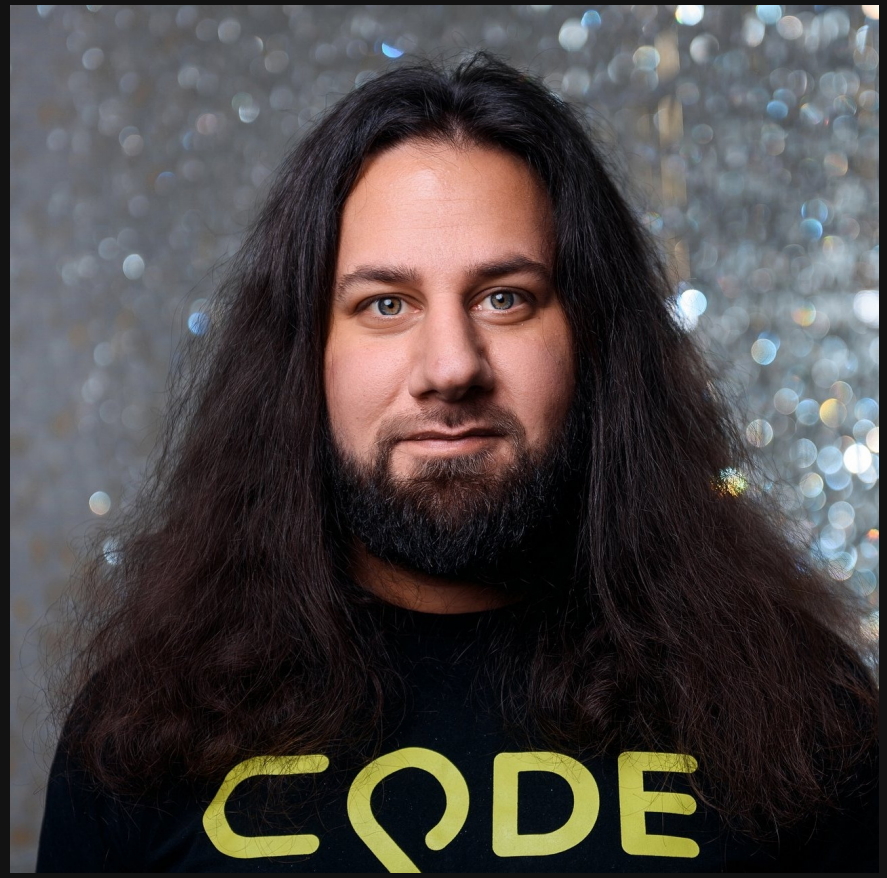
Kotlin Goodies for Testing

Pasha Finkelshteyn, 

`whoami`

- Developer at
- Average enjoyer
- Speaker and streamer (https://twitch.tv/jetbrains or .tv/)
- Data engineer



All programming activities have one common trait

They require testing!

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In this talk I’m trying to tell about good autotests.
With 

How test in Java usually look?

```
class MyVeryImportantTest {
    @Test
    void feature_should_work_somehow(){
       /*snip*/
       assert
    }
    @Test
    void feature_should_work_somehow2(){
       /*snip*/
       assert
    }
    @Test
    void feature_should_work_somehow3(){
       /*snip*/
       assert
    }
}
```

Many, many times!

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9          /*snip*/
10         assert
11      }
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15         assert
16      }
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Many, many times!


The Flat World

But we wanna beauty!

```
passwordService {
    shouldHash {
        length { /* snip */ }
        salt { /* snip  */ }
    }
    shouldCheck {
        validPasswords()
        invalidPasswords()
    }
}
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But we wanna beauty!

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Parametrized tests? Python

```python
@pytest.mark.parametrize("test_input,expected", [("3+5", 8), ("2+4", 6), ("6*9", 42)])
def test_eval(test_input, expected):
    assert eval(test_input) == expected
```

`test_input,expected`, really?

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Parametrized tests? Java

```java
static Stream<Arguments> stringIntAndListProvider() {
    return Stream.of(
        arguments("apple", 1, Arrays.asList("a", "b")),
        arguments("lemon", 2, Arrays.asList("x", "y"))
    );
}
@ParameterizedTest
@MethodSource("stringIntAndListProvider")
void testWithMultiArgMethodSource(String str,
    int num, List<String> list) {/* snip */}
```

`stringIntAndListProvider`, really?

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Parametrized tests? Kotlin (with kotest)

