0 was expected, but 0.0 was received.
   (ch.nolix.coreTest.mathematicsTest.MatrixTest.java:69)
   PASSED: test_add (0ms)
   PASSED: test_appendAtRight (0ms)
   PASSED: test_getInverse (0ms)
   PASSED: test_getInverse_2 (0ms)
   PASSED: test_getInverse_3 (0ms)
   PASSED: test_getProduct (0ms)
   PASSED: test_getSolutionAsExtendedMatrix (0ms)
   PASSED: test_getSolutionAsExtendedMatrix_2 (0ms)
   PASSED: test_getTransposed (0ms)
   PASSED: test_toString (16ms)
   PASSED: test_toString_2 (0ms)
   PASSED: test_toString_3 (0ms)
   PASSED: test_toString_4 (0ms)
   PASSED: test_toString_5 (0ms)
   PASSED: test_toString_6 (0ms)
   PASSED: test_toString_7 (0ms)
   PASSED: test_toString_8 (0ms)
  =MatrixTest: 19/20 test methods passed (16ms)
```

1.6 How test units are tested

A test provides various methods to test the test units.

Example (boolean)

```
var boolean1 = true;
var boolean2 = false;

//Expects that ‘bool1’ is true.
expect(boolean1);

//Expects that ‘bool2’ is false.
expectNot(boolean2);
```

Example (int)

```

//Expects that an int is positive.
expect(15).isPositive();

//Expects that an int is bigger than 10.
expect(15).isBiggerThan(10);
```

Example (string)

```

//Expects that a string is not empty.
expect(“Hello World!”).isNotEmpty();

//Expects that a string is not longer than 20 characters.
expect(“Hello World!”).isNotLongerThan(20);
```

1.7 How floating point numbers with deviations are tested

Floating point numbers can have rounding errors, especially when they are calculated by a complex algorithm. For example, when the ideal result is 2.0, but 1.999999 or 2.000001 comes out.

Tests provide functionalities to test floating point numbers with deviations. A value is regarded as correct, when it does not deviate more than the default deviation or a given maximum deviation. The default deviation is 10^{-9}.

```
var result = getSquareRoot(2.0);

//Expects that the result is 1.4142 with a maximum deviation of 0.001.
expect(result).withMaxDeviation(0.001).isEqualTo(1.4142);
```

1.8 How methods are tested to exceptions

Tests are able to test if a method throws an exception.

```
//Expects that dividing by 0 throws an arithmetic exception.
expect(() -> 10 / 0).throwsExceptionOfType(ArithemeticException);

//Expects that dividing by 2 throws no exception.
expect(() -> 10 / 2).throwsNoException();
```

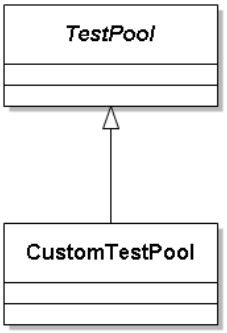
2 Test pools

2.1 What a test pool is

A test pool can contain tests and can run them all.

2.2 How a custom test pool is defined

A custom test pool can be defined by inheriting from the test pool class. A test pool is empty at the beginning.




```
import ch.nolix.core.test.TestPool;

public class CustomTestPool extends TestPool {

}
```

The test pool class can be found in the package ‘ch.nolix.core.testoid’.

2.3 How tests are added to a test pool

A test pool can contain several tests. Tests cannot be added to a test pool from outside. So the tests of a test pool must be added in the constructor.

Lets add 2 tests to our custom test pool.

```
import ch.nolix.core.test.TestPool;

public class CustomTestPool extends TestPool {

	//constructor
	public CustomTestPool() {
		addTest(
			new CustomTest(),
			new MatrixTest()
		);
	}
}
```

The method ‘addTest’ can take an arbitrary number of tests.

2.4 How a test pool is created and run

To run the tests of a test pool, an instance of the test pool must be created and its run method must be called.

```
var testPool = new CustomTestPool();
testPool.run();
```

This can be done in 1 line.

```
new CustomTestPool().run();
```

The tests of the test pool are run the same way as when they were created and run separately one after one. The tests of a test pool are run in the same order how they were added to the test pool.

2.5 How test pools are nested

A test pool can also contain other test pools. Test pools cannot be added to another test pool from outside. The further test pools a test pool contains must be added in the constructor. A test pool can contain both, tests and other test pools.

Lets add two other test pools to our custom test pool.

```
import ch.nolix.core.test.TestPool;

public class CustomTestPool extends TestPool {

	//constructor
	public CustomTestPool() {

		addTestPool(
			new CustomSubTestPool1(),
			new CustomSubTestPool2()
		);

		addTest(
			new CustomTest(),
			new MatrixTest()
		);
	}
}
```

The method ‘addTestPool’ can take an arbitrary number of test pools.

A test pool cannot contain itself recursively to avoid circular execution calls. If there is tried to add a test pool that violates this condition, the method ‘addTestPool’ throws an exception.