TEST, TRANSFORM, REFACTOR

PHPUK 2014

by @_md

Learning

@_md

Marcello Duarte

Lead developer

Head of Training

$$\text{Kata}\left\{\begin{array}{l}\text{form}\\ \text{movement}\\ \text{practice}\\ \text{deliberate}\end{array}\right.$$

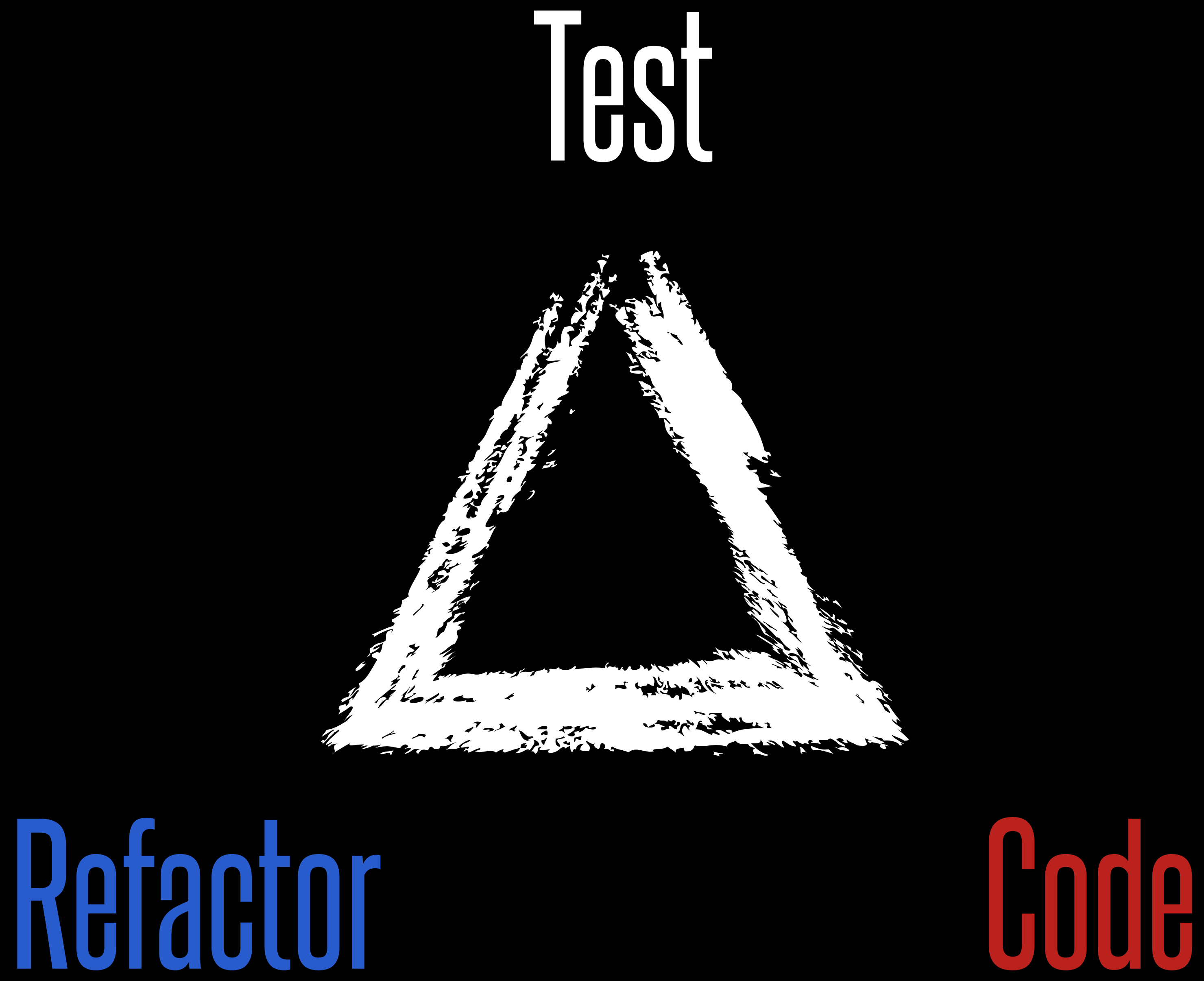
20 minutes

throw away

TDD

refactor

$\Bigg\}$ Kata


Test
Refactor
Code

TDD 3Rules

- no code without test
- enough to go red
- enough to go green

Test

Code

no code without test

enough to go red

enough to go green

Refactor

Simple Design

4Rules

- tests run and pass
- dry
- remove opacity
- simplify

The Roman Numerals Kata

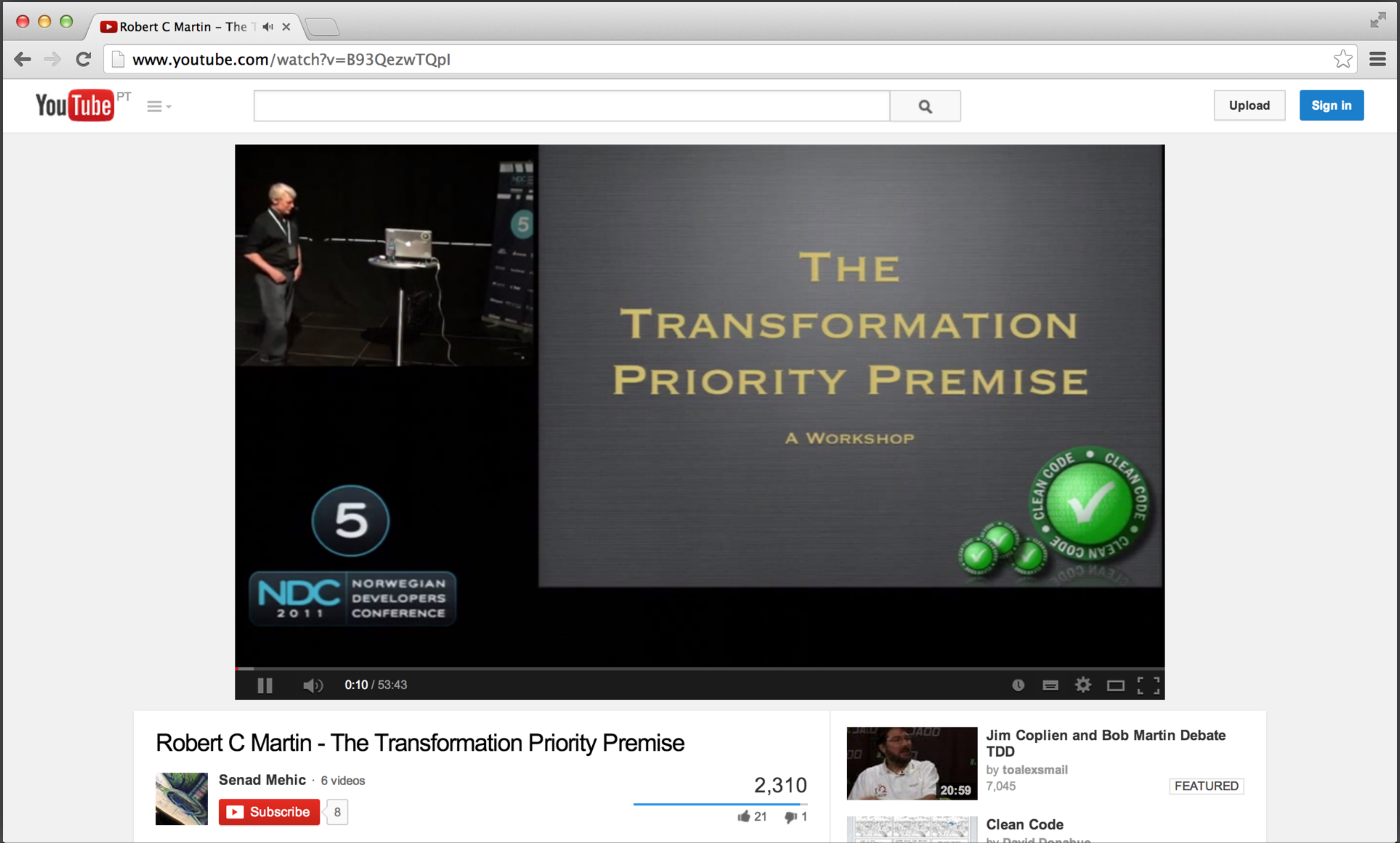
Converting arabic numbers into their roman equivalent

e.g. 2149 => MMCXLIX

Test	Make it red
Code	Make it green
Refactor	Make it right

The Roman Numerals Kata gone wrong demo

Introducing TPP


Robert C Martin - The T
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The Transformation Priority Premise
A Workshop
Clean Code
5
NDC 2011 Norwegian Developers Conference
0:10 / 53:43

Robert C Martin - The Transformation Priority Premise

Senad Mehic · 6 videos

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2,310

21 1

Jim Coplien and Bob Martin Debate TDD
by toalexsmail
7,045
20:59
FEATURED

Clean Code

Test	Make it more specific
Transform	Make it more generic
Refactor	Put on the design hat

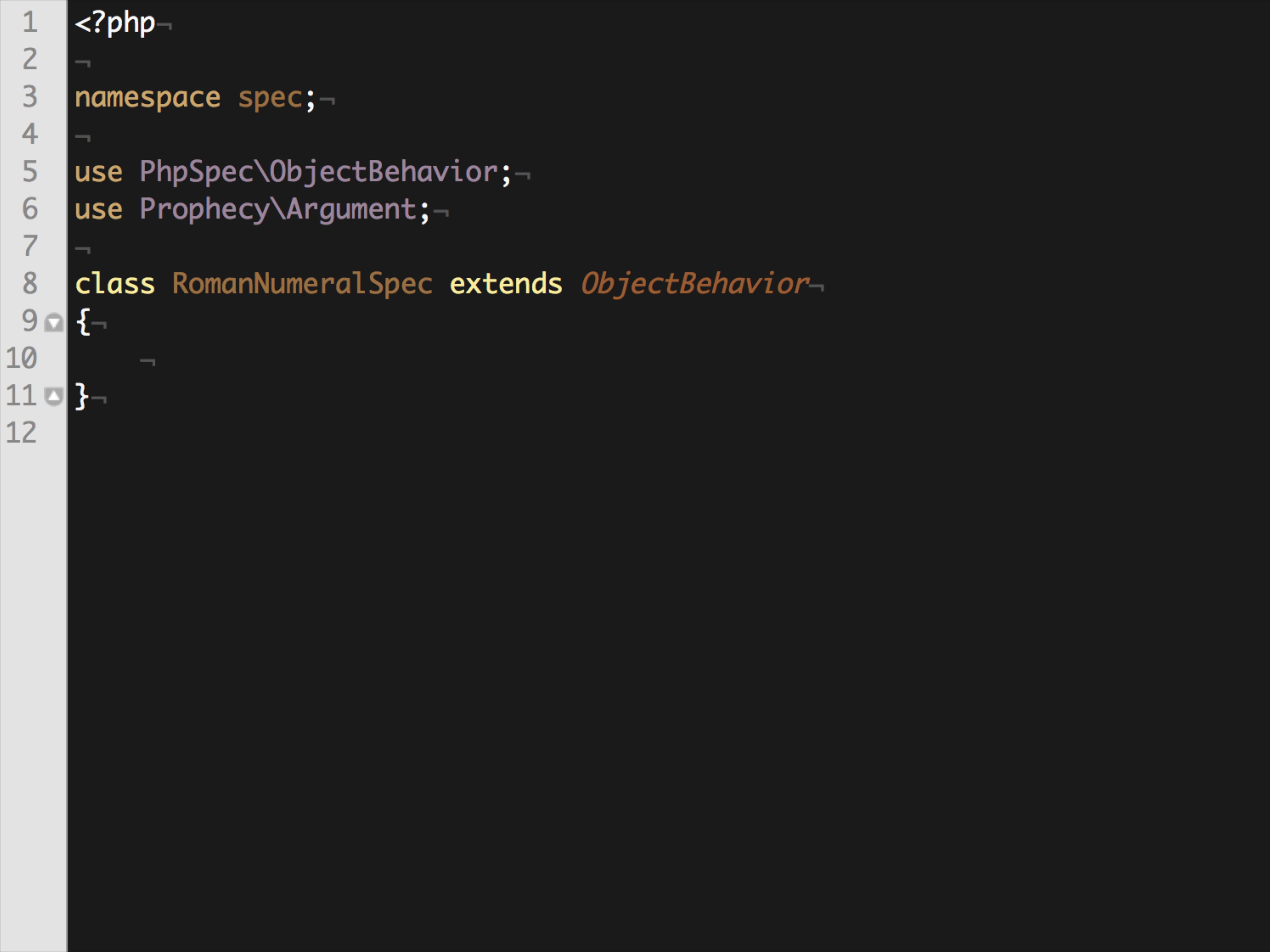
```
null to constant
constant to constant+
constant to scalar
statement to statements
unconditional to if
if to while
```

Transformations (just the most basic ones)

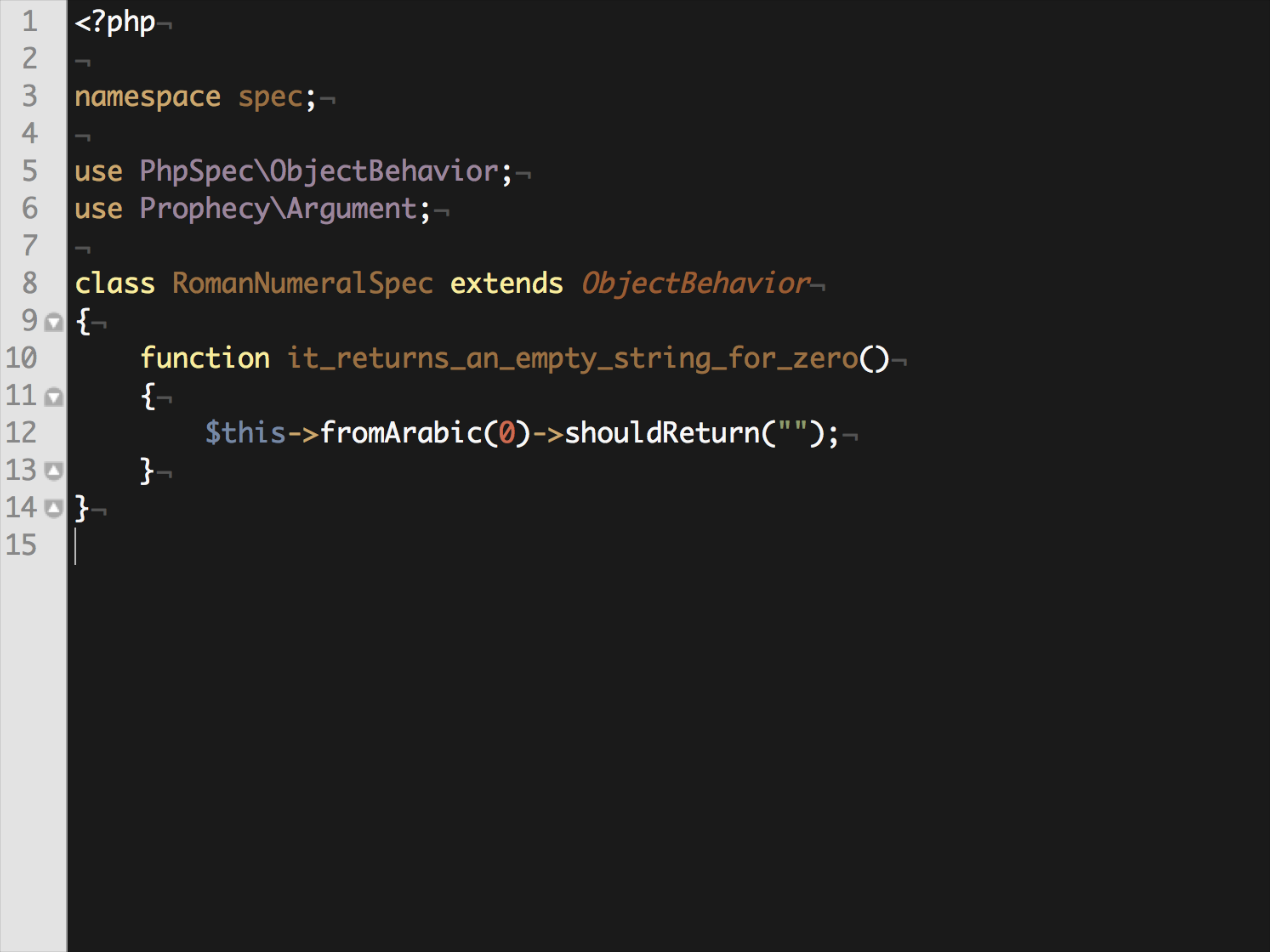
Jim Weirich's Roman Numeral Kata*

* in PHP

http://www.flickr.com/photos/jorendegroof/4471189540/



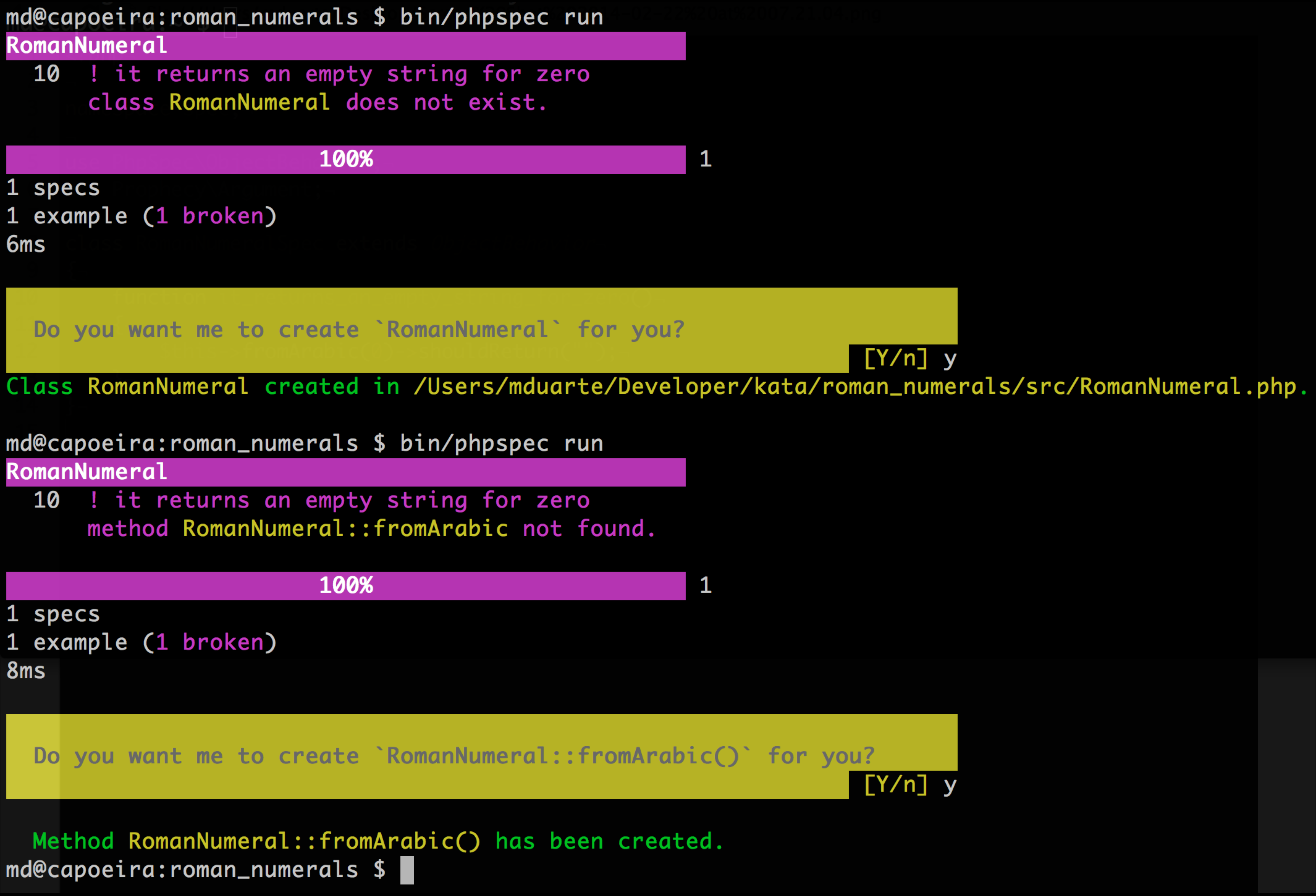
```php
<?php

namespace spec;

use PhpSpec\ObjectBehavior;
use Prophecy\Argument;

class RomanNumeralSpec extends ObjectBehavior
{
    
}
```