```kotlin
fun isPythagTriple(a: Int, b: Int, c: Int): Boolean = a * a + b * b == c * c

// snip…

withData(
  Triple(3, 4, 5),
  Triple(6, 8, 10),
  Triple(8, 15, 17),
  Triple(7, 24, 25)
) { (a, b, c) ->
  isPythagTriple(a, b, c) shouldBe true
}
```


What if
I need to test things I don’t know I need to test?

Never write your own hashing (unless…)

```
withData(
    "love",
    "secret",
    "god", // Who will remember the reference?
) { input ->
    MD5.compute(input) shouldBe libMd5(input)
}
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Launching…

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2. ✔ secret
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Time to investigate!

Property tests!

To test things we can not even *imagine*

```
checkAll(
    Arb.string(
        codepoints = Arb.of(
            (Char.MIN_VALUE.code..Char.MAX_VALUE.code).map(::Codepoint)
        ),
        range = 0..52
    )
) { input ->
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Error!

```
Property test failed for inputs

0) "꿟ル渼啣ຣᓄ驓拒③ஹ꽌⍰⍰滤砑琶10月뉥寵巘뗑筞醉°F२쫡Ấ鼏켓鹗맵檍ở儋⋉綦講뾧仈ी豳鄙ῇ悤川陜盜"

Caused by io.kotest.assertions.AssertionFailedError: expected:<"90b23a970ed1b799850a24140ae8ad39"> but was:<"5a430f76b3d544a1
```

Wow, it was a complex sample!

But there is more…

Error!

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Attempting to shrink arg "꿿ル湺啣ຮᑌ騿拒③ဤ괖□□潩砑琶㋉뇗竉嚱떪筴醉°Fʾ쫔Ẩ鼏켔鶚맥檍ở儋⋉綦講㜳仦ី豳鄙ŋ̇怣川陝盗"
Shrink #1: "꿿ル湺啣ຮᑌ騿拒③ဤ괖□□潩砑琶㋉뇗竉嚱떪筴醉°F" fail
Shrink #2: "꿿ル湺啣ຮᑌ騿拒③ဤ괖✷" fail
Shrink #3: "꿿ル湺啣ຮᑌ" fail
Shrink #4: "꿿ル湺" fail
Shrink #5: "꿿ル" fail
Shrink #6: "꿿" fail
Shrink #7: <empty string> pass
Shrink result (after 7 shrinks) => "꿿"
```

And there is more!

Error!

```
Attempting to shrink arg "꿟ル渕啣ຮᴗ騿挋③ဤ곺⍰⍰㵍砑琶㋉놡竉嚱떱筞醉°Fʢ쫙Ẩ鼏켗鶚맥檍ở僐⋉綦講뺕仦ꦿ豳鄙ŋ̣悳川陜盗"
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Shrink #7: <empty string> pass
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Shrink #5: "꾧ル" fail
Shrink #6: "꾧" fail
Shrink #7: <empty string> pass
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Attempting to shrink arg "꿿ᥰ渕啣ຣᓑ騿拒③ꦗ괖⍰⍰滺砑琶㏩뇷寵曦땽筴醉°F꒶쬒Ẩ冪켔鴞맥檍ở僖ϰ綦講㛙仦ᯤ豳鄙ŋ̣悳川陜盔"
Shrink #1: "꿿ᥰ渕啣ຣᓑ騿拒③ꦗ괖⍰⍰滺砑琶㏩뇷寵曦땽筴醉°F" fail
Shrink #2: "꿿ᥰ渕啣ຣᓑ騿拒③ꦗ괖✷" fail
Shrink #3: "꿿ᥰ渕啣ຣᓑ" fail
Shrink #4: "꿿ᥰ渕" fail
Shrink #5: "꿿ᥰ" fail
Shrink #6: "꿿" fail
Shrink #7: <empty string> pass
Shrink result (after 7 shrinks) => "꿿"
```

And there is more!

