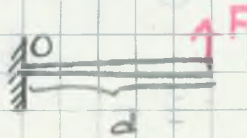
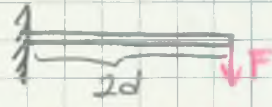


# - TORK - (MOMENT)

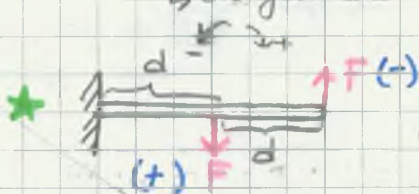
→ Kuvvetin dönüştürme etkisine **tork** denir. Vektörel büyüklüktür. Birimi **N.m** dir. Yönü sağ el kuralı ile bulunur.



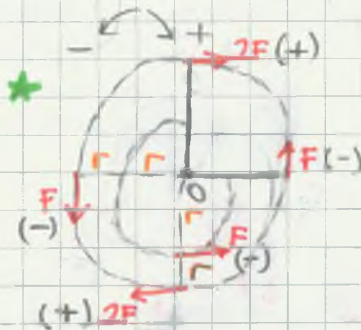
$T = F \cdot d$      $T: \odot$   
↳ dik yükseklik



$T = F \cdot 2d$      $T: \otimes$

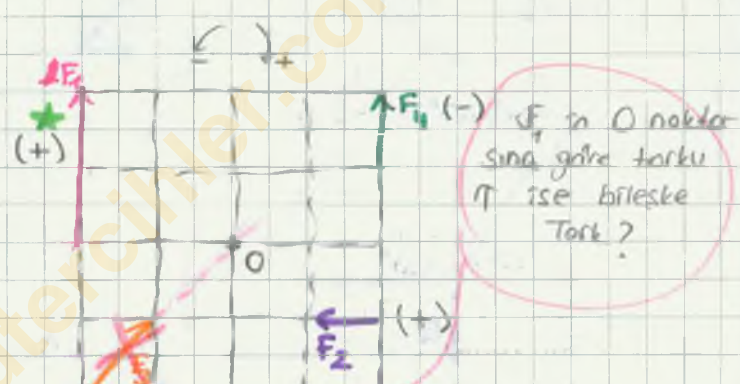


Torkun yönü     $-F \cdot 2d + F \cdot d = -Fd$      $\odot$



O noktasına göre torkun yönü ve büyüklüğü?

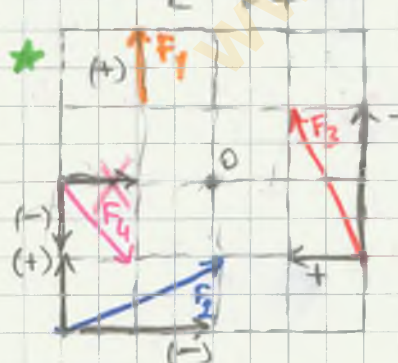
$+2F \cdot r - F \cdot 2r + 2F \cdot 2r - F \cdot r - F \cdot 2r$   
 $+3Fr$      $\otimes$



$F_1$  in O noktasına göre torku  $\uparrow$  ise bileşte Tork?

$T_1: F_1 \cdot d_1 = 2 \cdot 2 = +4 = \uparrow$   
 $T_2: F_2 \cdot d_2 = +1 \cdot 1 = +1 = \uparrow$   
 $T_3: F_3 \cdot d_3 = -1 \cdot 2 = -2 = \downarrow$   
 $T_4 = 0$

$\frac{3T}{4}$      $\uparrow$



$T_1 = 1 \cdot 1 = 1 = \uparrow$   
 $T_2 = +1 \cdot 2 - 2 \cdot 2 = -2$   
 $T_3 = +1 \cdot 1 - 2 \cdot 2 = -3$   
 $T_4 = -1 \cdot 2 = -2$   
 $-6 = -6T$



