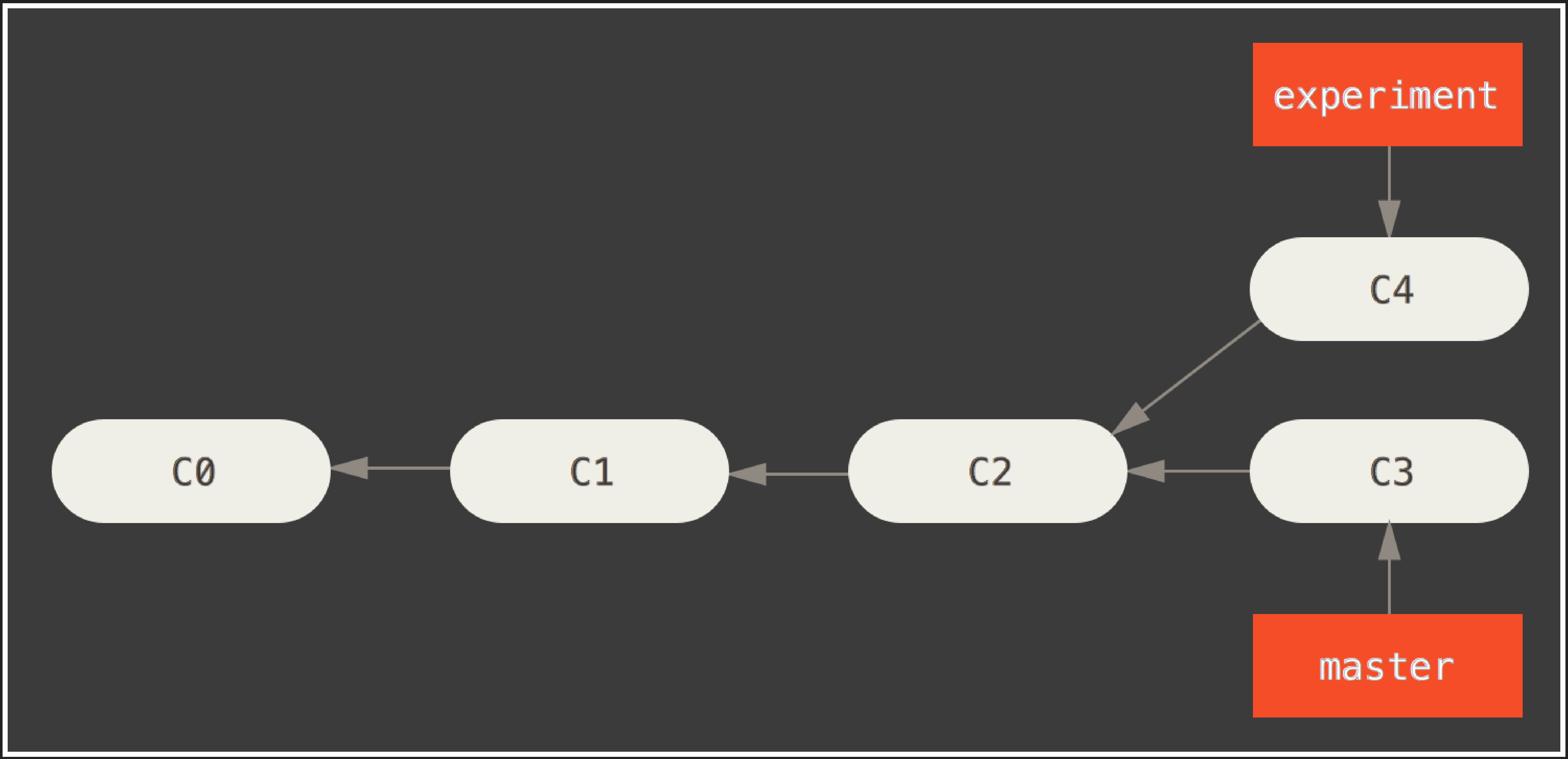