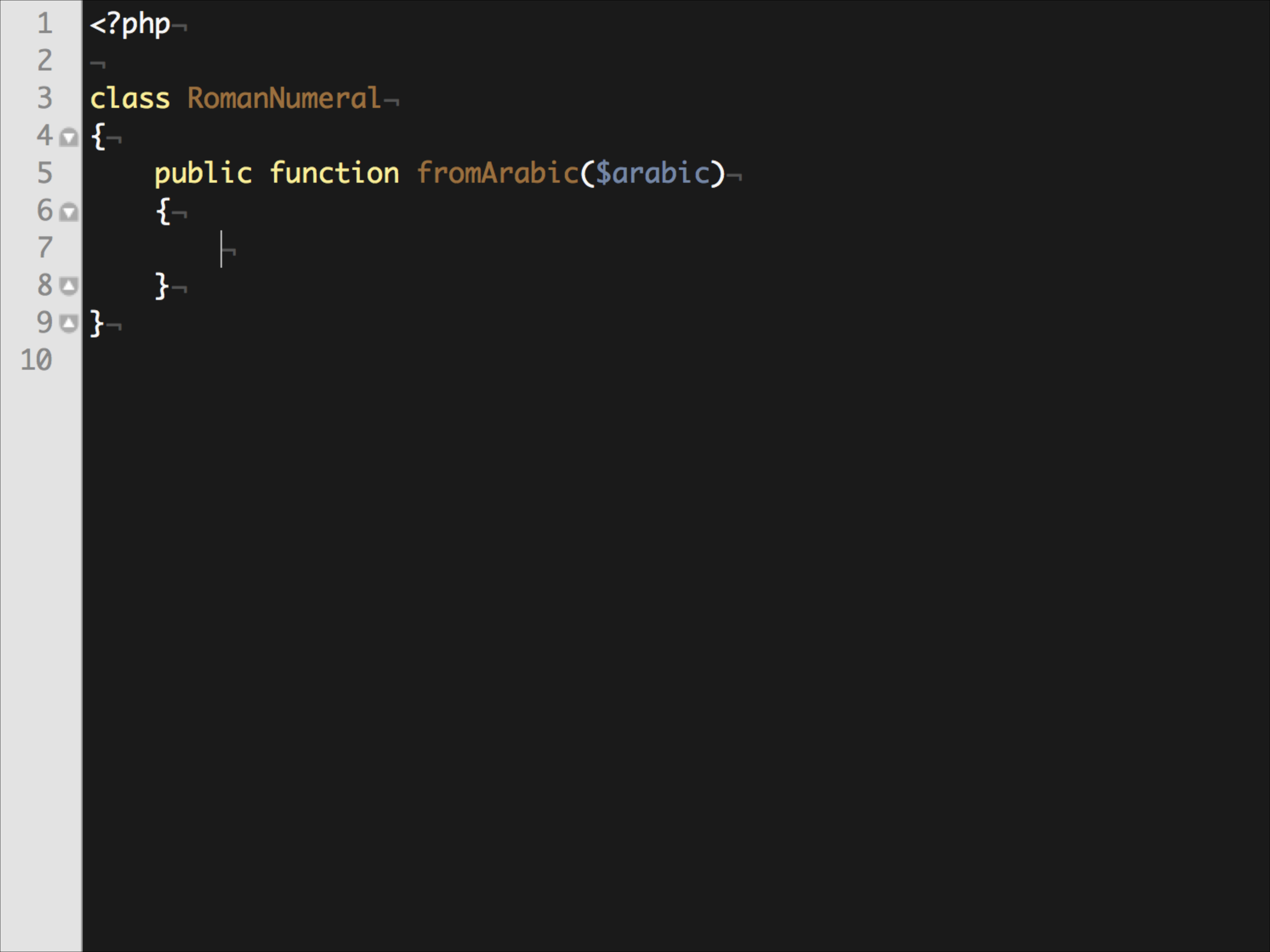
```php
<?php

namespace spec;

use PhpSpec\ObjectBehavior;
use Prophecy\Argument;

class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }
}
```

Walking skeleton

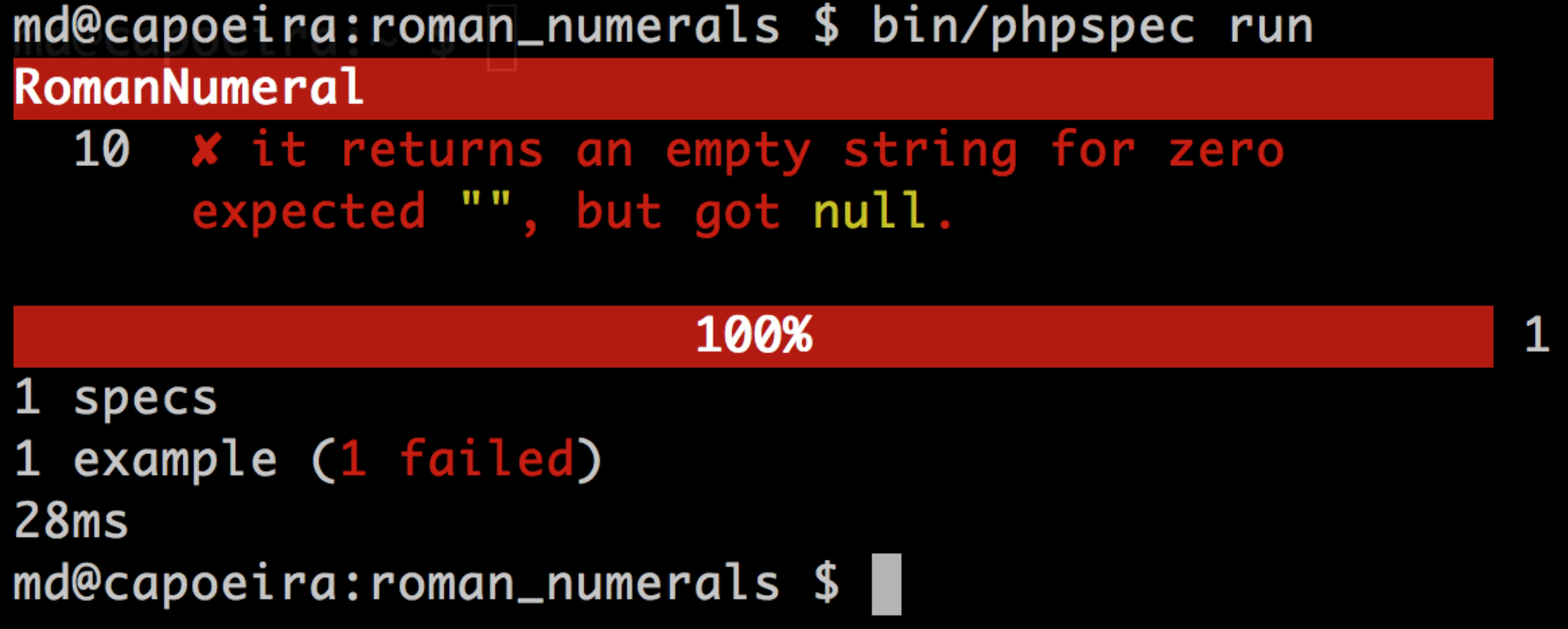
[Cockburn 94]



```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  10  ! it returns an empty string for zero
        class RomanNumeral does not exist.

                       100%                        1
1 specs
1 example (1 broken)
6ms


  Do you want me to create `RomanNumeral` for you?
                                                              [Y/n] y
Class RomanNumeral created in /Users/mduarte/Developer/kata/roman_numerals/src/RomanNumeral.php.

md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  10  ! it returns an empty string for zero
        method RomanNumeral::fromArabic not found.

                       100%                        1
1 specs
1 example (1 broken)
8ms


  Do you want me to create `RomanNumeral::fromArabic()` for you?
                                                              [Y/n] y

  Method RomanNumeral::fromArabic() has been created.
md@capoeira:roman_numerals $
```



```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        
    }
}
```

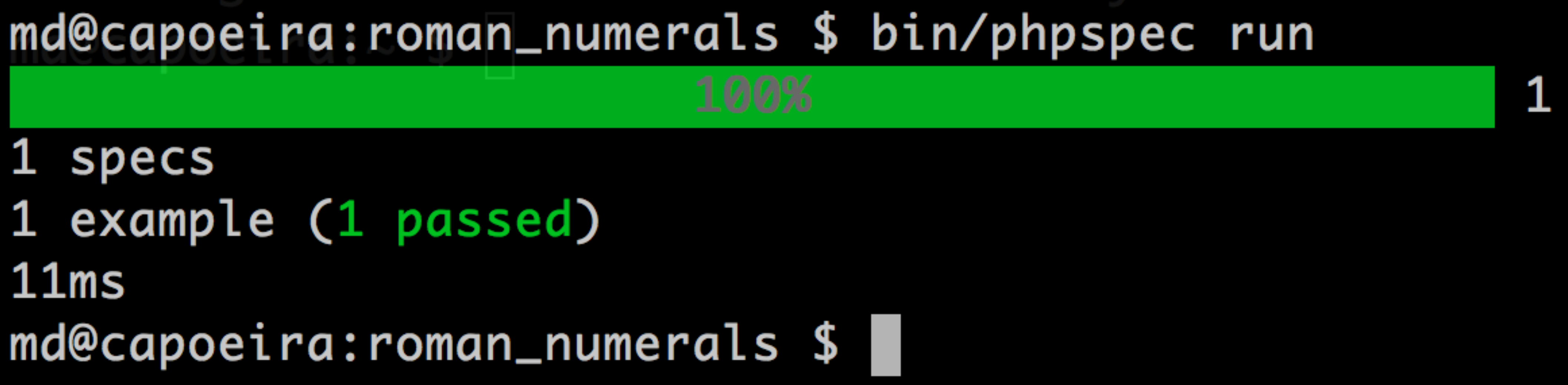


```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  10  ✘ it returns an empty string for zero
        expected "", but got null.

                        100%                          1
1 specs
1 example (1 failed)
28ms
md@capoeira:roman_numerals $
```

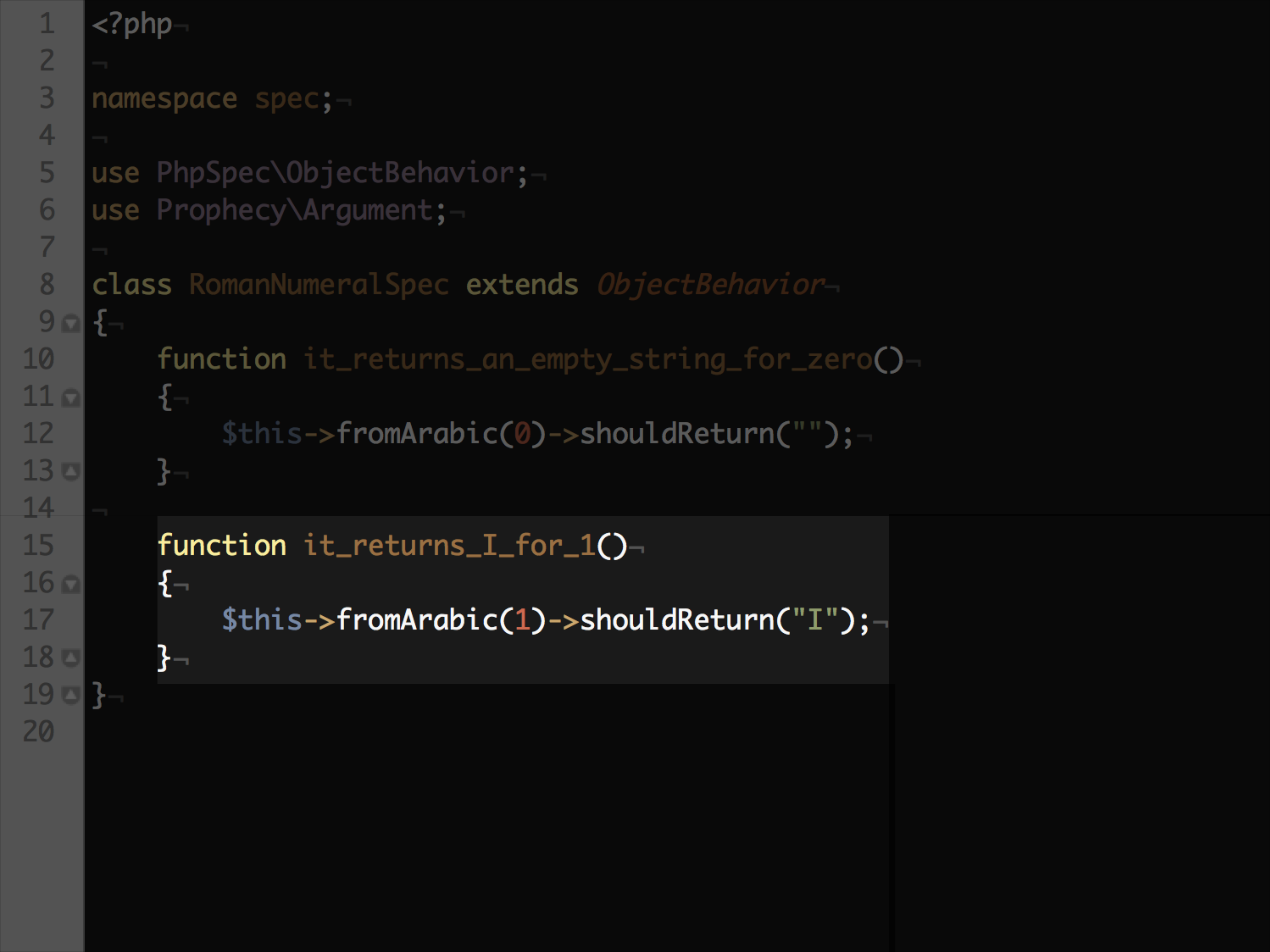
Transformation

`null -> constant`

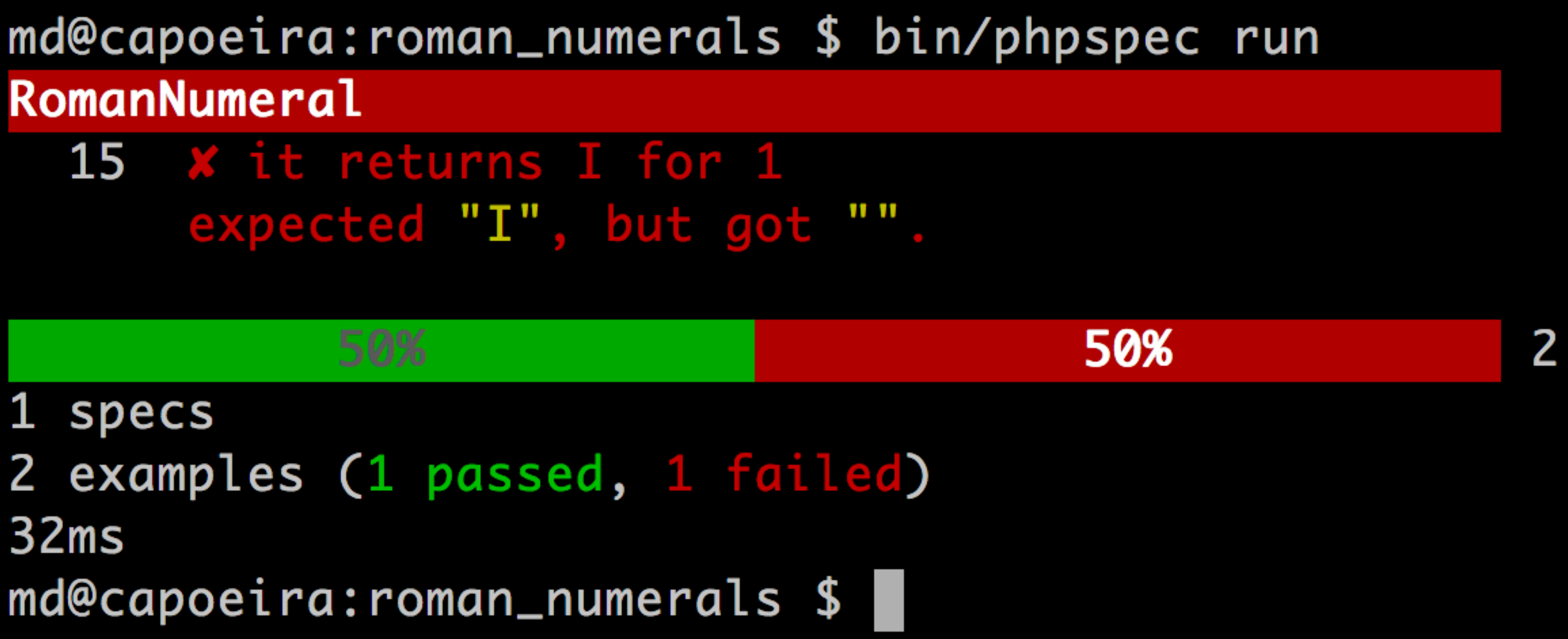
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        return "";
    }
}
```



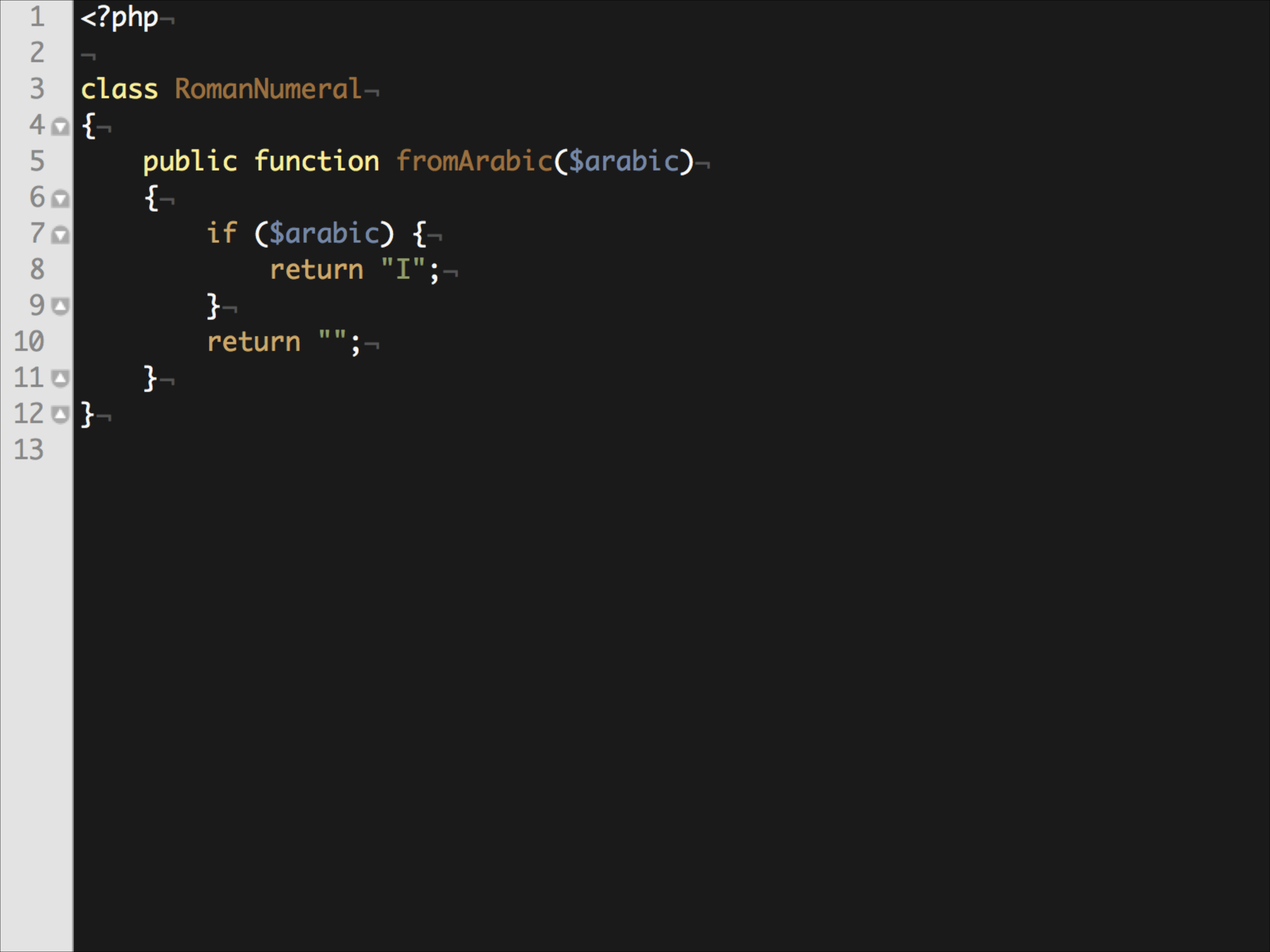
```
md@capoeira:roman_numerals $ bin/phpspec run
                         100%                                  1
1 specs
1 example (1 passed)
11ms
md@capoeira:roman_numerals $ 
```



