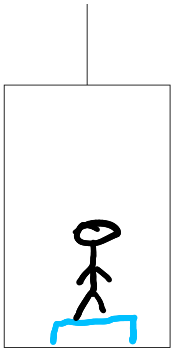


$m = 75\,kg \quad g = 9{,}8\,m/s^2$

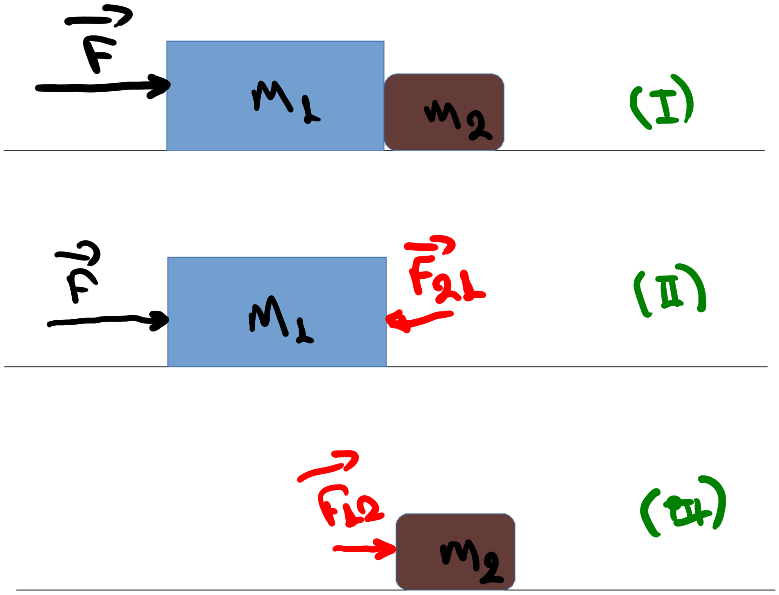
α) $v = \text{σταθερή}$

β) $a = 2\,m/s^2 \downarrow$

γ) $a = 2\,m/s^2 \uparrow$

$W =$ ↑ βάρος

Δυο σώματα με την ίδια $\vec{\alpha}$



(II) $\Sigma\vec{F} = m_1 \cdot \vec{\alpha} \Rightarrow$

$F - F_{21} = m_1 \cdot \alpha$ (1)

(III) $\Sigma\vec{F} = m_2\vec{\alpha}$

$\Rightarrow F_{12} = m_2 \cdot \alpha$ (2)

Δράση - Αντίδραση

$F_{21} = F_{12}$ (3)

(1) (2)(3) $F - m_2\alpha = m_1 \cdot \alpha \Rightarrow$

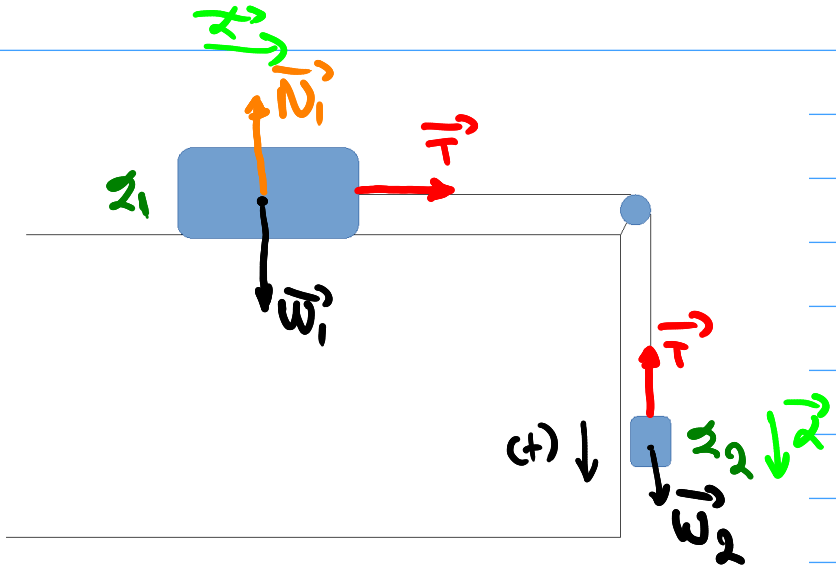
$F = m_1\alpha + m_2 \cdot \alpha \Rightarrow$