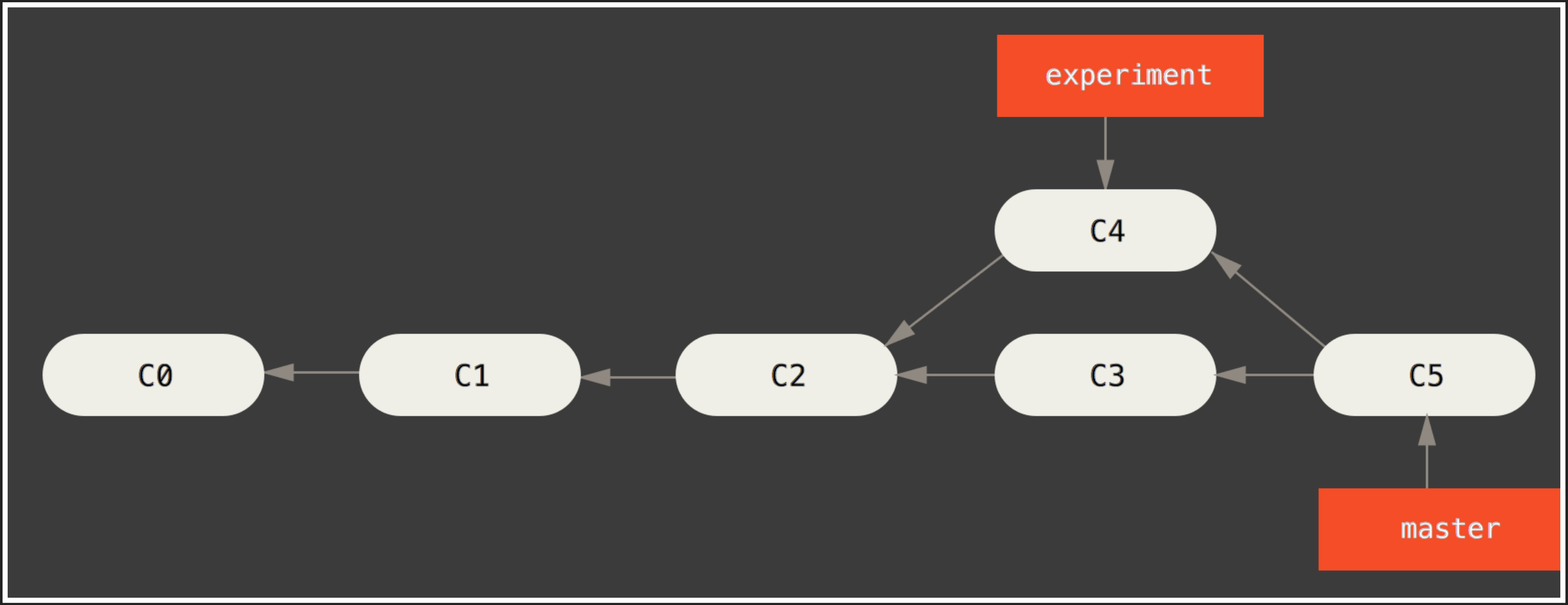
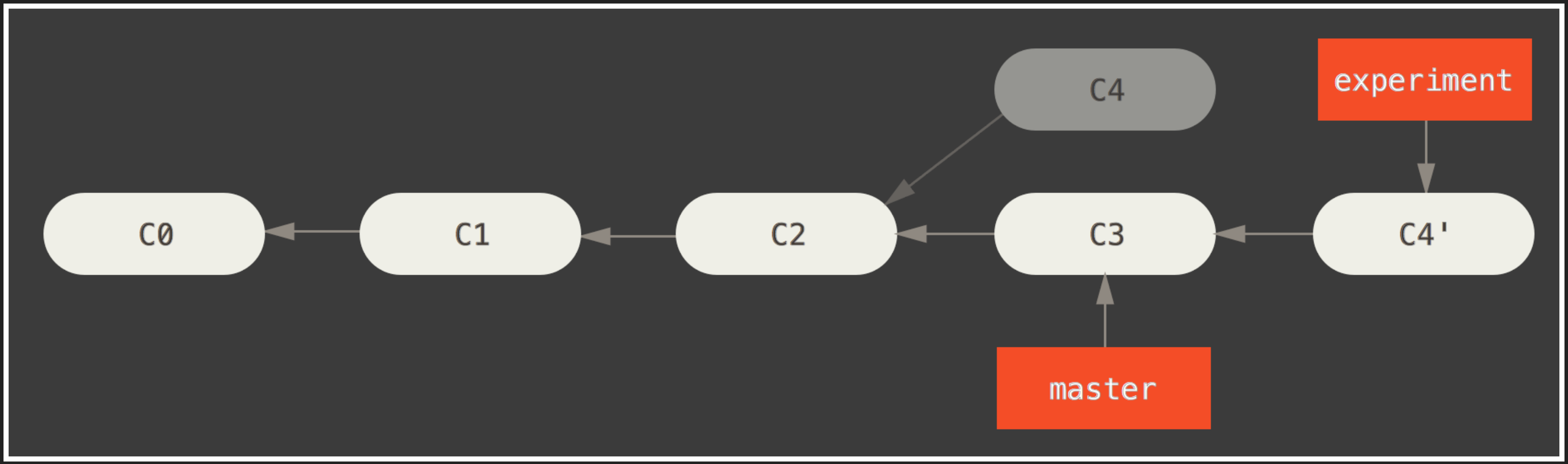