Cisim dengede ise:  $\sum T = 0$

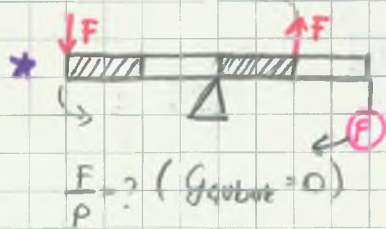
Hepsi dengede



$$\frac{P}{G} = ? \quad \frac{2}{3}$$

$$P \cdot 2 + P \cdot 1 = G \cdot 2$$

$$3P = 2G$$

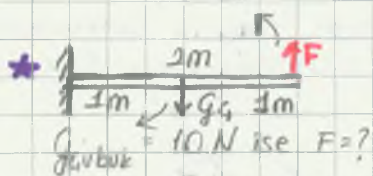


$$\frac{F}{P} = ? \quad (\text{Geçerlik} = 0)$$

$$F \cdot 2 + F \cdot 1 = P \cdot 2$$

$$3F = 2P$$

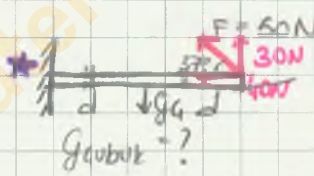
$$\frac{F}{P} = \frac{2}{3}$$



Geçerlik = 10 N ise  $F = ?$

$$F \cdot 2 = 10 \cdot 1$$

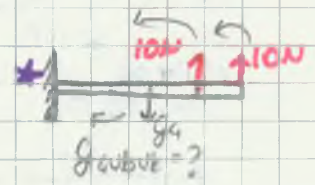
$$F = 5 \text{ N}$$



Geçerlik = ?

$$G_G \cdot d = 30 \cdot 2d$$

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

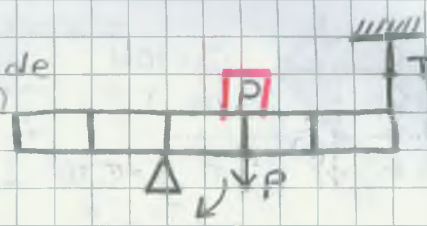


Geçerlik = ?

$$10 \cdot 3 + 10 \cdot 4 = G_G \cdot 2$$

$$70 = G_G \cdot 2$$

$$G_G = 35 \text{ N}$$



$\uparrow$  kaç  $P$  dir?

$$P \cdot 1 = T \cdot 3$$

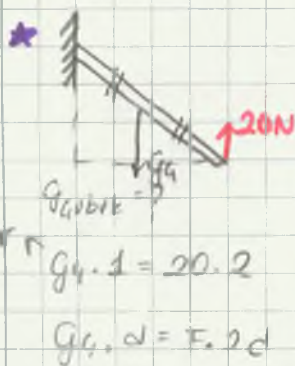
$$T = \frac{P}{3}$$



$\frac{T_1}{T_2} = ?$

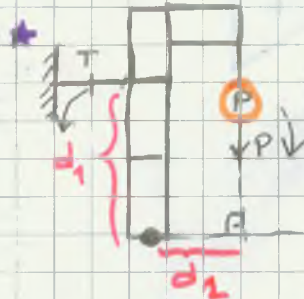
$$T_1 \cdot 4 = T_2 \cdot 2$$

$$\frac{T_1}{T_2} = \frac{1}{2}$$



$$G_G \cdot 1 = 20 \cdot 2$$

$$G_G \cdot d = F \cdot 2d$$



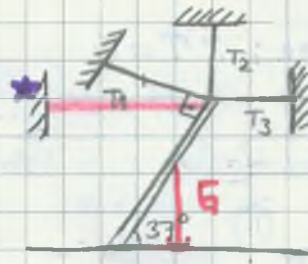
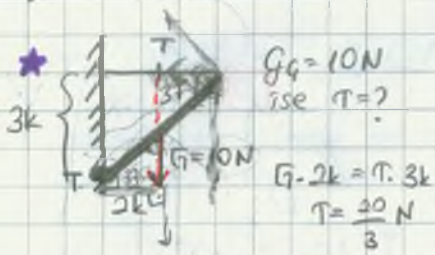
Geçerlik = 0  $\frac{T}{P} = ?$

$$T \cdot d_1 = P \cdot d_2$$

$$T \cdot 2 = P \cdot 1$$

$$\frac{T}{P} = \frac{1}{2}$$

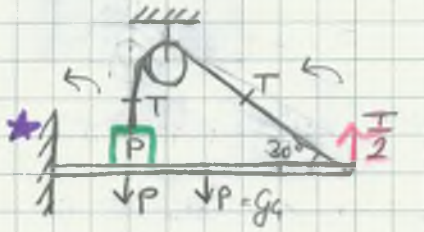




İpler aynı aynı dengede  
 Old. göre  $T_1, T_2, T_3$   
 arasındaki ilişki?  
 İplerin forkları eşittir