```php
<?php

namespace spec;

use PhpSpec\ObjectBehavior;
use Prophecy\Argument;

class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }
}
```



```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  15  ✘ it returns I for 1
        expected "I", but got "".

                 50%                      50%               2
1 specs
2 examples (1 passed, 1 failed)
32ms
md@capoeira:roman_numerals $ 
```

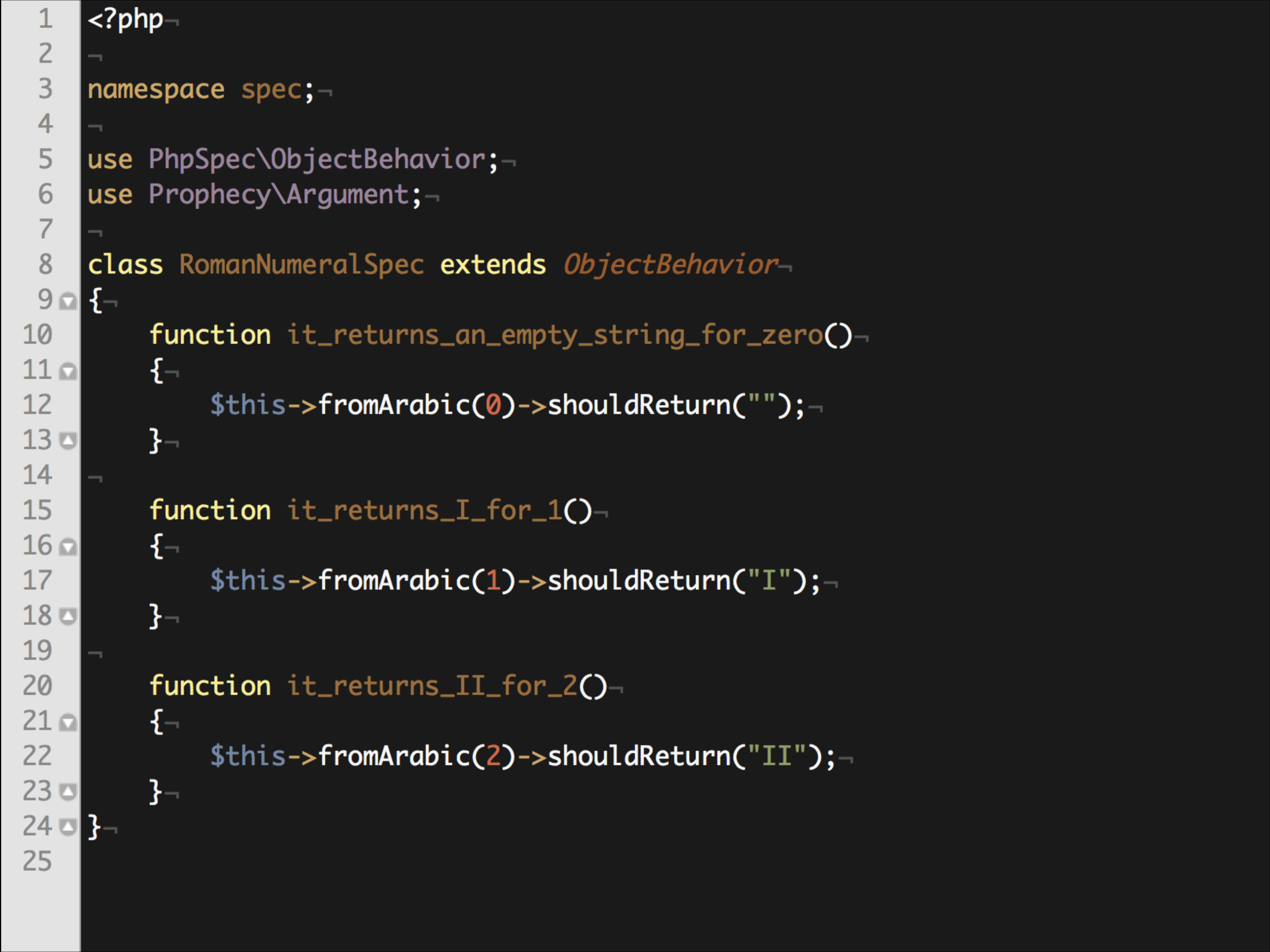


```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic) {
            return "I";
        }
        return "";
    }
}
```

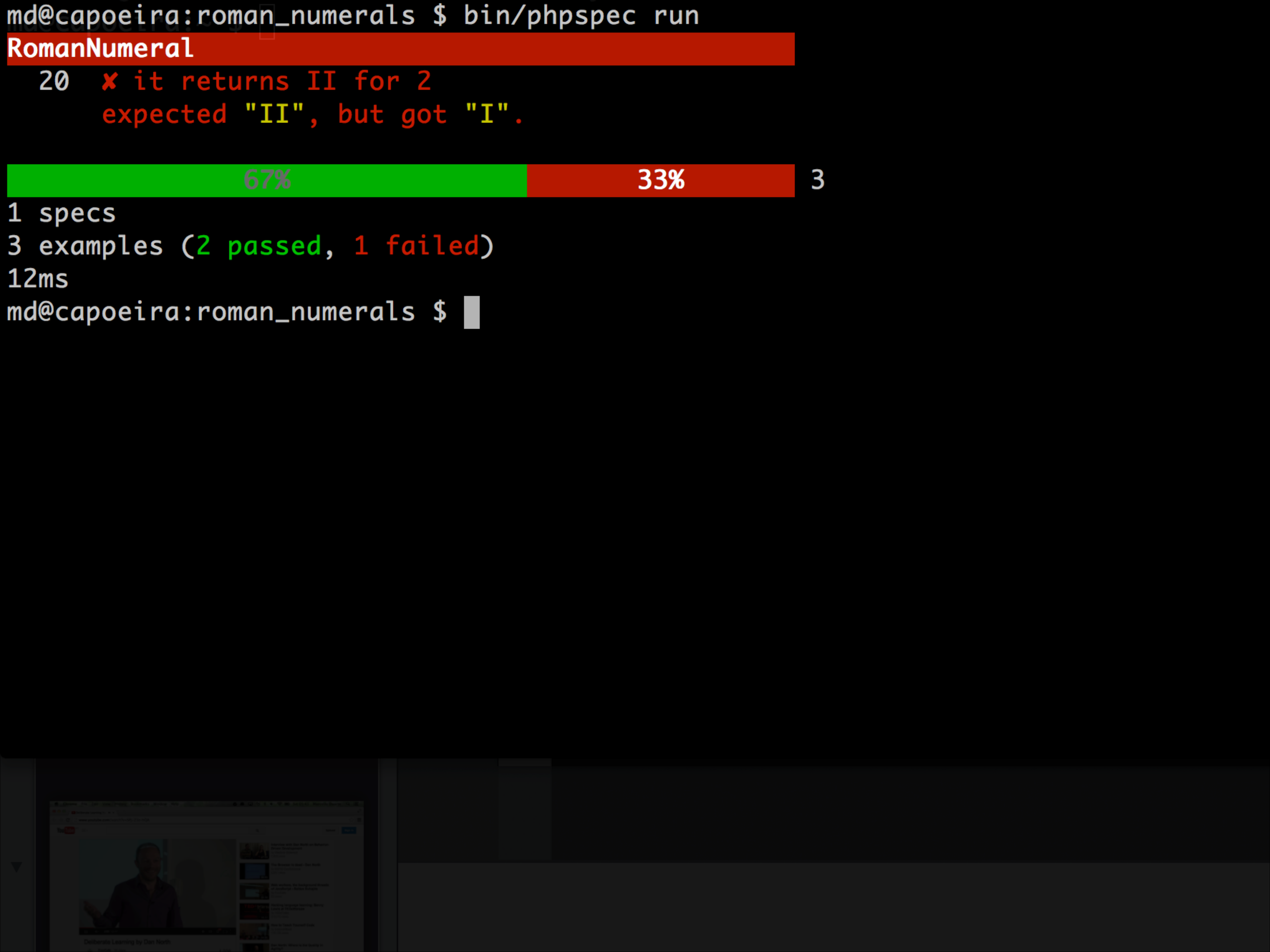
Transformation

`unconditional -> if`

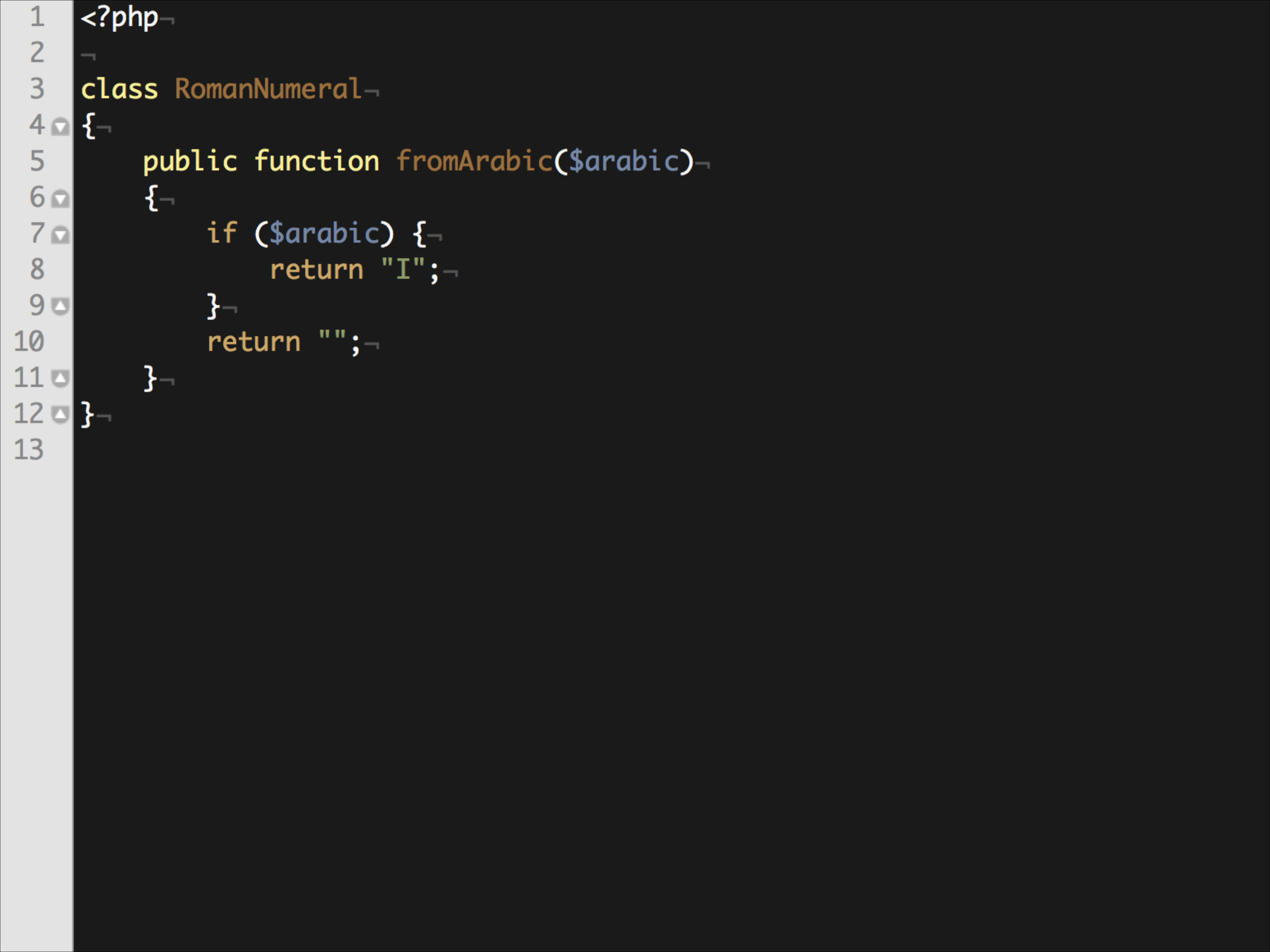
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic) {
            return "I";
        }
        return "";
    }
}
```



```php
<?php

namespace spec;

use PhpSpec\ObjectBehavior;
use Prophecy\Argument;

class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }
}
```



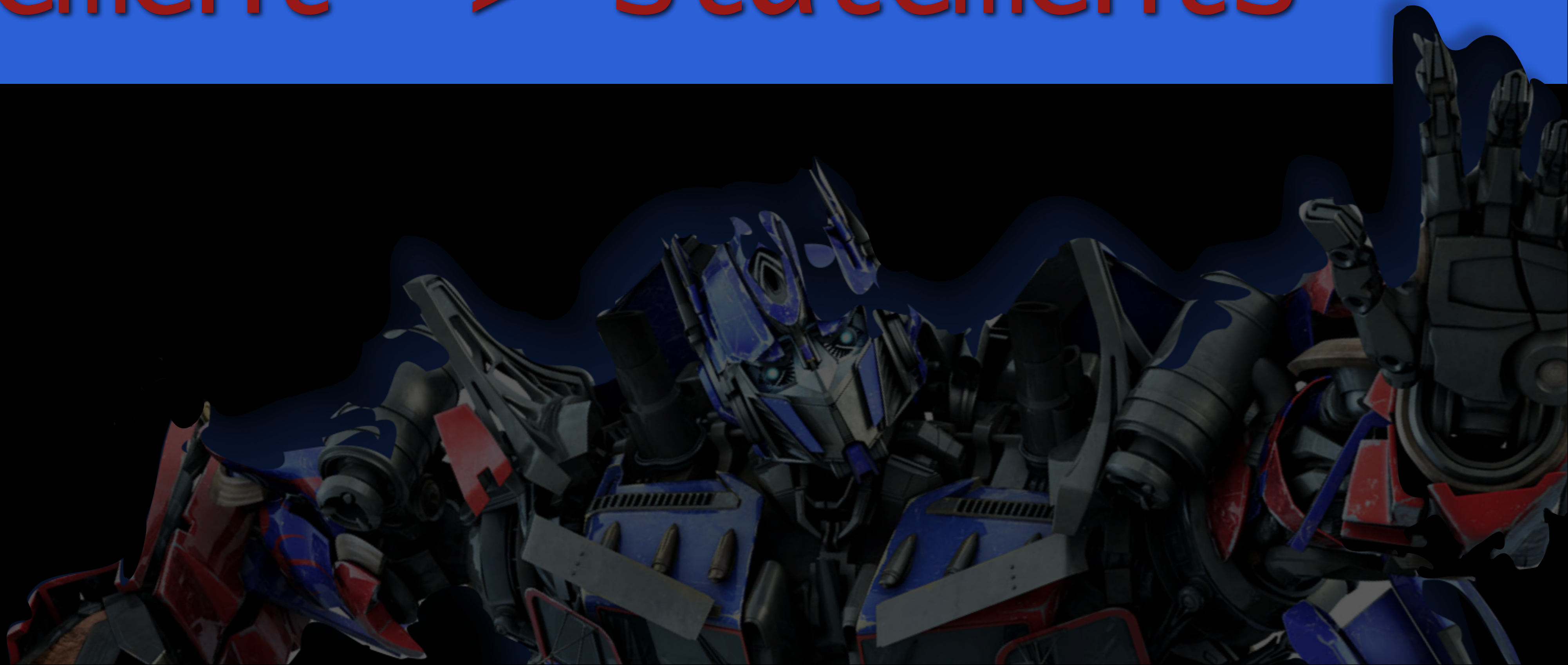
```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  20  ✘ it returns II for 2
        expected "II", but got "I".

                 67%                              33%              3
1 specs
3 examples (2 passed, 1 failed)
12ms
md@capoeira:roman_numerals $
```

