2. This is an arithmetico-geometric sequence.
Let,

$$S = \frac{1}{3} + \frac{2}{9} + \frac{3}{27} + \frac{4}{81} + \cdots$$

Thus,

$$3S = 1 + \frac{2}{3} + \frac{3}{9} + \frac{4}{27} + \cdots$$

Subtracting S from $3S$ gives

$$2S = 1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \cdots$$

Thus, $2S$ is an infinite geometric series with first term 1 and common ratio $\frac{1}{3}$. Using the formula for the sum of an infinite geometric series, we get that $2S = \frac{1}{1-\frac{1}{3}} = \frac{1}{\frac{2}{3}} = \frac{3}{2}$. This makes $S = \frac{\frac{3}{2}}{2} = \boxed{\frac{3}{4}}$