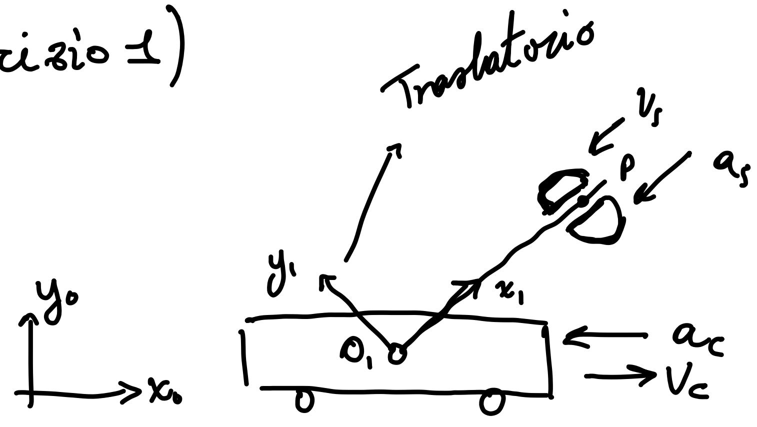
Oratorio 2

Esercizio 1)

O_1, y_1, x_1 traslatorio

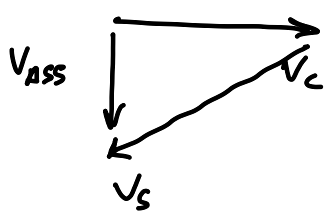


$$(P-O_0) = (P-O_1) + (O_1-O_0) = (O_1-O_0) + x_1\hat{\imath}_1 + y_1\hat{\jmath}_1$$

$$\vec{V}_P = V_c + \dot{x}_1\hat{\imath}_1 + \cancelto{0}{\dot{y}_1}\hat{\jmath}_1 + (x_1 \cancelto{0}{\vec{\omega}} \times \hat{\imath}_1 + y_1 \cancelto{0}{\vec{\omega}} \times \hat{\jmath}_1$$

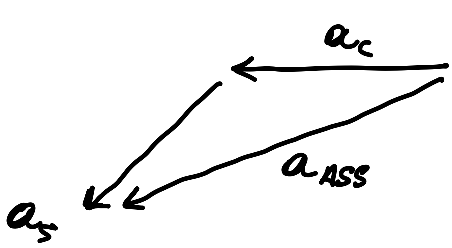
$$= V_c\,\hat{\imath}_0 - V_s\,\hat{\imath}_1$$

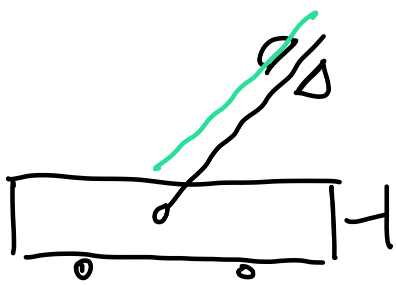
$$\vec{a}_P = \vec{a}_c + \ddot{x}\hat{\imath}_1 + \cancelto{0}{\ddot{y}_1\hat{\jmath}}$$