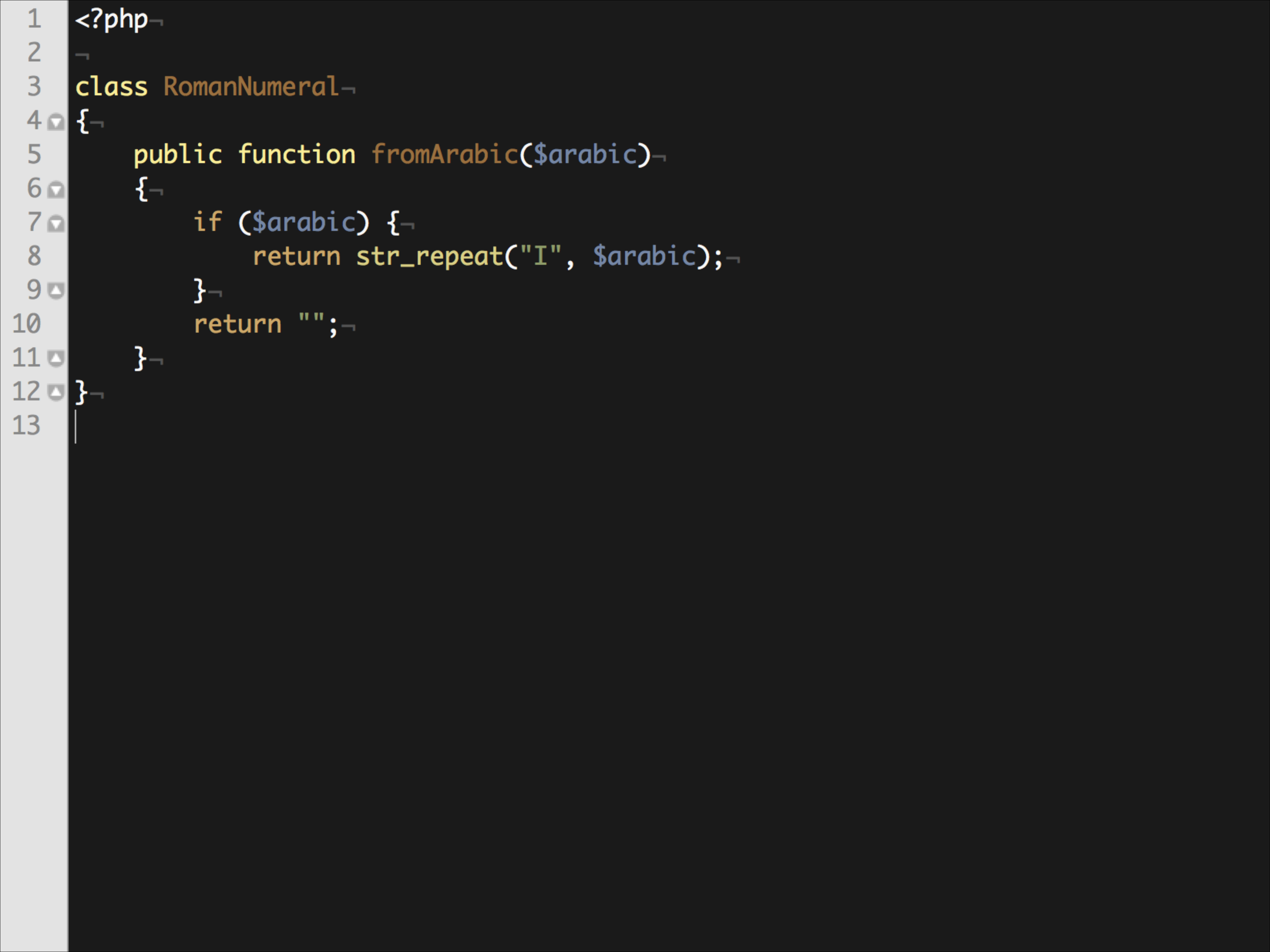


```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic) {
            return "I";
        }
        return "";
    }
}
```

Transformation

statement -> statements





```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic) {
            return str_repeat("I", $arabic);
        }
        return "";
    }
}

```

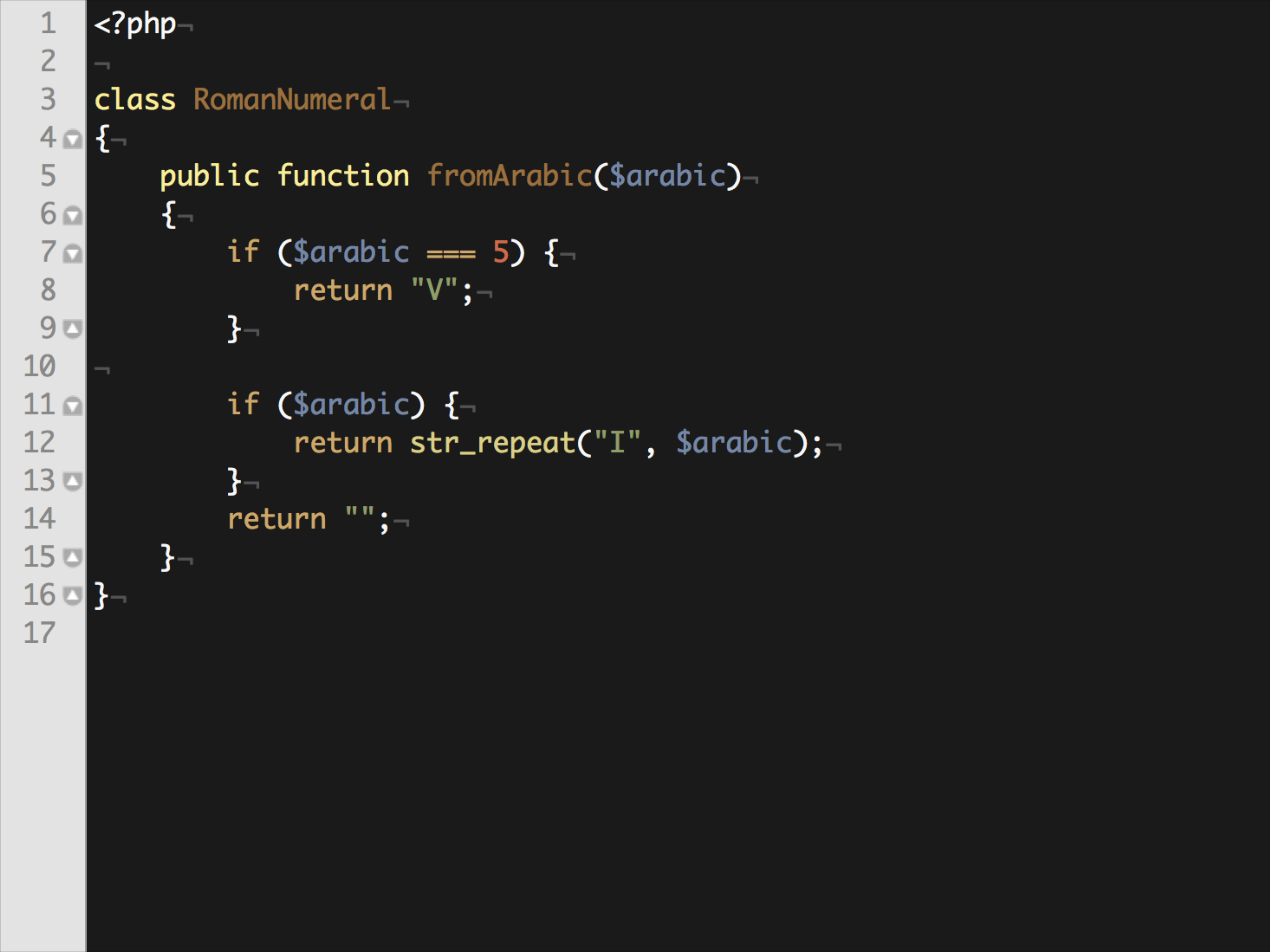
```php

class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }
}

```

```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  25  ✘ it returns V for 5
        expected "V", but got "IIIII".

                   75%                      25%       4
1 specs
4 examples (3 passed, 1 failed)
11ms
md@capoeira:roman_numerals $
```

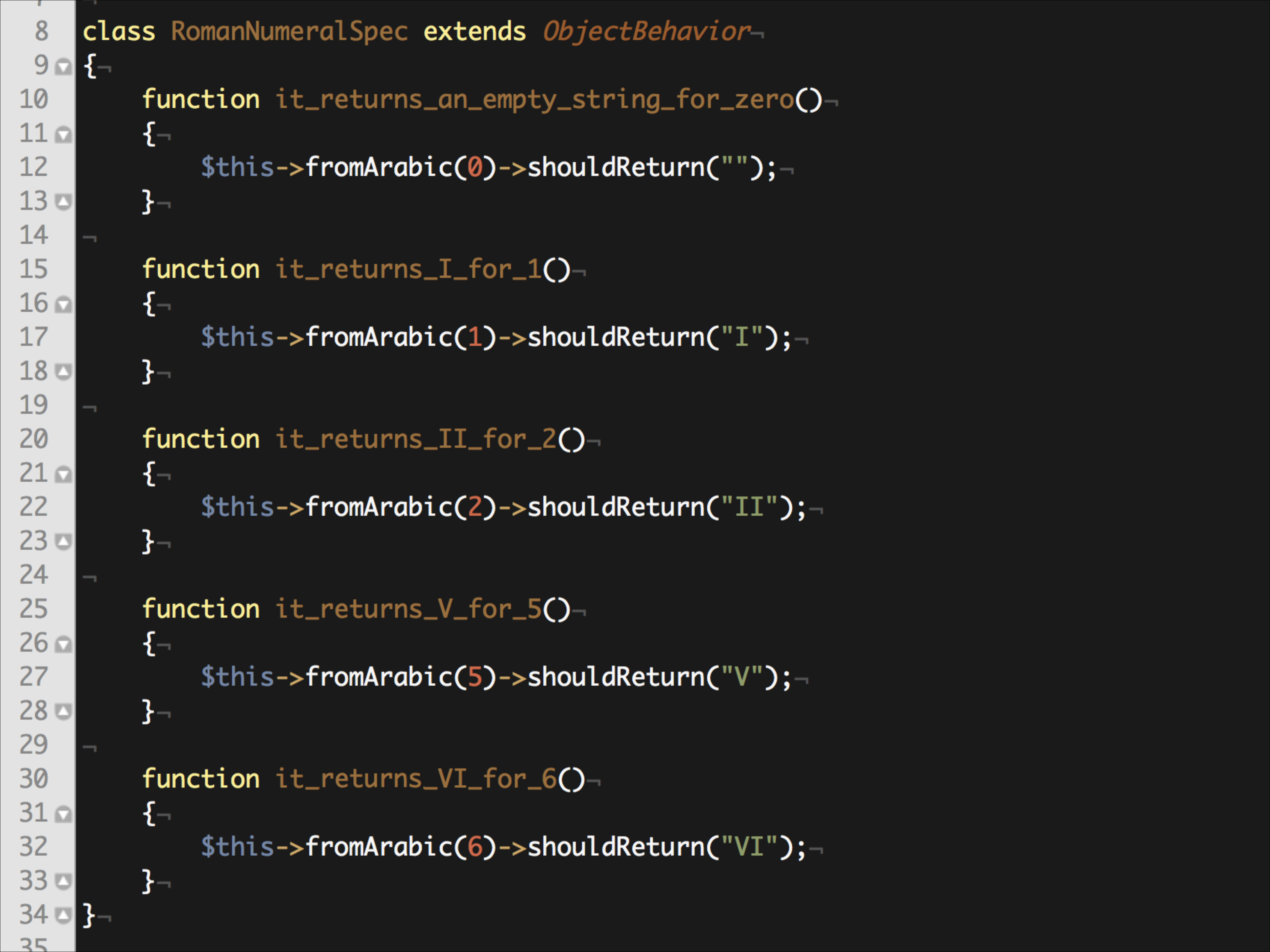
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic) {
            return str_repeat("I", $arabic);
        }
        return "";
    }
}

```

Transformation

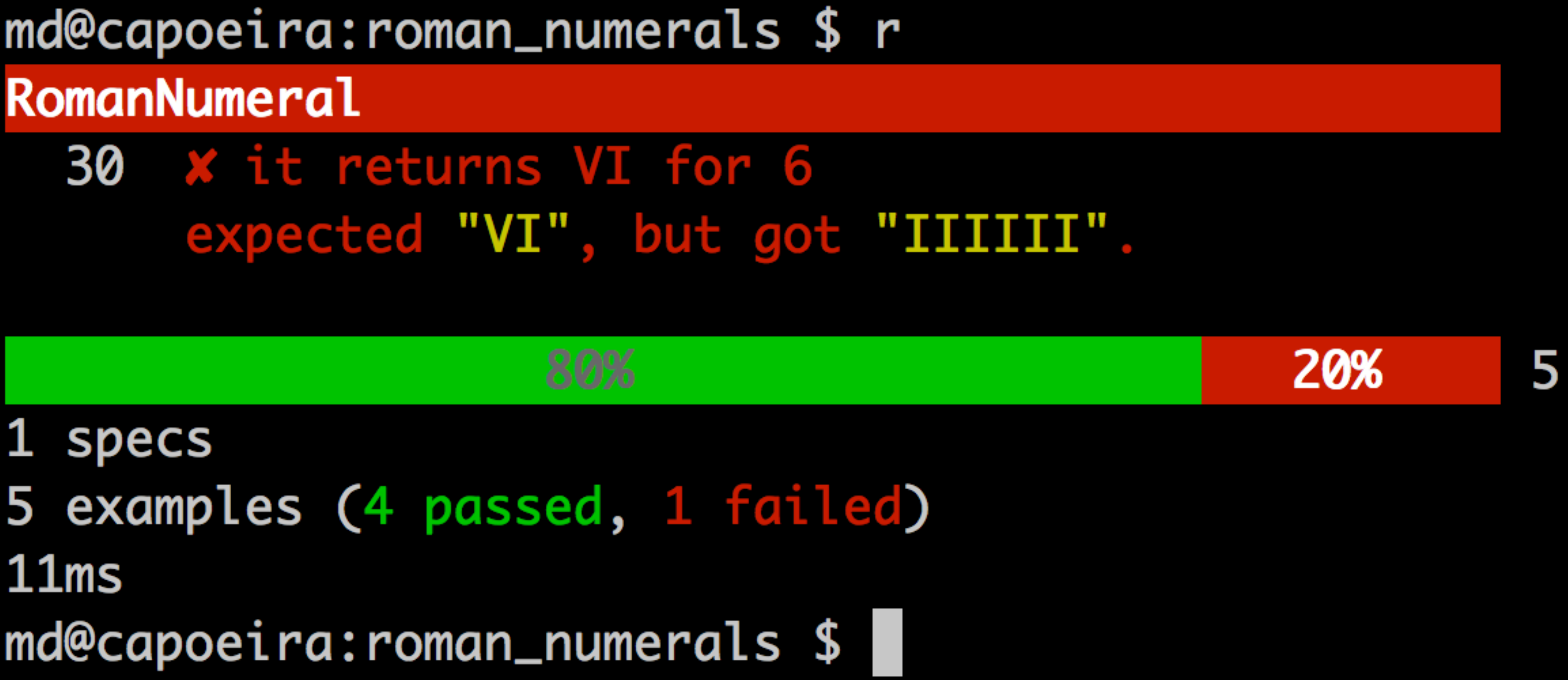
`unconditional -> if`



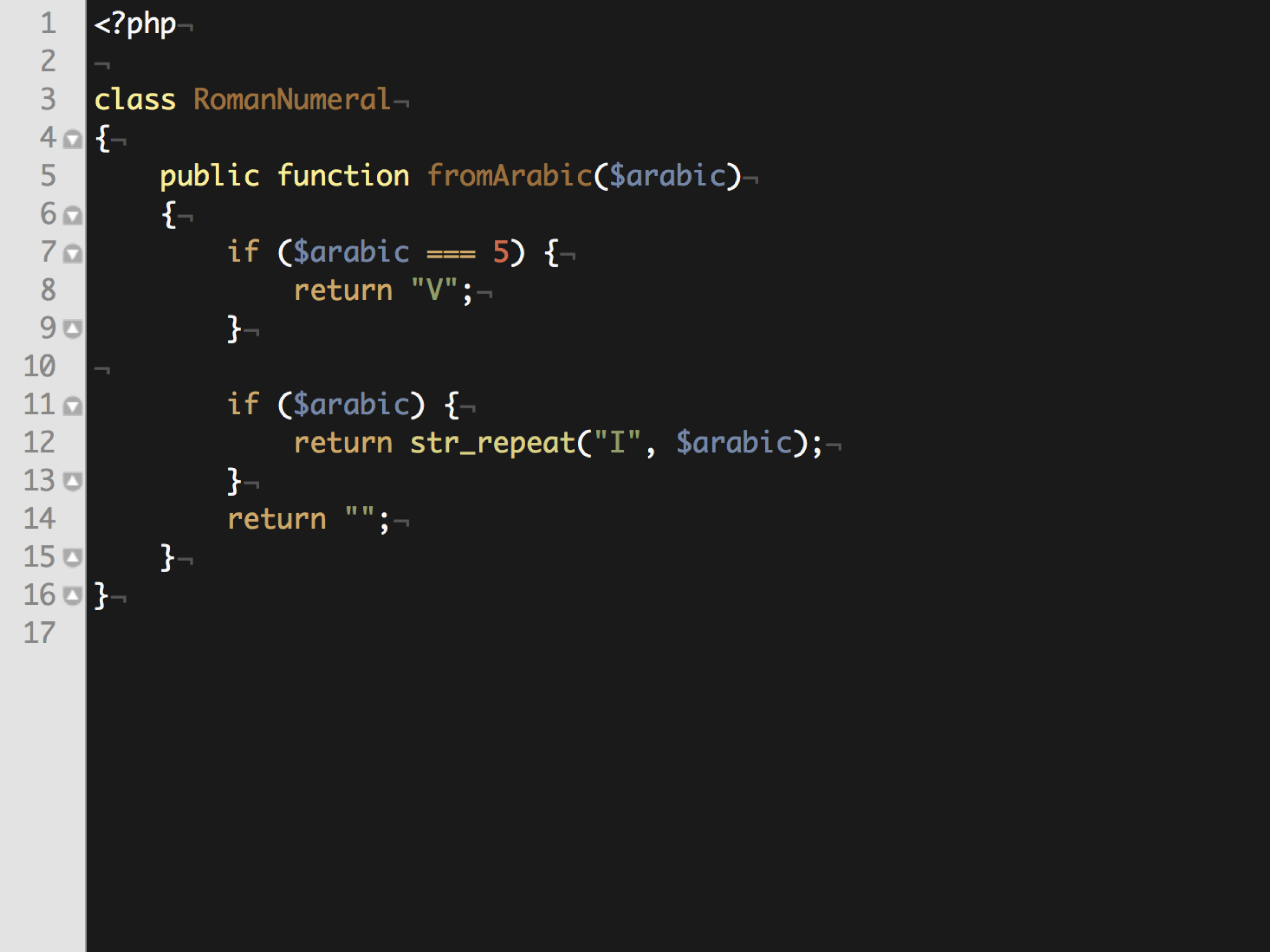
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic === 5) {
            return "V";
        }

        if ($arabic) {
            return str_repeat("I", $arabic);
        }
        return "";
    }
}
```



```php
class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }

    function it_returns_VI_for_6()
    {
        $this->fromArabic(6)->shouldReturn("VI");
    }
}
```

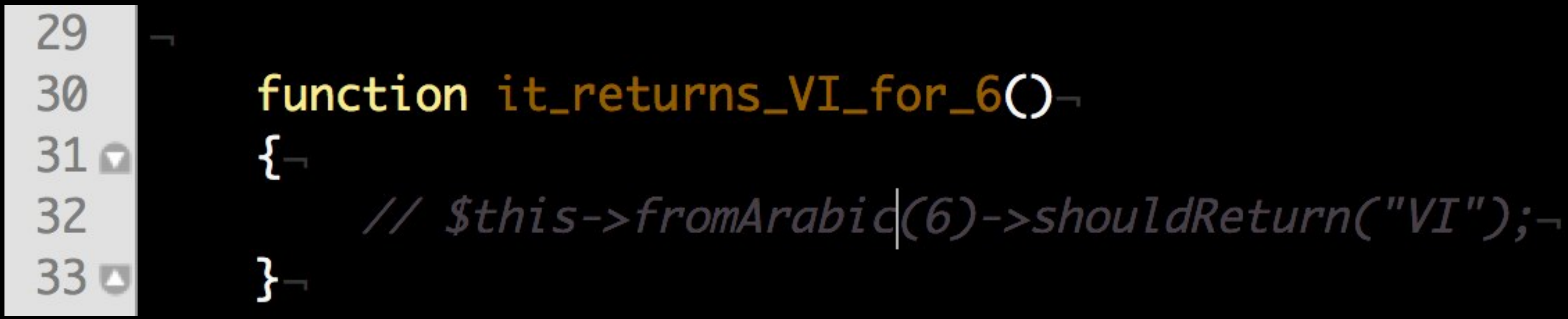


```
md@capoeira:roman_numerals $ r
RomanNumeral
  30  ✘ it returns VI for 6
        expected "VI", but got "IIIIII".

                    80%                         20%     5
1 specs
5 examples (4 passed, 1 failed)
11ms
md@capoeira:roman_numerals $
```

