BALABHADRA SKILL DEVELOPMENT ACADEMY
MATHS FORMULA - 12
ARITHMETIC

MIXTURES AND ALLIGATION

Sl	Situation	Formula
1	When two or more than two substances are mixed in any ratio, than the resultant product is known as ———	Mixture
2	The cost price of unit quantity of the mixture is called ———	Mean Price
3	Let cost price of a unit of cheaper article is Rs. c and that of a unit of dearer article is Rs.d. If the average price of mixture is Rs.m, then	$\frac{\text{Quantity of cheaper article}}{\text{Quantity of dearer article}} = \frac{(\text{Cost price of a unit of dearer article} - \text{Average price})}{(\text{Average price} - \text{Cost price of a unit cheaper article})}$
3(a)	Quantity of cheaper articles : quantity of dearer articles	$\frac{d-m}{m-c}$
4	A mixture contains two liquids in the ratio a:b, if x litre of b is added to the mixture and the ratio of the two liquids becomes a:c, then quantity of (i) liquid 'a' in the mixture is given by and (ii) that of liquid 'b' is given by	(i) $\frac{ax}{c-b}$
		(ii) $\frac{bx}{c-b}$
5	A container initially contains x units of a liquid. If 'a' units of liquid are taken out and are replaced by a unit of water repeatedly upto n times, then the final quantity of the original liquid left in the container is given as	$\left[x\left(1-\frac{a}{x}\right)^n\right]$ units
6	A container has milk and water in the ratio a:b, a second container has milk and water in the ratio c:d. If both the mixtures are emptied into a third container, then the ratio of milk to water in third container is given by	$\left(\frac{a}{a+b}+\frac{c}{c+d}\right):\left(\frac{b}{a+b}+\frac{d}{c+d}\right)$

PROBLEMS BASED ON TRAINS

Sl	Situation	Formula
1	If two trains with speeds a km/h and b km/h (where, a>b) are moving in same direction, then their relative speed will be	(a-b)km/h
2	If two trains are moving in opposite directions with speed a km/h and b km/h (where, a>b) then their relative speed will be	(a+b)km/h
3	If two trains start at the same time from points A and B towards each other and after crossing each other, they take t_1 and t_2 time in reaching points B and A respectively, then ratio of their speeds	$\sqrt{\frac{t_2}{t_1}}$
4	A train crosses a man in t_1 time and a platform of length x in t_2 time, then length of train	$\frac{x}{t_2 - t_1} \times t_1$
5	If a train overtakes two persons who are walking with speeds of a and b, respectively in the same direction and passes them completely in t1 and t2 time respectively, then	$\text{Length of train} = \frac{(a \sim b) \times t_1 \times t_2}{(t_1 \sim t_2)}$
6	If without stoppage, a train travels at an average speed of 'a' and with stoppage it covers the same distance at an average speed of 'b', then time of rest per hour (when a>b)	$\frac{a - b}{a}$
7	If two trains of equal lengths and different speeds take t1 and t2 time to cross a pole, then time taken by them to cross each other is equal to	$\frac{2t_1t_2}{t_1 \pm t_2}$

8	If two trains leave from A to B at time t1 and t2 and travel with speeds a and b respectively, then the distance d from the starting point A to the point where the two trains meet, is given as	$d = (t_1 - t_2) \times \frac{a \times b}{b - a}$ $Here, t_1 > t_2 \; and \; b > a$
9	The distance covered by a train in passing a pole, a man or any other object of negligible length is equal to the	Length of train
10	The distance covered by a train in passing a station, bridge or any other object having some considerable length is equal to	The sum of length of train and that of particular object