Que-1: Find the value of $1 + \frac{1+2}{2!} + \frac{1+2+3}{3!} + \cdots$

Ans: We can see the kth term as

$$\frac{\sum_1^k i}{k!} = \frac{\left\{\frac{k(k+1)}{2}\right\}}{k!}$$
$$= \frac{1}{2}\left\{\frac{k+1}{(k-1)!}\right\}$$
$$= \frac{1}{2}\left\{\frac{k-1+2}{(k-1)!}\right\}$$
$$= \frac{1}{2}\left\{\frac{1}{(k-2)!} + \frac{2}{(k-1)!}\right\}$$

So, now $1 + \frac{1+2}{2!} + \frac{1+2+3}{3!} + \cdots = \sum_{k=0}^{\infty} \frac{1}{2}\left\{\frac{1}{(k-2)!} + \frac{2}{(k-1)!}\right\}$

$$= \frac{1}{2}\left\{\sum_{k=2}^{\infty}\frac{1}{(k-2)!} + \sum_{k=1}^{\infty}\frac{2}{(k-1)!}\right\}$$
$$= \frac{1}{2}\{e + 2e\}$$
$$= \frac{3}{2}e$$