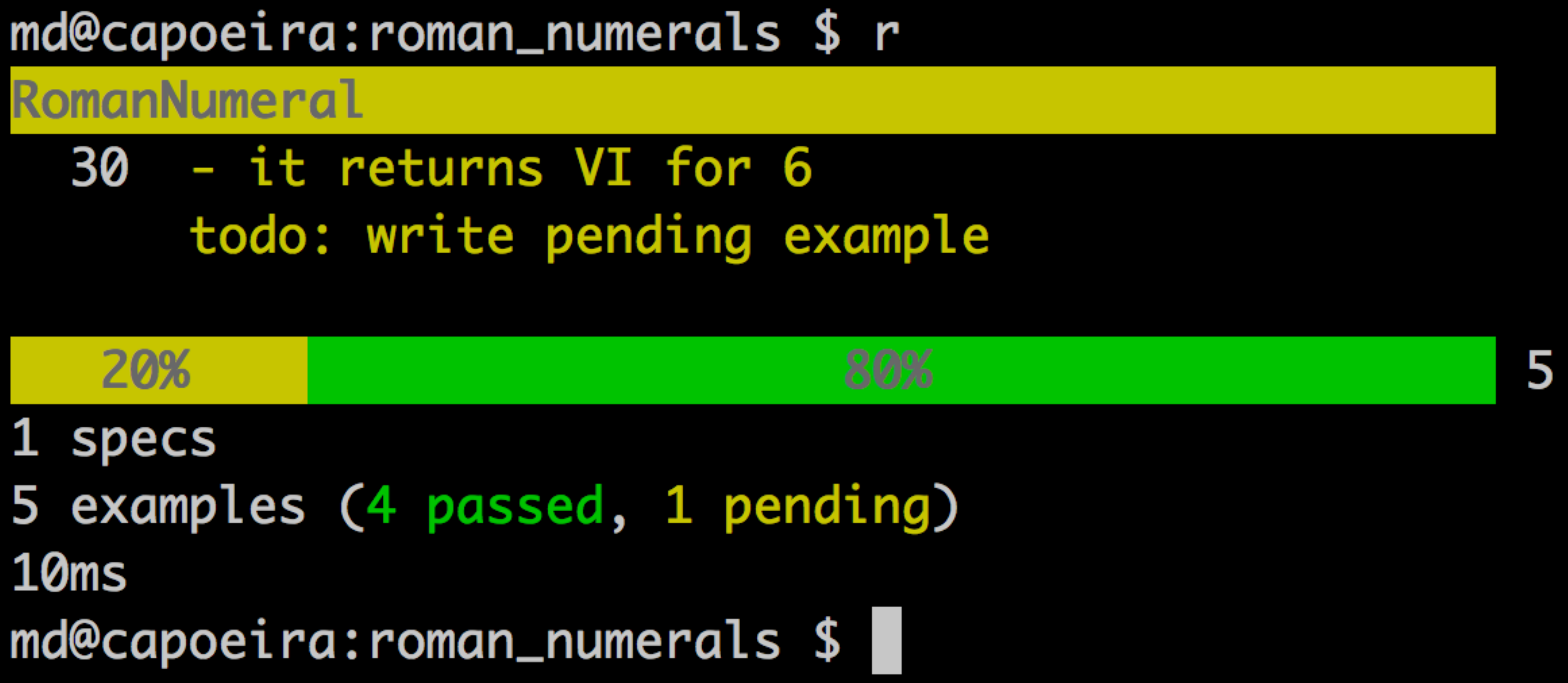


```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic === 5) {
            return "V";
        }

        if ($arabic) {
            return str_repeat("I", $arabic);
        }
        return "";
    }
}
```

Refactor time?



```php

    function it_returns_VI_for_6()
    {
        // $this->fromArabic(6)->shouldReturn("VI");
    }
```

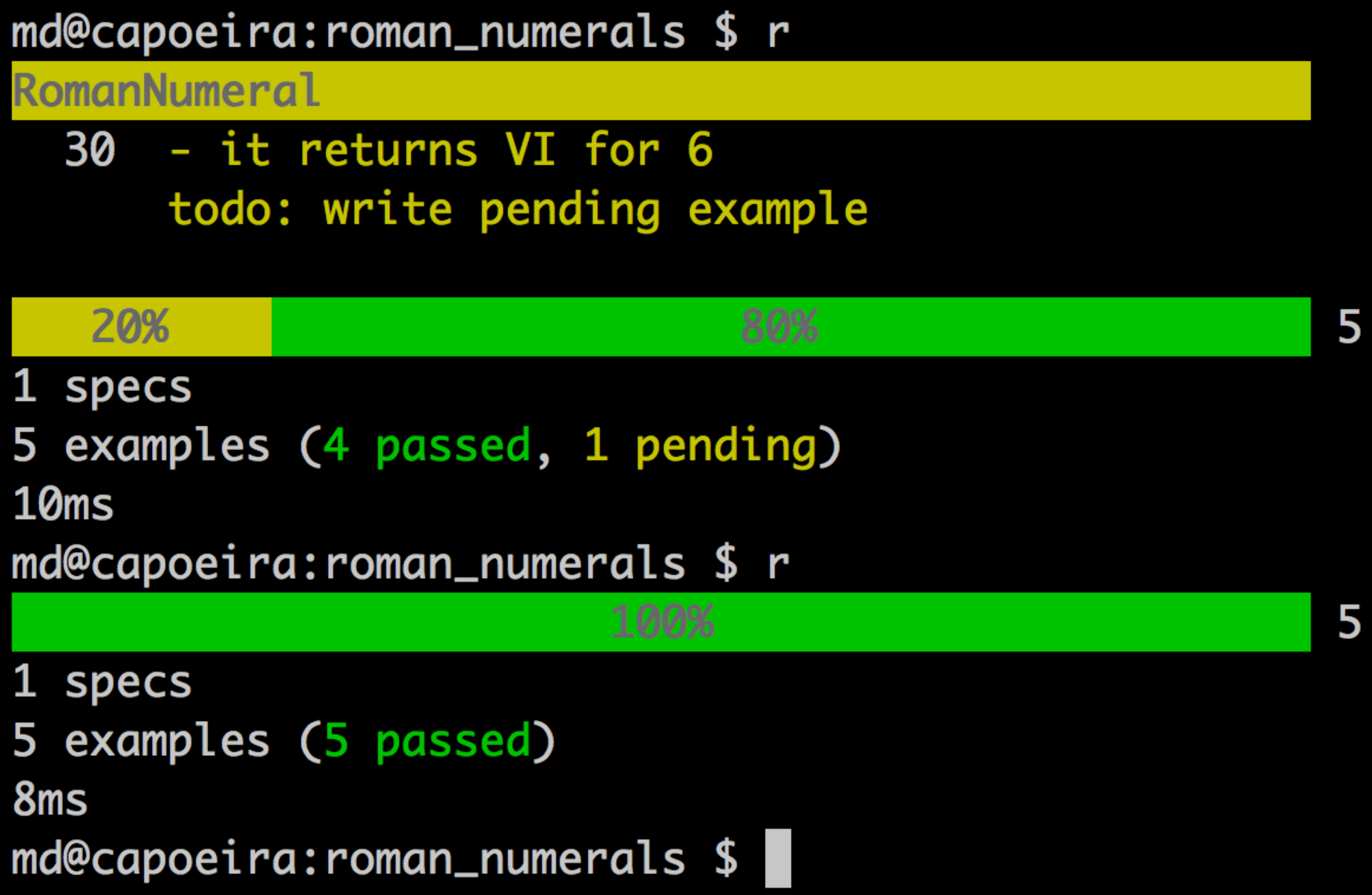


```
md@capoeira:roman_numerals $ r
RomanNumeral
  30  - it returns VI for 6
      todo: write pending example

   20%               80%                       5
1 specs
5 examples (4 passed, 1 pending)
10ms
md@capoeira:roman_numerals $
```

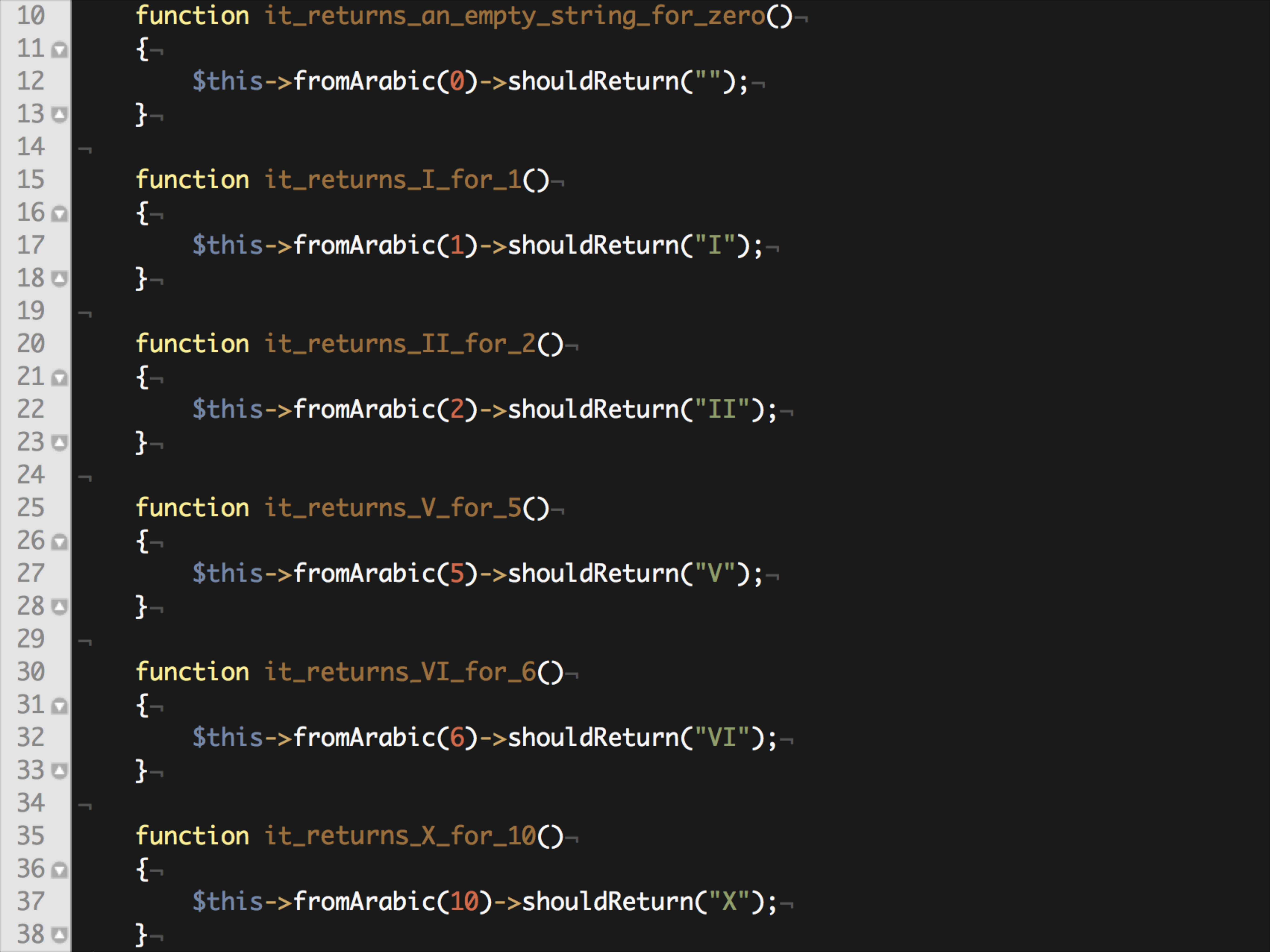
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        if ($arabic === 5) {
            return "V";
        }

        if ($arabic) {
            return str_repeat("I", $arabic);
        }
        return "";
    }
}
```

```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        if ($arabic === 5) {
            $roman = "V";
            $arabic -= 5;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```

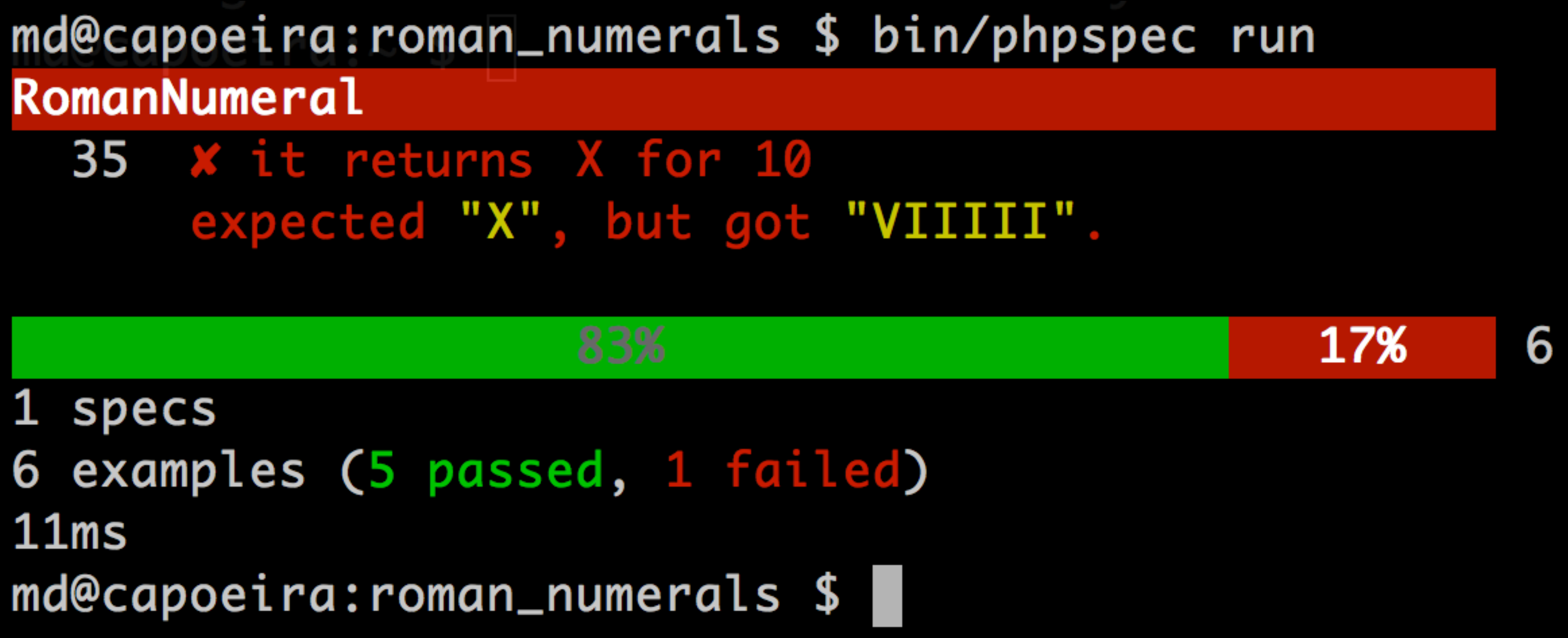
```php
class RomanNumeralSpec extends ObjectBehavior
{
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }

    function it_returns_VI_for_6()
    {
        $this->fromArabic(6)->shouldReturn("VI");
    }
}
```



```
md@capoeira:roman_numerals $ r
RomanNumeral
  30  - it returns VI for 6
      todo: write pending example

    20%                    80%                   5
1 specs
5 examples (4 passed, 1 pending)
10ms
md@capoeira:roman_numerals $ r
                       100%                      5
1 specs
5 examples (5 passed)
8ms
md@capoeira:roman_numerals $
```

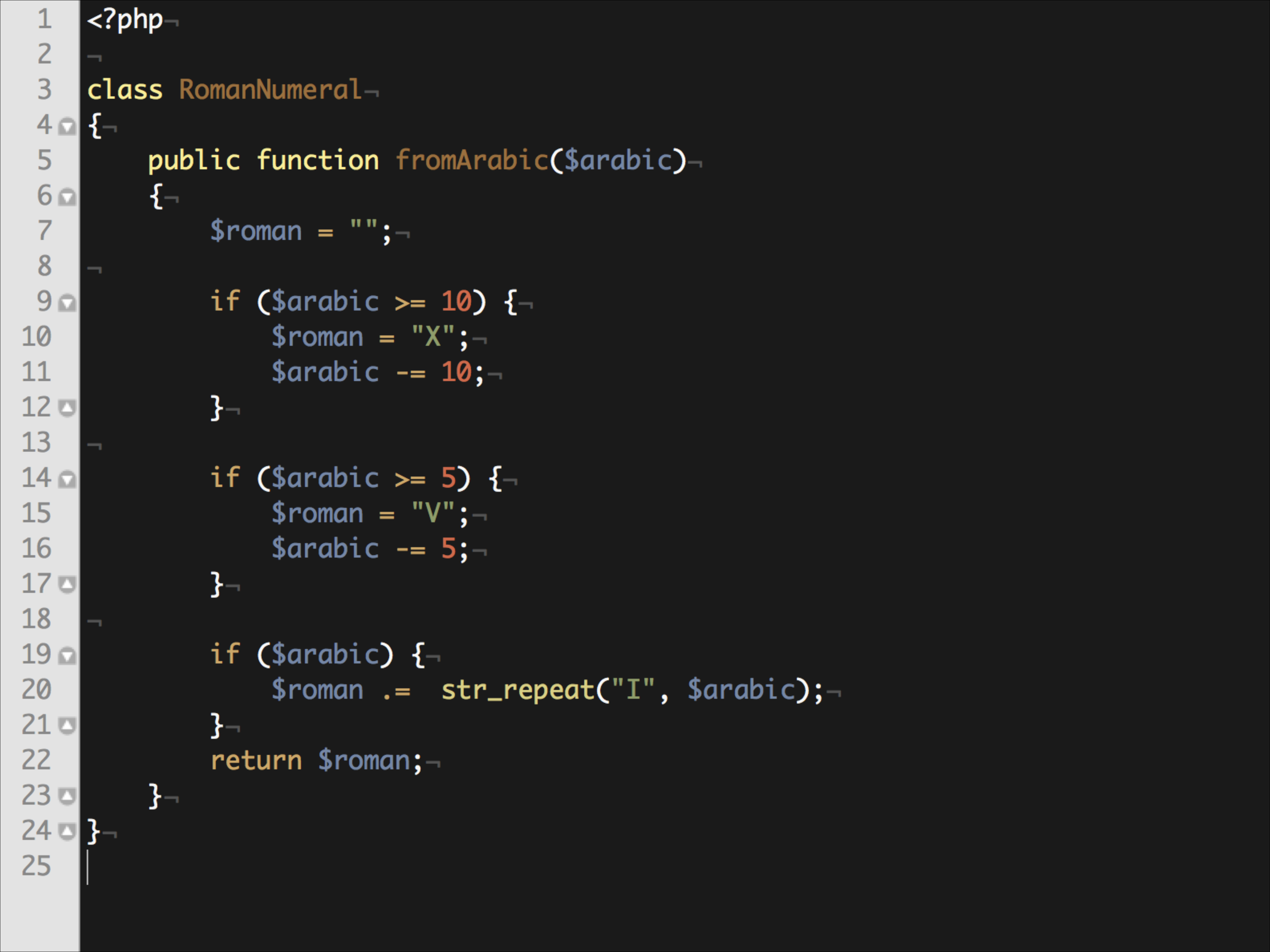


```php
    function it_returns_an_empty_string_for_zero()
    {
        $this->fromArabic(0)->shouldReturn("");
    }

    function it_returns_I_for_1()
    {
        $this->fromArabic(1)->shouldReturn("I");
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }

    function it_returns_VI_for_6()
    {
        $this->fromArabic(6)->shouldReturn("VI");
    }

    function it_returns_X_for_10()
    {
        $this->fromArabic(10)->shouldReturn("X");
    }
```