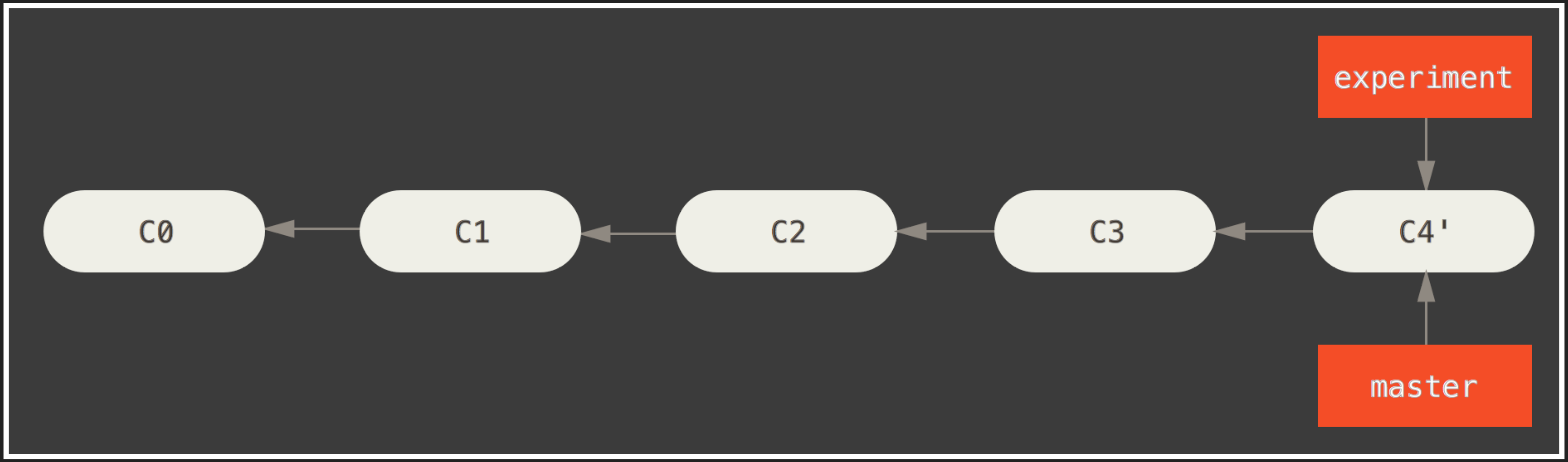
上节课后练习 REBASE