$T_1 \cdot 5k = G \cdot 2k$   
 $T_2 \cdot 4k = G \cdot 2k$   
 $T_3 \cdot 3k = G \cdot 2k$

$T_3 > T_2 > T_1$

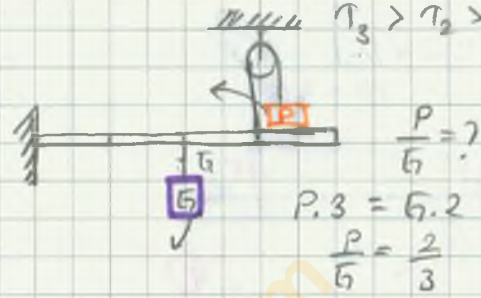


$G = P$  ise  $P = ?$

$P \cdot 1 + P \cdot 2 = T \cdot 1 + \frac{T}{2} \cdot 4$

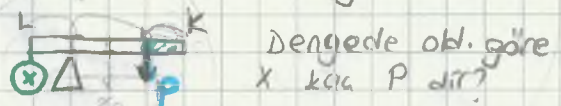
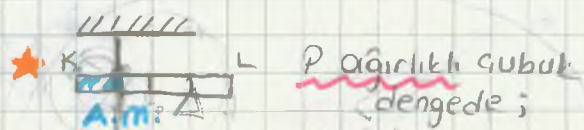
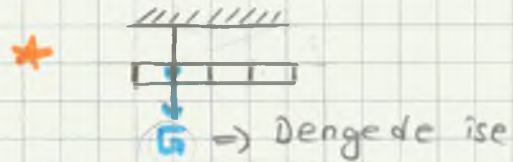
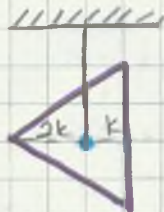
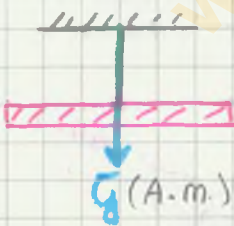
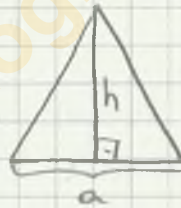
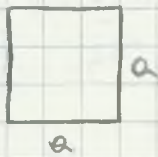
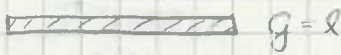
$3P = 3T$

$P = T$



## - Ağırlık Merkezi -

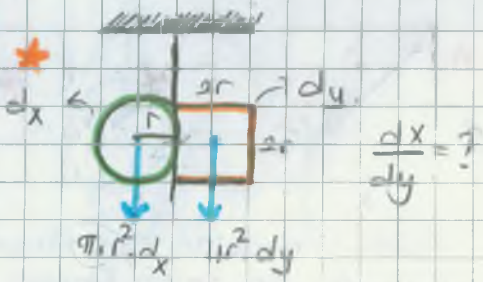
Ağırlığı bilinmeyen cisimlerde cisim çubuk ise ağırlık yerine **uzunluk**  
 cisim levha ise ağırlık yerine **alan**, cisim 3 boyutlu katı cisim ise  
 ağırlık yerine **hacim** kullanılır. Ve bu cisimler ancak ağırlık merkezlerinden  
 asılırsa ya da ağırlık merkezlerinden destek üzerine bırakılırsa dengede  
 kalabilirler.