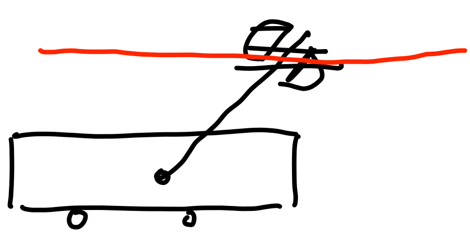
$$= \vec{a}_c + \vec{a}_s$$

$$= a_c\hat{\imath}_0 - a_s\hat{\imath}_1$$





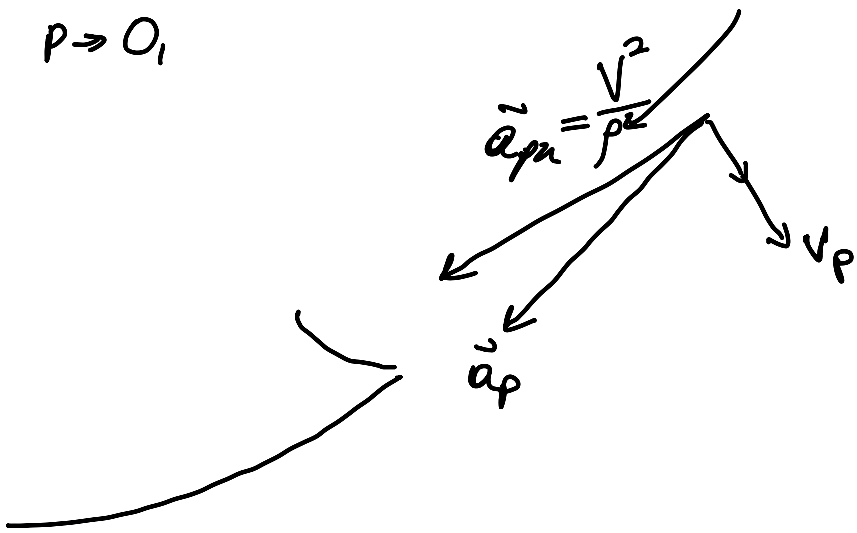
Ψ^{TRA}



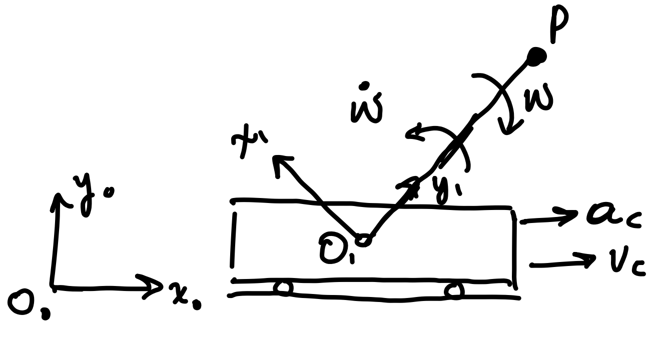
V_P	V_{TRA}	V_{REL}
?	V_c	V_s
?	$//x_0$	$//PO_1$
		$P \to O_1$

$$K = \frac{\alpha''(t-\Delta t) - \alpha''(t)}{\Delta t}$$

a_P	a_{TRA}	a_{REL}
?	a_c	a_s
?	$-t_0$	$//PO_1$
		$P \to O_1$



Esercizio 2



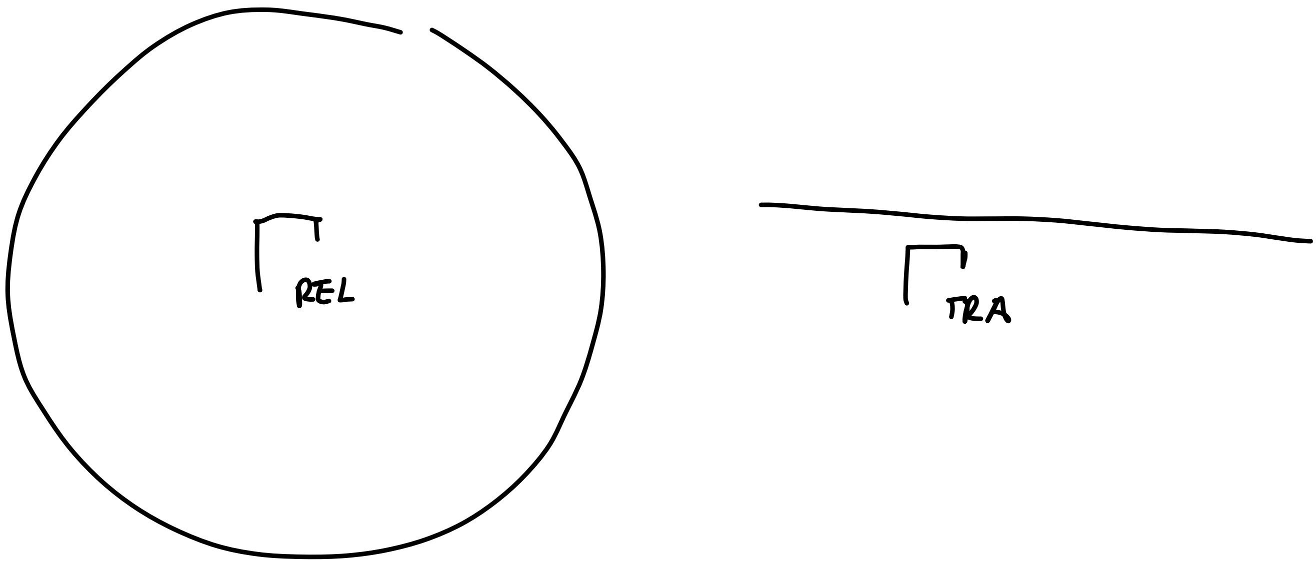
$$(P-O_0) = (O_1-O_0) + (P-O_1) = (O_1-O_0) + x_1\hat{i}_1 + y_1\hat{j}_1$$