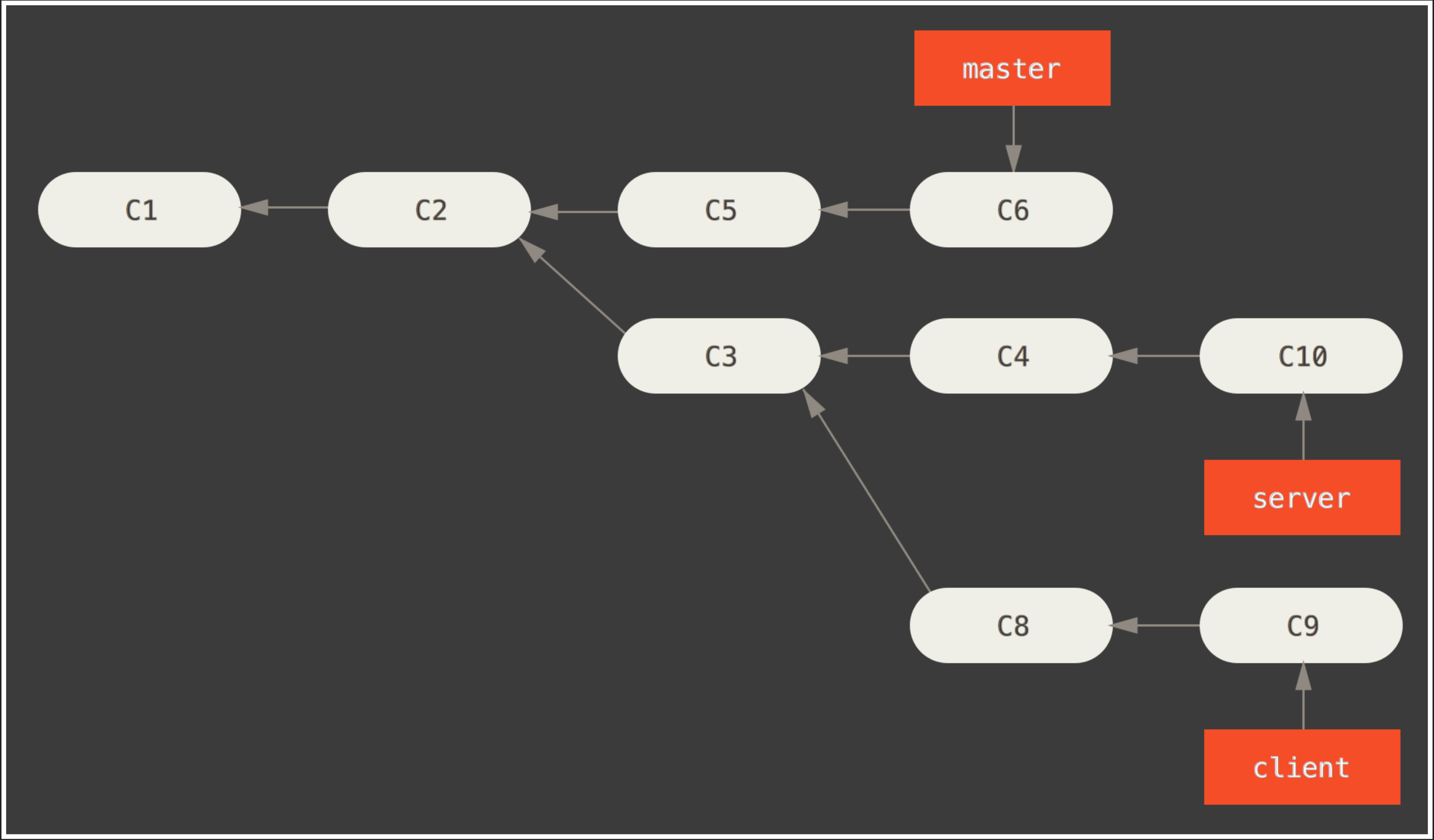

experiment
C4
C0
C1
C2
C3
master

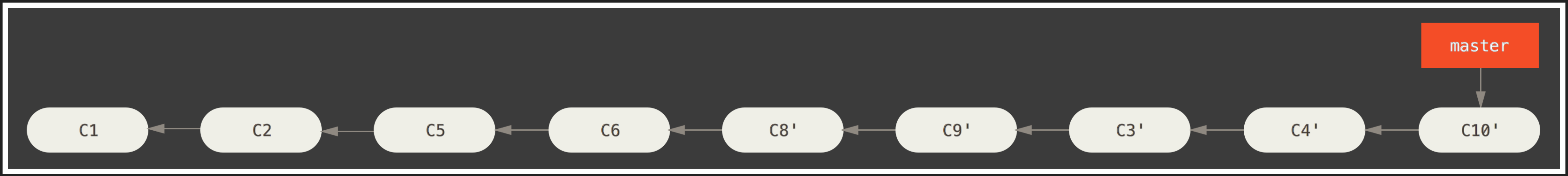

experiment
C4
C0
C1
C2
C3
C5
master


C4
experiment
C0
C1
C2
C3
C4'
master


experiment
C0
C1
C2
C3
C4'
master

好处




master
C1
C2
C5
C6
C8'
C9'
C3'
C4'
C10'

风险

一旦分支中的提交对象发布到公共仓库，就千万不要对该分支进行衍合操作。

TESTING FRAMEWORK

JUNIT

- http://junit.org/
- 是一个Java单元测试框架
- A research survey performed in 2013 across 10,000 GitHub projects found that JUnit, along with slf4j-api, are the most popular libraries. Each library was used by 30.7% of projects.

