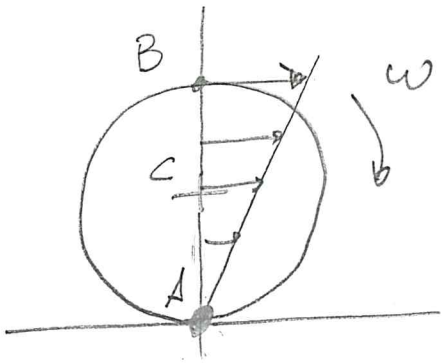
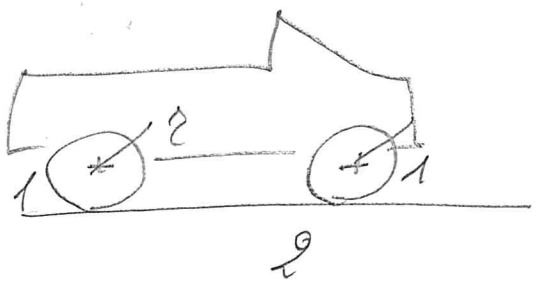
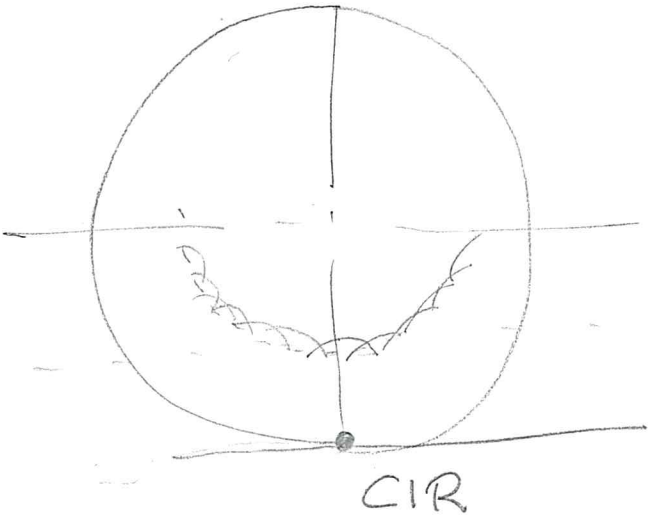
28.09.2016



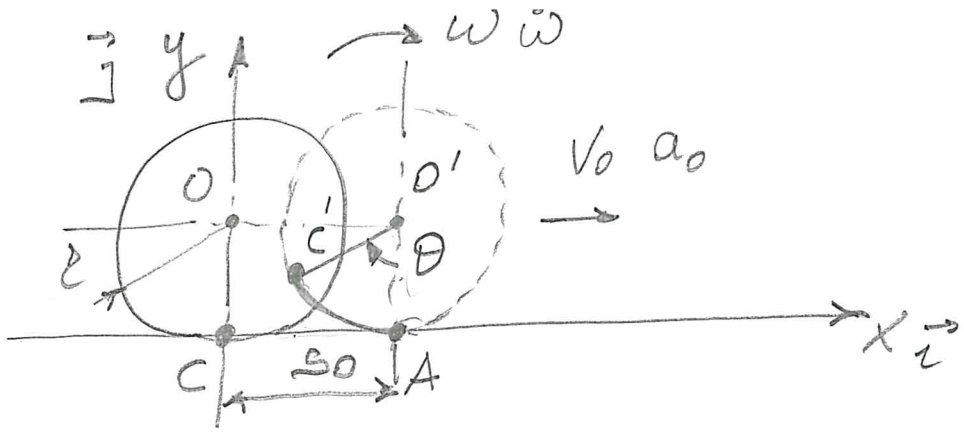
$V_B = \omega 2r$



2



CIR



$$\vec{s_0} = r\vartheta\vec{i}$$

$$\vec{V_0} = \frac{d\vec{s_0}}{dt} = r\dot{\vartheta}\vec{i} = r\omega\vec{i}$$

$$\vec{a_0} = \frac{d\vec{V_0}}{dt} = r\ddot{\vartheta}\vec{i} = r\dot{\omega}\vec{i}$$

$$\begin{cases} x_{C'} = s_0 - r\sin\vartheta = r(\vartheta - \sin\vartheta) \\ y_{C'} = r - r\cos\vartheta = r(1-\cos\vartheta) \end{cases}$$

$$\begin{cases} \dot{x}_{C'} = r(\dot{\vartheta} - \dot{\vartheta}\cos\vartheta) = r\dot{\vartheta}(1-\cos\vartheta) \\ \dot{y}_{C'} = r\dot{\vartheta}\sin\vartheta \end{cases}$$

