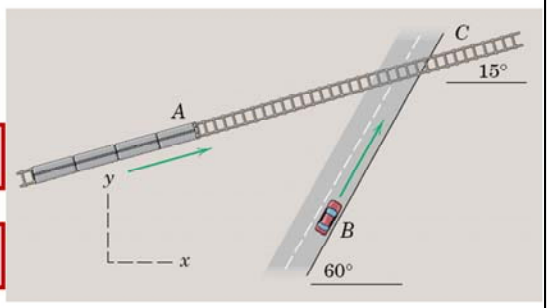
Vector Representation: Exercise

$$\mathbf{r}_A = \mathbf{r}_B + \mathbf{r}_{A/B}$$

$$\mathbf{v}_A = \dot{\mathbf{r}}_A = \dot{\mathbf{r}}_B + \dot{\mathbf{r}}_{A/B}$$

$$\mathbf{a}_A = \dot{\mathbf{v}}_A = \ddot{\mathbf{r}}_A = \ddot{\mathbf{r}}_B + \ddot{\mathbf{r}}_{A/B}$$



Train ***A*** travels with constant ***speed*** v_A= 120 km/h. Anticipating the need to stop, car ***B*** decreases its ***speed*** of 90 km/h at the rate of 3 m/s^2.

Determine the ***velocity*** and ***acceleration*** of the train relative to the car.

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$\underline{v}_{A/B} = \underline{v}_A - \underline{v}_B$

$= 120[\cos 15°\,\underline{i} + \sin 15°\,\underline{j}] - 90[\cos 60°\,\underline{i} + \sin 60°\,\underline{j}]$

$= \underline{70.9\,\underline{i} - 46.9\,\underline{j}} \ \text{km/h}$

$\underline{a}_{A/B} = \underline{a}_A - \underline{a}_B = \underline{0} - 3(-\cos 60°\,\underline{i} - \sin 60°\,\underline{j})$

$= \underline{1.5\,\underline{i} + 2.60\,\underline{j}} \ \text{m/s}^2$