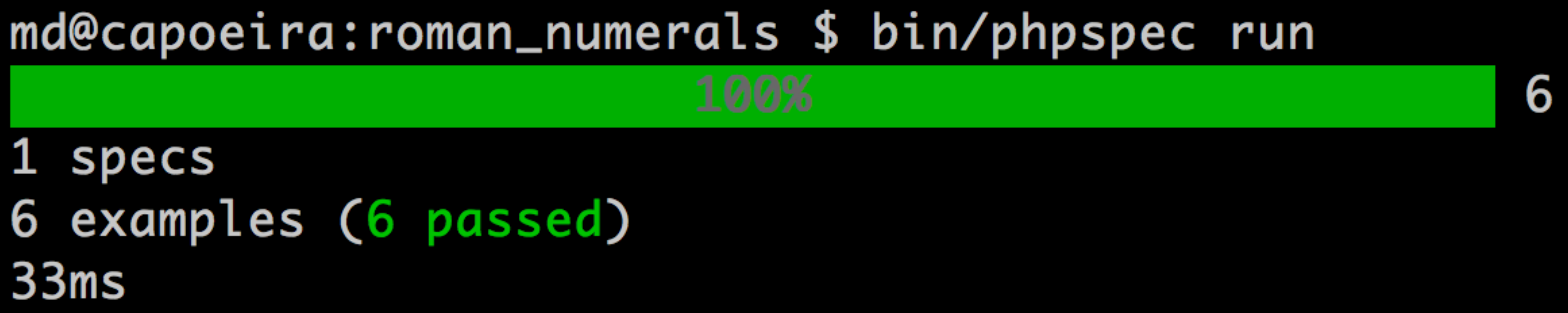


```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  35  ✘ it returns X for 10
        expected "X", but got "VIIIII".

                    83%                      17%      6
1 specs
6 examples (5 passed, 1 failed)
11ms
md@capoeira:roman_numerals $ 
```

```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        if ($arabic === 5) {
            $roman = "V";
            $arabic -= 5;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}

```

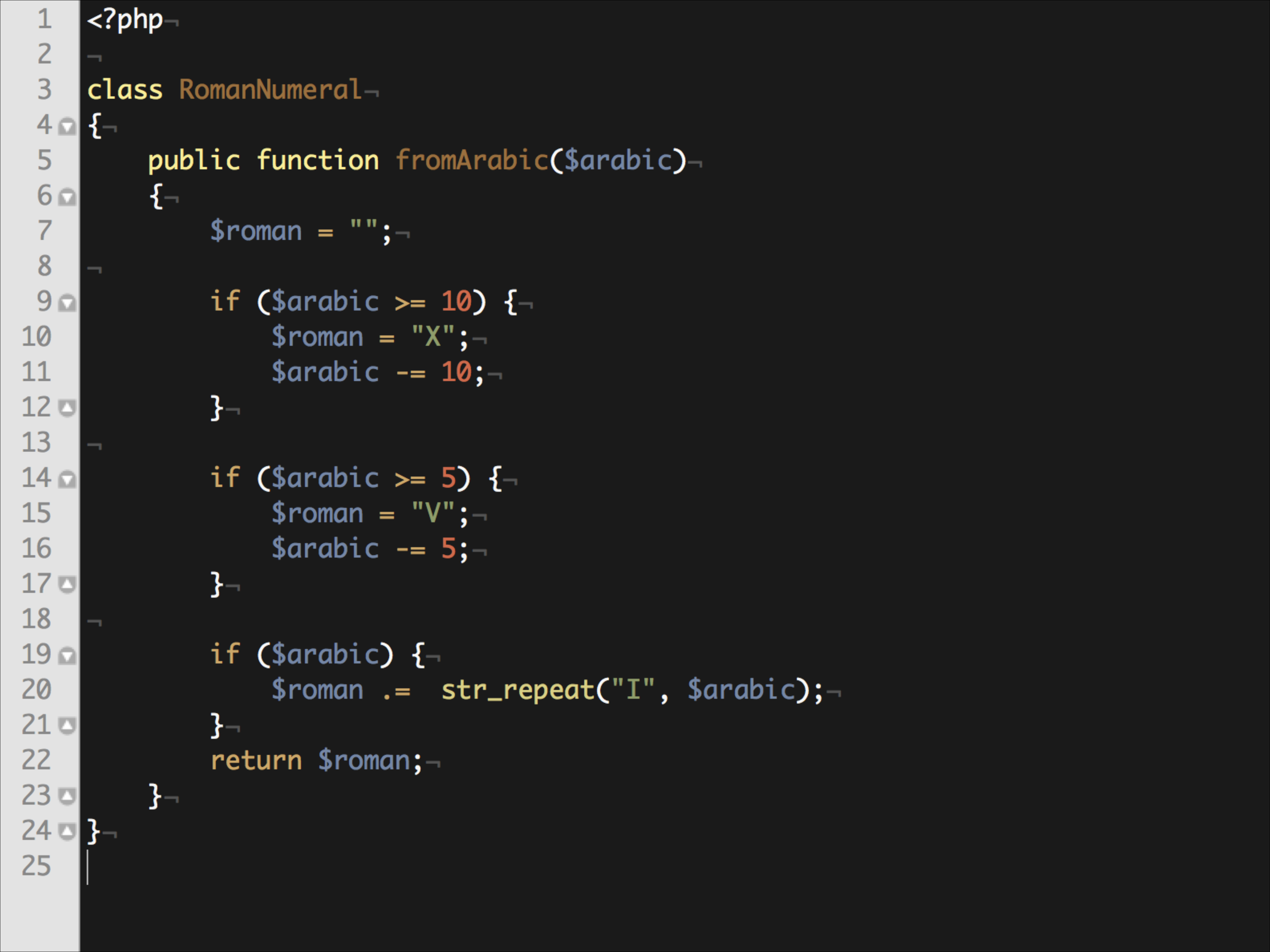


```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        if ($arabic >= 10) {
            $roman = "X";
            $arabic -= 10;
        }

        if ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```


```
md@capoeira:roman_numerals $ bin/phpspec run
                        100%                         6
1 specs
6 examples (6 passed)
33ms
```

```php
    }

    function it_returns_II_for_2()
    {
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }

    function it_returns_VI_for_6()
    {
        $this->fromArabic(6)->shouldReturn("VI");
    }

    function it_returns_X_for_10()
    {
        $this->fromArabic(10)->shouldReturn("X");
    }

    function it_returns_XX_for_20()
    {
        $this->fromArabic(20)->shouldReturn("XX");
    }
}
```

```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  40  ✘ it returns XX for 20
        expected "XX", but got "VIIIII".

                    86%                         14%   7
1 specs
7 examples (6 passed, 1 failed)
12ms
md@capoeira:roman_numerals $ 
```



```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        if ($arabic >= 10) {
            $roman = "X";
            $arabic -= 10;
        }

        if ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```

Transformation

`if -> while`

Condition to loop transformation

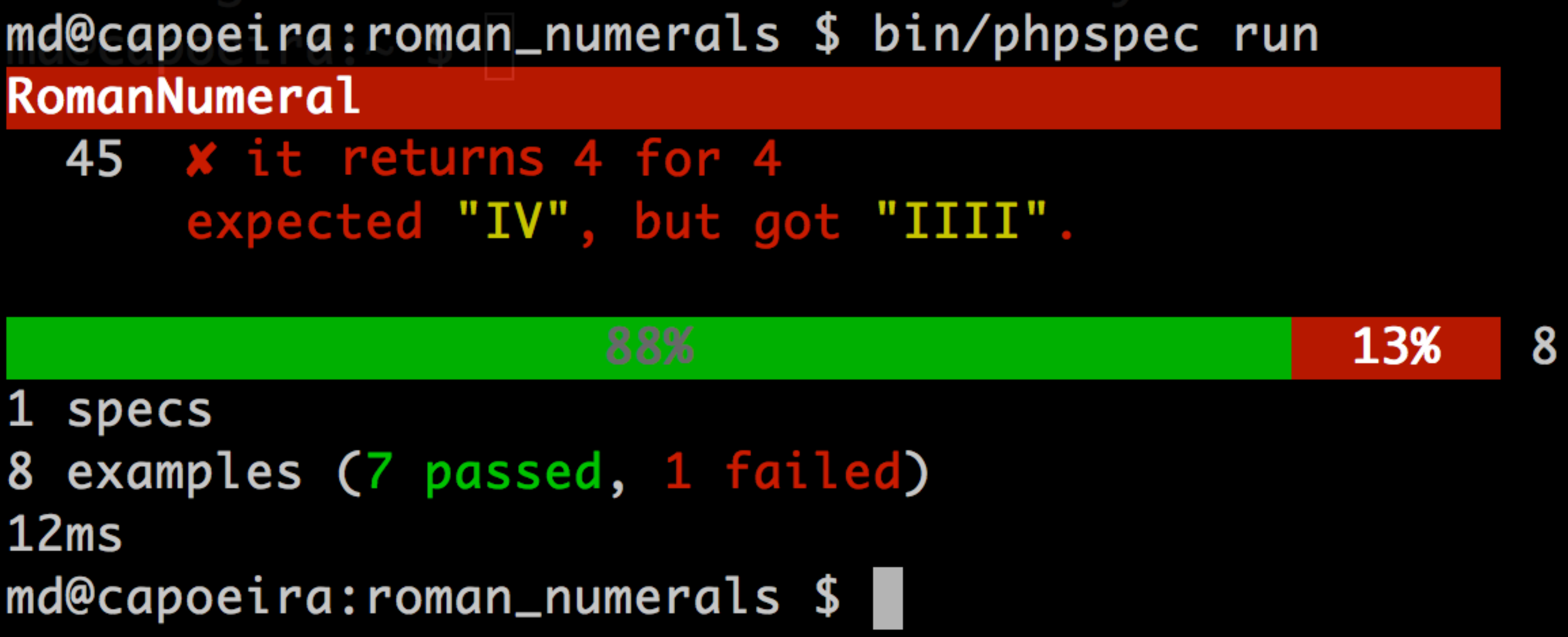
is a great indicator you are in the right track of solving the algorithm

[Martin 13]

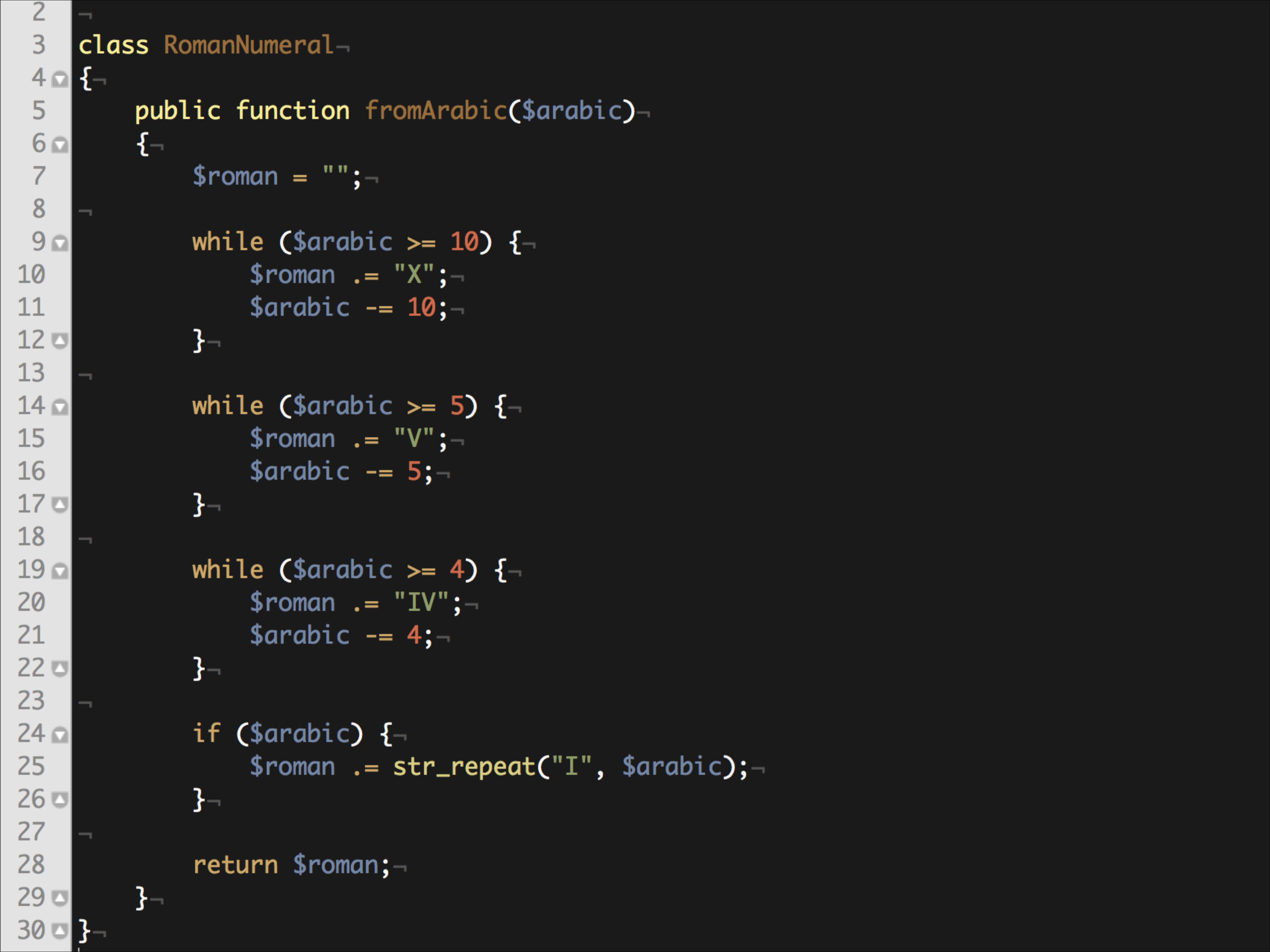
```php
<?php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        while ($arabic >= 10) {
            $roman .= "X";
            $arabic -= 10;
        }

        if ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```

```
md@capoeira:roman_numerals $ bin/phpspec run
                          100%                          7
1 specs
7 examples (7 passed)
9ms
md@capoeira:roman_numerals $ 
```

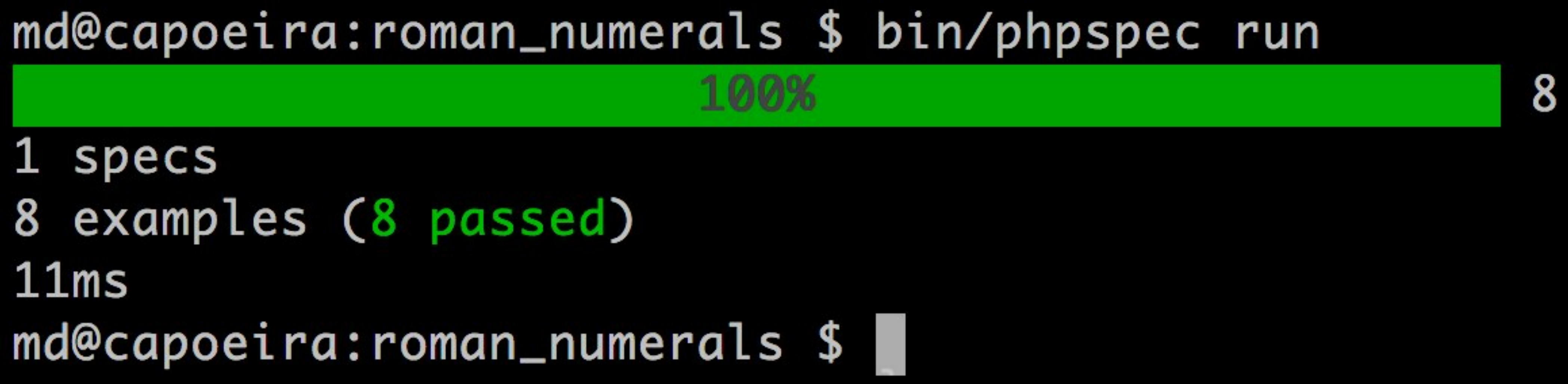
```php
        $this->fromArabic(2)->shouldReturn("II");
    }

    function it_returns_V_for_5()
    {
        $this->fromArabic(5)->shouldReturn("V");
    }

    function it_retunrs_VI_for_6()
    {
        $this->fromArabic(6)->shouldReturn("VI");
    }

    function it_retunrs_X_for_10()
    {
        $this->fromArabic(10)->shouldReturn("X");
    }

    function it_retunrs_XX_for_20()
    {
        $this->fromArabic(20)->shouldReturn("XX");
    }

    function it_retunrs_4_for_4()
    {
        $this->fromArabic(4)->shouldReturn("IV");
    }
}
```



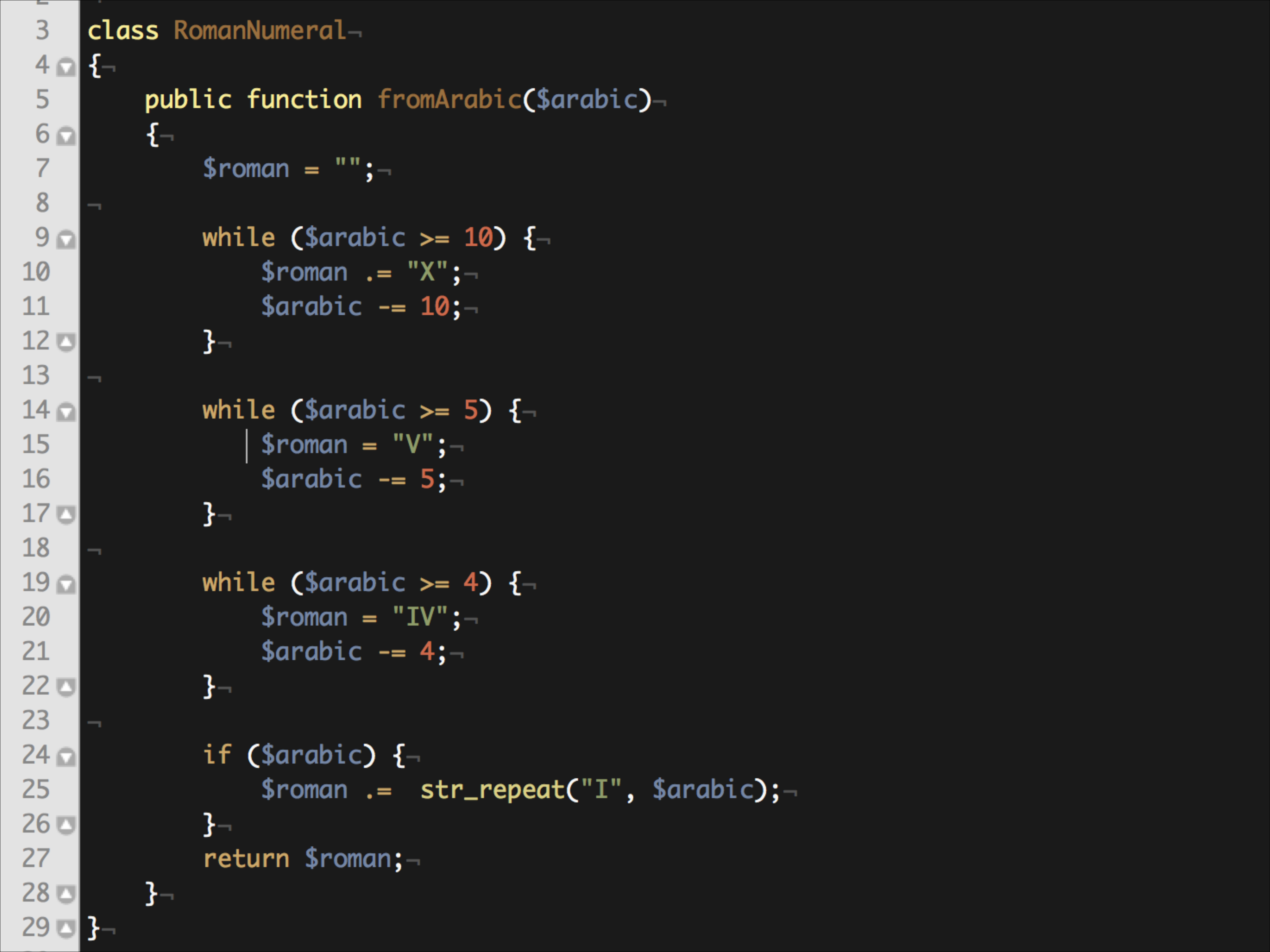
```
md@capoeira:roman_numerals $ bin/phpspec run
RomanNumeral
  45  ✘ it returns 4 for 4
        expected "IV", but got "IIII".

