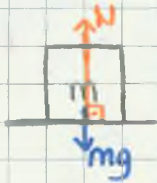


-DİNAMİK-

1- Eylemsizlik

2- Etki - Tepki

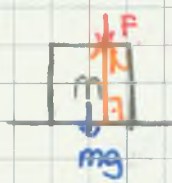
Etki ve tepki her zaman birbirlerine eşit büyüklükte fakat **zıt yönlüdür.**
Tepki kuvveti her zaman yüzeyden dışarı doğar ve diktir.



$$mg = N$$

$$f_s = N \cdot k$$

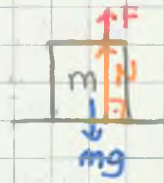
$$= mg \cdot k$$



$$F + mg = N$$

$$f_s = N \cdot k$$

$$= (F + mg) \cdot k$$

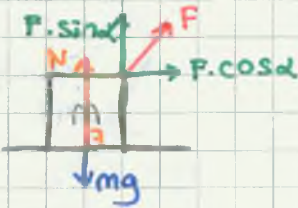


$$N + F = mg$$

$$mg - F = N$$

$$f_s = N \cdot k$$

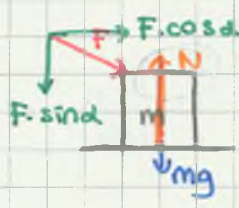
$$= (mg - F) \cdot k$$



$$N + F \sin \alpha = mg$$

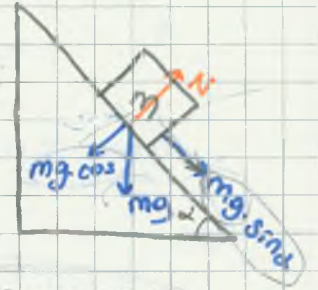
$$N = mg - F \sin \alpha$$

$$f_s = (mg - F \sin \alpha) \cdot k$$



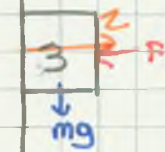
$$mg + F \sin \alpha = N$$

$$f_s = (mg + F \sin \alpha) \cdot k$$



$$N = mg \cdot \cos \alpha$$

$$f_s = mg \cos \alpha \cdot k$$



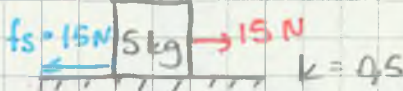
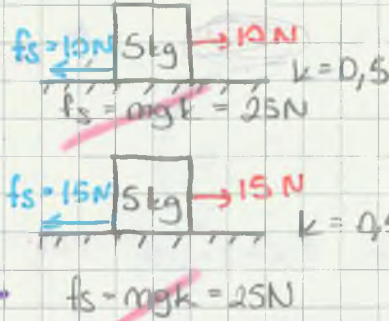
$$N = F \quad f_s = F \cdot k$$

$$f_s = N \cdot k$$

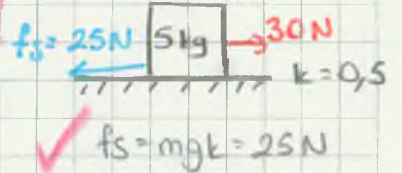
↓
tepki

↓
sürt. kat.

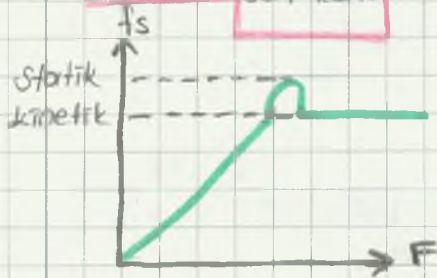
statik
sürtünme
kuvveti



$$f_s = mgk = 25N$$



Kinetik sürtünme
kuvveti

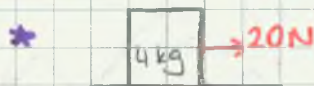


⇒ $K_{s} > K_{k}$

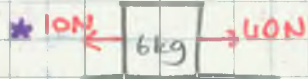
3-Dinamiğin Temel Prensipleri

$$\vec{F}_{net} = m \cdot \vec{a}$$

Hareket yönüne etkili eden kuvvetler — ters yöndeki kuvvetler.



