Cantor's Comb Exploration Questions

The Cantor comb is a way to visualize the famous Cantor set. Georg Cantor was interested in this set because it is infinite and completely disconnected (all of the points are separated from each other), even though it is built by looking at line segments. In fractal terms we refer to such disconnected sets as "fractal dust."

Directions: Draw several iterations of the basic Cantor Comb (removing the middle 1/3 each time), filling in the table below.

Cantor's Middle Thirds Comb

Iteration	1	2	3	4	5
Length of one line segment					
Total Length					

Answer the following questions:

- What would the length of a line segment in the N-th iteration be? Look at the patterns made by the numbers both before and after simplifying.

- What would the total length be in the N-th iteration?

- What do you expect the Cantor Comb to look like? In other words, what would you expect to happen if you repeated this infinitely many times?

- What is the length of the Cantor Comb?

Now try other fractions: Try removing the middle ½ and the middle ¼, filling the tables below:

Cantor's Middle Halves Comb

Iteration	1	2	3	4	5
Length of one line segment					
Total Length					

Cantor's Middle Quarters Comb

Iteration	1	2	3	4	5
Length of one line segment					
Total Length					

Compare the results of these trials. Try a few other fractions of your choice and then list any general conclusions you can draw. For example, can you build a formula for the N-th iteration total length that would work for any fraction of the form 1/X?