Relative Velocity in 1D

$v_{A/G}$ = 2 m/s

A

$v_{B/G}$ = 3 m/s

B

$V_{O/G}$ means the speed of the object to the ground

From the perspective of A, how fast and in what direction is B moving?

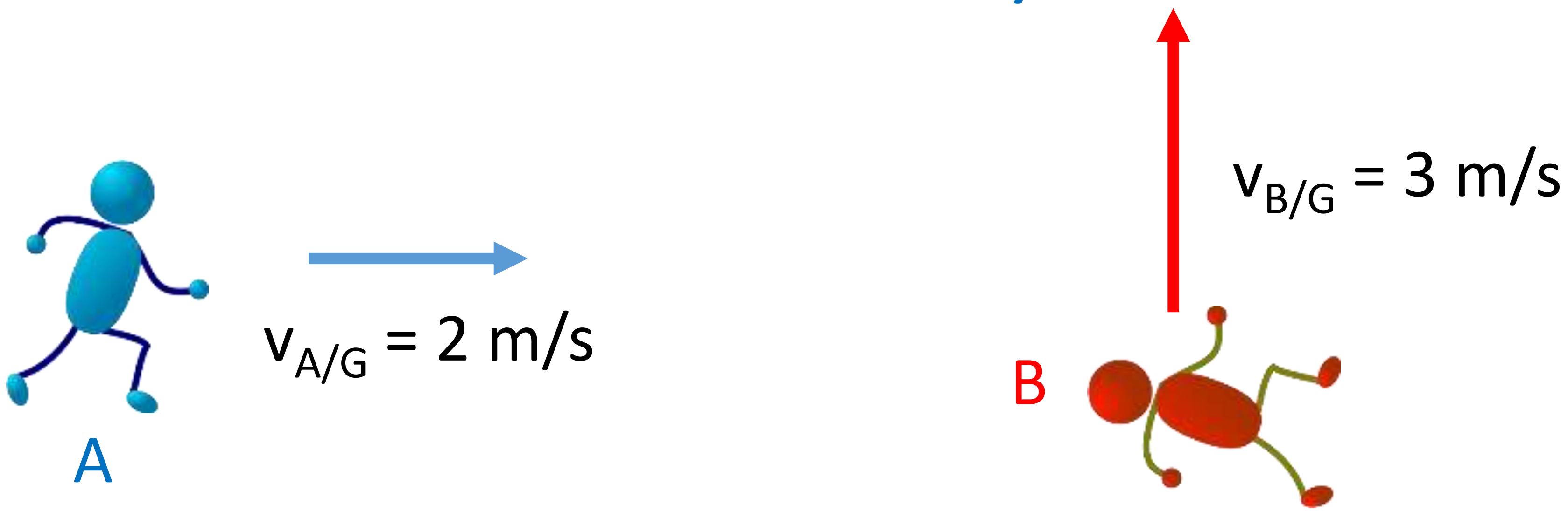
$$\vec{v}_{B/A} = +1\ m/s$$

From the perspective of B, how fast and in what direction is A moving?

$$\vec{v}_{A/B} = -1\ m/s$$

Note $\vec{v}_{B/A} = -\vec{v}_{A/B}$

Relative Velocity in 2D



$V_{O/G}$ means the speed of the object to the ground

From the perspective of A, how fast and in what direction is B moving?

$$\vec{v}_{B/A} = \{-2\hat{\boldsymbol{\imath}} + 3\hat{\boldsymbol{\jmath}}\}\, m/s$$

From the perspective of B, how fast and in what direction is A moving?

$$\vec{v}_{A/B} = \{+2\hat{\boldsymbol{\imath}} - 3\hat{\boldsymbol{\jmath}}\}\, m/s$$

Note $\vec{v}_{B/A} = -\vec{v}_{A/B}$

$$\vec{v}_{A/B} = \vec{v}_{A/G} - \vec{v}_{B/G}$$

- Velocity of A relative to B.
- How fast B says A moves.

- Relationship hold for position and acceleration as well.

$$\vec{r}_{A/B} = \vec{r}_{A/G} - \vec{r}_{B/G}$$

$$\vec{a}_{A/B} = \vec{a}_{A/G} - \vec{a}_{B/G}$$