Error!

```
Attempting to shrink arg "꾧ル㴵啣ຣں騿拒③ꦝ괖⍰⍰㴧砑琶㏪뇛竉嚱띱筞醉°Fʢ짴Ẩ鼏켗鶚맥槵ở僖ϰ綦講嚶仦ั豳鄙ῃ悳川陜盗"
Shrink #1: "꾧ル㴵啣ຣں騿拒③ꦝ괖⍰⍰㴧砑琶㏪뇛竉嚱띱筞醉°F" fail
Shrink #2: "꾧ル㴵啣ຣں騿拒③ꦝ괖✷" fail
Shrink #3: "꾧ル㴵啣ຣں" fail
Shrink #4: "꾧ル㴵" fail
Shrink #5: "꾧ル" fail
Shrink #6: "꾧" fail
Shrink #7: <empty string> pass
Shrink result (after 7 shrinks) => "꾧"
```

And there is more!

Error!

```
Attempting to shrink arg "꽹ル湵啣ຣں騿挋③ဤ괖⍰⍰潩砑琶㋉늻竉嚱떕筞醉°FʢÂ쫚鼏켗鶚맵檍ở僐ᶍ綦講噢仦ᦂ豳鄙ŋ̉悥川陝盗"
Shrink #1: "꽹ル湵啣ຣں騿挋③ဤ괖⍰⍰潩砑琶㋉늻竉嚱떕筞醉°F" fail
Shrink #2: "꽹ル湵啣ຣں騿挋③ဤ괖✷" fail
Shrink #3: "꽹ル湵啣ຣں" fail
Shrink #4: "꽹ル湵" fail
Shrink #5: "꽹ル" fail
Shrink #6: "꽹" fail
Shrink #7: <empty string> pass
Shrink result (after 7 shrinks) => "꽹"
```

And there is more!

Error!

```
Property failed after 1 attempts

  Arg 0: "괭" (shrunk from 괭ㅿ溎啣ຣ౿騿搄③ꩡ괖⍰⍰滬砑琶㏠뇷寵巘땷筞醉°Fʔ쬒Ẩ鼏켗鶚맵檍ở僪⋉綦講뽖仦ꦾ黺鄙ῃ悳川陜盀)

Repeat this test by using seed 4919313423746630853
```

Error!

```
Property failed after 1 attempts

  Arg 0: "꽲" (shrunk from 꽲ル滌啣ຮں騿拒③ᨍᨏ괅⍰⍰滬砑琶⑽뇷寵巇땫筞醉°Fʅ쫚Ȁ鼏켓鶚맵檍ở僑⋉綦講螧仦ន豩鄙ῄ悤川陜盔)

Repeat this test by using seed 4919313423746630853
```

Error!

```
Property failed after 1 attempts

  Arg 0: "꾕" (shrunk from 꾕ㅆ滐啣ȣ￼驜拒③ဤ괖￼￼滤砑琶㏨뇘寵巘떪筞醉°F⥿쫙Ẩ鼏켔鶚맥槵ở僐⋉綦講뾏仈ǹ粉鄙ῃ悥川陝盗)

Repeat this test by using seed 4919313423746630853
```

Error!

```
Property failed after 1 attempts

  Arg 0: "꽪" (shrunk from 꽪ㅅ濒啣ꜱ◡驊挋③ᨐ괖⊡⊡溳砑琶10朋늷竈囌땒箂醉°Fᵡ꽑Ấ鼏켓鶚맼橞ð鵽ᵪ綦講뿆仆ᵮ黝鄙ῆ惹川陝盜)

Repeat this test by using seed 49193134237466308 53
```

Repeat? Yes!

```
checkAll(
    PropTestConfig(seed = 4919313423746630853),
    Arb.string(
        codepoints = Arb.of(
            ('a'.code..Char.MAX_HIGH_SURROGATE.code)
                .map(::Codepoint)
        ),
    )
) { input ->
    MD5.compute(input) shouldBe libMd5(input)
}
```

- reproduce the test **exactly** like in the failed instance
- debug it
- fix it
- PROFIT!!

Repeat? Yes!

```
checkAll(
    PropTestConfig(seed = 4919313423746630853),
    Arb.string(
        codepoints = Arb.of(
            ('a'.code..Char.MAX_HIGH_SURROGATE.code)
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```

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