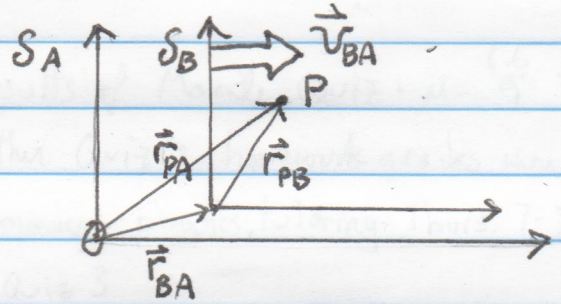
Relative Motion

- Define Frames of Reference "A" and "B"
  (We usually relate to the "A" F.O.R. as the "rest" frame while "B" is moving)



$$\vec{r}_{PA} = \vec{r}_{PB} + \vec{r}_{BA} \quad (1)$$

Note that: $\vec{r}_{BA} = \underbrace{\vec{r}_{BA,0}}_{\text{at } t=0} + \vec{v}_{BA}\, t \quad (2)$

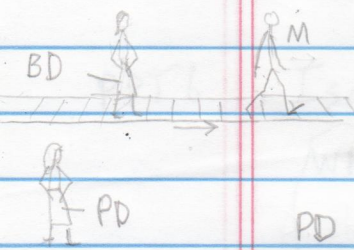
Subst (2) in (1): $\vec{r}_{PA} = \vec{r}_{PB} + \vec{r}_{BA,0} + \vec{v}_{BA}\, t$

Take derivative: $\vec{v}_{PA} = \vec{v}_{PB} + 0 + \vec{v}_{BA}$

"Galilean Transformation"

$$\vec{v}_{PA} = \vec{v}_{PB} + \vec{v}_{BA}$$

Ex) [PPT5] Blue dress lady sees man walking at $v_{M,BD} = 2\ ^m/_s$. She wants to tell pink dress lady how fast she will see him in her coord. system, which sees B.D. moving at $v_{BD,PD} = 3\ ^m/_s$.



F.O.R. PD → A

F.O.R BD → B

PD lady sees: $v_{M,PD} = v_{M,BD} + v_{BD,PD}$

$= 2 + 3 = 5\ ^m/_s$