$$\vec{v}_P = \underbrace{\vec{v}_c}_{V_{TRA}} + \vec{\omega}\times(x_1\hat{i}_1 + y_1\hat{j}_1) + \cancel{\dot{x}_1\hat{i}_1 + \dot{y}_1\hat{j}_1}$$

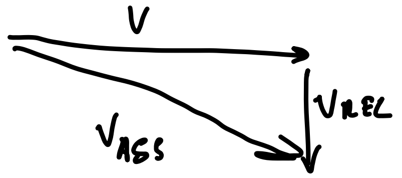
$$= \vec{a}_c + \vec{\omega}\times(\vec{\omega}\times(x_1\hat{i}_1 + y_1\hat{j})) + \vec{\omega}\times(\cancel{\dot{x}_1\hat{i}_1} + \dot{y}_1\hat{j}_1) +$$
$$\cancel{\ddot{x}\hat{i}_1 + \ddot{y}_1\hat{j}_1} + \vec{\omega}\times\cancel{(\dot{x}_1\hat{i}_1 + \dot{y}_1\hat{i}_1)} + \dot{\vec{\omega}}\times(P-O_1)$$

$$= \vec{a}_c + \vec{\omega}\times(\vec{\omega}\times(P-O_1))$$

$$\vec{a}_P = \vec{a}_c - \vec{\omega}^2\times(P-O_1) + \dot{\vec{\omega}}\times(P-O_1)$$

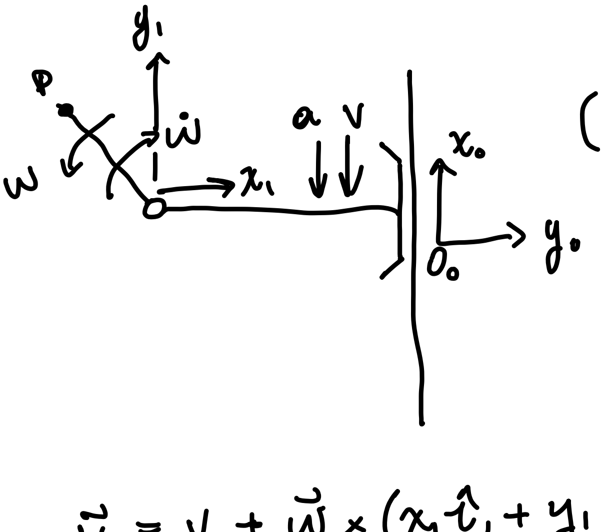


V_P	V_{TRA}	$V_{REL,\tau}$	$V_{REL,n}$
?	V_c	$\vec{\omega}\times(P-O_1)$	X
?	ORIZZ	$\perp PO_1$	X



a_p	$a_{TRA,T}$	$a_{REL,T}$	$a_{REL,N}$
?	a_c	$\vec{\omega} \times (P-O_1)$	$\omega^2 \times (P-O_1)$
?	ORIZZ	$\perp O_1P$	$// PO_1$ $P \to O_1$