                        88%                          13%   8
1 specs
8 examples (7 passed, 1 failed)
12ms
md@capoeira:roman_numerals $
```



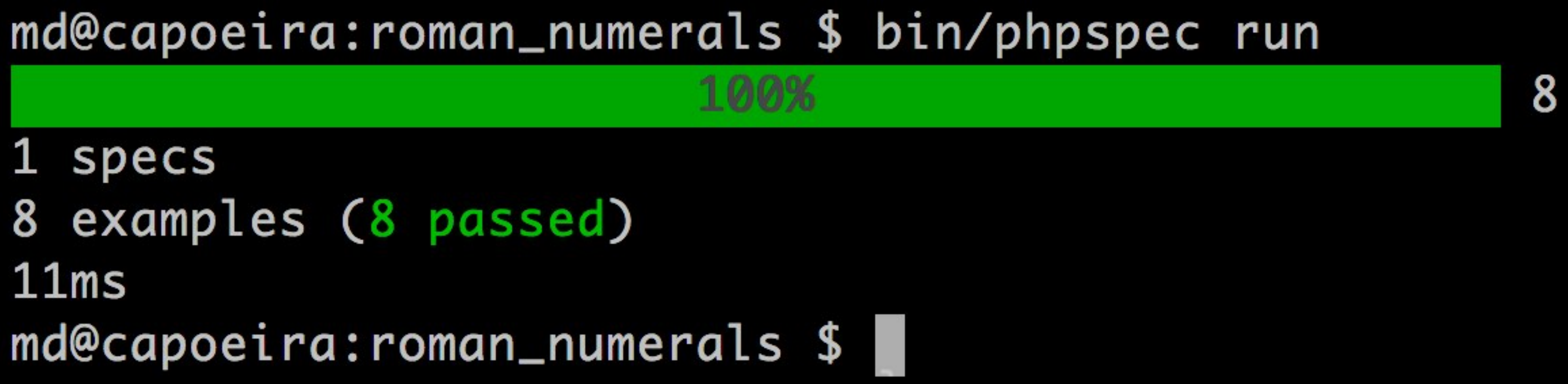
```php

class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        while ($arabic >= 10) {
            $roman .= "X";
            $arabic -= 10;
        }

        while ($arabic >= 5) {
            $roman .= "V";
            $arabic -= 5;
        }

        while ($arabic >= 4) {
            $roman .= "IV";
            $arabic -= 4;
        }

        if ($arabic) {
            $roman .= str_repeat("I", $arabic);
        }

        return $roman;
    }
}
```



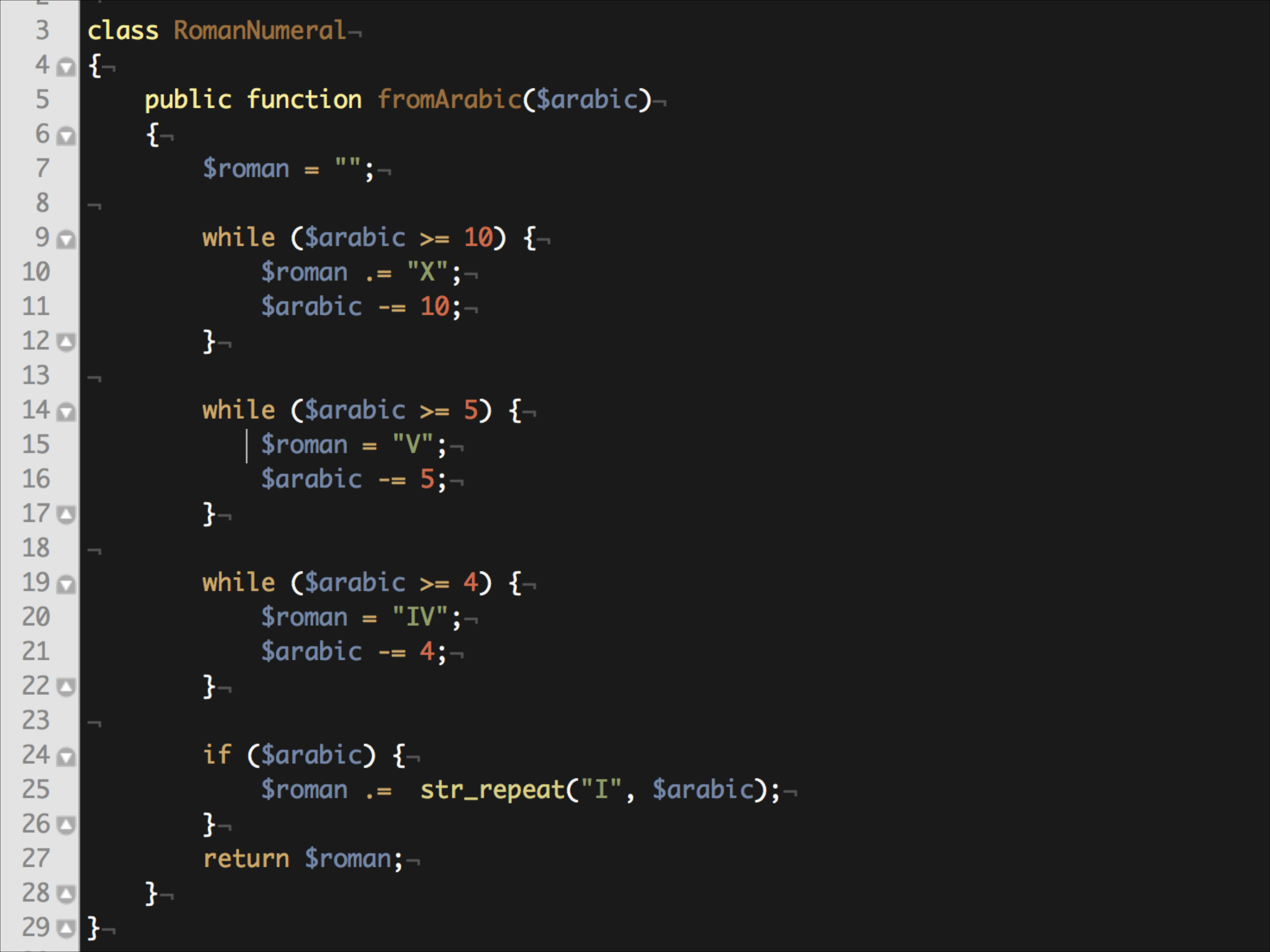
```
md@capoeira:roman_numerals $ bin/phpspec run
                         100%                          8
1 specs
8 examples (8 passed)
11ms
md@capoeira:roman_numerals $ 
```



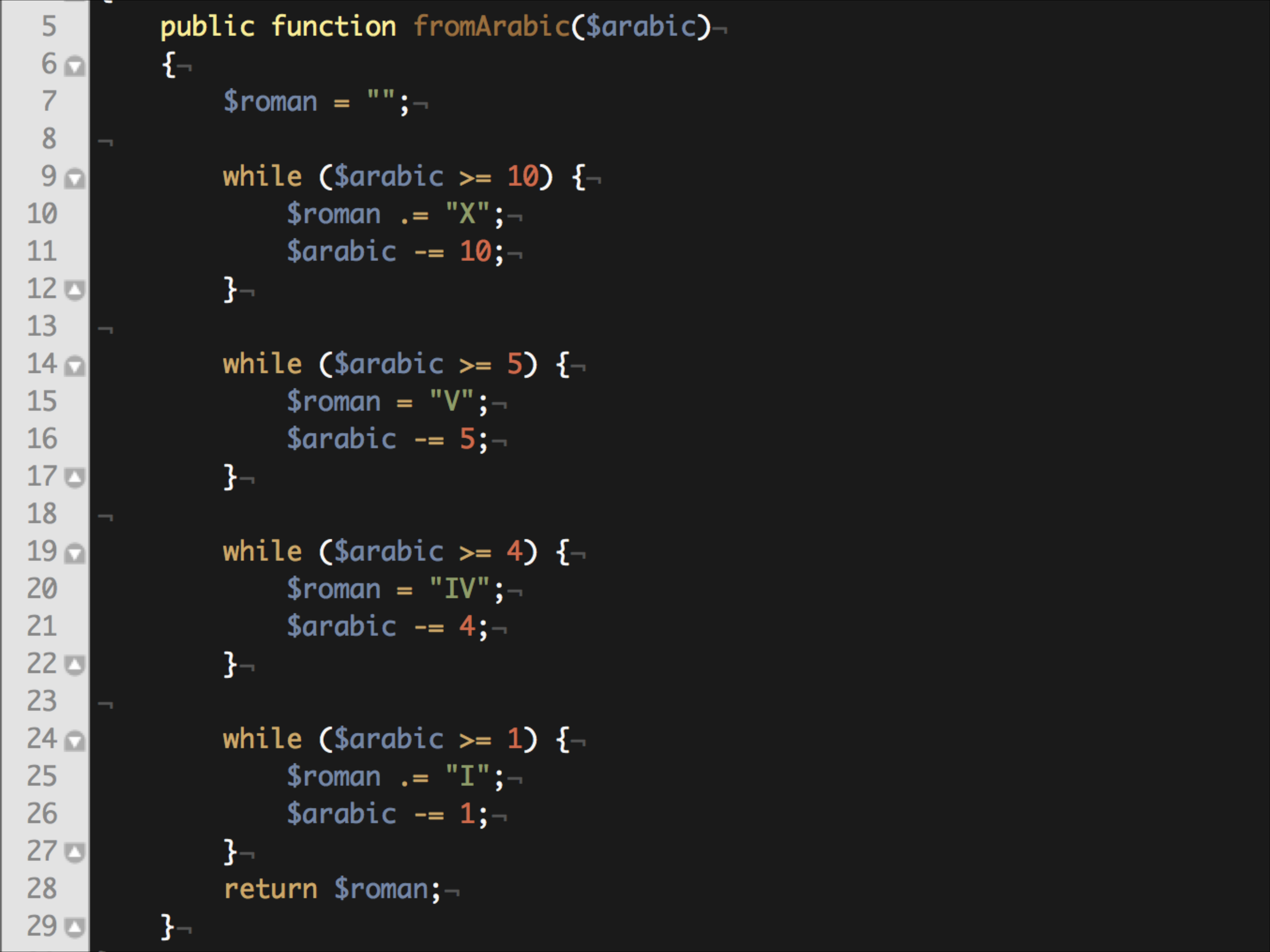
```php
class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        while ($arabic >= 10) {
            $roman .= "X";
            $arabic -= 10;
        }

        while ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        while ($arabic >= 4) {
            $roman = "IV";
            $arabic -= 4;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```



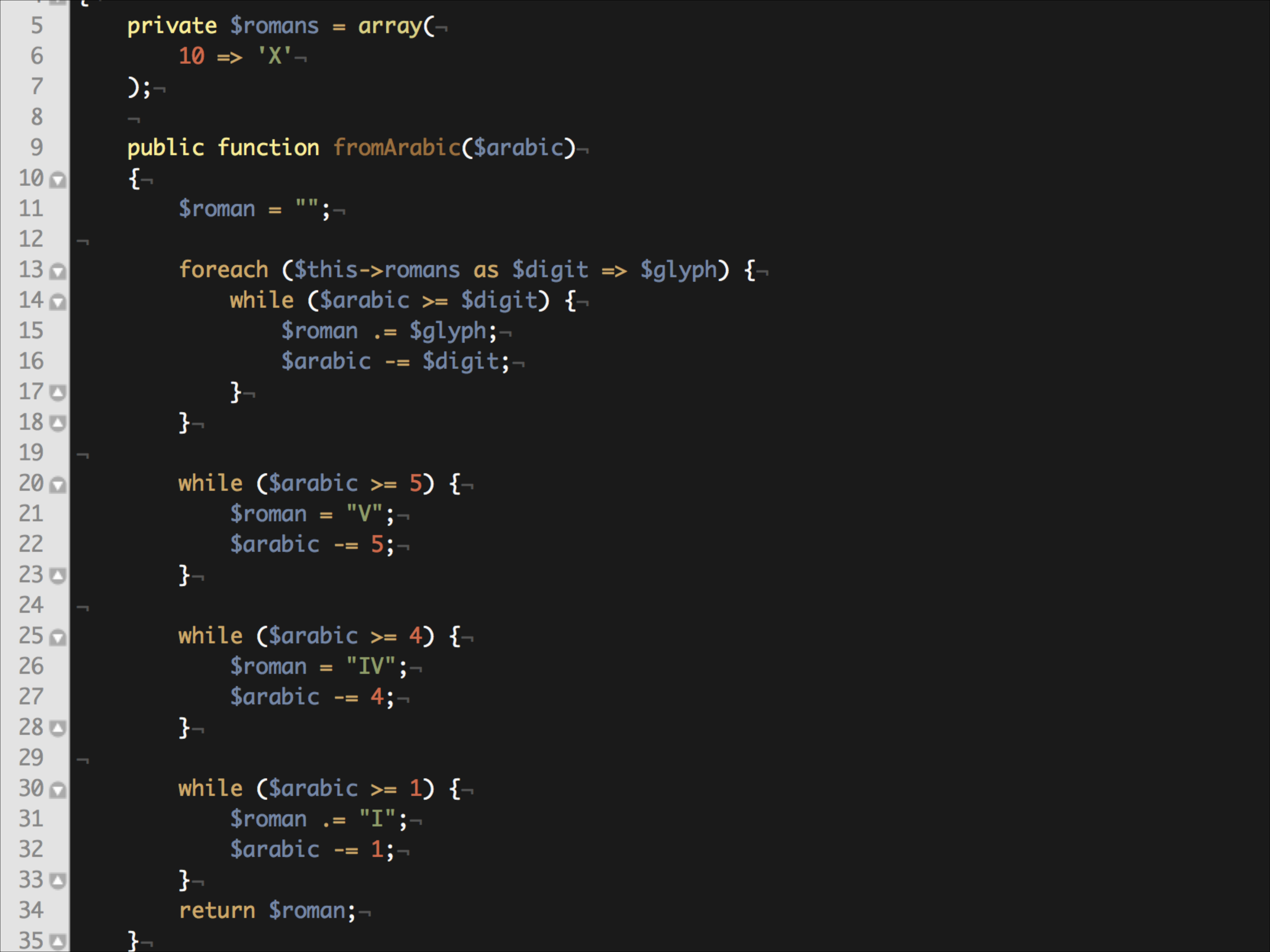
```
md@capoeira:roman_numerals $ bin/phpspec run
                      100%                        8
1 specs
8 examples (8 passed)
11ms
md@capoeira:roman_numerals $ 
```



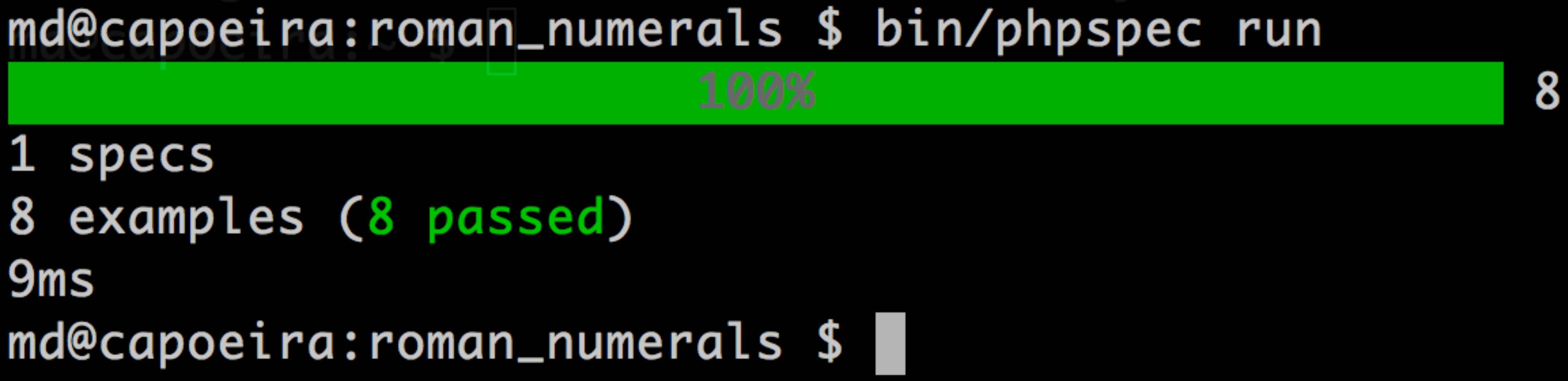
```php
class RomanNumeral
{
    public function fromArabic($arabic)
    {
        $roman = "";

        while ($arabic >= 10) {
            $roman .= "X";
            $arabic -= 10;
        }

        while ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        while ($arabic >= 4) {
            $roman = "IV";
            $arabic -= 4;
        }

        if ($arabic) {
            $roman .=  str_repeat("I", $arabic);
        }
        return $roman;
    }
}
```