$P \cdot X \cdot 1 = P \cdot 2$   
 $X = 2P$



Y



$$\frac{dx}{dy} = ?$$

$$d = \frac{M}{V} \quad m = d \cdot V$$

$$m = d \cdot \text{Alan}$$

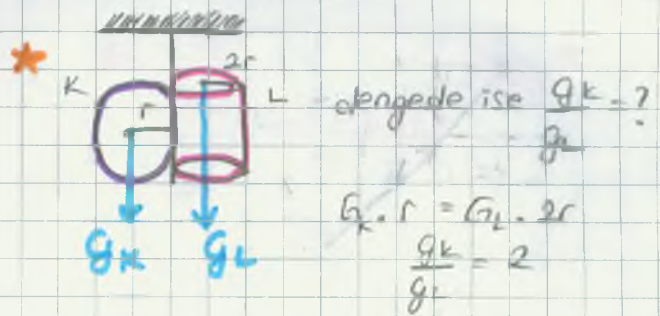
$$m = d \cdot \text{uzunluk}$$

$$\pi r^2 dx = 4r^2 dy$$

$$3dx = 4 dy$$

$$\frac{dx}{dy} = \frac{4}{3}$$

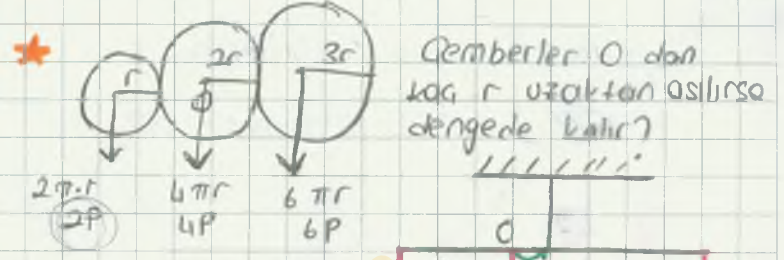
□



dengede ise  $\frac{G_k}{G_l} = ?$

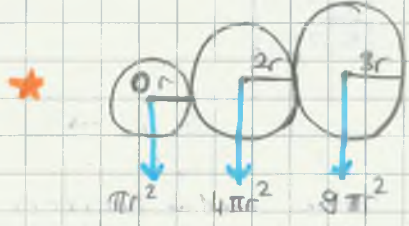
$$G_k \cdot r = G_l \cdot 2r$$

$$\frac{G_k}{G_l} = 2$$

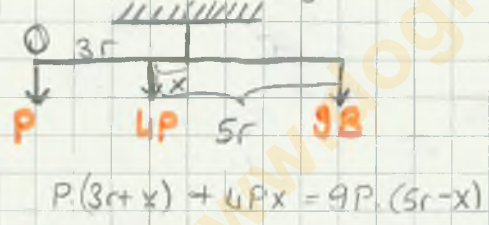


$$2P(3r+x) + 4P \cdot x = 6P(5r-x)$$

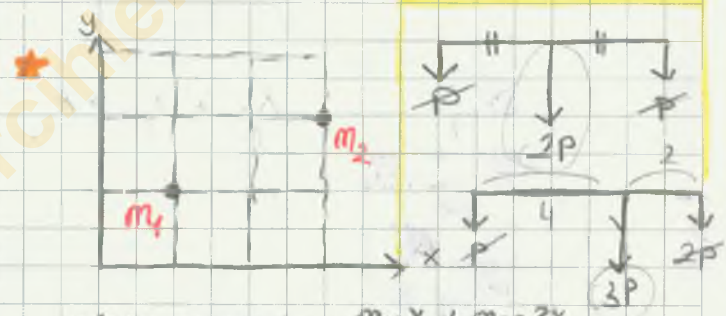
$$6r+2x+4x = 30r-6x \quad 12x = 24r \quad x = 2r$$



Levhalar 0 da kaç r uzaktan asılırsa dengede kalır?