$a = ?$
 $F_{net} = m \cdot a$
 $20 = 4 \cdot a \Rightarrow 5 \text{ m/s}^2$



$a = ?$
 $40 - 10 = m \cdot a$
 $30 = 6 \cdot a \Rightarrow 5 \text{ m/s}^2$



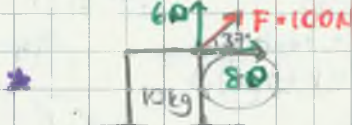
$a = ?$
 $f_s = \mu \cdot N = 5 \cdot 10 \cdot 0.5 = 25 \text{ N}$
 $15 = 5 \cdot a \Rightarrow 3 \text{ m/s}^2$



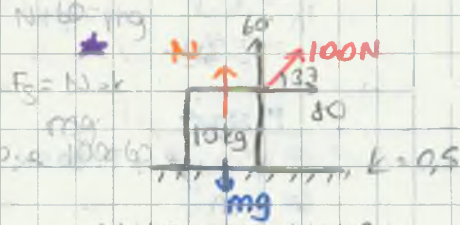
$F_{net} = m \cdot a$
 $F = m \cdot a_1$



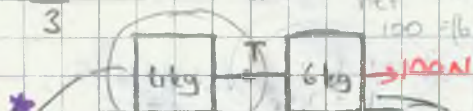
$F_{net} = 3F = 2m \cdot a_2$
 $\frac{a_1}{a_2} = \frac{F}{3F} = \frac{m \cdot a_1}{2m \cdot a_2}$
 $\frac{1}{2} = \frac{a_1}{2a_2} \Rightarrow 3a_1 = 2a_2$



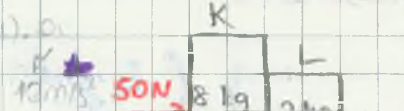
$a = ?$
 $F_{net} = m \cdot a$
 $80 = 10 \cdot a \Rightarrow a = 8 \text{ m/s}^2$



$N + 60 = 100$
 $N = 40$
 $f_s = 10 \cdot 0.5 = 20 \text{ N}$
 $F_{net} = m \cdot a$
 $80 - 20 = 10 \cdot a$
 $60 = 10 \cdot a \Rightarrow a = 6 \text{ m/s}^2$

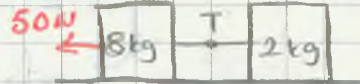


1- $k = 0$ ise;
 $T = m \cdot a$
 $T = 6 \cdot 10 = 60 \text{ N}$
 $100 = (6+6) \cdot a \Rightarrow a = 10 \text{ m/s}^2$



1- K'nin altına uygulanan kuvvet? $T = 10$
 2- 2'nin K'ye uygulanan kuvvet? $T = 10$

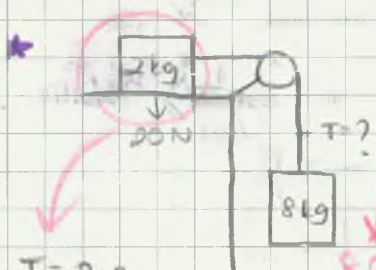
2- $k = 0.5$ ise; $100 - T = 6 \cdot a$



$T = m \cdot a$



$100 - 20 - 20 = (6+4) \cdot a$
 $60 = 10 \cdot a \Rightarrow a = 6 \text{ m/s}^2$
 $T - 20 = 4 \cdot 6 \Rightarrow T = 44 \text{ N}$



$80 = (8+4) \cdot a$
 $80 = 12 \cdot a \Rightarrow a = 6.67 \text{ m/s}^2$
 $80 - T = 8 \cdot a$
 $T = 16 \text{ N}$

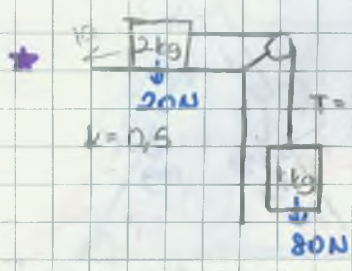
$F_{net} = m \cdot a$
 $80 = 12 \cdot a$

