Patterns

2 types of patterns: (LINEAR & GEOMETRIC)

① Numeric/Linear patterns: + −

General formula:

$$T_n = a + (n-1) \times (d)$$

$$d = T_2 - T_1$$

n: Position in pattern

a: Term 1

d: Constant difference

Quick example: 9; 12; 15

- Find general formula

$T_n = a + (n-1) \times (d)$

$T_n = 9 + (n-1) \times (3)$

$d = T_2 - T_1$

$d = 12 - 9$

$d = 3$

## ② GEOMETRIC PATTERNS:

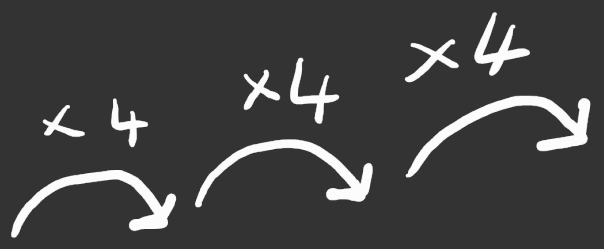
- What are they? $\times$ ; $\div$
- General Formula:

$$T_n = a \times (r)^{n-1}$$

n: Position
a: $T_1$ (first term)
r: ratio ($\times$ ; $\div$)

$$T_n = a \times (r)^{n-1}$$
$$T_n = 12 \times (4)^{n-1}$$
$$T_4 = 12 \times (4)^{(4)-1}$$
$$T_4 = \underline{768}$$

$$r = T_2 \div T_1$$
$$r = 48 \div 12$$
$$r = \textcircled{4}$$




Quick example: 12; 48; 192; ...

key words for questions: (All a's a variation of these!

- Position → n $T_1$ / n=1
- General term / formula → $T_n = a + (n-1)(d)$ / $T_n = a(r)^{n-1}$
- What number is equal to...
- What are the next 4 numbers...

EXAM STYLE QUESTIONS:

- FIRST, TRY ON YOUR OWN, THEN CONTINUE WATCHING

① Consider the Following **linear** pattern

6; 11; 16; 21; ...

a. List the next 3 terms in the pattern.
b. Determine this patterns General Term.
c. What will the 26th term equal?
d. Which term will be equal to 161?

ⓐ 6; 11; 16; 21; 26; 31; 36.

$d = T_2 - T_1$

$d = +5$

$T_5 = 26 \quad T_7 = 36$

$T_6 = 31$

ⓑ $T_n = a + (n-1) \times (d) \quad d = +5$

$T_n = 6 + (n-1) \times (+5)$

ⓒ $n = 1$ ; 6 . $n = 26^{th}$ term

$T_{26} = 6 + (26 - 1) \times (+5)$

$T_{26} = 131$

(d) $T_n = 6 + (n-1)(5)$ term = 161

$161 = 6 + (n-1) \times (5)$

$161 - 6 = (n-1) \times (5)$

$155 = (n-1) \times 5$

$\frac{155}{5} = n-1$

$31 = n-1$

$31+1 = n$

$n = 32$

$T_{32} = 6 + (32-1)(5)$

$T_{32} = 161$

(2) CONSIDER THE FOLLOWING GEOMETRIC PATTERN

22; 132; 792; ... (÷) $(T_n = a \times (r)^{n-1})$

a. Determine the rate of this pattern.
b. What is the patterns general term?
c. What will the 5th term be equal to?

(a) r?

$r = T_3 \div T_2$

$r = 792 \div 132$

$r = 6.$

(b) 22; 132; 792; ...; ...

$T_n = a \times (r)^{n-1}$ $\quad r = \times 6$

$T_n = 22 \times (6)^{n-1}$

(c) $n = 5$

$T_n = 22(6)^{n-1}$

$T_5 = 22(6)^{5-1}$

$T_5 = 28\,512$

(3) CONSIDER THE FOLLOWING PATTERN:

2; -10; -22; ...

-12 -12

a. Determine the type of pattern.
b. Determine the general term of this pattern.
c. what will the $8^{th}$ term equal?
d. which term will be equal to -48?

(a) & (d) LINEAR

(b) (2); -10; -22

$T_n = a + (n-1) \times (d)$ $\quad d = -12$

$T_n = 2 + (n-1) \times (-12)$

(c) $n = 8$?

$T_n = a + (n-1) \times (d)$

$T_8 = 2 + (8-1) \times (-12)$

$T_8 = -82$

(d) $-48 = 2 + (n-1) \times (-12)$

$-50 = (n-1) \times (-12)$

$\frac{-50}{-12} = n-1$

$25/6 = n-1$

$25/6 + 1 = n$

$\frac{31}{6} = n$

$\frac{31}{6} = 5,1667...$

$\therefore$ NA $-48$

Keep in mind:

- which general term values to fill in.
- n means position, not value.
- Can show pattern with pictures, in exam.
- Memorize
  - Linear formula
  - Geometric formula

] you will need to know them.