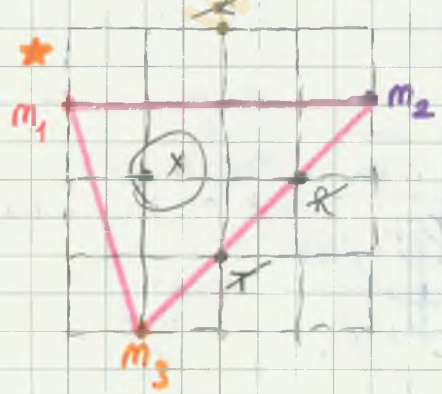


$$P(3r+x) + 4Px = 9P(5r-x)$$



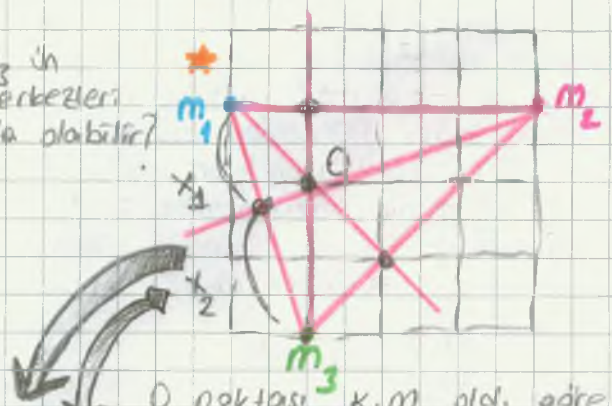
$$x \text{ (kütle merkezi)} = \frac{m_1 \cdot x + m_2 \cdot 3x}{m_1 + m_2}$$

$$y \text{ (k.m)} = \frac{m_1 y + m_2 2y}{m_1 + m_2}$$



$m_1, m_2, m_3$  in kütle merkezleri hangi noktada olabilir?

$$m_1 > m_3 > m_2$$



O noktası k.m. oldu göre kütleler arası ilişki?

$$m_3 \cdot 1 = m_2 \cdot 2 \quad \frac{m_3}{m_2} = 2 \quad m_3 > m_2$$

$$m_1 \cdot 1 = m_2 \cdot 3 \quad \frac{m_1}{m_2} = 3 \quad m_1 > m_2$$

$$m_1 \cdot x_1 = m_3 \cdot x_2$$

$$x_2 > x_1 \Rightarrow m_3 < m_1$$

ab5

$$a+b = 6$$

$$a+b = 6$$

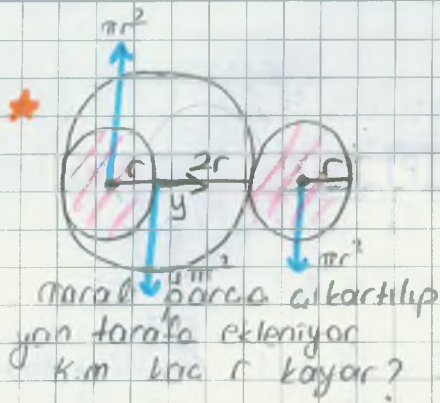
$$a+b = 6$$

$$b+c = 4$$





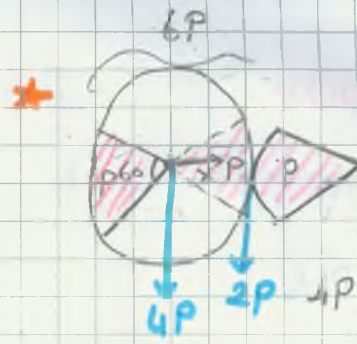




Maral parca çıkartılıp  
yan tarafa ekleniyor  
K.M kaç r kayar?

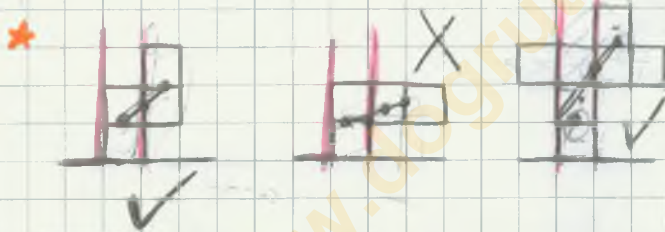
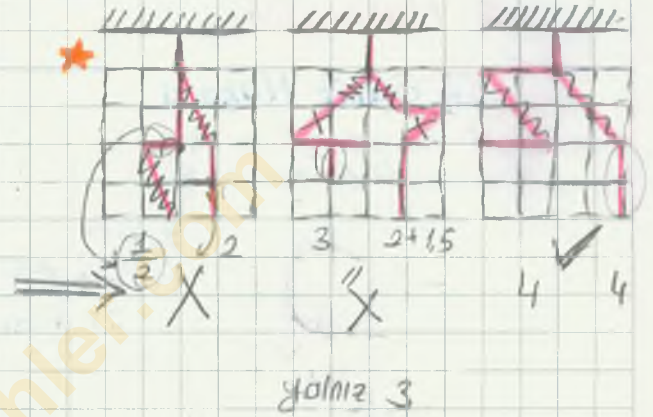
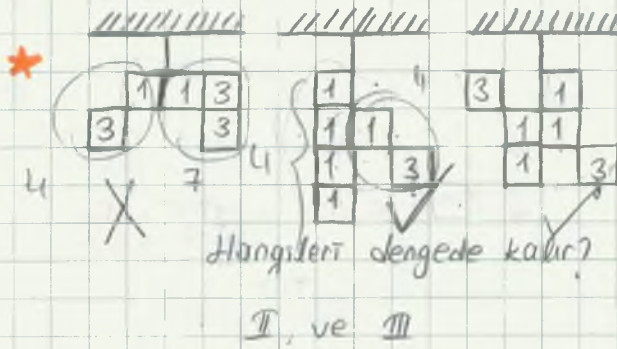
$$= \pi r^2 (r+y) + \pi r^2 (3r-y)$$