$F = (m_1 + m_2)\alpha \Rightarrow$

$$\alpha = \frac{F}{m_1 + m_2}$$

$F = 300N$, $m_1 = 20\,kg$, $m_2 = 50\,kg$

$\alpha = ;$



m_1, m_2, g

χωρίς τριβές

$w_1 = m_1 \cdot g$

$w_2 = m_2 \cdot g$

$x_2: \sum \vec{F} = m_2 \vec{a_2} \Rightarrow w_2 - T = m_2 a_{2y}$ (1)

$x_1: \sum f_y = 0 \Rightarrow N_1 - w_1 = 0$

$\sum f_x = m_1 \cdot a_{1x} \Rightarrow T = m_1 \cdot a_{1x}$ (2)

$a_{1x} = a_{2y} = a$ (3)

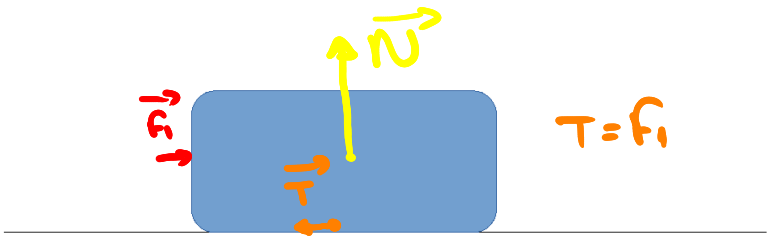
(1) (2) (3) $\rightarrow$ $w_2 - m_1 \cdot a = m_2 \cdot a \Rightarrow$

