

Sum Of A Geometric Series

$$\begin{aligned} S_n &= a + ar + ar^2 + \dots + ar^{n-1} \\ rS_n &= ar + ar^2 + ar^3 + \dots + ar^{n-1} + ar^n \end{aligned}$$

$$(r-1)S_n = ar^n - a$$

$$S_n = \frac{a(r^n - 1)}{r - 1} \quad , \text{if } |r| > 1$$

OR

$$S_n = \frac{a(1 - r^n)}{1 - r} \quad , \text{if } |r| < 1$$

e.g. (i) Find the sum of the first 10 terms of $2 + 6 + 18 + \dots$

$$a = 2, r = 3 \text{ and } n = 10$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$
$$S_{10} = \frac{2(3^{10} - 1)}{3 - 1}$$
$$= \underline{59048}$$

$$(ii) \sum_{n=3}^8 6\left(\frac{1}{2}\right)^{n-1}$$

$$a = 6\left(\frac{1}{2}\right)^2 \quad r = \frac{1}{2}, n = 6$$

$$= \frac{3}{2}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

$$S_6 = \frac{\frac{3}{2}\left(1 - \left(\frac{1}{2}\right)^6\right)}{1 - \frac{1}{2}}$$

$$= \frac{3}{2} \times \frac{63}{64} \times \frac{2}{1}$$

$$= \frac{189}{64}$$

**Exercise 1G; 4cf, 7, 8b, 9c, 12,
13, 14, 16a, 18, 20b**