Esercizio 3



$$(P-O_0) = (O_1-O_0) + (P-O_1)$$

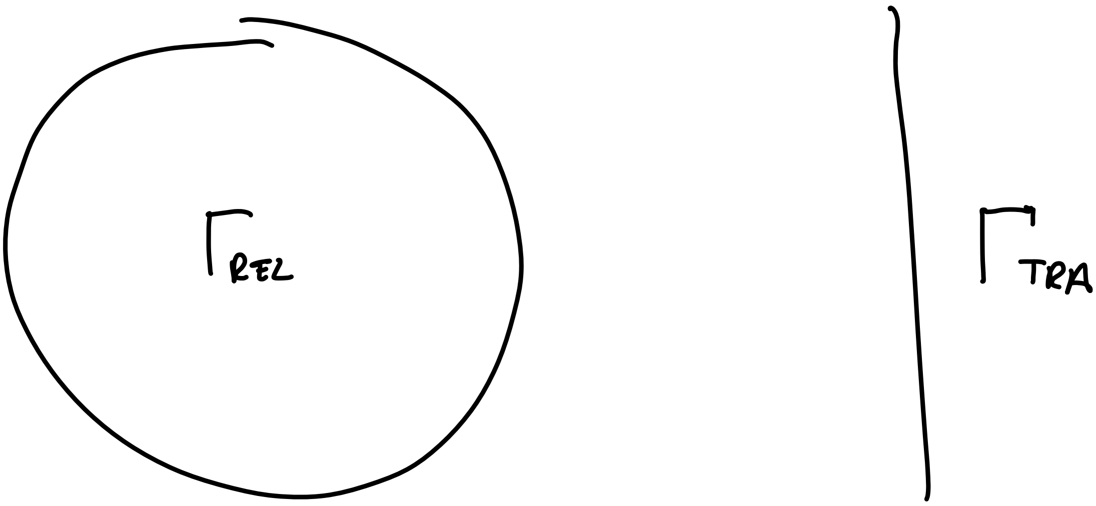
$$= (O_1-O_0) + x_1\hat{i}_1 + y_1\hat{j}_1$$

$$\vec{v}_p = v + \vec{\omega} \times (x_1\hat{i}_1 + y_1\hat{j}_1) + \cancel{\dot{x}\hat{i} + \dot{y}_1}\hat{j}_1$$

$$\vec{a}_p = a + \dot{\vec{\omega}} \times (P-O_1) + \vec{\omega} \times (\cancel{\dot{x}\hat{i}_1} + \dot{y}\hat{j}_1) + \vec{\omega} \times (\vec{\omega} \times (x_1\hat{i}_1 + y_1\hat{j}_1))$$

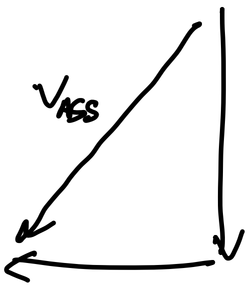
$$+ \cancel{\ddot{x}\hat{i}} + \ddot{y}\hat{j}_1 + \quad \vec{\omega} \times (\cancel{\dot{x}\hat{i}} + \dot{y}_1\hat{j}_1)$$

$$\vec{a}_p = a + \dot{\vec{\omega}} \times (P - O_1) - \vec{\omega}^2 \times (P - O_1)$$

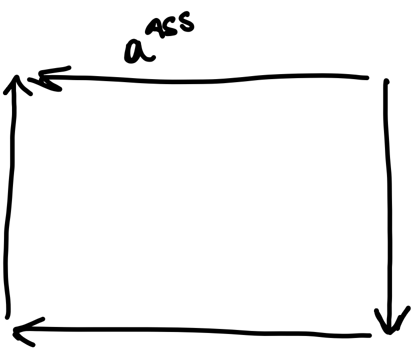


$$V_p^{ASS} = V_p^{TRA} + V_p^{REL,T}$$

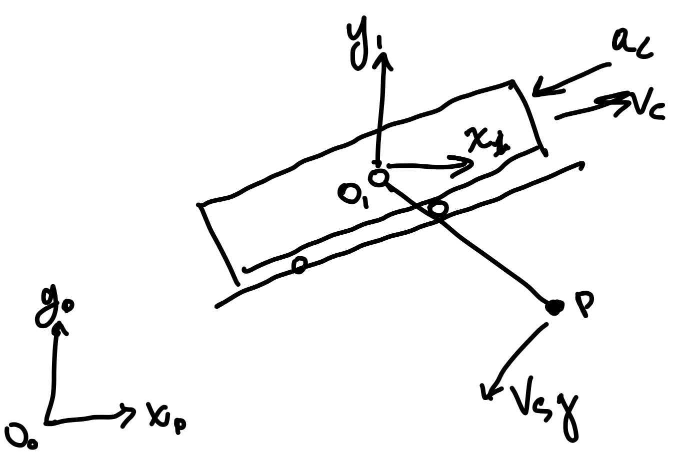
M	?	v	$\dot{\vec{\omega}} \times (PO_1)$
D	?	$/\!/ BC$	$\perp OP$



a_p	$a_{TRA,T}$	$a_{TRA,n}$	$a_{REL,T}$	$a_{REL,n}$	a_{co}
?	a	X	$\dot{\vec{\omega}} \times (P - O_1)$	$\omega^2 \times (P - O_1)$	X
?	$/\!/$	X	$\perp PO_1$	$/\!/ PO_1$	X



