Testing

Unit Testing

Studying impact of climate change on agriculture

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Have aerial photos of farms from 1980–83

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Want to compare with photos from 2007–present

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Want to compare with photos from 2007–present

First step is to find regions where fields overlap

Luckily, these fields are in Saskatchewan...

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...where fields are rectangles

A student has written a function that finds the overlap between two rectangles

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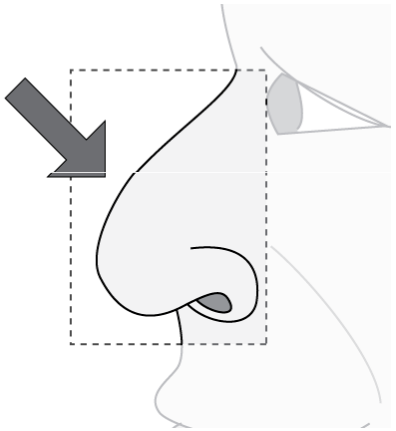
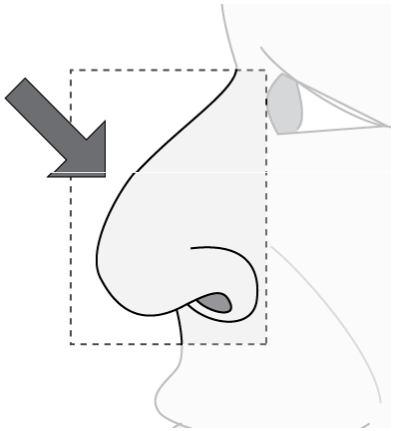
Use Python's Nose library



Nose

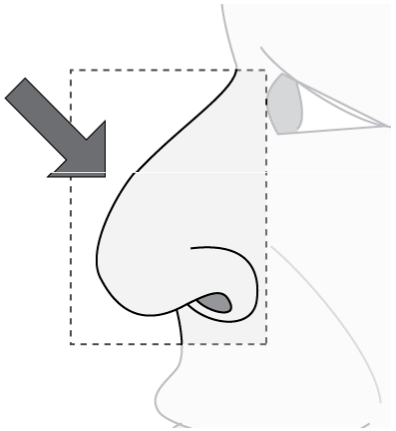
Each test is a function



Nose

Each test is a function

– Whose name begins with `test_`



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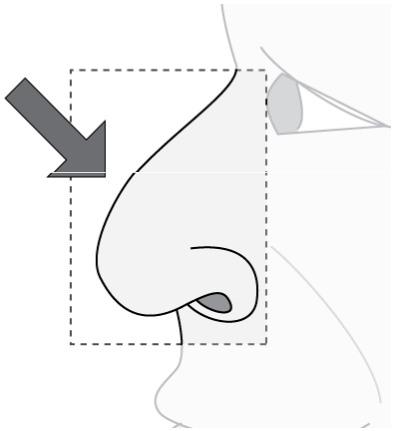

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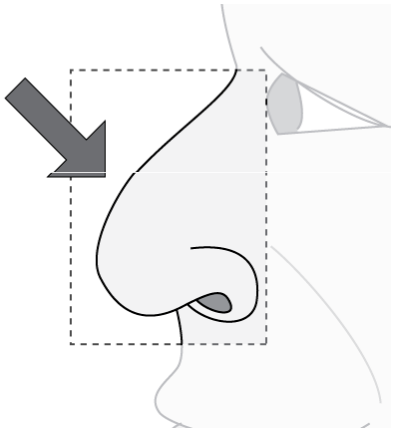

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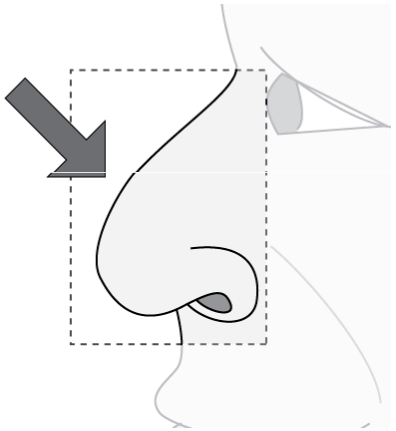
Run the command `nosetests`



