Q- Two towns A&B are connected by a regular bus service with a bus leaving in either direction every T min. A man cycling with a speed of 20 Km/hr in the direction A to B notices that a bus goes past him every 18min in the direction of his motion, and every 6 min in the opposite direction. What is the period T of the bus service and with what speed, (assumed constant) do the buses ply on the road.

Let the speed of each bus is V km/hr.

The distance between any two buses moving in the same direction remains constant and equal to velocity of each bus*time = V*T

Velocity of the buses moving in same direction relative to the man will be $V - V_m$ and thus the distance between the buses is covered in time t_1 given by

$$(V - V_m) * t_1 = V * T$$

----- (1)

----- (2)

Similarly the distance between any two buses moving in the direction opposite to the man remains constant and equal to velocity of each bus*time = V*T

Velocity of the buses moving in the opposite direction relative to the man will be $V + V_m$ and thus the distance between the buses is covered in time t_2 given by

$$(V+V_m)*t_2=V*T$$

Equating the two equations we get

$$\frac{(V+V_m)}{(V-V_m)} = \frac{t_1}{t_2}$$

Substituting the values we get

$$\frac{V+20}{V-20} = \frac{18}{6}$$

Gives V = 40 km/hr

And from equation (1) we get

$$(40 - 20)^*(18/60) = 40^*T$$

Gives T = 9/60 hr = 9 min