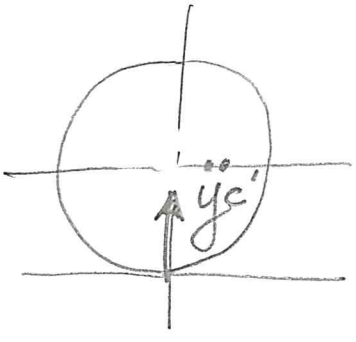
$$\begin{cases} \ddot{x}_{C'} = r\ddot{\vartheta}(1-\cos\vartheta) + r\dot{\vartheta}^2\sin\vartheta \\ \ddot{y}_{C'} = r(\ddot{\vartheta}\sin\vartheta + \dot{\vartheta}^2\cos\vartheta) \end{cases}$$

$C \equiv C' \quad \vartheta = 0$

$$x_{C'} = 0 \qquad y_{C'} = 0$$

$$\dot{x}_{C'} = 0 \qquad \dot{y}_{C'} = 0$$

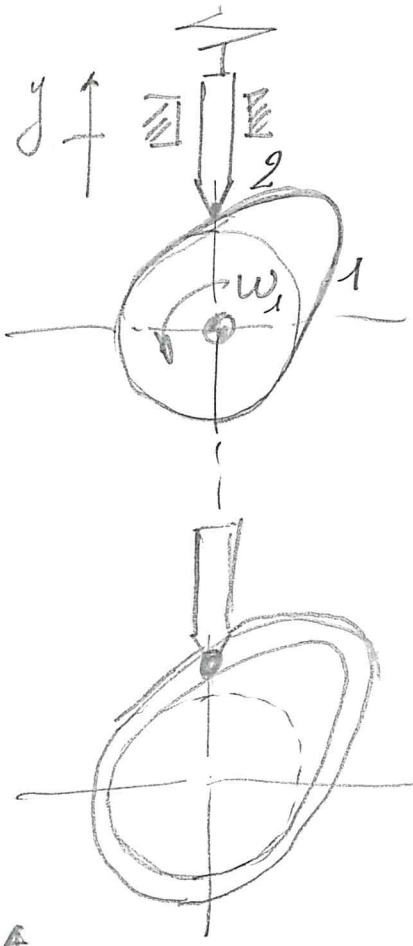
$$\ddot{x}_{C'} = 0 \qquad \ddot{y}_{C'} = r\dot{\vartheta}^2$$



