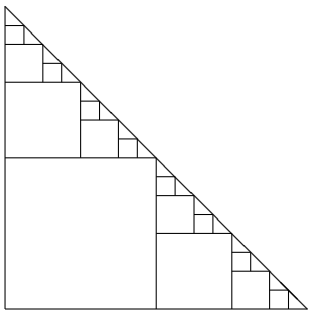
6. (12 points) We have learned how to use slicing to calculate areas and volumes. This problem explores a different kind of slicing through a simple example. A right-isoceles triangle with sides of length 2 is covered by squares as illustrated and explained in the figure below.



step 1: one square of side length 1

step 2: two squares of side length 1/2

step 3: four squares of side length 1/4

step 4: eight squares of side length 1/8

... etc ...

(a) Use a geometric series to find the area covered by the squares after the N^{th} step.

(b) Use your answer to part **(a)** and your knowledge of series to find the total area covered by the infinitely many squares.

(c) How do you know your answer to part **(b)** is the correct one?