KEY
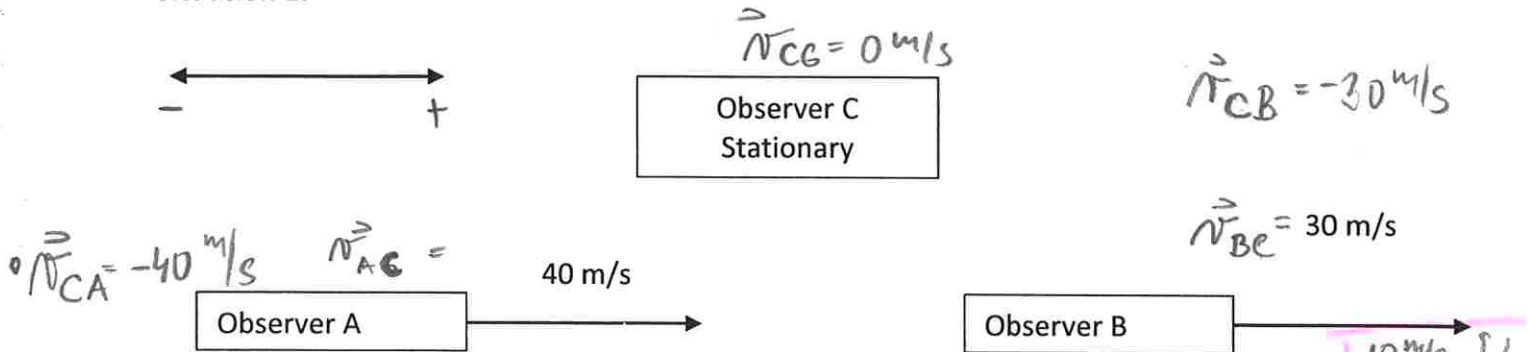
Relative Velocity – Practice

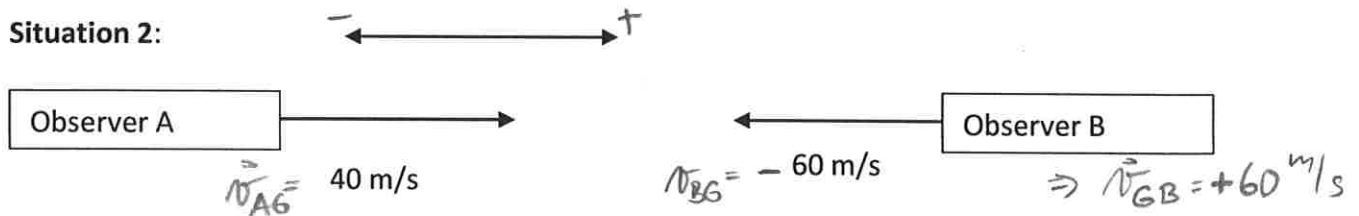Determine what the relative velocities are in the following situations:

Situation 1:
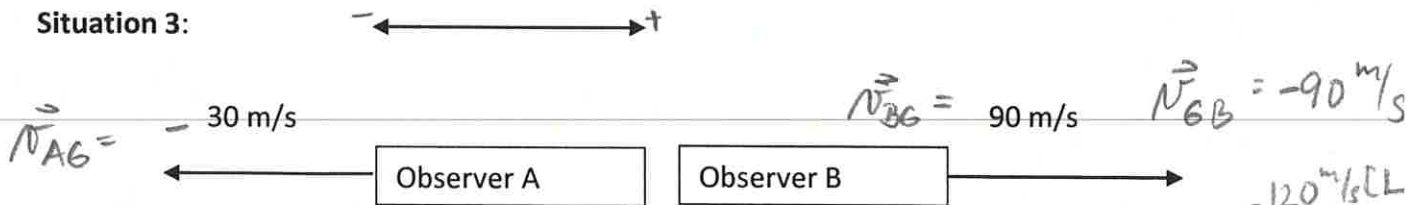
$\vec{N}_{CC} = 0\ m/s$

$\vec{N}_{CB} = -30\ m/s$

Observer C
Stationary

$\vec{N}_{BC} = 30\ m/s$

$\vec{N}_{CA} = -40\ m/s$ $\quad \vec{N}_{AC} = 40\ m/s$

Observer A		Observer B

$= 10\ m/s\ [L$

1. What is the velocity of B relative to A? $\underline{\vec{N}_{BA} = \vec{N}_{BC} + \vec{N}_{CA} = 30 + (-40) = -10\ m/s}$

2. What is the velocity of A relative to B? $\underline{\vec{N}_{AB} = \vec{N}_{AC} + \vec{N}_{CB} = 40 + (-30) = 10\ m/s}$

3. What is the velocity of B relative to C? $\underline{\vec{N}_{BC} = 30\ m/s\ [R]}$

Situation 2:

$\longleftarrow \quad \longrightarrow +$

Observer A			Observer B

$\vec{N}_{AG} = 40\ m/s \qquad \vec{N}_{BG} = -60\ m/s \qquad \Rightarrow \vec{N}_{GB} = +60\ m/s$

4. What is the velocity of A relative to B? $\underline{\vec{N}_{AB} = \vec{N}_{AG} + \vec{N}_{GB} = 40 + (60) = 100\ m/s\ [R}$

5. What is the velocity of B relative to A? $\underline{\vec{N}_{BA} = -\vec{N}_{AB} = -100\ m/s = 100\ m/s\ [L]}$

Situation 3:

$\longleftarrow \quad \longrightarrow +$

$\vec{N}_{AG} = -30\ m/s \qquad\qquad \vec{N}_{BG} = 90\ m/s \qquad \vec{N}_{GB} = -90\ m/s$

Observer A	Observer B

$= 120\ m/s\ [L$

6. What is the velocity of A relative to B? $\underline{\vec{N}_{AB} = \vec{N}_{AG} + \vec{N}_{GB} = -30 + (-90) = -120\ m}$

7. What is the velocity of B relative to A? $\underline{\vec{N}_{BA} = \vec{N}_{BG} + \vec{N}_{GA} = 90 + 30 = 120\ m/s}$

$\vec{N}_{GA} = -(-30)$
$= 30\ m/s\ [R]$