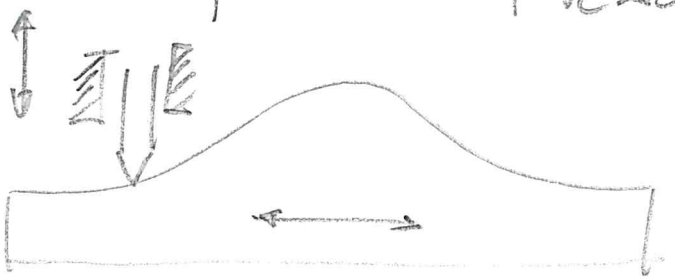
ROTATORIO - TRASLATORIO

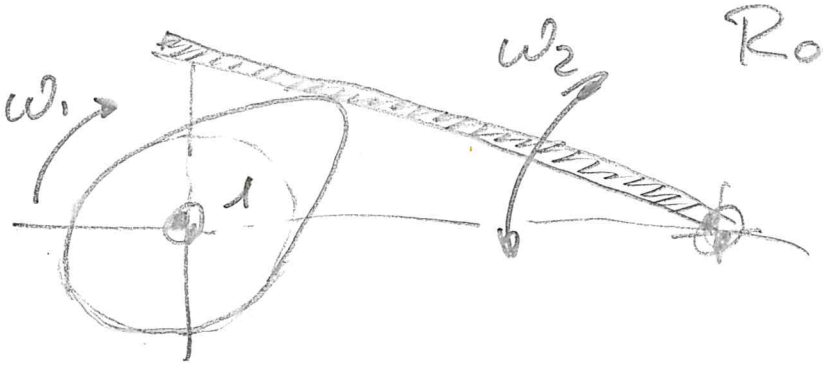
1 CAMMA MOVENTE

2 PUNTERIA CEDENTE



TRASLATORIO - TRASLATORIO

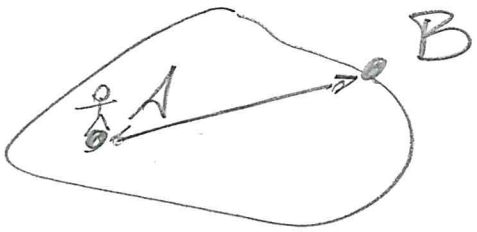




ROTATORIO — ROTATORIO

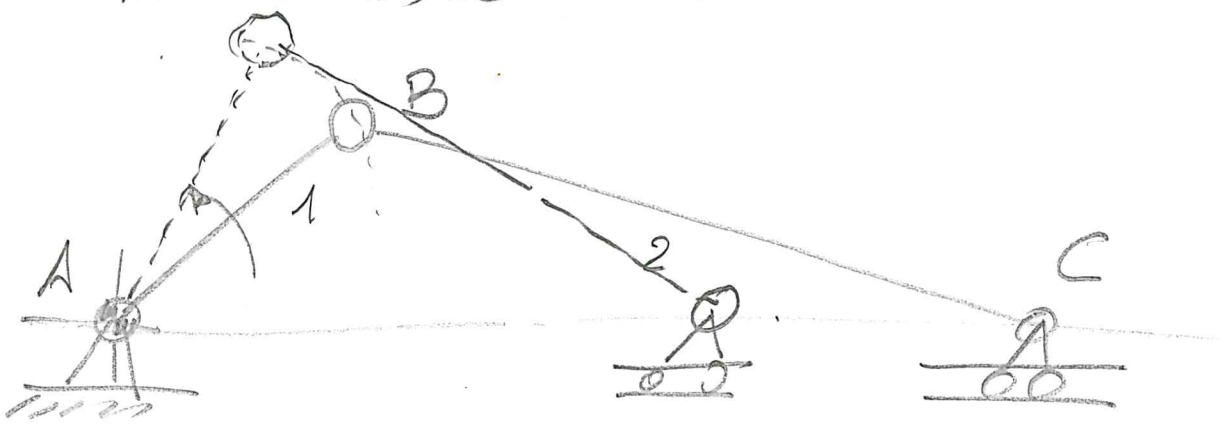
$$* \quad \vec{V}_B = \vec{V}_A + \vec{V}_{B/A} \qquad \text{GALILEO}$$

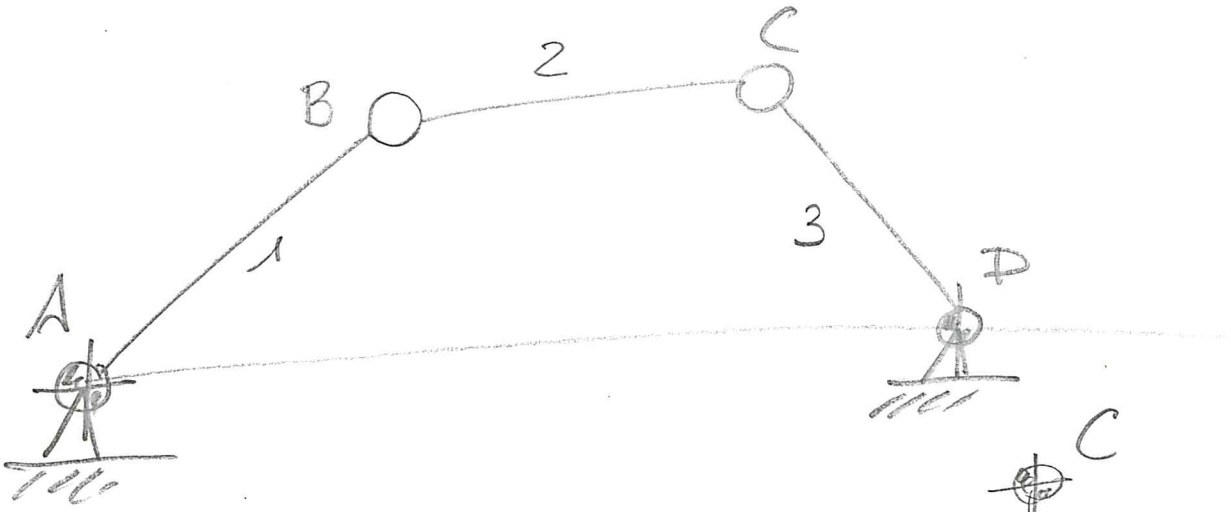
$$\vec{V}_{B/A} = \vec{\omega} \wedge \vec{AB}$$