$m_2 \cdot g = m_2 a + m_1 a \Rightarrow$

$m_2 g = (m_2 + m_1) a \Rightarrow$

$$a = \frac{m_2 g}{m_2 + m_1}$$

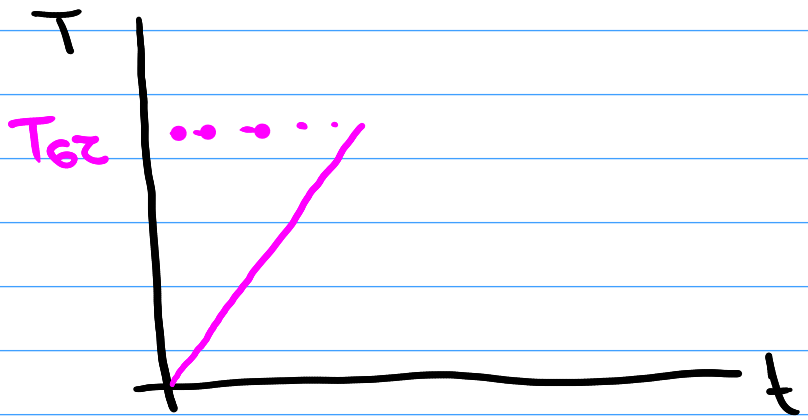
Тривій

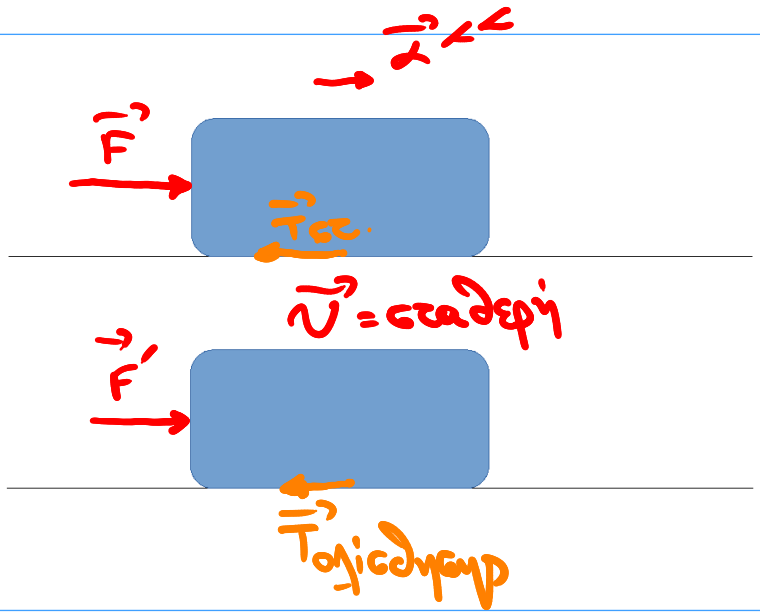


Зчасний Тривій: $T_{сг} \leq T_{сг(max)}$

$\downarrow$

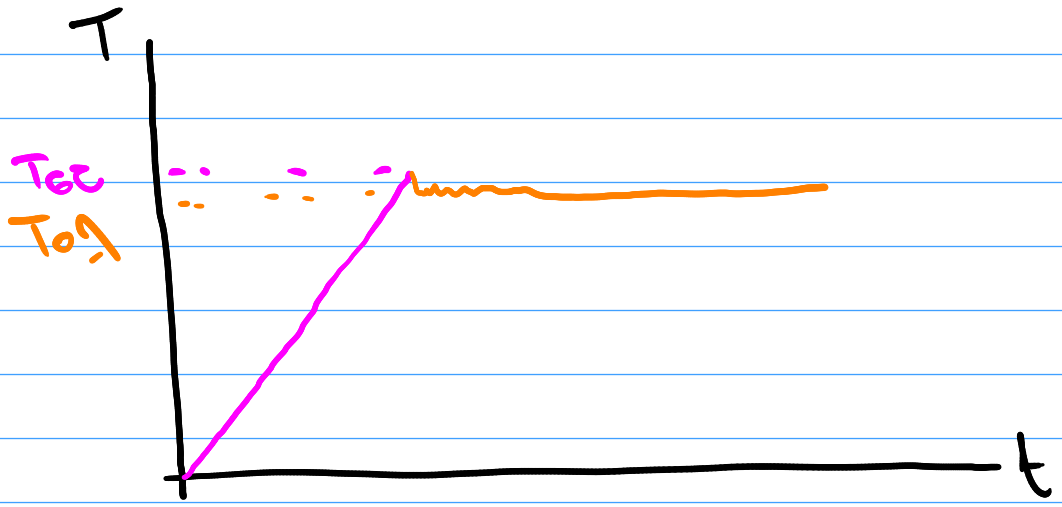
$T_{сг} \leq \mu_{сг} \cdot N$





$F' \ll F$

$T_{ολισθησης} \ll T_{στα$



$T_{στ} \leq \mu_{στ} \cdot N$

$T_{ολ} = \mu_{ολ} N$

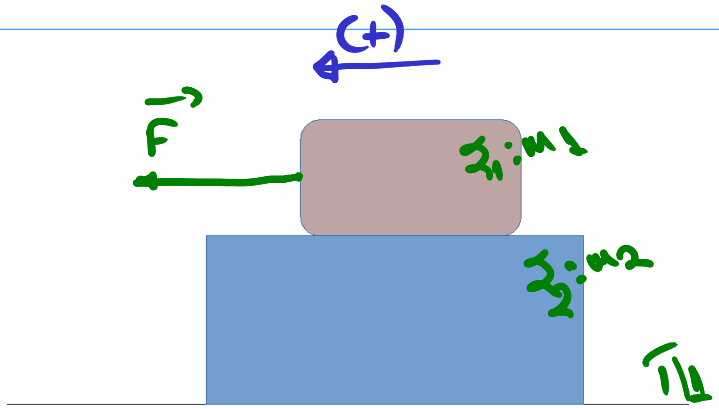
$T_{ολισθησης} = T_{κινητική}$

Παράδειγμα: Οι μηχανικοί ορίζουν τον συντελεστή κύλισης

$$\mu_κ = \frac{T}{N}$$

T: οριζόντια δύναμη για σταθερή ταχύτητα

$T = F$

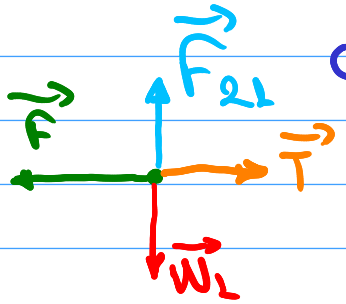


$\mu_{s2} = 0{,}60$
$\mu_{0g} = 0{,}40$
} Σ_1, Σ_2

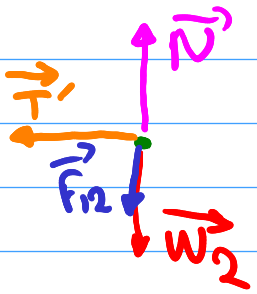
Το Σ_2 κινείται πάνω στο Π_1

$m_2 = 40\ kg$
$m_1 = 10\ kg$
$F = 100N$
$g = 9{,}8\ m/s^2$

Σ_1 : (I)