$$80 - T = 8 \cdot a$$

$$f_s = mgk$$

$$20 \cdot 0,5 = 10$$

$$70 = 10 \cdot a \Rightarrow a = 7 \text{ m/s}^2$$

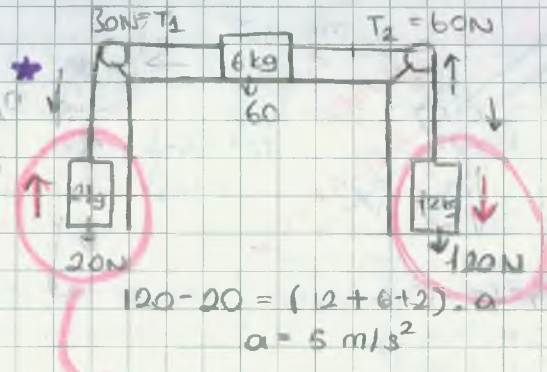


$$80 - 10 = (8 + 2) \cdot a$$

$$a = 7 \text{ m/s}^2$$

$$80 - T = 8 \cdot 7$$

$$T = 24 \text{ N}$$



$$120 - 20 = (2 + 6 + 2) \cdot a$$

$$a = 5 \text{ m/s}^2$$

$$T_1 - 20 = 2 \cdot 5$$

$$T_1 = 30 \text{ N}$$

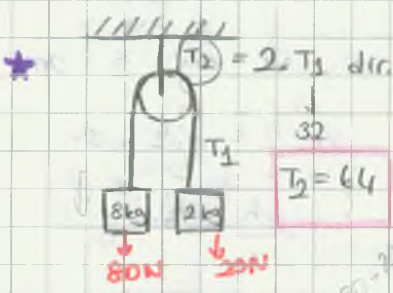
$$120 - T_2 = 12 \cdot 5$$

$$T_2 = 60 \text{ N}$$

$$100 = m \cdot a$$

$$\downarrow$$

$$20 \cdot a = 5 \text{ m/s}^2$$

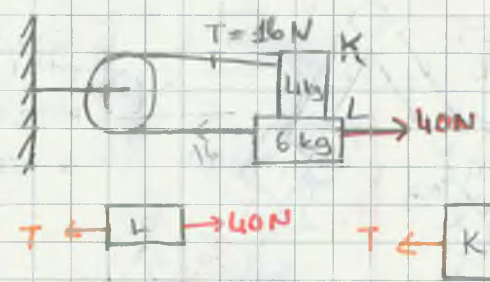


$$80 - 20 = 10 \cdot a$$

$$a = 6 \text{ m/s}^2$$

$$T_1 - 20 = 2 \cdot 6$$

$$T_1 = 32$$



$$40 - T = 6 \cdot a$$

$$40 - 4a = 6a$$

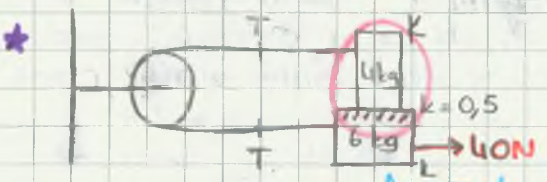
$$40 = 10a$$

$$a = 4 \text{ m/s}^2$$

$$T = ?$$

$$m \cdot a = m \cdot a$$

$$40 - T = 10 \cdot a$$



$$T = ?$$

$$f_s \leftarrow L \rightarrow 60 \text{ N}$$

$$T \leftarrow K \rightarrow f_s$$

$$60 - (T + 20) = 6 \cdot a$$

$$f_s = mgk$$

$$= 4 \cdot 10 \cdot 0,5$$

$$= 20 \text{ N}$$

$$60 - (4a + 20 + 20) = 6a$$

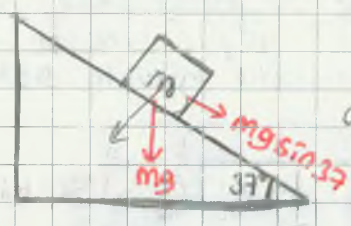
$$60 - 4a - 40 = 6a$$

$$20 = 10a$$

$$a = 2 \text{ m/s}^2$$

$$T = 4 \cdot 2 + 20$$

$$= 28 \text{ N}$$

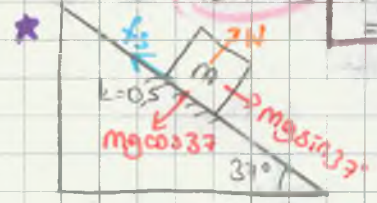


$$f_{\text{net}} = m \cdot a$$