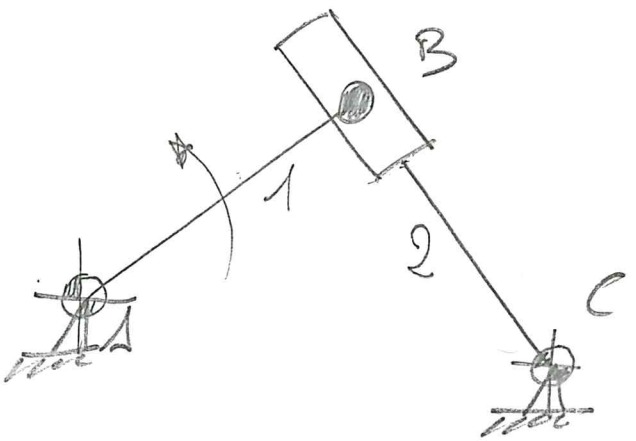


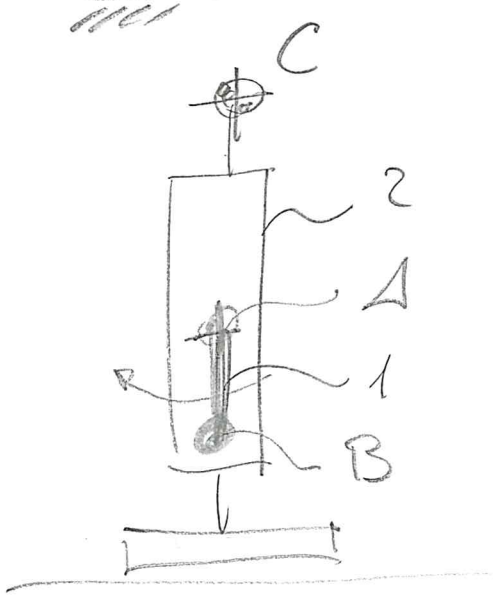
$$* \quad \vec{a}_B = \vec{a}_A + \vec{a}_{B/A} \qquad \text{RIVALS}$$

