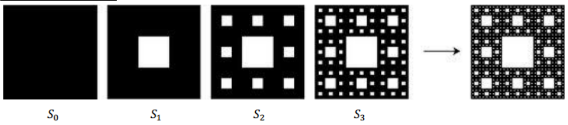
Sierpinski Carpet:



Let S_n be the nth step of the construction of the Sierpinski Carpet. Suppose that S_0 has area 1.

	S_0	S_1	S_2	S_3
Perimeter of this iteration	$P_0 = 4$	$P_1 =$	$P_2 =$ $8^1/9^2$	$P_3 =$ $8^2/9^3$
Perimeter added to previous iteration to obtain this one	N/A	$\frac{8^0}{9^1} = 8^0/(3^2)^1$	$= 8^1/(3^2)^2$	$= 8^2/(3^2)^3$
Area removed from previous iteration to obtain this iteration	N/A	$8^0 \cdot \left(\frac{1}{3^1}\right)^2$	$8^1 \cdot \left(\frac{1}{3^2}\right)^2$	$\boxed{8^2 \cdot \left(\frac{1}{3^3}\right)^2}$
Total area removed up to this point	0			
Number of squares in this iteration	1			
Area of a square in this iteration	1			
Total area of this iteration	$A_0 = 1$	$A_1 =$	$A_2 =$	$A_3 =$
Area of this iteration divided by area of previous iteration	N/A	$\frac{A_1}{A_0} =$	$\frac{A_2}{A_1} =$	$\frac{A_3}{A_2} =$

$(a^m)^n$

a^{mn}

a^{nm}

$(a^n)^m$

case $n=2$

area removed from S_2 to obtain S_3

$8^2/9^3$

The area of S_n equals _____ times the area of S_{n-1}. Therefore the area of S_n is _____ .

The area of S_n can also be found as follows: S_n consists of _____ squares of area _____. Therefore area of S_n equals _____.

The area removed to obtain S_{n+1} from S_n equals $\boxed{a}$. Thus total area removed can be found as the sum of a series (write down the series and calculate its sum):

$$a = \frac{8^n}{9^{n+1}}$$

$$\frac{8^n}{9^n \cdot 9^1} = \frac{8^n}{9^n} \cdot \frac{1}{9^1}$$

~~Find the (total) perimeter of S_n. Explain and show your work.~~

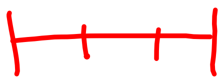
$n=2$

$n+1=3$

$$\sum_{n=0}^{\infty} \frac{8^n}{9^{n+1}} = \sum_{n=0}^{\infty} \frac{8^n}{9^n \cdot 9^1} = \underbrace{\sum_{n=0}^{\infty} \frac{1}{9}\left(\frac{8}{9}\right)^n}_{1^{st}\text{ term}} = \frac{1/9}{1 - 8/9} \boxed{1}$$

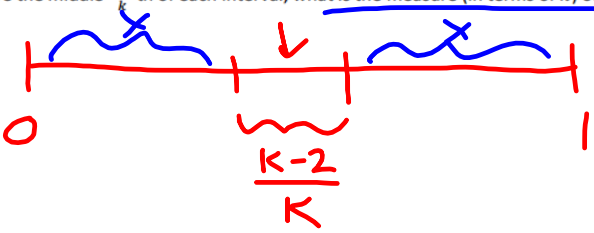
$$S_\infty = \sum_{n=0}^{\infty} c(r)^n = \frac{1^{st}\text{ term}}{1-r} \quad \text{if } |r|<1$$

Other Cantor Sets



Fix an integer k. Let C^k be the set constructed in the same way as the standard Cantor set, except for on each step we remove the middle $\frac{k-2}{k}$th of each of the intervals (instead of removing the middle one third).

If we remove the middle $\frac{k-2}{k}$th of each interval, what is the measure (in terms of k) of each of the two remaining pieces?



What is x in terms of K?

Find the fractal dimension of C^k.

in terms of K

S = scaling factor

N = # of pieces = 2

S = the # we divide edge length by to get edge length of next iteration

What does the fractal dimension of C^k tend to as k goes to ∞?