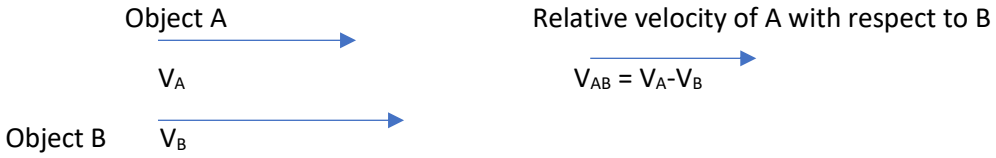
Relative velocity –

The relative velocity of one object with respect to another is the velocity with which one object moves with respect to another object .When two objects A and B are moving with different velocities , then the velocity of one object A with respect to another object B is called relative velocity of object A with respect to object B , hence ***relative velocity is defined as the time rate of change of relative position of one object with respect to another.***

Expression for the relative velocities – Suppose two objects A and B moving with uniform velocities V_A and V_B respectively along parallel straight line path in the

(i) Same direction (I.e. angle between them is 0^0) then ,

Relative velocity of A with respect to B = $V_{AB} = V_A - V_B$.



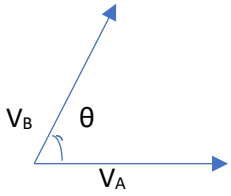
(ii) Opposite direction (I.e. angle between them is 180^0) then,

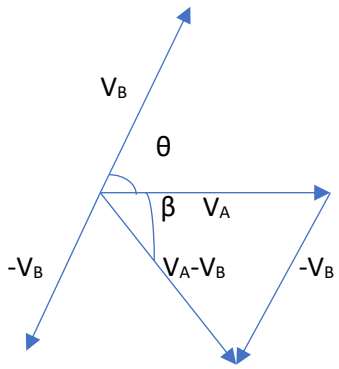
Relative velocity of A with respect to B = $V_A + V_B$.

Relative velocity of A with respect to B = $V_A – (-V_B) = V_A + V_B$

Relative velocity objects A and B when angle between them is θ – If angle between their velocities are θ then relative velocity between them can be find with the help of substraction of vectors .

Let angle between V_A and V_B is θ (as shown in figure)





Here substraction of vectors (relative velocity) = $V_{AB} = (V_A^2+V_B^2 - 2V_AV_B \cos\theta)^{1/2}$.

And direction of the relative velocity will be given as

$$\text{Tan}\beta = V_B\sin\theta /V_A- V_B \cos\theta .$$