$$\vec{a}_{B/A} = \vec{a}_{B/A)_n} + \vec{a}_{B/A)_t}$$

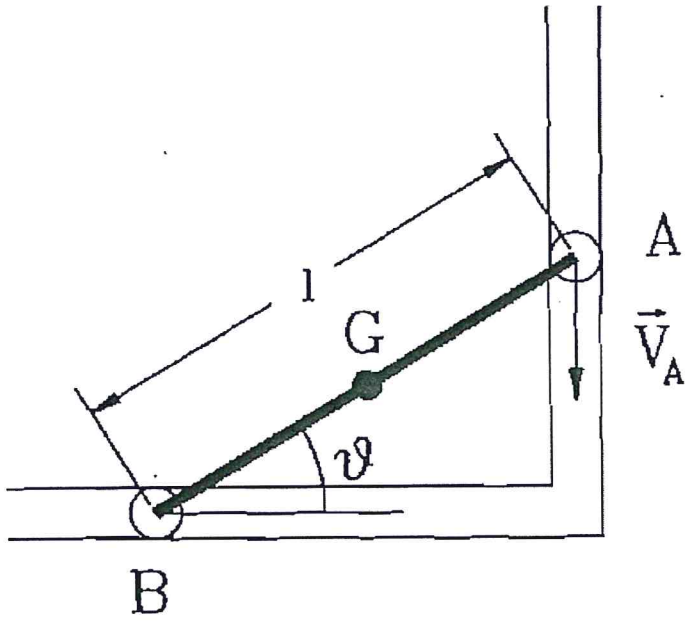








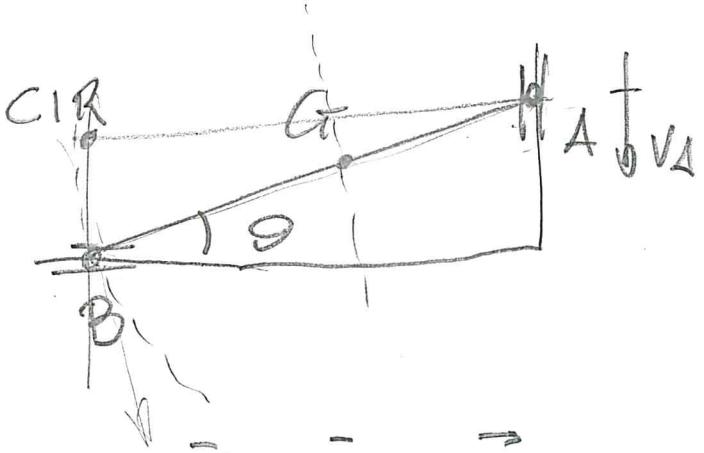
La barretta rigida AB, di lunghezza l=200 *mm*, ha le estremità che scorrono in due guide ortogonali. L'estremità A ha una velocità costante verso il basso di 2 *m/s*. Determinare, nell'istante in cui ϑ =30°, la velocità angolare della barretta, la velocità del punto medio G (V_G) e la sua accelerazione a_G.



$AB = l = 0{,}2\ m$

$V_A = 2\ m/s$

$\vartheta = 30°$



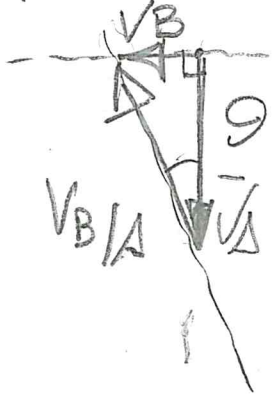
ω V_G a_G

$\vec{V}_B = \vec{V}_A + \vec{V}_{B/A}$

?	2 m/s	ωAB	⊥
// x	// y	⊥ AB	D
?	↓	?	V

$\vec{V}_G = \vec{V}_A + \vec{V}_{G/A}$

?	2 m/s	ωAG ?	⊥
?	// y	⊥ AG	D
?	↓	?	V



$$V_{B/A} = \frac{V_A}{\cos\vartheta}$$

$$\omega = \frac{V_{B/A}}{l}\ (-\vec{k})$$

$$\omega = 11{,}5\ \frac{rad}{s}$$

$$V_{G/A} = \omega AG = 1{,}15\ m/s$$

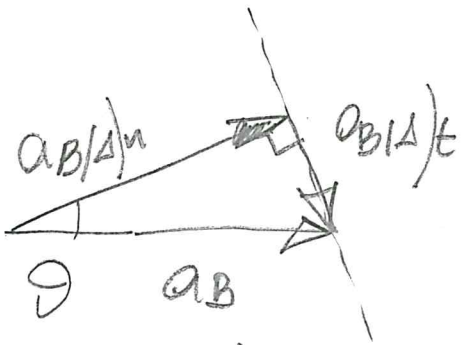
$$V_G = \sqrt{V_A^2 + V_{G/A}^2 - 2 V_A V_{G/A} \cos\vartheta} = 1{,}157\ m/s$$

$\vec{a}_B = \vec{a}_A + \vec{a}_{B/A)n} + \vec{a}_{B/A)t}$

?	0	$\omega^2 l$ $26{,}45\ m/s^2$	$\dot{\omega} l$?	M
//x	A	//AB	⊥AB	D
?	A	B→A	?	V

