

## Geometric sequence

Given

$$S_n = \frac{1}{2}(3^n - 1), \text{ the sum of } n \text{ elements}$$

$$\text{Find } \Rightarrow \quad a_1 = ? \quad (1)$$

$$q = ? \quad (2)$$

$$S_5 = ? \quad (3)$$

$$a_n = ? \quad (4)$$

$$a_1 = S_1$$

$$S_1 = \frac{1}{2}(3^1 - 1) = \frac{1}{2} \cdot 2 = 1$$

$$a_1 = 1$$

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$q = ?$  we have to find  $a_n$

$$S_n - S_{n-1} = a_n$$

$$a_n = \frac{1}{2}(3^n - 1) - \frac{1}{2}(3^{n-1} - 1) = \frac{1}{2}(3^n - 3^{n-1}) = \frac{1}{2} \cdot 2 \cdot 3^{n-1}$$

$$a_n = 3^{n-1} \quad a_1 = 1$$

$$a_2 = 3$$

$$a_3 = 9$$

$$q = \frac{3^{n-1}}{3^{n-2}} = 3$$

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$$S_5 = \frac{1}{2}(3^5 - 1) = \frac{1}{2}(243 - 1) = \frac{242}{2} = 121$$

$$S_5 = 1 + 3 + 9 + 27 + 81 = 121$$