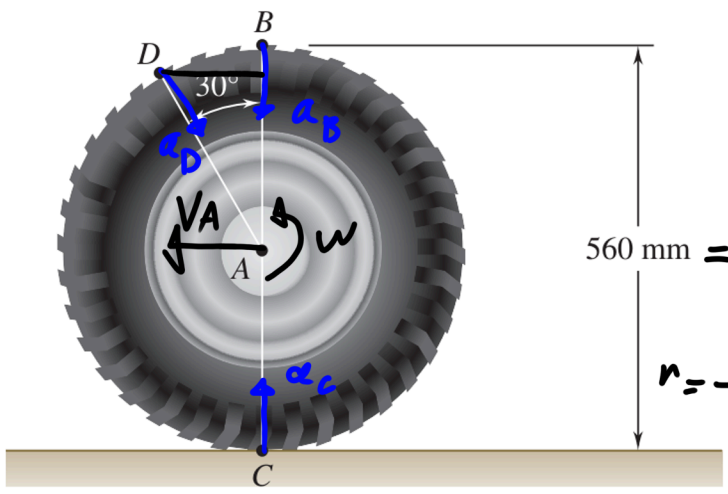
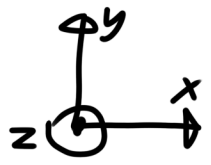
An automobile travels to the left at a constant speed of 90 km/h. Knowing that the diameter of the wheel is 650 mm, determine the acceleration of (*a*) point *B*, (*b*) point *C*, (*c*) point *D*.





$r = \frac{d}{2} = \frac{0.56\ m}{2}$

$= 0.325\ m$

$V_A = 90\ km/h \left(\frac{1000\ m}{1\ km}\right)\left(\frac{1\ h}{60\ min}\right)\left(\frac{1\ min}{60\ s}\right) = 25\ m/s$

$\vec{V}_A = -25\,i\ m/s \qquad \vec{a}_A = \vec{0}$

$\omega = \frac{25\ m/s}{\pi\, 0.56\ m / rev} = 12.2\ \frac{rev}{s}\ \frac{2\pi\ rad}{1\ rev} = 77\ rad/s$

$\vec{\alpha} = \vec{0}$

$\vec{r}_{B/A} = 0.325\,j\ m$

$\vec{a}_B = \vec{a}_A + \vec{\alpha} \times \vec{r}_{B/A} - \omega^2 \vec{r}_{B/A} = -\omega^2 \vec{r}_{B/A} = -77^2\, 0.325\,j$

$= -1927\,j\ m/s^2$

$\vec{r}_{C/A} = -0.325\,j\ m$

$\vec{a}_C = \vec{a}_A + \vec{\alpha} \times \vec{r}_{C/A} - \omega^2 \vec{r}_{C/A} = -\omega^2 \vec{r}_{C/A}$

$= -77^2(-0.325\,j)$

$= 1927\,j\ m/s^2$

$\vec{r}_{D/A} = -0.325 \sin 30\, i + 0.325 \cos 30\, j$

$= -0.1625\,i + 0.28\,j$

$\vec{a}_D = -\omega^2 \vec{r}_{D/A} = -77^2(-0.1625\,i + 0.28\,j)$

$= 963\,i - 1661\,j\ m/s^2$

$\vec{r}_{D/B} = -0.16\,i - 0.045\,j\ m$

$\vec{a}_D = \vec{a}_B + \vec{\alpha} \times \vec{r}_{D/B} - \omega^2 \vec{r}_{D/B}$

$= -1927\,j - 77^2(-0.16\,i - 0.045\,j)$

$= -1927\,j + 963\,i + 266\,j$

$= 963\,i - 1660\,j\ m/s$ ✓