$\vec{a}_G = \vec{a}_A + \vec{a}_{G/A)n} + \vec{a}_{G/A)t}$

				M
				D
				V

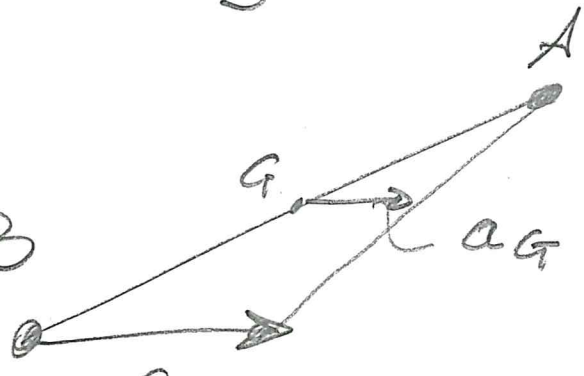


$$a_B = \frac{a_{B/A)n}}{\cos\vartheta} = 30{,}6\ m/s^2$$

$$a_{B/A)t} = a_{B/A)n} \operatorname{tg}\vartheta = 15{,}27\ \frac{m}{s^2}$$

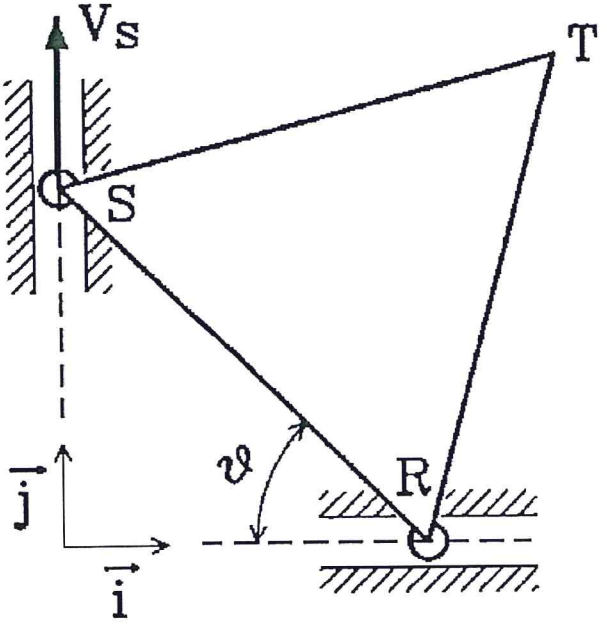
$$\dot{\omega} = \frac{a_{B/A)t}}{l} = 152{,}7\ \frac{rad}{s^2}\ (+\bar{k})$$

$$\frac{a_G}{AG} = \frac{a_B}{AB}$$



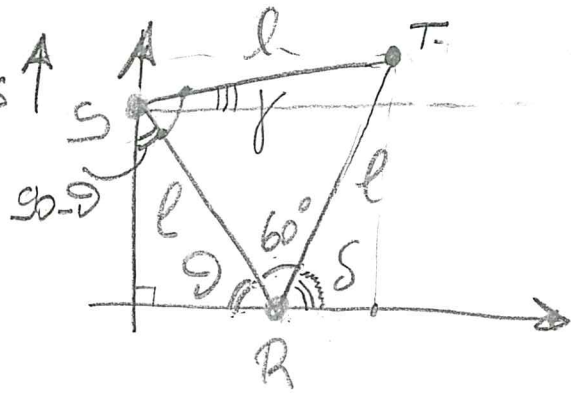
$$a_G = \frac{a_B}{2} = 15{,}3\ m/s^2$$

Il corpo rigido RST ha la forma di un triangolo equilatero, di lato $l=0,5\ m$. I vertici R e S sono vincolati a scorrere lungo due guide prismatiche ortogonali.
E' assegnata al vertice S una velocità costante pari a $0,8\ m/s$ nel verso indicato in figura.
Calcolare per quale valore di ϑ la velocità di T ha componente verticale nulla. Con ϑ pari al valore calcolato, determinare la velocità del punto T e l'accelerazione del punto R.