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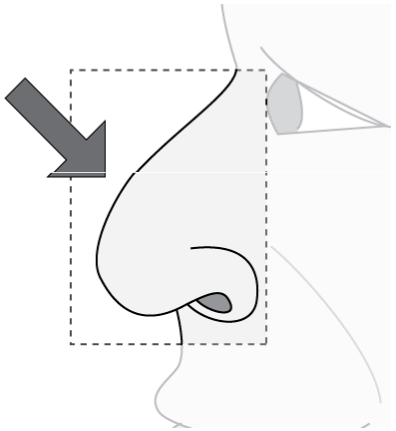
– Which automatically search the current directory and sub-directories for tests



Nose

Simple example: testing `dna_starts_with`

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```
def test_starts_with_itself():
  dna = 'actgt'
  assert dna_starts_with(dna, dna)

def test_starts_with_single_base_pair():
  assert dna_starts_with('actg', 'a')

def does_not_start_with_single_base_pair():
  assert not dna_starts_with('ttct', 'a')
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Give tests meaningful names

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Use `assert` to check results

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Use variables for fixtures to prevent typing mistaeks

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If we test `dna_starts_with('atc', 'a')`,

we're unlikely to learn much from testing

`dna_starts_with('ttc', 't')`

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So choose tests that are as different from each other as possible

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So choose tests that are as different from each other as possible

Look for *boundary cases*

Apply this to overlapping rectangles

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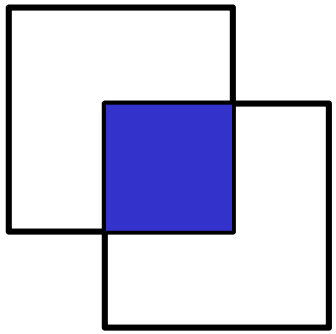
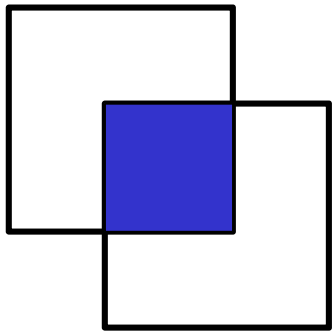


A "normal" case

Apply this to overlapping rectangles



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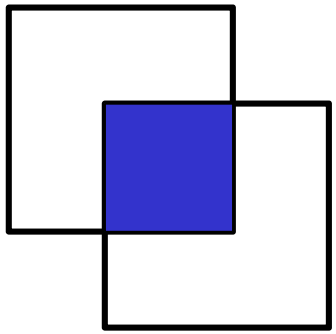

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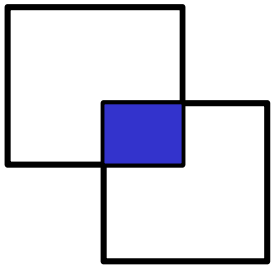