Σ_2 : (II)



(I) $W_1 = m_1 g$

$\Sigma F_y = 0 \Rightarrow$

$F_{21} - W_1 = 0 \Rightarrow$

$F_{21} = m_1 g$ (1)

$\Sigma F_x = m_1 a_1 \Rightarrow F - T = m_1 a_1$ (2)

(II) $\Sigma F_y = 0 \Rightarrow N - F_{12} - W_2 = 0 \Rightarrow$

$N = F_{12} + W_2$ (3)

$\Sigma F_x = m_2 a_2 \Rightarrow T' = m_2 \cdot a_2$ (4)

Δράση - Αντίδραση: $F_{12} = F_{21}$ (5), $T' = T$ (6)

Υπόθεση $\alpha_1 = \alpha_2 = \alpha$ (Τέλεια)

$F = (m_1 + m_2)\alpha \Rightarrow \alpha = \frac{F}{m_1+m_2} \Rightarrow \alpha = \frac{100N}{(40+10)kg}$

$\alpha = 2\,m/s^2$

(4) $\longrightarrow T' = m_2 \alpha \Rightarrow$

$T' = 40 \cdot 2 = 80N$

Άρα $T = 80N$

$T_{\sigma\tau} = \mu_{\sigma\tau} \cdot F_{\Delta\iota} \Rightarrow T_{\sigma\tau} \overset{(1)}{=} \mu_{\sigma\tau} \cdot m_1 \cdot g \Rightarrow$

$T_{\sigma\tau} = 0,60 \cdot 10 \cdot 9,8 \Rightarrow$

$T_{\sigma\tau} = 58,8N$

Άρα $T_{\text{απαιτείται}} > T_{\sigma\tau}$ επομένως δεν μπορούν $\alpha_1 = \alpha_2$ (δηλαδή πρέπει $\alpha_1 \neq \alpha_2$)

· Αφού $\alpha_1 \neq \alpha_2$ (Τροχαλίας)

$T_{og} = \mu_{og} \cdot F_{21} \Rightarrow T_{og} = 0,40 \cdot m_1 g \Rightarrow$

$T_{og} = 0,40 \cdot 10 \cdot 9,8 \Rightarrow$

$T_{og} = 39,2 N$

(2) $\Rightarrow F - T = m_1 \alpha_1 \Rightarrow \alpha_1 = \frac{F - T}{m_1} \Rightarrow$

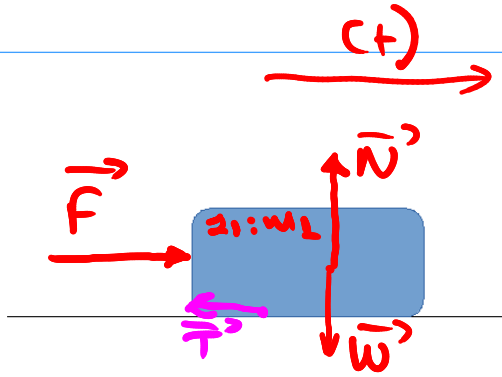
$\alpha_1 = \frac{100 - 39,2}{10} \Rightarrow \alpha_1 = 6,08 \, m/s^2$

(4) $\Rightarrow \alpha_2 = \frac{T}{m_2} \Rightarrow \alpha_2 = \frac{39,2}{40} \Rightarrow$

$\alpha_2 = 0,98 \, m/s^2$

$\vec{\alpha_1} = (6,08 \, m/s^2) \hat{i}$

$\vec{\alpha_2} = (0,98 \, m/s^2) \hat{i}$



$m_1 = 1,5\ kg$ $\quad \vec{F} = (1,8 \cdot t)\,\hat{i}$ $\quad g = 9,8\ m/s^2$

$\vec{a} = 0$ για $0 \le t \le 2,8\ s$ (ακίνητο)