Esercizio 4



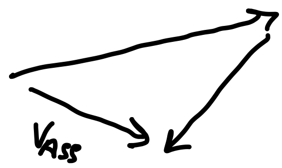
$$\vec{\omega} = \frac{V_{S\gamma}}{R}$$

$$(P - O_0) = (O_1 - O_0) + (P - O_1) = (O_1 - O_0) + x_1 \hat{i}_1 + y_1 \hat{j}_1$$

$$\vec{v}_P = V_c + \vec{\omega} \times (x_1 \hat{i}_1 + y_1 \hat{j}_1) + \cancel{\dot{x}_1 \hat{i}_1 + \dot{y}_1 \hat{j}_1}$$

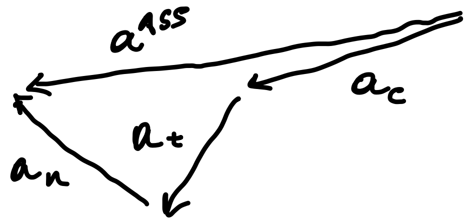
$$\vec{a}_P = a_c + \vec{\omega} \times (\vec{\omega} \times (x_1 \hat{i}_1 + y_1 \hat{j}_1)) + \vec{\omega} \times (\cancel{\dot{x}_1 \hat{i}_1 + \dot{y}_1 \hat{j}_1}) + \dot{\vec{\omega}} \times (x_1 \hat{i}_1 + y_1 \hat{j}_1)$$
$$+ \cancel{\ddot{x}_1 \hat{i}_1 + \ddot{y}_1 \hat{j}_1} + \vec{\omega} \times (\cancel{\dot{x}_1 \hat{i}_1 + \dot{y}_1 \hat{j}_1})$$

V_P	V_{TRA}	V_{REL}
?	V_c	$\vec{\omega} \times (P - O_1)$
?	$// \sigma$	$\perp PO_1$



a_P	$a_{TRA,T}$	$a_{TRA,n}$	$a_{REL,T}$	$a_{REL,n}$	a_{co}
?	a_c	X	$\dot{\vec{\omega}} \times (P - O_1)$	$\omega^2 \times (P - O_1)$	X
?	$// \sigma$	X	$\perp PO_1$	$// PO_1$	X

$P \to O_1$



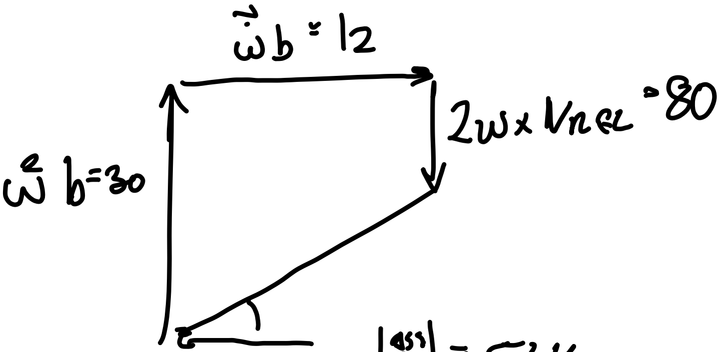
<u>Esercizio 5</u>

$$(P-O) = x_1 \hat{i}_0 + y_1 \hat{j}_0$$

$\vec{v}_p =$

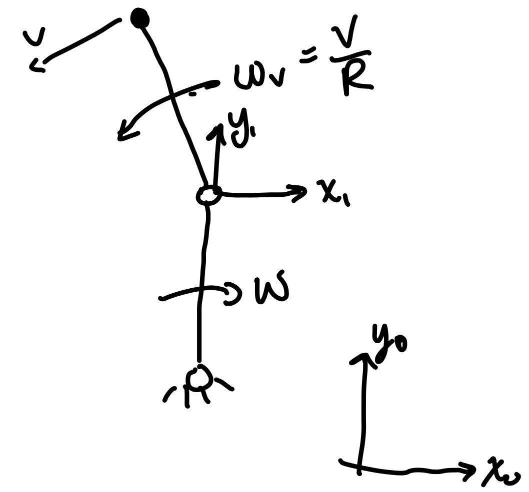
V_p	V_{TRA}	V_{REL}
?	ωb	v
?	$\perp OP$	$\parallel \hat{i}_1$