$$= 4\pi r^2 y$$



Maral parca  
kayıp yan tarafa  
ekleniyor A.M kaç  
r değişir?

$$4P \cdot x = 2P(r-x)$$



## - Basit Makineler -

Basit makinelerde isten kazanç ya da kayıp yoktur. Ya kuvvetten  
ya da yoldan kazanç vardır. Kuvvetten kazanç, varsa yoldan kayıp,  
yoldan kazanç, varsa kuvvetten kayıp vardır. **yük / Kuvvet**  
1 den büyük ise kuvvetten kazanç vardır.  $\frac{P}{F} > 1 \Rightarrow K.K$

$$\text{Mükül yaptığı iş} / \text{Kuvvetin yaptığı iş} = \text{VERİM}$$



## 1- Kaldıraçlar



$$F \cdot l_1 = P \cdot l_2$$

$$\frac{P}{F} = \frac{l_1}{l_2} > 1 \text{ ise kuvvetten kazanç vardır}$$

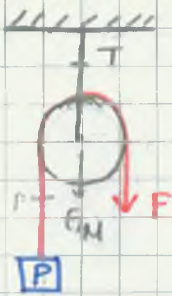


$$P \cdot l_1 = F \cdot l_2$$

$$\frac{P}{F} = \frac{l_2}{l_1} > 1 \text{ kuvvetten kazanç var}$$

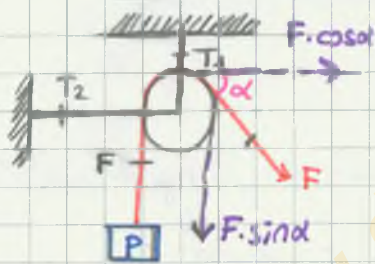
## 2- Makaralar

### → Sabit Makara



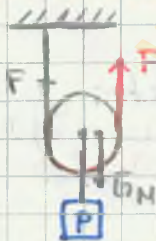
$$\begin{aligned} F &= P \\ T &= P + F + G_M \\ &= 2F + G_M \\ &= 2P + G_M \end{aligned}$$

$$2\pi r n = h \quad n = \frac{h}{2\pi r}$$

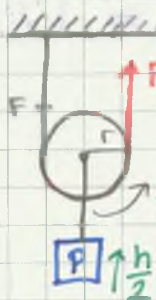


$$\begin{aligned} P &= F \\ T_1 &= P + F \sin \alpha \\ T_2 &= F \cos \alpha \end{aligned}$$

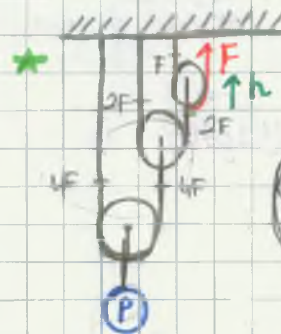
### → Hareketli Makara



$$2F = P + G_M \quad (\text{yükselme miktarı için } G_M \text{ ise katılmaz.})$$

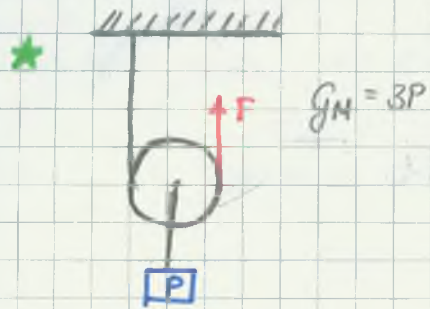


$$\begin{aligned} 2F &= P \\ h \cdot m &= 2m \cdot \frac{h}{2} \\ 2\pi r \cdot n &= \frac{h}{2} \end{aligned}$$

