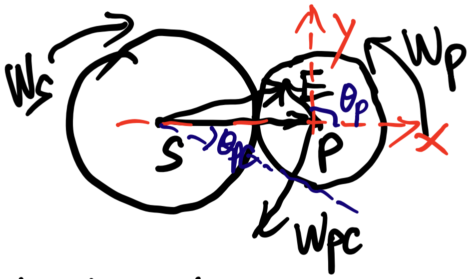


$\vec{R} = \vec{SP}$ $\quad \vec{r_{SE}} = \vec{R} + \vec{PE}$

$\vec{V_E^p} = \vec{W_p} \times \vec{r_{pE}}$ $\quad \vec{V_E^s} = \vec{V_E^p} + \vec{W_{pc}} \times \vec{R}$

set anti-clockwise positive

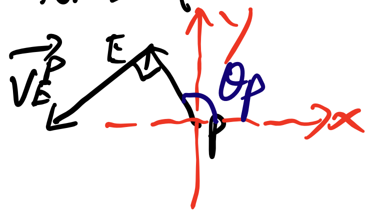
$\vec{\theta_p} = \vec{W_p} \cdot t$ $\quad \vec{\theta_{pc}} = \vec{W_{pc}} \cdot t$

already calculated:

$\frac{r_s}{r_{pc}} = \frac{15}{4}$ $\quad \frac{r_c}{r_p} = \frac{7}{4}$

$\frac{r_{pc}}{r_p} = \frac{7}{15}$

For E refered to the planet gear



Angle of $\vec{V_E^p}$: $\theta_p' = \theta_p + \frac{\pi}{2}$

so $V_{Ex}^p = |\vec{V_E^p}| \cos(\theta_p')$

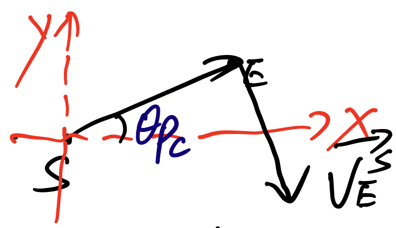
$= |\vec{V_E^p}| \cos(\theta_p + \frac{\pi}{2})$

$V_{Ey}^p = |\vec{V_E^p}| \sin(\theta_p + \frac{\pi}{2})$

For E refered to the sun gear

Angle of $\vec{V_E^s}$:

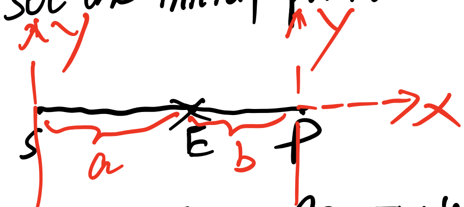
$\theta_{pc}' = \theta_{pc} - \frac{\pi}{2}$



same as above: $V_{Ex}^s = |\vec{V_E^s}| \cos(\theta_{pc} - \frac{\pi}{2})$

$V_{Ey}^s = |\vec{V_E^s}| \sin(\theta_{pc} - \frac{\pi}{2})$

set the initial point.



$\theta_{p_0} = \pi \rightarrow \theta_p = \pi + w_p t$

$\theta_{pc_0} = 0 \rightarrow \theta_{pc} = -\frac{\pi}{2} - w_{pc} \cdot t$

And: $\vec{V_E^s} = \vec{V_E^p} + \vec{w_{pc}} \times \vec{R}$

$V_{Ex}^s = V_{Ex}^p + (\vec{W_{pc}} \times \vec{R})_x$

$V_{Ey}^s = V_{Ey}^p + (\vec{W_{pc}} \times \vec{R})_y$

$V_E = \sqrt{V_{Ex}^2 + V_{Ey}^2}$

$$\boxed{\begin{aligned} V^S_{Ex} &= |\vec{W_p} \times \vec{r_{PE}}| \cos(\theta_p + \tfrac{\pi}{2}) + |\vec{W_{pc}} \times \vec{R}| \cos(\theta_{pc} - \tfrac{\pi}{2}) \\ V^S_{Ey} &= |\vec{W_p} \times \vec{r_{PE}}| \sin(\theta_p + \tfrac{\pi}{2}) + |\vec{W_{pc}} \times \vec{R}| \sin(\theta_{pc} - \tfrac{\pi}{2}) \end{aligned}}$$

in our case: $|\vec{W_p} \times \vec{r_{PE}}| = w_p \cdot r_{PE} = 2\pi n_p \cdot \underbrace{r_{PE}}_{b}$

$|\vec{w_{pc}} \times \vec{R}| = w_{pc} \cdot R = 2\pi n_{pc} \cdot R$

$R = r_{PE} + r_{SE} = b + a$

if consider from the initial point:

$\theta_p = \pi + w_p \cdot t \qquad \theta_{pc} = -\frac{\pi}{2} - w_{pc} \cdot t$

$\frac{w_p}{w_{pc}} = \frac{n_p}{n_{pc}} = \frac{15}{7}$

in Python: θ_p (pi : 3pi : 0.05) rotate one round

θ_{pc} (0 : 2pi*7/15 : 0.05*7/15)

if $a = 64.5mm$ $b = 48mm$ $W_p = 15.2381 RPS$

$|\vec{V^S_E}|_{max} = 9622.2525 mm/s$

if $a = 54.5mm$ $b = 58mm$ $W_p = 15.2381 RPS$

$|\vec{V^S_E}|_{max} = 10,579.6906 mm/s$

TC: A: 10,807.08 mm/s