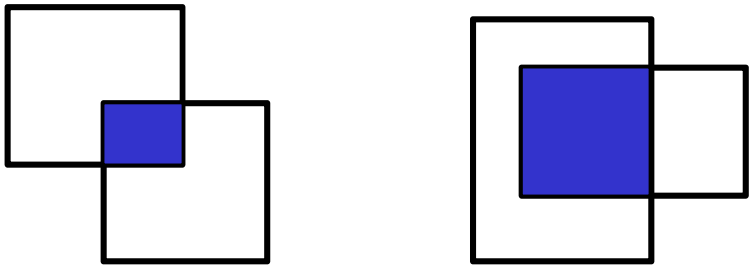

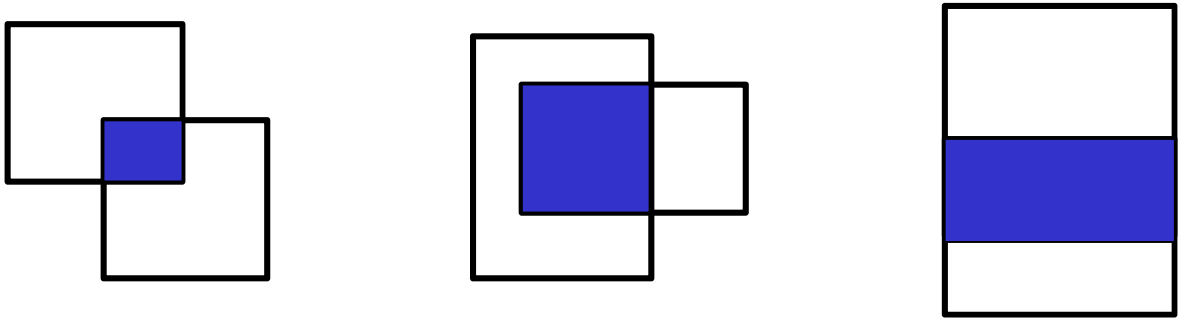

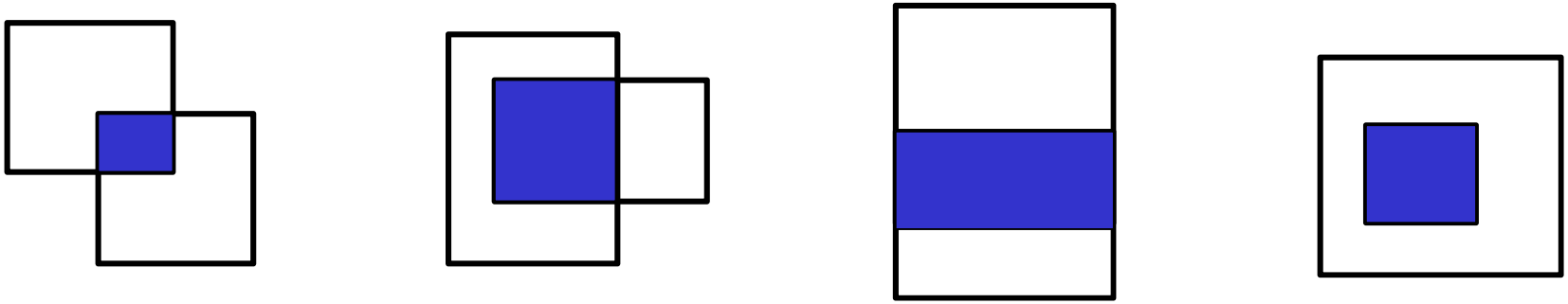

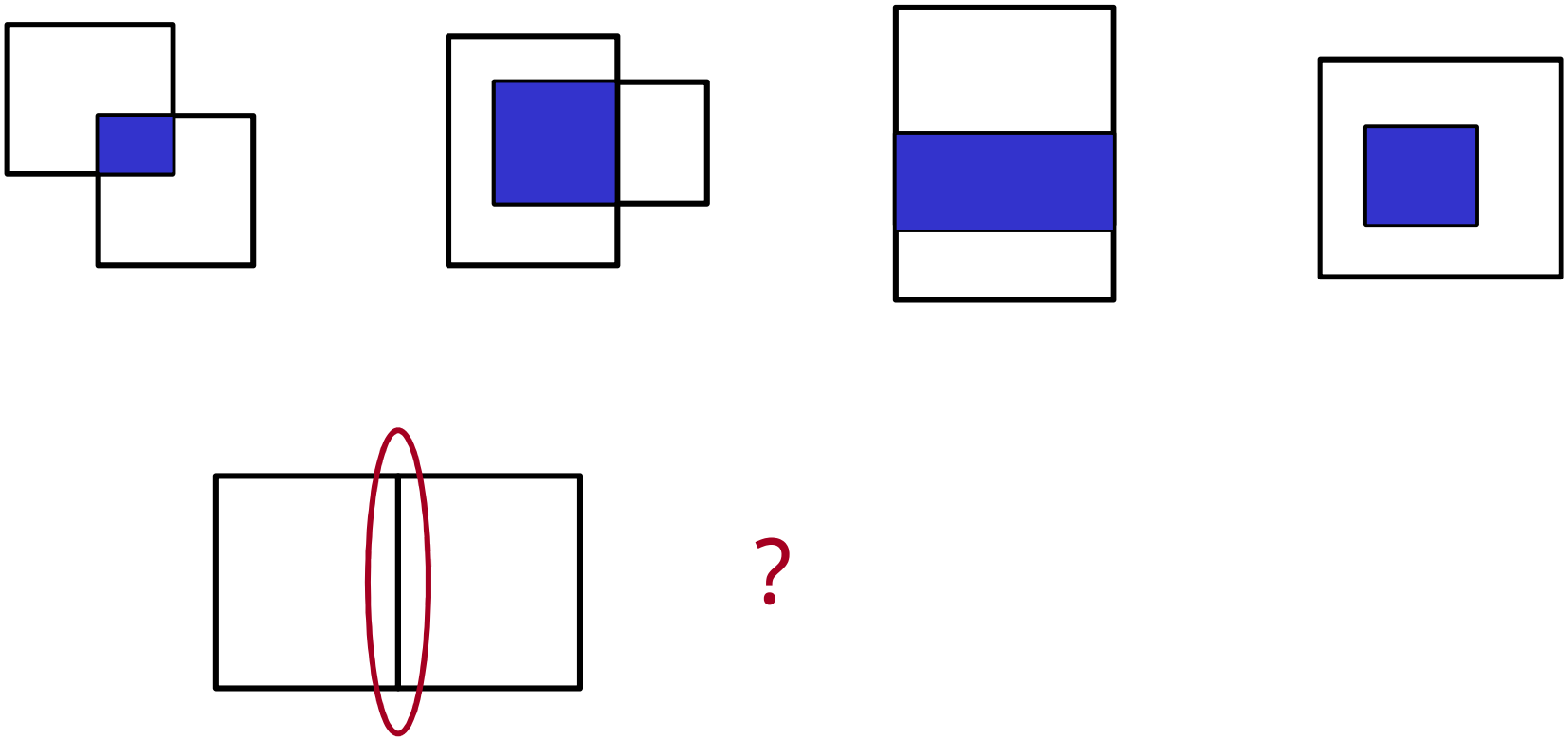

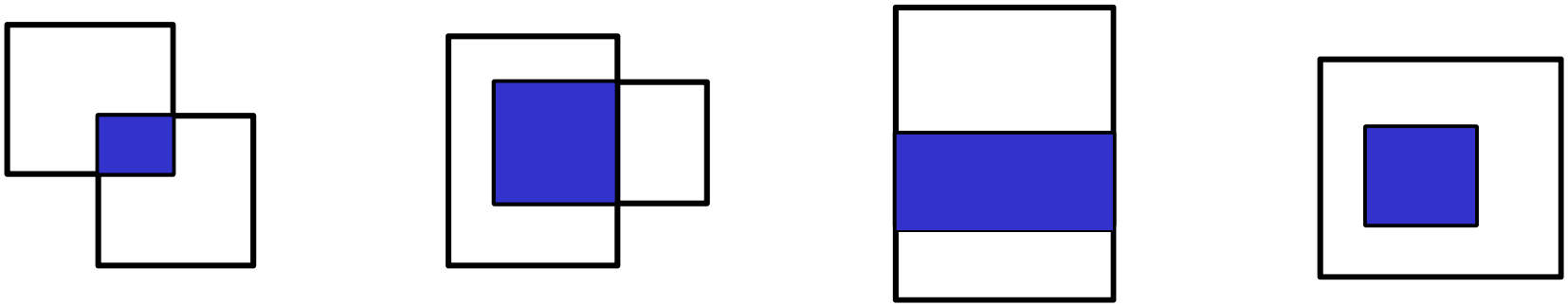