CREATE A TEST

```java
import org.junit.Test;

import static org.junit.Assert.assertTrue;

public class MyTest {
    @Test
    public void testNewArray() throws Exception {
        final boolean result = false;
        assertTrue(result);
    }
}
```

ASSERTIONS

```
java.lang.AssertionError
    at org.junit.Assert.fail(Assert.java:86)
    at org.junit.Assert.assertTrue(Assert.java:41)
    at org.junit.Assert.assertTrue(Assert.java:52)
    at macdao.MyTest.testNewArray(MyTest.java:11)
```

ASSERTTHAT

```
assertThat([value], [matcher statement]);
```

```java
import org.junit.Test;

import static org.hamcrest.CoreMatchers.is;
import static org.junit.Assert.assertThat;

public class MyTest {
    @Test
    public void testNewArray() throws Exception {
        final boolean result = false;
        assertThat(result, is(true));
    }
}
```

```
Expected: is <true>
     but: was <false>
```

MATCHERS

- org.hamcrest.CoreMatchers

```
assertThat("good", is("good"));

assertThat(new Object(), notNullValue());

assertThat(new Object(), not(sameInstance(new Object())));

assertThat("good", startsWith("goo"));

assertThat(Arrays.asList(1, 2), hasItem(1));
```

```java
assertThat("fab", both(containsString("a")).and(containsString("b")));

assertThat("good", not(allOf(equalTo("bad"), equalTo("good"))));

assertThat("good", anyOf(equalTo("bad"), equalTo("good")));

assertThat(7, not(either(equalTo(3)).or(equalTo(4))));
```

IGNORING A TEST

```
@Ignore("Test is ignored as a demonstration")
@Test
public void testSame() {
    assertThat(1, is(1));
}
```

FIXTURE ANNOTATIONS

```java
import org.junit.*;
import static java.lang.System.out;
public class MyTest {
    @BeforeClass
    public static void setUpClass() { out.println("@BeforeClass"); }
    @AfterClass
    public static void tearDownClass() { out.println("@AfterClass"); }
    @Before
    public void setUp() throws Exception { out.println("@Before"); }
    @After
    public void tearDown() throws Exception { out.println("@After"); }
    @Test
    public void test1() throws Exception { out.println("test1"); }
    @Test
    public void test2() throws Exception { out.println("test2"); }
}
```

```
@BeforeClass
@Before
test1
@After
@Before
test2
@After
@AfterClass
```

EXERCISE 1

你是一名体育老师，在某次课距离下课还有五分钟时，你决定搞一个游戏。

此时有100名学生在上课。游戏的规则是：

1. 你首先说出三个不同的特殊数，要求必须是个位数，比如3、5、7。
2. 让所有学生拍成一队，然后按顺序报数。
3. 学生报数时：
   - 如果所报数字是第一个特殊数（3）的倍数，那么不能说该数字，而要说Fizz；
   - 如果所报数字是第二个特殊数（5）的倍数，那么要说Buzz；
   - 如果所报数字是第三个特殊数（7）的倍数，那么要说Whizz。

编写Student的测试

- 当三个特殊数是3、5、7时，学生1说1
- 当三个特殊数是3、5、7时，学生3说Fizz
- 当三个特殊数是3、5、7时，学生5说Buzz
- 当三个特殊数是3、5、7时，学生7说Whizz

- $ git remote add upstream http://code.huawei.com/qixi/prs-capability.git
- $ git fetch upstream master
- $ git checkout -b 2-testing-framework upstream/master

- `$ sbt -mem 500`
- `> ~test`

EXPECTED EXCEPTIONS

```java
@Test(expected = IndexOutOfBoundsException.class)
public void empty() {
     new ArrayList<Object>().get(0);
}
```

```java
@Test
public void testExceptionMessage() {
    try {
        new ArrayList<Object>().get(0);
        fail("Expected an IndexOutOfBoundsException to be thrown");
    } catch (IndexOutOfBoundsException exception) {
        assertThat(exception.getMessage(), is("Index: 0, Size: 0"));
    }
}
```

```java
@Rule
public ExpectedException thrown = ExpectedException.none();

@Test
public void shouldTestExceptionMessage() throws IndexOutOfBoundsException {
    List<Object> list = new ArrayList<Object>();

    thrown.expect(IndexOutOfBoundsException.class);
    thrown.expectMessage("Index: 0, Size: 0");
    list.get(0); // execution will never get past this line
}
```

SYSTEM RULES

```
public void MyTest {
    @Rule
    public final SystemOutRule systemOutRule = new SystemOutRule().enableLog();

    @Test
    public void writesTextToSystemOut() {
        System.out.print("hello world");
        assertEquals("hello world", systemOutRule.getLog());
    }
}
```

