	SEQUENCE AND SERIES - SPECIAL SERIES **Class XI**	
Q.17)	Find the sum to n terms $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5$.....$n$ terms.	
Sol.17)	The general term of this series given by $a_n = (n)(n+1)(n+2)$ $a_n = n(n^2 + 3n + 2)$ $a_n = n^3 + 3n^2 + 2n$ Now, $\sum n = \sum an$ $= \sum n^3 + 3n^2 + 2n$ $= \sum n^3 + 3\sum n^2 + 2\sum n$ $= \frac{n^2(n+1)^2}{4} + \frac{3n(n+1)(2n+1)}{6} + \frac{2n(n+1)}{2}$ $= n(n+1)\left[\frac{n(n+1)}{4} + \frac{(2n+1)}{2} + 1\right]$ $= n(n+1)\left[\frac{n^2+n+4n+2+4}{4}\right]$ $= \frac{n(n+1)(n^2+5n+6)}{4}$ $S^n = \frac{(n+1)(n+2)(n+3)}{4}$ ans.	
Q.18)	Find the sum to n terms $3 \times 1^2 + 5 \times 2^2 + 7 \times 3^3 +$.....$n$ terms	
Sol.18)	General term of this series is $a_n = (2n+1)(n^2)$ $a_n = (2n^3 + n^2)$ Now, $S^n = \sum an$ $= \sum(2n^3 + n^2)$ $= 2\sum n^3 + \sum n^2$ $= 2\frac{n^2(n+1)^2}{4} + \frac{n(n+1)(2n+1)}{6}$ $= n(n+1)\left[\frac{n(n+1)}{4} + \frac{(2n+1)}{2}\right]$ $= n(n+1)\left[\frac{3n^2+3n+2n+1}{6}\right]$ $= \frac{n(n+1)(3n^2+5n+1)}{6}$ $= \frac{n(n+1)(n^2+5n+1)}{6}$ $S^n = \frac{n(n+1)(3n^2+5n+1)}{6}$ ans.	
Q.19)	Find the sum $5^2 + 6^2 + 7^2$.....20^2.	
Sol.19)	Let $S = 5^2 + 6^2 + 7^2$.....20^2. $= (1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2$.....$20^2) - (1^2 + 2^2 + 3^2 + 4^2)$ $= S = \left[\frac{n(n+1)(2n+1)}{6}\right] - \left[\frac{n(n+1)(2n+1)}{6}\right]$ Here, put $n = 20$ put $n = 4$ $= S = \left[\frac{20(20+1)(40+1)}{6}\right] - \left[\frac{4(4+1)(8+1)}{6}\right]$ $= S = \frac{20(21)(41)}{6} - \frac{4(5)(9)}{6}$ $= 2870 - 30 = 2840$ ans.	

Q.20)	Find the sum to n terms $\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+$.....$n$ terms.	
Sol.20)	General term of the series is $a_n=\frac{1}{n(n+1)}$ Let $S_n=\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+$.....$\frac{1}{n(n+1)}$ $S_n=\left(\frac{1}{1}-\frac{1}{2}\right)+\left(\frac{1}{2}-\frac{1}{3}\right)+\left(\frac{1}{3}-\frac{1}{4}\right)+$.....$\left(\frac{1}{n}-\frac{1}{n+1}\right)$ $S_n=\frac{1}{n}-\frac{1}{n+1}$ $S_n=\frac{n+1-1}{n+1}$ $\therefore\ S_n=\frac{n}{n+1}$ ans.	