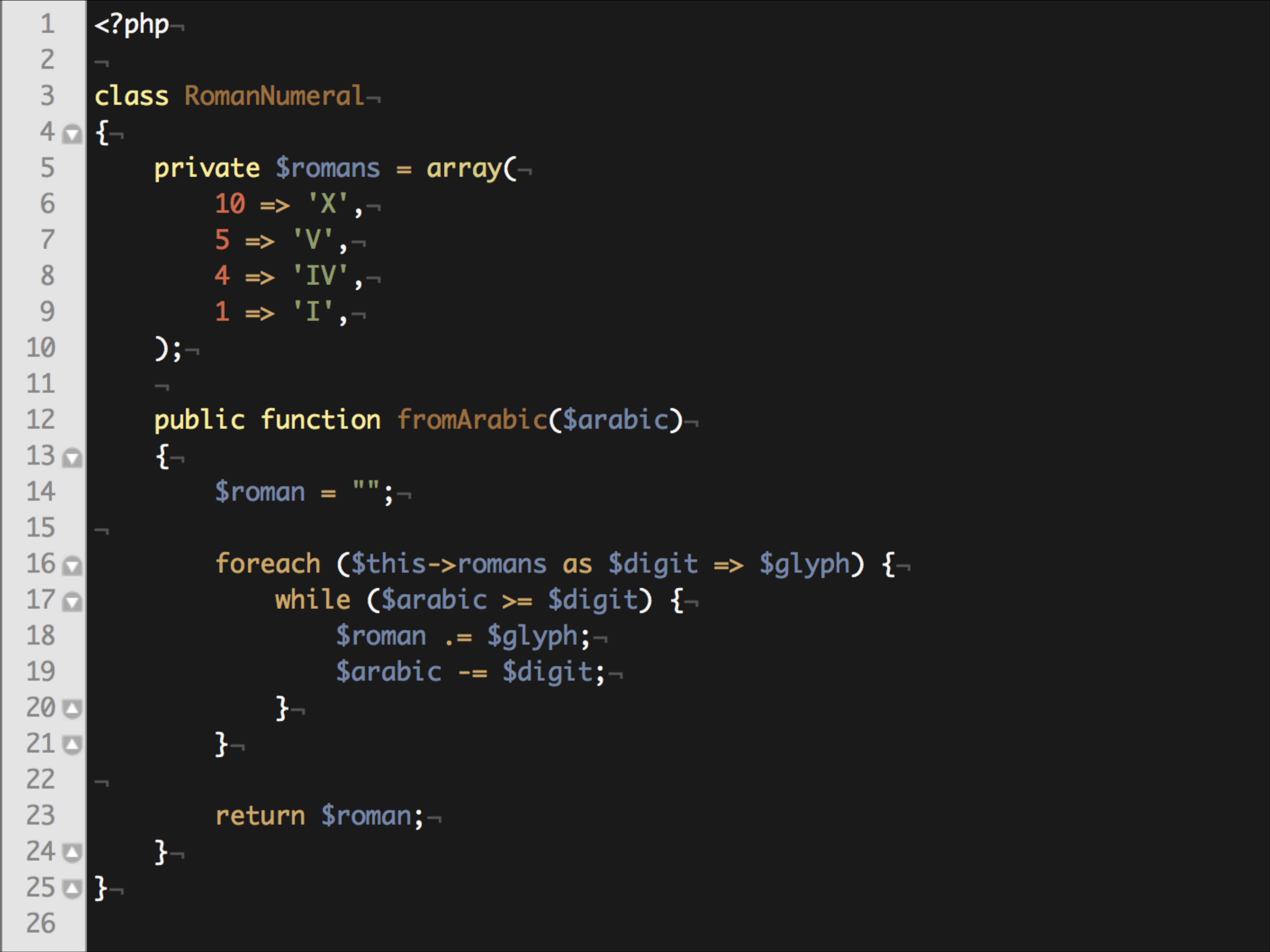
```php
    public function fromArabic($arabic)
    {
        $roman = "";

        while ($arabic >= 10) {
            $roman .= "X";
            $arabic -= 10;
        }

        while ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        while ($arabic >= 4) {
            $roman = "IV";
            $arabic -= 4;
        }

        while ($arabic >= 1) {
            $roman .= "I";
            $arabic -= 1;
        }
        return $roman;
    }
```



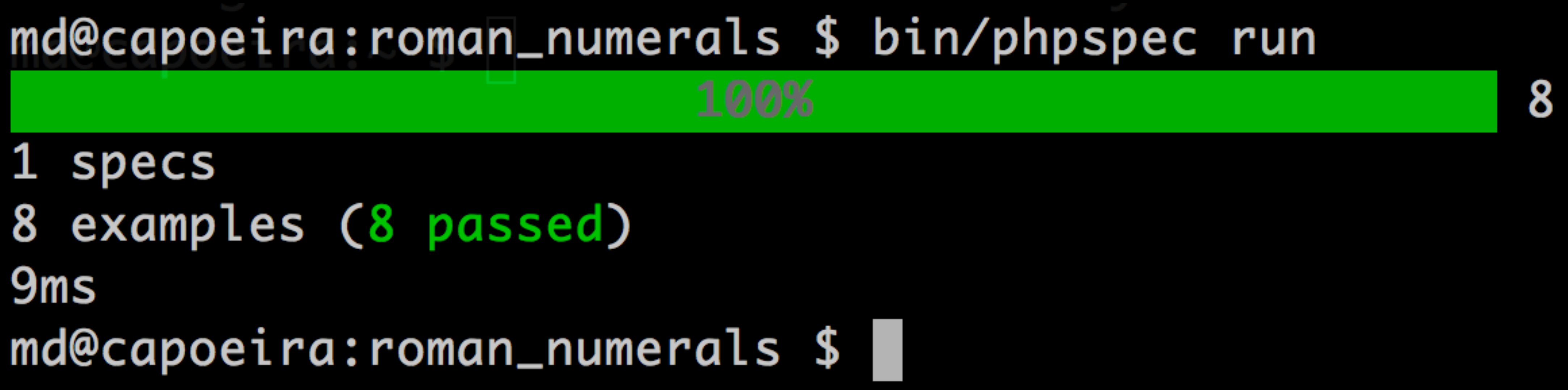
```php
    private $romans = array(
        10 => 'X'
    );

    public function fromArabic($arabic)
    {
        $roman = "";

        foreach ($this->romans as $digit => $glyph) {
            while ($arabic >= $digit) {
                $roman .= $glyph;
                $arabic -= $digit;
            }
        }

        while ($arabic >= 5) {
            $roman = "V";
            $arabic -= 5;
        }

        while ($arabic >= 4) {
            $roman = "IV";
            $arabic -= 4;
        }

        while ($arabic >= 1) {
            $roman .= "I";
            $arabic -= 1;
        }
        return $roman;
    }
```



```
md@capoeira:roman_numerals $ bin/phpspec run
                              100%                                  8
1 specs
8 examples (8 passed)
9ms
md@capoeira:roman_numerals $ 
```

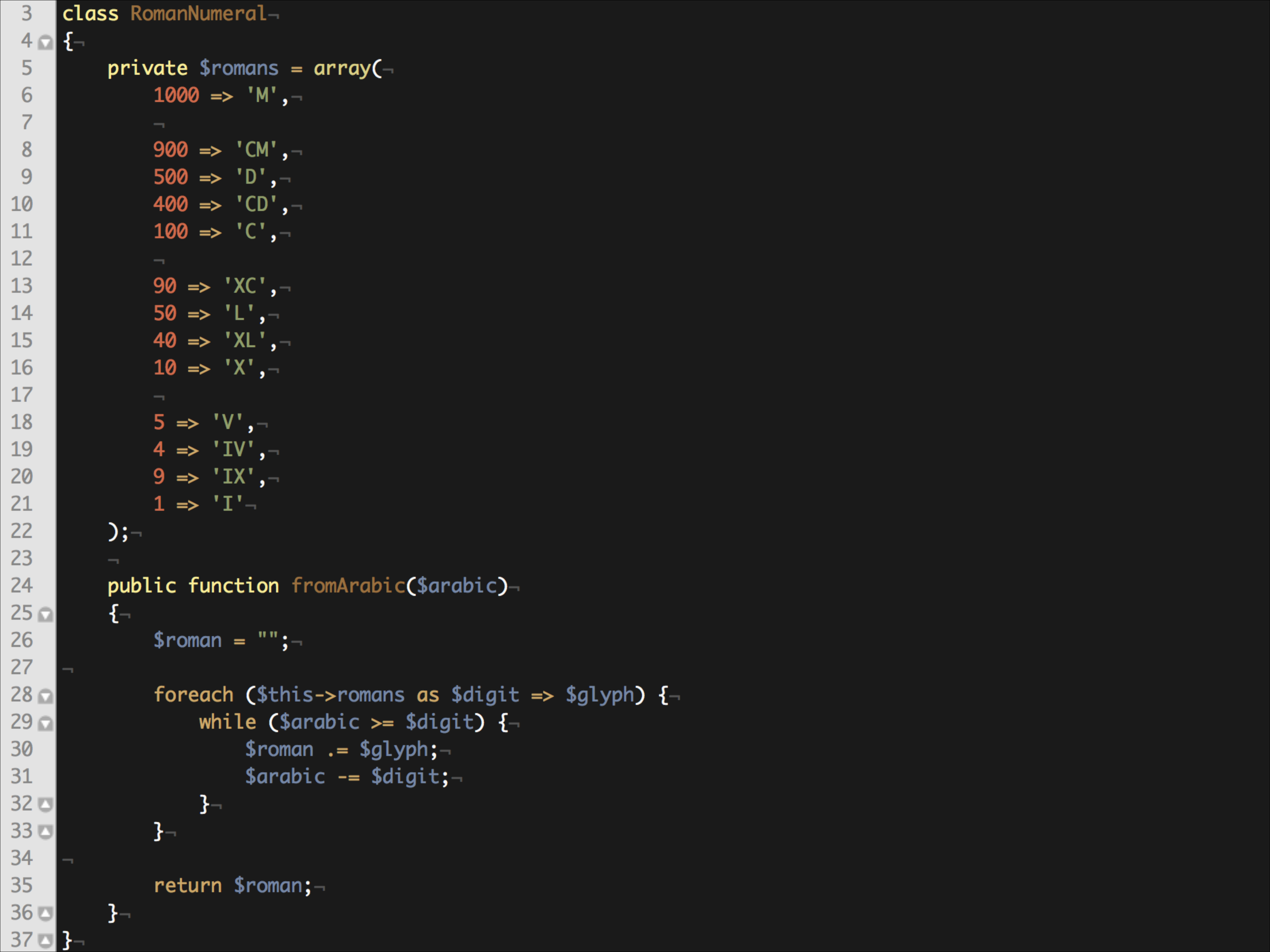


```php
<?php

class RomanNumeral
{
    private $romans = array(
        10 => 'X',
        5 => 'V',
        4 => 'IV',
        1 => 'I',
    );

    public function fromArabic($arabic)
    {
        $roman = "";

        foreach ($this->romans as $digit => $glyph) {
            while ($arabic >= $digit) {
                $roman .= $glyph;
                $arabic -= $digit;
            }
        }

        return $roman;
    }
}
```

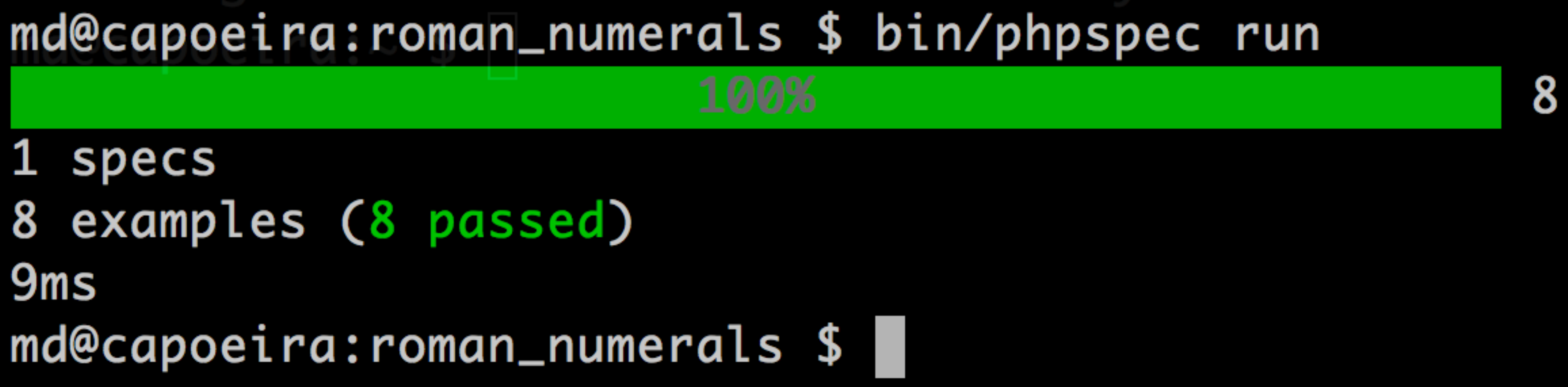


```
md@capoeira:roman_numerals $ bin/phpspec run
                       100%                          8
1 specs
8 examples (8 passed)
9ms
md@capoeira:roman_numerals $
```

```php
function it_returns_the_roman_equivalent_of_any_arabic_number()
{
    $this->fromArabic(2465)->shouldReturn("MMCDLXV");
}
```

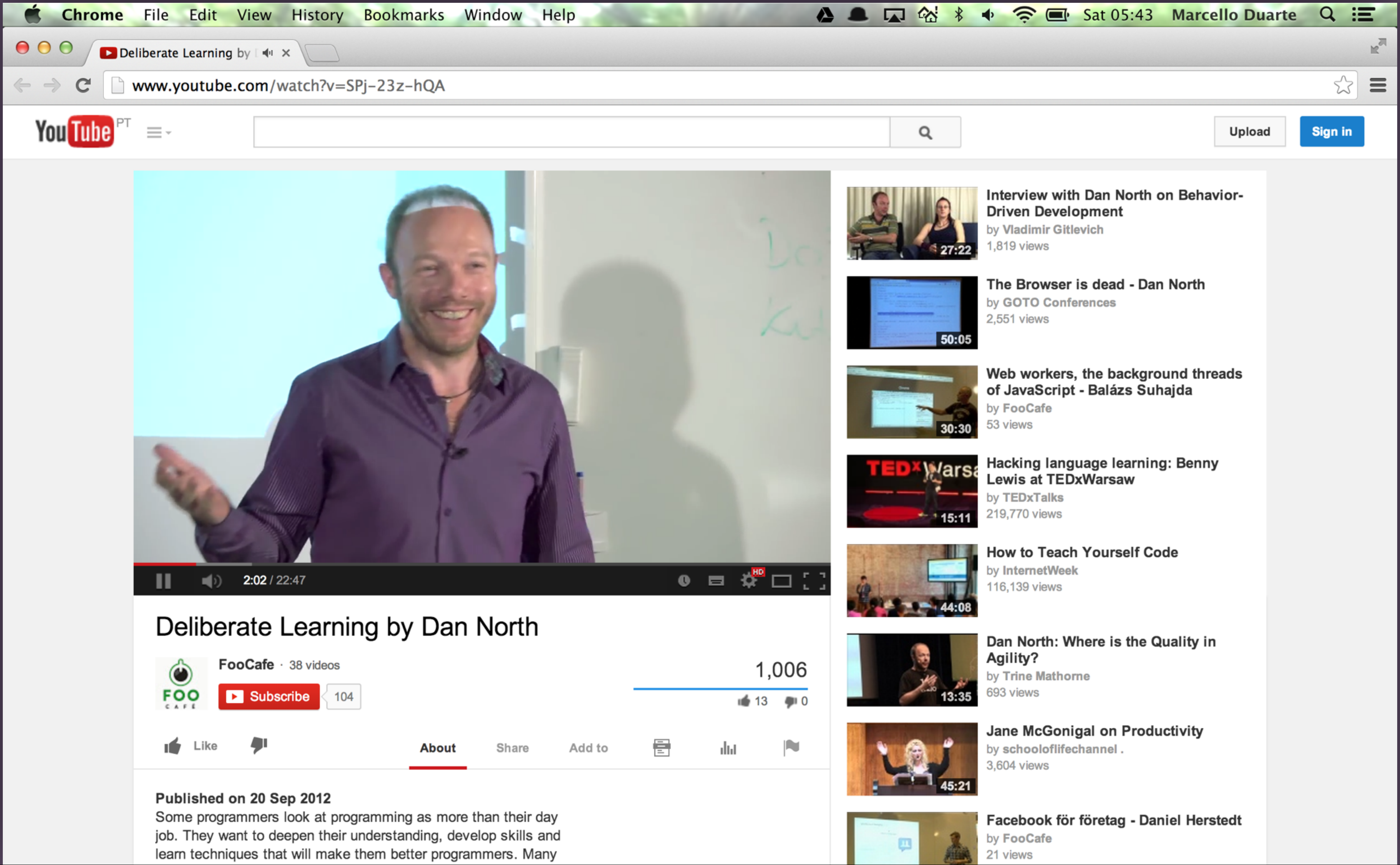


```php
class RomanNumeral
{
    private $romans = array(
        1000 => 'M',

        900 => 'CM',
        500 => 'D',
        400 => 'CD',
        100 => 'C',

        90 => 'XC',
        50 => 'L',
        40 => 'XL',
        10 => 'X',

        5 => 'V',
        4 => 'IV',
        9 => 'IX',
        1 => 'I'
    );

    public function fromArabic($arabic)
    {
        $roman = "";

        foreach ($this->romans as $digit => $glyph) {
            while ($arabic >= $digit) {
                $roman .= $glyph;
                $arabic -= $digit;
            }
        }

        return $roman;
    }
}
```



```
md@capoeira:roman_numerals $ bin/phpspec run
                              100%                                  8
1 specs
8 examples (8 passed)
9ms
md@capoeira:roman_numerals $ 
```

Katas and Learning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Kata	Koan
Deliberate Practice	Deliberate Learning
• Optimising for performance	• Optimising for discovery
• Minimising variance	• Maximising variance

[North 12]

Learning TDD is learning all that TDD does for you

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Ein Lehrbuch des Schachspiels
auf ganz neuartiger Grundlage

von

A. Nimzowitsch

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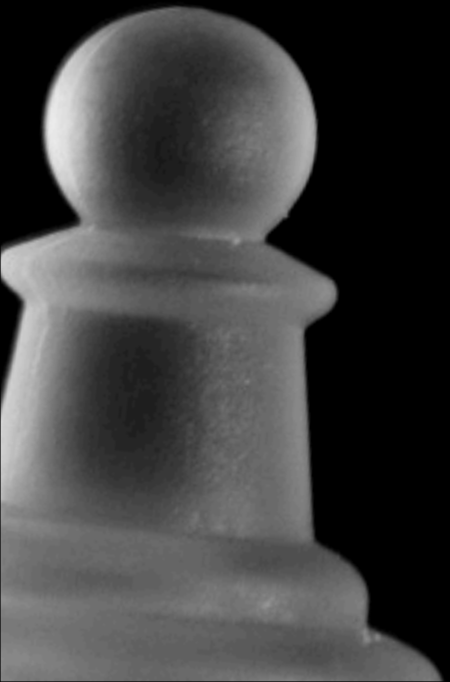
“The beauty of a move lies not in its' appearance but in the thought behind it.”

My System

elements of chess

positional play

illustrative games



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