$\vec{a}_p =$	$a_{TRA,T}$	$a_{TRA,n}$	$a_{REL,T}$	$a_{REL,n}$	a_{CO}
?	$\dot{\vec{\omega}} \times (PO)$	$\omega^2 \times (PO)$	X	X	$2 \omega V_{REL}$
?	$\perp PO$	$/\!/ PO$	X	X	$/\!/ PO$
		$P \to O$			$O \to P$



$|\vec{a}^{ass}| = 57{,}4$ $\qquad \theta = 0{,}24$ rad

6)



$$(P-O) = (C-O) + (P-C)$$

$$= x_0 \hat{i}_0 + y_0 \hat{j}_0 + x_1 \hat{i}_1 + y_1 \hat{j}_1$$

$$\vec{V}_p = \vec{\omega} \times (x_0 \hat{i} + y_0 \hat{j}_0) + \dot{x}_0 \cancel{\hat{i}_0 + \dot{y}_0} \hat{j}_0 + \vec{\omega} \times (x_1 \hat{i}_1 + y_1 \hat{j}_1) + \dot{x}_1 \cancel{\hat{i}_1 + \dot{y}_1} \hat{j}_1$$

$$\vec{a}_p = \dot{\vec{\omega}} \times (x_0 \hat{i}_0 + y_0 \hat{j}_0) + \vec{\omega} \times (\vec{\omega} \times (x_0 \hat{i}_0 + y_0 \hat{j}_0) + \vec{\omega} \times (\dot{x}_0 \hat{i}_0 + \dot{y}_0 y_0)$$

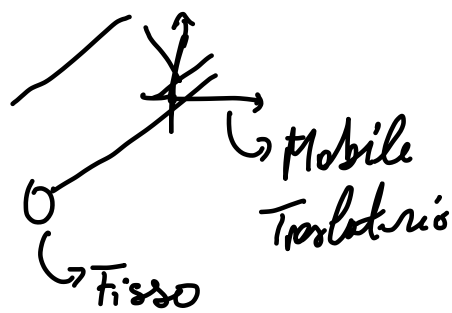
$$+\dot{\vec{\omega}}_p (x_i \hat{i}_i + y_i \hat{j}_i) + \vec{\omega}_p \times (\vec{\omega}_p \times (x_0 \hat{i}_i + y_0 \hat{j}_i) + \vec{\omega}_p \times (\dot{x}_p \hat{i}_1 + \dot{y}_q \hat{j}_q)$$

	$\vec{V}_p =$	$\vec{V}_{TRA}$	V_{REL}
M	?	$\vec{\omega} R \cdot 2$	V
D	?	-ORIZZ	ORIZZ

	$\vec{a}_p$	$a_p^{TRA,T}$	$a_p^{TRA,N}$	$a_p^{REL,T}$	$a_p^{REL,N}$	a_p^{CO}
M	?	X	$\omega^2 R \cdot 2$	X	$\omega_p^2 R$	$2\omega V_{REL}$
D	?	X	$P \to O$	X	$P \to C$	$O \to P$

7)

	V_p	V_{REL}	V_{TRA}
M	?	V	ωb
D	?	$\perp BC$	$//BC$



a_p	$a^{TRA,T}$	$a^{TRA,N}$	$a^{REL,T}$	$a^{REL,N}$	a^{CO}
?	X	$\omega^2 b$	X	X	$2\omega V$
?	X	$P \to O$	X	X	$O \to P$

8)

	V_p	V_{TRA}	V_{REL}
M	?	$2\omega(R+r)$	V_s
D	?	$-\perp PC$	$\perp PC$

	a_p	$a^{TRA,T}$	$a^{TRA,N}$	$a^{REL,T}$	$a^{REL,N}$	a^{CO}
M	?	X	$\omega^2 \times (R+r)$	X	$\frac{v^2}{r}$	$2\omega V_s$
D	?	X	$P \to O$	X	$P \to C$	$C \to P$

$\vec{a} = 50 \frac{m}{s^2}$ $P \to O$