$\vec{a} = (1,2t - 2,4)\,\hat{i}$ $\quad t > 2,8\ s$

(α) $\mu_{cc} = ;$ $\quad$ (β) $\mu_{ολ} = ;$

(α) $F(2,8\ s) = T_{cc(max)} \Rightarrow$

$F(2,8\ s) = \mu_{cc} \cdot N$

$(N = w = m \cdot g = 1,5 \cdot 9,8 \Rightarrow N = 14,7\ N)$

$(1,8 \cdot 2,8)\ N = \mu_{cc} \cdot 14,7\ N$

$\Rightarrow \mu_{cc} = \frac{5,04}{14,7} \Rightarrow$

$\mu_{cc} = 0,343$ (0,34)

(β) $\vec{F} + \vec{T}_{ολ} = m\vec{a} \Rightarrow$

$\Sigma F_x = ma \Rightarrow F - T_{ολ} = ma \Rightarrow$

$a = \frac{F - T_{ολ}}{m} \Rightarrow 1,2 \cdot t - 2,4 = \frac{1,8t - \mu_{ολ} 14,7}{1,5}$

$$1{,}2t - 2{,}4 = \frac{1{,}8}{1{,}5}t - \mu g \cdot \frac{14{,}7}{1{,}5} \Rightarrow$$

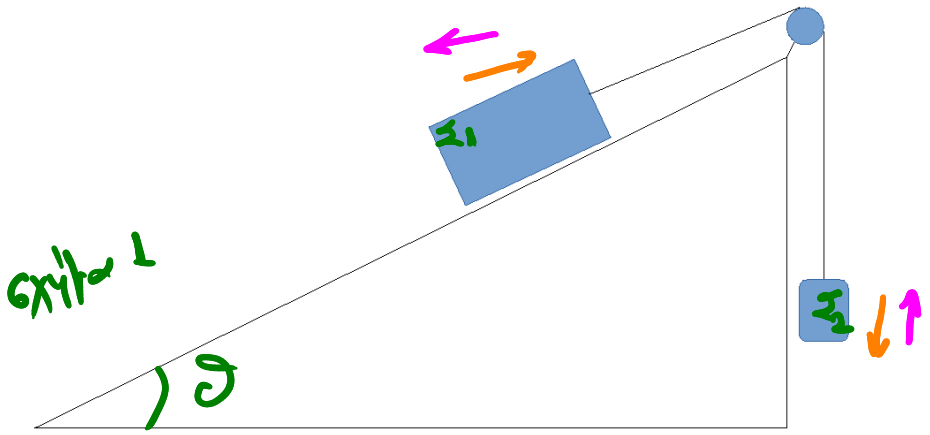
$$1{,}2t - 2{,}4 = 1{,}2t - 9{,}8\,\mu g \Rightarrow$$

$$\mu g = \frac{-2{,}4}{-9{,}8} \Rightarrow \mu g = 0{,}245 \approx 0{,}25$$

1) Ένα 1000 kg κινείται 90 km/h όταν η μηχανή του σταματά. Το έργο της δύναμης τριβής $\vec{T}$ ανάμεσα στο ελαστικό και το νερό είναι $T = -50 \cdot \upsilon$ (όπου υ σε SI)
Να βρεθεί ο χρόνος για να γίνει $\upsilon = 45$ km/h.

2) Κουτί πάνω σε επίπεδο με ($m = 5$ kg) μ_ολίσθησης = 0,20 κ' μ_στατικής = 0,30.
Πόσο είναι το έργο της $\vec{F}$ όταν εφαρμόζω δύναμη
$F = 0,\ 1,\ 5,\ 10,\ 15,\ 20,$
$25,\ 30$ N ;
Να γίνει και γραφική T ως προς F

3)



Γνωστά
$m_1, m_2, g, \theta, \mu_{cc}$

Ζητούνται
α)
β)

Σχέση $m_1, m_2, g, \theta, \mu_{cc}$

4) Στο σχήμα 1 $m_1 = 10\,kg$, $\mu_{cg} = 0{,}30$, $\theta = 30^\circ$
$g = 9{,}8\,m/s^2$, $m_2 = 10\,kg$
Να βρεθεί η $\vec{a}$