



$$A = \frac{1^2}{3^1} + \frac{2^2}{3^2} + \frac{3^2}{3^3} + \frac{4^2}{3^4} + \frac{5^2}{3^5} + \dots \Rightarrow$$

$$A = \frac{1}{3} + \frac{(1+1)^2}{3^2} + \frac{(2+1)^2}{3^3} + \dots = \frac{1}{3} + \frac{1^2 + 2(1) + 1^2}{3^2} + \frac{2^2 + 2(2) + 1^2}{3^3} + \dots$$

$$A = \frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \dots + \frac{2}{3} \left(\frac{1}{3} + \frac{2}{3^2} + \frac{3}{3^3} + \dots \right) + \frac{1}{3^2} + \frac{2^2}{3^3} + \dots$$

$$A = \frac{\left(\frac{1}{3}\right)}{\left(1 - \frac{1}{3}\right)} + \left(\frac{2}{3}\right)\left(\frac{2}{3}\right) + \left(\frac{1}{3}\right)A \Rightarrow \left(\frac{2}{3}\right)A = \frac{1}{3} + \frac{1}{3} = \frac{2}{3} \Rightarrow A = \frac{2}{3}$$