EXERCISE 2

编写FizzGameTest的测试

- 输出应该是100行
- 当输入是3、5、7时，学生1说1
- 当输入是3、5、7时，学生3说Fizz
- 当输入是3、5、7时，学生5说Buzz

SCALATEST

- http://www.scalatest.org/
- 可以测试Java和Scala

FUNSUITE

```scala
import org.scalatest.FunSuite

class SetSuite extends FunSuite {

  test("An empty Set should have size 0") {
    assert(Set.empty.size == 0)
  }

  test("Invoking head on an empty Set should produce NoSuchElementException") {
    intercept[NoSuchElementException] {
      Set.empty.head
    }
  }
}
```

FLATSPEC

```scala
import org.scalatest.FlatSpec

class SetSpec extends FlatSpec {

  "An empty Set" should "have size 0" in {
    assert(Set.empty.size == 0)
  }

  it should "produce NoSuchElementException when head is invoked" in {
    intercept[NoSuchElementException] {
      Set.empty.head
    }
  }
}
```

FUNSPEC

```scala
import org.scalatest.FunSpec

class SetSpec extends FunSpec {

  describe("A Set") {
    describe("when empty") {
      it("should have size 0") {
        assert(Set.empty.size == 0)
      }

      it("should produce NoSuchElementException when head is invoked") {
        intercept[NoSuchElementException] {
          Set.empty.head
        }
      }
    }
```

PATH.FUNSPEC

```
import org.scalatest.path

class SetSpec extends path.FunSpec {
  describe("A Set") {
    describe("when empty") {
      Console.println("when empty")
      it("should have size 0") {
        assert(Set.empty.size == 0)
      }

      it("should produce NoSuchElementException when head is invoked") {
        intercept[NoSuchElementException] {
          Set.empty.head
        }
      }
    }
```

USING ASSERTIONS

```
val left = 2
val right = 1
assert(left == right)
```

```
val a = 5
val b = 2
assertResult(2) {
  a - b
}
```

```scala
intercept[IndexOutOfBoundsException] {
  "hi".charAt(-1)
}
```

USING MATCHERS

```
class StudentSpec extends path.FunSpec with Matchers
```

```scala
Array(1, 2) should equal (Array(1, 2))

val array: Array[Int] = Array(1, 2); array should be theSameInstanceAs array

None should be (None)

"abc" should have length 3

"Hello seven world" should startWith ("Hello")

"Hello seven world" should include ("seven")

"Hello seven world" should startWith regex "Hel*o"

1 should be < 7
```

```
new File(".") shouldBe 'directory

new File(".") should be a 'directory

new File(".") should not be a ('file)

"" shouldBe 'empty

"" shouldBe empty

all (Array(1,2,3)) should be < 10

5 should (be > 0 and be <= 10)

None should (equal (Some(List(1, 2, 3))) or be (None))
```

EXERCISE 3

编写Student的测试

- 当三个特殊数是3、5、7时，学生1说1
- 当三个特殊数是3、5、7时，学生3说Fizz
- 当三个特殊数是4、5、6时，学生1说1
- 当三个特殊数是4、5、6时，学生3说3
- 当三个特殊数是4、5、6时，学生4说Fizz

SOME(SSH KEYS)

- http://code.huawei.com/qixi/prs-capability.git
- git@code.huawei.com:qixi/prs-capability.git

- `$ ssh-keygen -t rsa -C "qixi@huawei.com"`
- `$ clip < ~/.ssh/id_rsa.pub`
- Add SSH Key on Code Club

SOME(BUILD.SBT)

```
lazy val root = (project in file(".")).
  settings(
    name := "2-testing-framework",
    version := "1.0",
    scalaVersion := "2.11.4",
    libraryDependencies += "org.scalatest" %% "scalatest" % "2.2.4" % "test",
    libraryDependencies += "com.novocode" % "junit-interface" % "0.11" % "test",
    libraryDependencies += "com.github.stefanbirkner" % "system-rules" % "1.11.0" % "test",
    libraryDependencies += "commons-io" % "commons-io" % "2.0" % "test" force(),
    crossPaths := false
  )
```

SOME(.GITIGNORE)

```
# idea project directory
.idea/
target
# will match my.o and my.a
*.[oa]
# will match hello and hellp but not hellop
hell?
```

课后练习

- 需求

  学生报数时，如果所报数字同时是两个特殊数的倍数情况下，也要特殊处理，比如第一个特殊数和第二个特殊数的倍数，那么不能说该数字，而是要说FizzBuzz，以此类推。如果同时是三个特殊数的倍数，那么要说FizzBuzzWhizz。

- 有FizzGame和Student的测试和实现
- 提交到Code Club上并发Merge Request