$$mg \sin 37 = m \cdot a$$

$$10 \cdot 0,6 = a$$

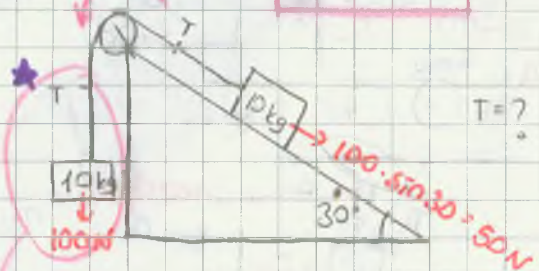
$$a = 6 \text{ m/s}^2$$



$$mg \sin 37 = f_s = m \cdot a$$

$$mg \sin 37 - mg \cos 37 \cdot k = m \cdot a$$

$$6 - 4 = a = 2 \text{ m/s}^2$$

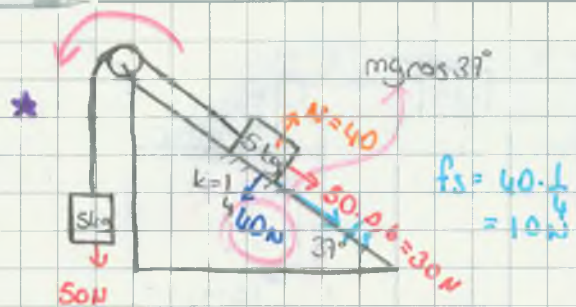


$$100 - 50 = (10 + 10) \cdot a$$

$$a = 2,5 \text{ m/s}^2$$

$$100 - T = 10 \cdot 2,5$$

$$T = 75 \text{ N}$$



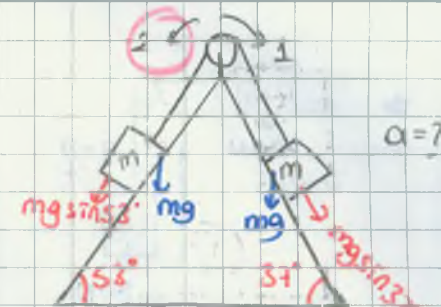
$$50 - 30 - f_s = 10 \cdot a$$

$$10 = 10 \cdot a$$

$$a = 1 \text{ m/s}^2$$

$$50 - T + 5 \cdot 1$$

$$T = 45 \text{ N}$$

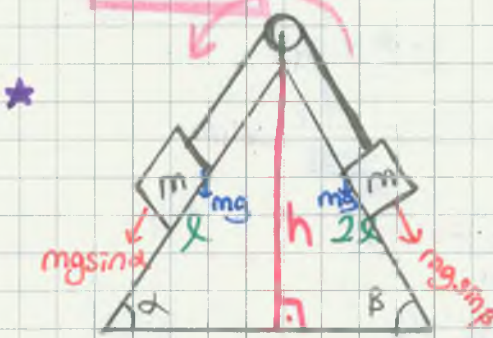


$$mg \cdot 0.8 - mg \cdot 0.6 = 2m \cdot a$$

$$0.2g = 2a$$

$$0.1g = a$$

$$a = 1 \text{ m/s}^2$$



$$\sin \alpha = \frac{h}{l}$$

$$\sin \beta = \frac{h}{2l}$$

$$mg \sin \alpha - mg \sin \beta = 2m \cdot a$$

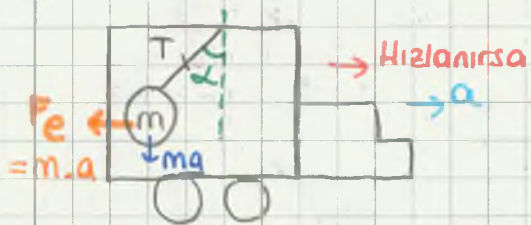
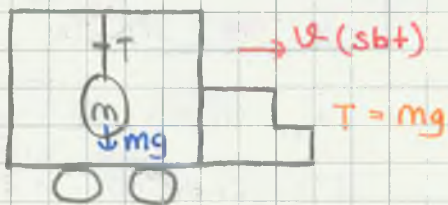
$$g \cdot \frac{h}{l} - g \cdot \frac{h}{2l} = 2a$$

$$\frac{gh}{2l} = 2a$$

$$\frac{10h}{4l} = a = 2.5 \frac{h}{l}$$

- EYLEMSİZLİK KUVVETİ -

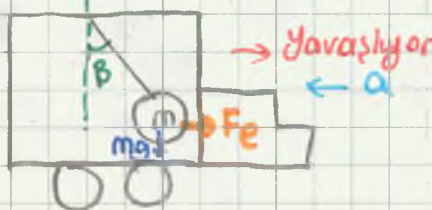
Bir cisme eylemsizlik kuvveti etki etmesi için o cismin ivmeli hareket yapar başka bir sistem içinde veya üzerinde olması gerekir. Eylemsizlik kuvveti sistemin ivmesine ters yönlü olarak cisme etki eder.



