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	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, $\sum n = \sum an$ = $\sum n^3 + 3n^2 + 2n$
	$= \sum n^3 + 3n + 2n$ $= \sum n^3 + 3\sum n^2 + 2\sum n$
	$=\frac{n^2(n+1)^2}{4} + \frac{3n(n+1)(2n+1)}{6} + \frac{2n(n+1)}{2}$
	$= n(n+1) \left[ \frac{n(n+1)}{4} + \frac{(2n+1)}{2} + 1 \right]$
	$= n(n+1) \left[ \frac{n^2 + n + 4n + 2 + 4}{4} \right]$
	$=\frac{n(n+1)(n^2+5n+6)}{4}$
	$S^n = \frac{(n+1)(n+2)(n+3)}{4}$ ans.
Q.18)	Find the sum to $n$ terms $3 \times 1^2 + 5 \times 2^2 + 7 \times 3^3 + \dots n$ terms
Sol.18)	General term of this series is
,	$a_n = (2n+1)(n^2)$
	$a_n = (2n^3 + n^2)$
	Now, $S^n = \sum an$
	$=\sum(2n^3+n^2)$
	$=2\sum n^3 + \sum n^2$
	$=2\frac{n^2(n+1)^2}{4}+\frac{n(n+1)(2n+1)}{6}$
	$= n(n+1) \left[ \frac{n(n+1)}{4} + \frac{(2n+1)}{2} \right]$
	$= n(n+1) \left[ \frac{3n^2 + 3n + 2n + 1}{6} \right]$
	$=\frac{n(n+1)(3n^2+5n+1)}{6}$
	$= \frac{n(n+1)(n^2+5n+1)}{(n^2+5n+1)}$
	$=\frac{n(n+1)(n+3n+1)}{6}$
	$S^n = \frac{n(n+1)(3n^2+5n+1)}{6}$ ans.
Q.19)	Find the sum $5^2 + 6^2 + 7^2$ $20^2$ .
	Let $S = 5^2 + 6^2 + 7^2 \dots 20^2$ .
,	$= (1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 \dots 20^2) - (1^2 + 2^2 + 3^2 + 4^2)$
	$= S = \left[ \frac{n(n+1)(2n+1)}{6} \right] - \left[ \frac{n(n+1)(2n+1)}{6} \right]$
	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.
	=2870-30=2840 ans.

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Q.20)	Find the sum to $n$ terms $\frac{1}{1\times 2} + \frac{1}{2\times 3} + \frac{1}{3\times 4} + \dots n$ terms.
Sol.20)	General term of the series is
	1
	$a_n = \frac{1}{n(n+1)}$
	Let $S_n = \frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots \frac{1}{n(n+1)}$
	$S_n = \left(\frac{1}{1} - \frac{1}{2}\right) + \left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{3} - \frac{1}{4}\right) + \dots \left(\frac{1}{n} - \frac{1}{n+1}\right)$
	$S_n = \frac{1}{n} - \frac{1}{n+1}$
	$ \begin{array}{c} S_n - \overline{n} - \overline{n+1} \\ n+1-1 \end{array} $
	$S_n = \frac{n+1-1}{n+1}$
	$\therefore S_n = \frac{n-1}{n+1} \text{ ans.}$

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