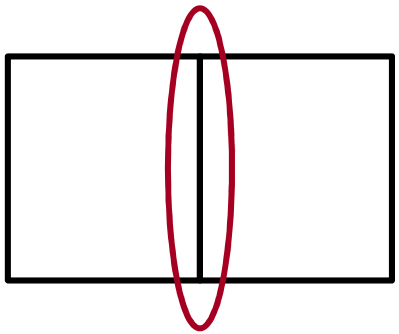

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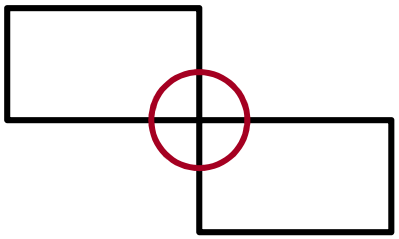

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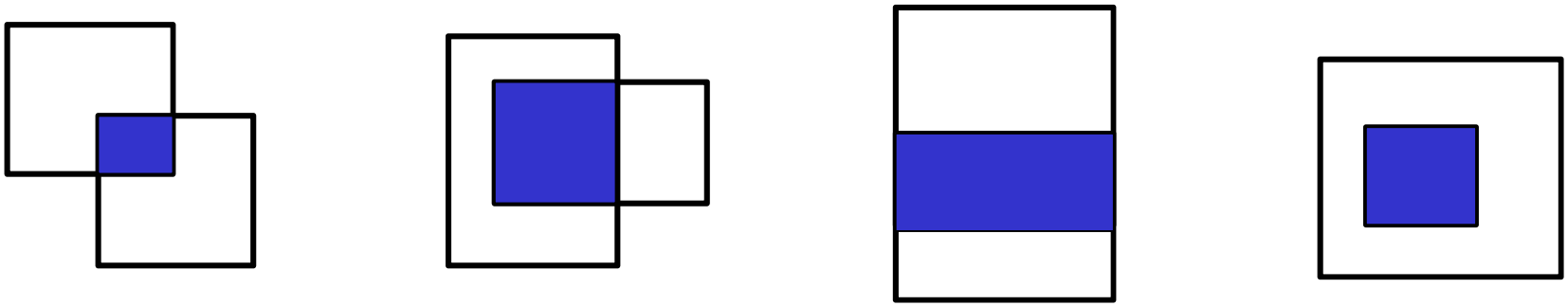

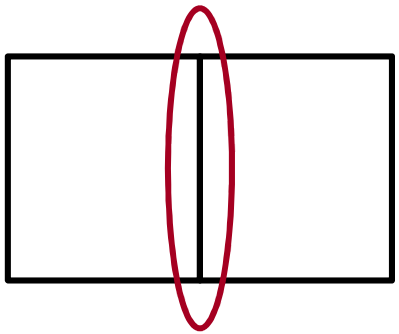

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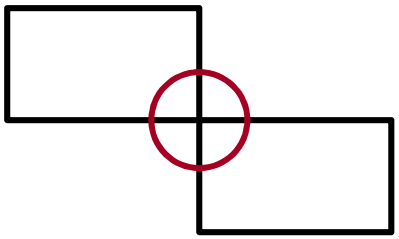

?

