

### 1. 등비수열

일정수를 곱해서 만든수열

$$a_1 \ a_2 \ a_3 \ \dots \ a_{10} \ \dots \ a_n$$

$$2. \text{ 공비 } : r = \frac{a_{n+1}}{a_n} \rightarrow a_{n+1} = ra_n \rightarrow \text{공비 } r \text{ 인 등비}$$

$$a_{n+1} = 3a_n : \text{공비 } 3 \text{ 인 등비수열}$$

$$a_{n+1} + a_n = 0 : a_{n+1} = -a_n \dots \text{공비 } -1 \text{ 인 등비}$$

$$a_{n+1} = a_n : \text{공비 } 1 \text{ 인 등비수열} \quad \therefore a_n = a_1$$

$$(a_{n+2} - a_{n+1}) = 3(a_{n+1} - a_n) : a_{n+1} - a_n \text{ 은 공비 } 3 \text{ 인}$$

등비수열

$$3. \text{ 일반항 } : a_n = ar^{n-1} \dots \text{초 } \cdot \frac{r}{\text{공}}^{n-1}$$

$$1, 2, 4, 8, \dots, a_n = 1 \cdot 2^{n-1} = 2^{n-1}$$

$$2, 4, 8, 16, \dots, a_n = 2 \cdot 2^{n-1} = 2^n$$

$$1, 4, 16, 64, \dots, a_n = 1 \cdot (4)^{n-1} = (2^2)^{n-1} = 2^{2n-2}$$

$$* a_n = p \cdot q^{\alpha n + \beta}$$

$$\text{초항 } : a_1 = p \cdot q^{\alpha + \beta} \quad \text{공비 } : q^\alpha$$

### 4. 등비수열 합

$$S_n = a + ar + ar^2 + \dots + ar^{n-1}$$

$$- r S_n = ar + ar^2 + \dots + ar^{n-1} + ar^n$$

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

$$\text{i) } r \neq 1 : S_n \frac{a(1 - r^n)}{1 - r} = \frac{a(r^n - 1)}{r - 1}$$

$$= \frac{\text{초}((\frac{r}{\text{공}})^n - 1)}{\frac{r}{\text{공}} - 1} = \frac{\text{초}(1 - (\frac{r}{\text{공}})^n)}{1 - \frac{r}{\text{공}}}$$

$$\text{ii) } r = 1 : S_n = a + a + a + \dots + a = na$$

### 예제1

$$1 + 2 + 4 + 8 + \dots + 2^n = \frac{1 \cdot (2^{n+1} - 1)}{2 - 1}$$

$$2 + 2^3 + 2^5 + \dots + 2^{2n-1} = \frac{2(4^n - 1)}{4 - 1}$$

$$2 + 2^3 + 2^5 + \dots + 2^{2n+1} = \frac{2(4^{n+1} - 1)}{4 - 1}$$

$$2 + 2^3 + 2^5 + \dots + 2^{2n-3} = \frac{2(4^{n-1} - 1)}{4 - 1}$$

### 5. $a, b, c$ 가 등비수열

$$\Rightarrow \frac{b}{a} = \frac{c}{b} \dots b^2 = ac$$

$$b = \pm \sqrt{ac} \quad * x > 0, y > 0 \text{ 일 때}$$

$$\frac{x+y}{2} \geq \sqrt{xy} \geq \frac{2xy}{x+y}$$