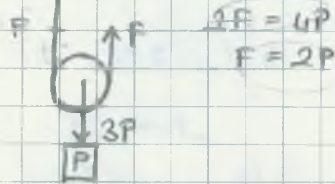


$$\begin{aligned} 8F &= P \\ h \cdot m &= 8m \cdot \frac{h}{8} \\ P \text{ yi } h \text{ kadar yüksetmek için;} \\ 8h \cdot m &= 8m \cdot h \end{aligned}$$





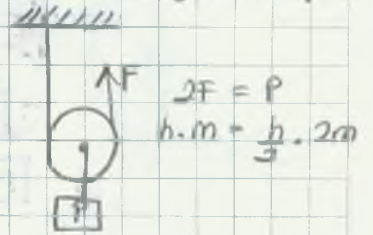
1- P kaç F dir?



$$2F = 4P$$

$$F = 2P$$

2- F h kadar çekilirse P ne kadar yükselir?

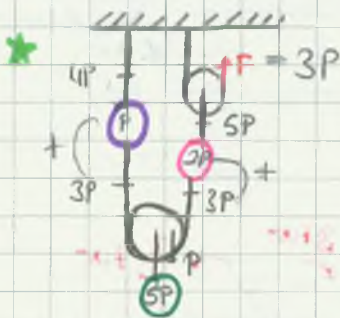


$$2F = P$$

$$h.m = \frac{h}{3} \cdot 2m$$

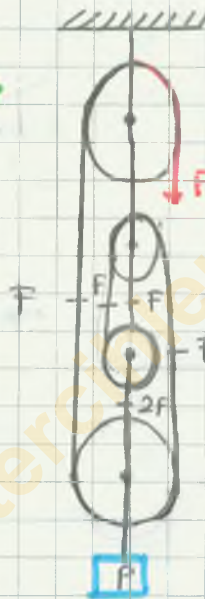
3- verim % kaçtır?

$$\frac{m \cdot \frac{h}{2}}{2m \cdot h} = \frac{1}{4} = \% 25$$



$G_M = P$  ise  $F = ?$

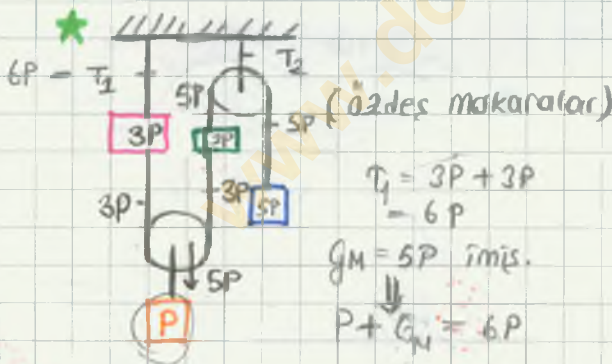
$$F = 3P$$



F h kadar indirsek P ne kadar yükselir?

$$4F = P$$

$$h.m = 4m \cdot \frac{h}{4}$$



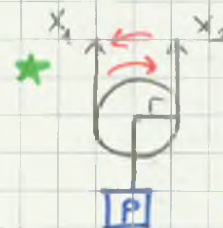
(22deş makaralar)

$$T_1 = 3P + 3P$$

$$= 6P$$

$G_M = 5P$  imiş.

