Haskell Unit 10: Program correctness

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Introduction

Consider the following solution to the problem of finding the sum of the squares of the two largest of the three numbers x, y and z:

```
sotl x y z
  | x < y && x < z = y*y + z*z
  | y < x && y < z = x*x + z*z
  | z < x && z < y = x*x + y*y
```

Is this definition correct? It certainly gives the correct answer for many inputs:

```
sotl 4 3 7 = 65
sotl 1 2 3 = 13
sotl 2 3 3 = 18
```

Mathematical induction

In order to prove that P(m) holds, for all non-negative numbers m it is sufficient to establish that P(0) holds and that P(n) => P(n+1) holds whenever n >= 0.

Structural induction for finite lists

In order to prove that P(ys) holds, for all finite lists ys, it is sufficient to establish that P([]) holds and that P(xs) => P(x:xs) holds for all lists xs and all elements x.