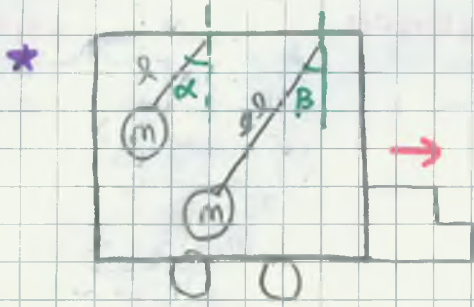
$$T \sin \alpha = F_e$$

$$T \cos \alpha = mg$$

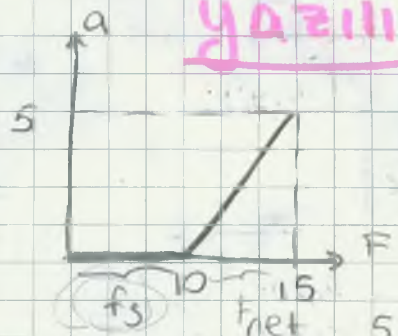
$$\tan \alpha = \frac{F_e}{mg} = \frac{m \cdot a}{mg} = \frac{a}{g}$$



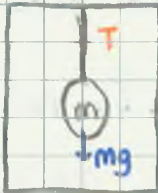
$$\tan \beta = \frac{F_e}{mg} = \frac{m \cdot a}{mg} = \frac{a}{g}$$



$$\frac{F}{P} = ? - 1$$

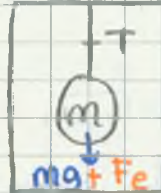


- Asansörler -



↑ (v sabit)

$$T = mg$$



↑ hızlanıyor

$$f_s = 10$$

$$mgk = 10$$

$$10 \cdot k = 10$$

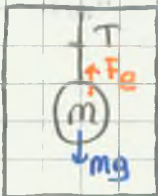
$$k = 1$$

$$T = mg + F_e$$

$$= m(g + a)$$

$$5 = m \cdot 5$$

$$m = 1$$



Yukarı a ivmesi ile yavaşlıyor.

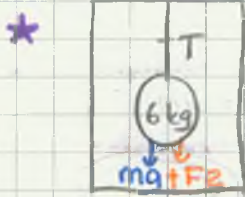
↓ a

$$T + F_e = mg$$

$$T = mg - F_e$$

$$= m(g - a)$$

$$\frac{a}{10} = \frac{3}{4}$$

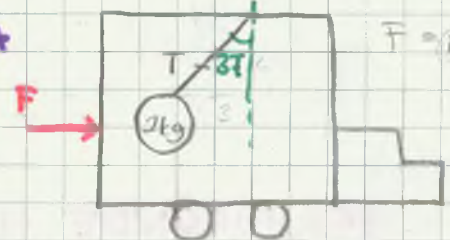


Asansör aşağı 4 m/s^2 lik ivme ile yavaşlarsa T=?

$$T = mg + F_e$$

$$T = 6(10 + 4)$$

$$= 64 \text{ N}$$



$$F = m \cdot a$$

$$8 \cdot a = 75$$

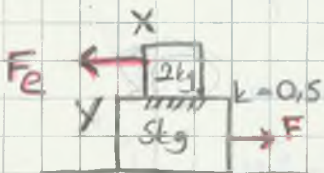
Araba = 8 kg ⇒ F=?

$$F = m_{\text{top}} \cdot a = (8 + 2) \cdot a$$

$$\tan 37^\circ = \frac{a}{g} = \frac{3}{4}$$

$$a = 7.5 \text{ m/s}^2$$

$$F = 10 \cdot 7.5 = 75 \text{ N}$$



$$F = m \cdot a$$

X'in Y üzerinde kaymadan hareket edebilmesi (birlikte hareket) için F'in en fazla kaç olması gerekir? Birlikte hareket için:

$$F_e = f_s \quad F = m_{\text{top}} \cdot a = 7.5 = 35 \text{ N}$$

$$ma = mgk$$

$$a = gk$$

$$a = 10 \cdot 0.5$$

$$= 5 \text{ m/s}^2$$