Tests help us define what "correct" actually means

Turn this into code

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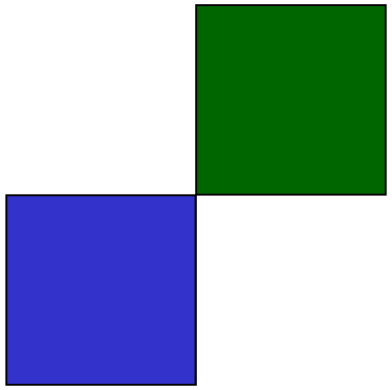
```
def test_touch_on_corner():
  one = ((0, 0), (1, 1))
  two = ((1, 1), (2, 2))
  assert overlap(one, two) == None
```



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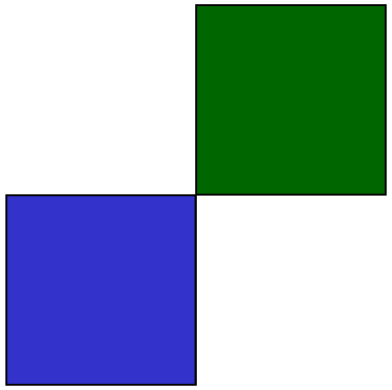
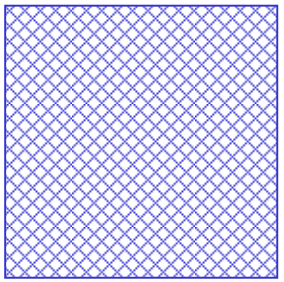


An unambiguous, runnable answer to our question about touching on corners

```
def test_unit_with_itself():
  unit = ((0, 0), (1, 1))
  assert overlap(unit, unit) == unit
```



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def test_unit_with_itself():
  unit = ((0, 0), (1, 1))
  assert overlap(unit, unit) == unit
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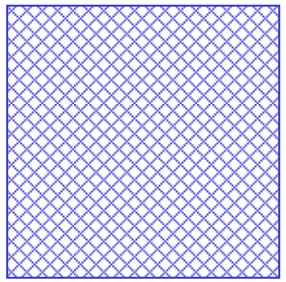
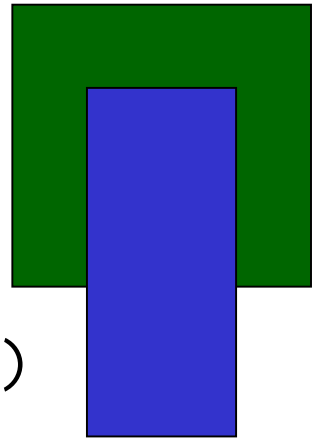


Wasn't actually in the set of test cases

we came up with earlier

```
def test_partial_overlap():
  red = ((0, 3), (2, 5))
  blue = ((1, 0), (2, 4))
  assert overlap(red, blue) == ((1, 3), (2, 4))
```



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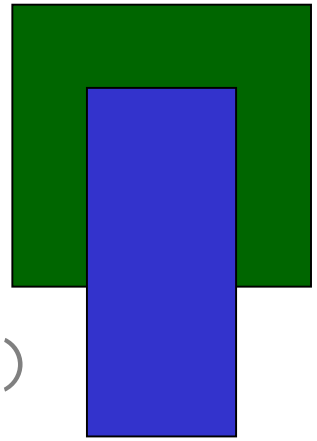

This test actually turned up a bug

```
def overlap(red, blue):
  '''Return overlap between two rectangles, or None.'''

  ((red_lo_x, red_lo_y), (red_hi_x, red_hi_y)) = red
  ((blue_lo_x, blue_lo_y), (blue_hi_x, blue_hi_y)) = blue

  if (red_lo_x >= blue_hi_x) or (red_hi_x <= blue_lo_x) or \
     (red_lo_y >= blue_hi_x) or (red_hi_y <= blue_lo_y):
    return None

  lo_x = max(red_lo_x, blue_lo_x)
  lo_y = max(red_lo_y, blue_lo_y)
  hi_x = min(red_hi_x, blue_hi_x)
  hi_y = min(red_hi_y, blue_hi_y)

  return ((lo_x, lo_y), (hi_x, hi_y))
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Oops

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"The tool shapes the hand"

software carpentry

created by

Greg Wilson

August 2010