$V_S = 0{,}8$ m/s cost

$l = 0{,}5$ m



a) $V_{yT} = 0$

$\gamma = [(90-\vartheta)+60] - 90° = 60° - \vartheta$

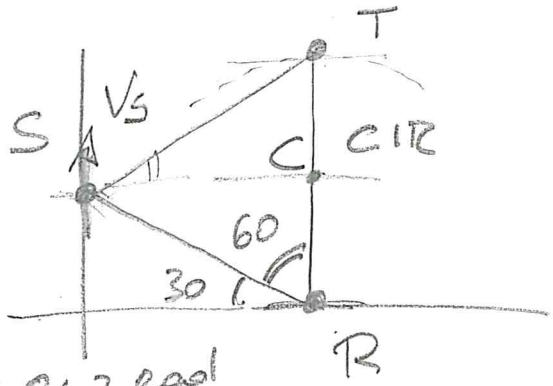
$\delta = 180 - 60 - \vartheta = 120 - \vartheta$

$$\begin{cases} x_T = l\cos\gamma = l\cos(60-\vartheta) \\ y_T = l\sin\delta = l\sin(120-\vartheta) \end{cases}$$

$$\begin{cases} \dot{x}_T = -l\sin(60-\vartheta)(-\dot{\vartheta}) = l\dot{\vartheta}\sin(60-\vartheta) \\ \dot{y}_T = l\cos(120-\vartheta)(-\dot{\vartheta}) = -l\dot{\vartheta}\cos(120-\vartheta) \end{cases}$$

$\dot{y}_T = 0 \quad \dot{\vartheta} = 0$

$\cos(120-\vartheta) = 0 \quad 120-\vartheta = 90 \quad \vartheta = 30°$



$x_C = l\cos 30° = 0{,}216$ m

$y_C = l\sin 30° = 0{,}250$ m

$CS = l\sin 60° = 0{,}433$ m

$V_S = \omega\, CS; \quad \omega = \dot{\vartheta} = \frac{V_S}{CS} = 1{,}847 \frac{\text{rad}}{\text{s}}$

$\dot{x}_T\big|_{\vartheta=30°} = l\dot{\vartheta}\sin 30° = 0{,}462$ m/s

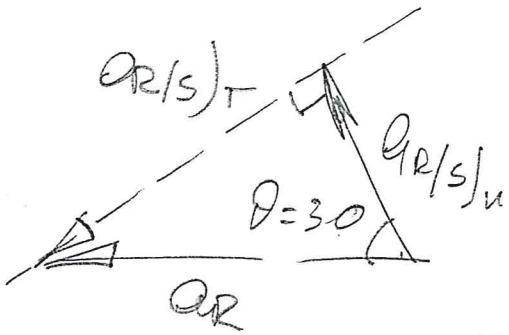
$\dot{y}_T\big|_{\vartheta=30°} = 0$

$$a_T = a_S + a_{T/S_n} + a_{T/S_t}$$

M	?	0	$\dot{\vartheta}^2 l_{1,706}$	$\ddot{\vartheta} l$!
D	?	A	// TS	⊥ TS
V	?	A	T → S	?

$$a_R = a_S + a_{R/S)_n} + a_{R/S)_T}$$

M	!	0	$\dot{\vartheta}^2 l_{1,706}$	$\ddot{\vartheta} l$?
D	// X	A	// RS	⊥ RS
V	?	A	R → S	?



$$a_{R/S)_T} = a_{R/S)_n} \operatorname{tg} \vartheta = 0{,}98 \text{ m/s}^2$$

$$\ddot{\vartheta} = \frac{a_{R/S)_T}}{l} = 1{,}97 \text{ rad/s}^2$$

DA $x_T = \ldots$
$x_T = \ldots$

$$\begin{cases} \ddot{x}_T = l\ddot{\vartheta}\sin(60-\vartheta) - l\dot{\vartheta}^2\cos(60-\vartheta) \\ \ddot{y}_T = -l\ddot{\vartheta}\cos(120-\vartheta) + l\dot{\vartheta}^2\sin(120-\vartheta) \end{cases}$$

SI HA con $\ddot{\vartheta} = 1{,}97 \text{ rad/s}^2$

$$\ddot{x}_T = -0{,}98 \text{ m/s}^2$$

$$\ddot{y}_T = -1{,}706 \text{ m/s}^2$$