Math Formula Sheet

(Updated ...

Type 1: Work / Tank Problems

Formula 1→ $\frac{1}{A}+\frac{1}{B}=\frac{1}{x}$

If Taps A and B are adding water while Tap C is draining water:

Formula 2→ $\frac{1}{A}+\frac{1}{B}-\frac{1}{C}=\frac{1}{x}$

Formula 3:

If A and B are working at the same job, but for different times →

$$\frac{\text{Time A works for}}{\text{Total Time A takes for full job}}+\frac{\text{Time B works for}}{\text{Total Time B takes for full job}}=1$$

Type 2: Ratio & Proportion

Direct Relations: Cross Multiply

Inverse Relations: Head-to-head Multiply

Examples:

1. Number of men hired is inversely proportional to the number of days taken to finish a certain job. Hence → $m_1 \times t_1 = m_2 \times t_2$

2. Two wheels attached together – number of revolutions made by each wheel is inversely proportional to its radius (or diameter). Hence:

$radius_1 \times revolutions_1 = radius_2 \times revolutions_2$

Combination of Direct & Inverse Relations:

$m_1 \times t_1 \times w_2 = m_2 \times t_2 \times w_1$

Type 3: Percentages / Selling Price / Cost Price

$Selling\ price = Cost + Profit$

$Discounted\ SP = Original\ SP - Discount$

$Change\ in\ Discount = Change\ in\ Profit$

$$Profit\ or\ loss\ \% = \frac{Amount\ of\ Profit\ or\ loss}{Cost} \times 100$$

$$Markup\ \% = \frac{Profit}{Cost} \times 100$$

$$Margin\ \% = \frac{Profit}{Selling\ Price} \times 100$$

To find Percentage Increase or Decrease:

$$Percentage\ Change = \frac{Change}{Original} \times 100$$

What % is x of y ? → $\frac{is}{of} \times 100 = \frac{x}{y} \times 100$

Percentage change in area of any geometric shape when **all sides** are increased by x % =

$$\frac{(100+x)^2}{100} - 100$$

Percentage change in area of any geometric shape when **ones side is** increased by x % and the **other side** is increased by y%=

$$x + y + \frac{xy}{100}$$

Note: For decrease in any side, use negative signs

Type 4: Averages

Average = *Sum / Number*

Sum = *Average* x *Number*

Last Score = *Old Average* + (*n* x *change*)

New Average = *Old Average* + *change*

Type 5 (a): Arithmetic Progression

$$\text{Average of an Arithmetic Progression} = \frac{(a+l)}{2}$$

$$\text{Sum of an Arithmetic Progression} = \frac{(a+l)}{2} \times n$$

N^{th} *Term of an Arithmetic Progression*

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

Sum of an Arithmetic Progression

$$S_n = \frac{n}{2}(2a + (n-1)\,d \quad \text{OR} \quad S_n = \frac{n}{2}(a+l)$$

$$\text{Number of terms} = \frac{l-a}{d} + 1$$

Type 5b: Geometric Progression

Term of a Geometric Progression

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

$$\text{Sum of } n \text{ terms} = \frac{a(r^n - 1)}{r-1}$$

Sum to infinity (can only be found if $1 < r < 1$)

$$= \frac{a}{1-r}$$

Type 6: Speed Problems

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

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Distance = *Speed* x *Time*

Average Speed for a Round Trip (also fo... broken in two parts, each part consisting o... same distance)

Whenever an object travels a certain distance at one speed (*a* mph) and comes back the SAME distance at another speed (*b* mph), the average speed for the ROUND-TRIP can be calculated by the formula

$$\text{Average Speed for round trip} = \frac{2ab}{(a+b)}$$

When Two Objects Travel in the Same Direction (one object trying to catch up with another)

In such cases **SUBTRACT** the speeds (find the **NET SPEED**)

If Car B is trying to catch up with Car A that is traveling ahead of B in the same direction:

Method 1 → $S_A \times t_A = S_B \times t_B$

Method 2 → *Time for B to catch A* = $\dfrac{\text{Headstart distance of } A}{\text{Net Speed}}$

When Two Objects Travel in the Opposite Directions

In such cases **ADD** the speeds (find the **COMBINED SPEED**)

If Car A and Car B travel from opposite sides towards each other, the time for them to meet each other :

$$\text{Time to meet} = \frac{\text{distance}}{\text{combined speed}}$$