Important Rules

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1. Arithmetic Progression (AP)

An **arithmetic progression** is a sequence of numbers in which the difference between any two successive members is constant.

1.1. Definitions

- **First term**:

$$a_1$$

- **Common difference**:

$$d = a_n - a_{n-1}$$

1.2. (n)th Term

- **Formula**:

$$a_n = a_1 + (n-1)\,d$$

1.3. Sum of First (n) Terms

- **Sum**:

$$S_n = \frac{n}{2}\,(a_1 + a_n) = \frac{n}{2}\,[2\,a_1 + (n-1)\,d]$$

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2. Geometric Progression (GP)

A **geometric progression** is a sequence where each term after the first is found by multiplying the previous one by a fixed, nonzero number called the **common ratio**.

2.1. Definitions

- **First term**:

$$g_1$$

- **Common ratio**:

$$r = \frac{g_n}{g_{n-1}}$$

2.2. (n)th Term

- **Formula**:

$$g_n = g_1 \, r^{\,n-1}$$

2.3. Sum of First (n) Terms

- **If (r != 1):**

$$S_n = g_1 \, \frac{r^n - 1}{r - 1}$$

- **If (|r| < 1):**

$$S_\infty = \frac{g_1}{1 - r}$$

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3. Divisibility Rules

Quick checks to determine if an integer is divisible by small numbers:

Divisor	Rule
2	Last digit is even (0, 2, 4, 6, 8).
3	Sum of digits is divisible by 3.
4	Last two digits form a number divisible by 4.
5	Last digit is 0 or 5.
6	Divisible by **2** and **3**.
7	Double the last digit, subtract it from the truncated leading number; if result divisible by 7.
8	Last three digits form a number divisible by 8.
9	Sum of digits is divisible by 9.
10	Last digit is 0.
11	Alternating sum of digits (odd positions minus even) is divisible by 11.
12	Divisible by **3** and **4**.

3.1. Examples

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234 divisible by 2?  → last digit 4 → yes
234 divisible by 3?  → 2 + 3 + 4 = 9; 9 mod 3 = 0 → yes
234 divisible by 4?  → last two digits 34; 34 mod 4 = 2 → no
234 divisible by 6?  → divisible by 2 & 3 → yes
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