Direct and Inverse Variation

Direct Variation

Two quantities are said to vary directly if the increase (or decrease) in one quantity cause the increase (or decrease) in other quantity.

Ex. Work and time
Work and No. of man
Distance and speed when time is constant.

Q. Cost 5 article is Rs. 60. Then find the cost of 7 article.

Sol. As cost is in direct variation with no. of article.

$$\frac{N_1}{N_2}=\frac{(cost)_1}{(cost)_2}\Rightarrow\frac{5}{7}=\frac{60}{(cost)_2}\Rightarrow(cost)_2=\frac{7\times60}{5}=\text{Rs. }84$$

Time & Work

One man can do a piece of work in m days.
Then in one day he can do $\frac{1}{m}$ part of work.

Ex. If A complete a piece of work in 8 days, and B in 6 days. Then no. of day required to complete the work, if they work together.

Sol. A's one day work = $\frac{1}{8}$

B's one day work = $\frac{1}{6}$ Req. day = $\frac{24}{7}$ Days.

(A + B)'s one day work = $\frac{1}{8}+\frac{1}{6}=\frac{3+4}{24}=\frac{7}{24}$

Time speed distance

- Speed = $\frac{\text{distance}}{\text{time}}$
- Avg. speed = $\frac{\text{total distance}}{\text{total time}}$
- km/h. = $\frac{5}{18}$ m/sec.

Q. Two trains running in the same direction at 40 km/hr and 22 km/hr completely pass one another in 1 minute. If the length of the Ist train is 125 m., then what will be the length of IInd train.

Sol. Here the speed will be taken as the difference of their speeds and the distance covered will be the sum of the lengths of the train.
Now in this case
Speed per hour = 40 – 22 = 18 km/hr.
∴ 18 km/hr. = 5 m/sec.
Let the length of second train = L m.
Distance covered = (125 + L) m
Time taken to cross each other = $\frac{\text{distance}}{\text{speed}}$

$\Rightarrow 60=\frac{L+125}{5}\Rightarrow L=175$ m.

Inverse Variation

Two quantity are said to vary inversely if the increase or decrease, in one quantity cause the decrease (or increase) in the other quantity.

Ex. No. man,No. of day to complete the work.
Speed & time when distance is constant.

Q. 10 men complete the work in 6 days. No. of days. required by 3 men to complete the same work.

Sol. As men and days are in inverse variation.

$$\therefore\frac{m_1}{m_2}=\frac{d_2}{d_1}\Rightarrow\frac{10}{3}=\frac{d_2}{6}\Rightarrow d_2=\frac{10\times6}{3}=20\text{ days.}$$

Pipe & Cistern

Q. Pipe A can fill the tank in 8 hr. & Pipe B empty the full tank in 10 hr. If pipe A pipe B open together then find the time required to fill the empty tank.

Sol. In 1hr. A fill $\frac{1}{8}$ Part of tank.

In 1 hr. B empty $\frac{1}{10}$ part of tank.

If they work togther in 1 hr. the part of tank filled = $\frac{1}{8}-\frac{1}{10}$

$=\frac{5-4}{40}=\frac{1}{40}$

Req. time = 40 hr.

Chart