

Fill in the Blanks

Sums of Squares and Cubes

Summation	Expand	Use Standard Formulae	Simplify
$\sum_{r=1}^n 12r^2$	$12 \sum_{r=1}^n r^2$	$12 \times \frac{n(n+1)(2n+1)}{6}$	$2n(n+1)(2n+1)$
$\sum_{r=1}^n (4r^3 + 3)$	$4 \sum_{r=1}^n r^3 + 3 \sum_{r=1}^n 1$	$4 \times \frac{n^2(n+1)^2}{4} + 3n$	$n^2(n+1)^2 + 3n$
$\sum_{r=1}^n (r^2 + 2r)$	$\sum_{r=1}^n r^2 + 2 \sum_{r=1}^n r$	$\frac{n(n+1)(2n+1)}{6} + 2 \times \frac{n(n+1)}{2}$	$\frac{n(n+1)(2n+7)}{6}$
$\sum_{r=1}^n (8r^3 - 6r^2)$	$8 \sum_{r=1}^n r^3 - 6 \sum_{r=1}^n r^2$	$8 \times \frac{n^2(n+1)^2}{4} - \frac{6n(n+1)(2n+1)}{6}$	$n(n+1)(2n^2 - 1)$
$\sum_{r=5}^n r^2$	$\sum_{r=1}^n r^2 - \sum_{r=1}^4 r^2$	$\frac{n(n+1)(2n+1)}{6} - \frac{4 \times 5 \times 9}{6}$	$\frac{n(n+1)(2n+1) - 180}{6}$
$\sum_{r=5}^n 2r^3 + 3$	$2 \sum_{r=1}^n r^3 + 3 \sum_{r=1}^n 1 - 2 \sum_{r=1}^4 r^3 - 3 \sum_{r=1}^4 1$	$2 \times \frac{n^2(n+1)^2}{4} + 3n - 2 \times \frac{4^2 \times 5^2}{4} - 12$	$\frac{n^2(n+1)^2 + 6n - 424}{2}$
$\sum_{r=1}^{2n} r^3 - 5r$	$\sum_{r=1}^{2n} r^3 - 5 \sum_{r=1}^{2n} r$	$\frac{(2n)^2(2n+1)^2}{4} - 5 \times \frac{2n(2n+1)}{2}$	$n(2n+1)(2n^2 + 2n - 5)$
$\sum_{r=n}^{2n} 6r^2$	$6 \sum_{r=1}^{2n} r^2 - 6 \sum_{r=1}^{n-1} r^2$	$6 \times \frac{2n(2n+1)(4n+1)}{6} - 6 \times \frac{n(n-1)(2n-1)}{6}$	$n(14n+1)(n+1)$