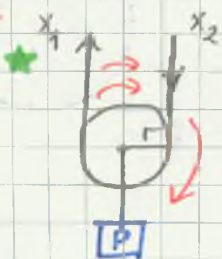
$$P + G_M = 6P$$



$\frac{x_1 + x_2}{2}$  yukarı çıkma miktarı

$\frac{x_1 - x_2}{2}$  etrafında dolanan ip

$$2\pi r \cdot n = \frac{x_1 - x_2}{2}$$

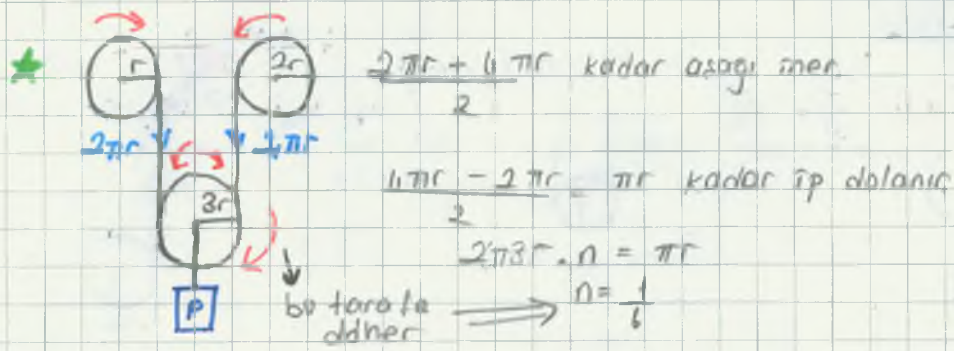


$(x_1 > x_2)$   $\frac{x_1 - x_2}{2}$  ↑ yukarı çıkma miktarı

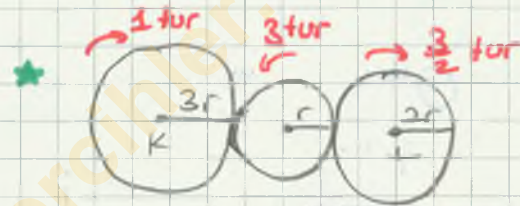
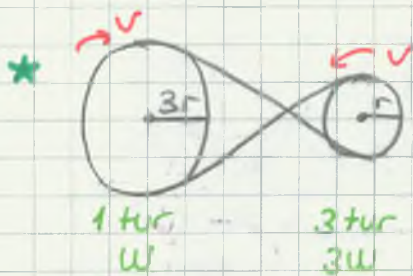
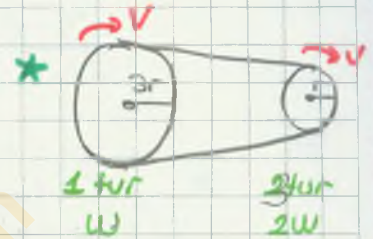
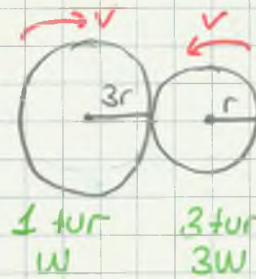
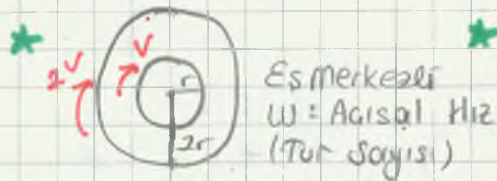
$\frac{x_1 + x_2}{2}$  ↻ dolanan ip

$$2\pi r \cdot n = \frac{x_1 + x_2}{2}$$

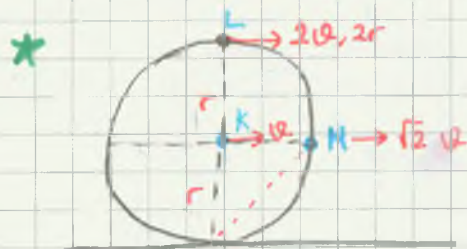
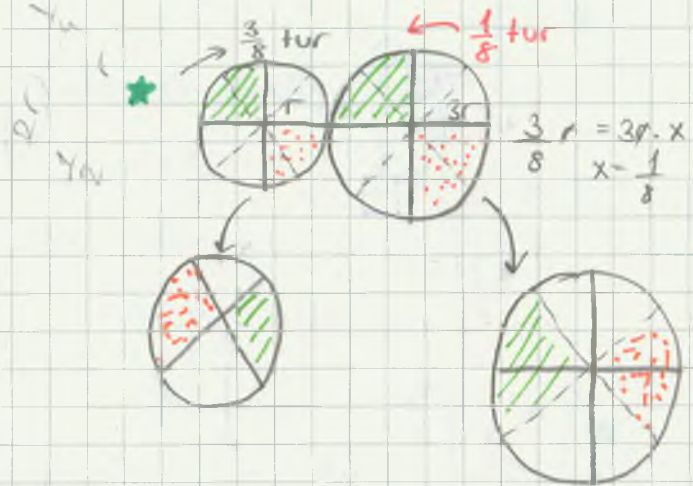




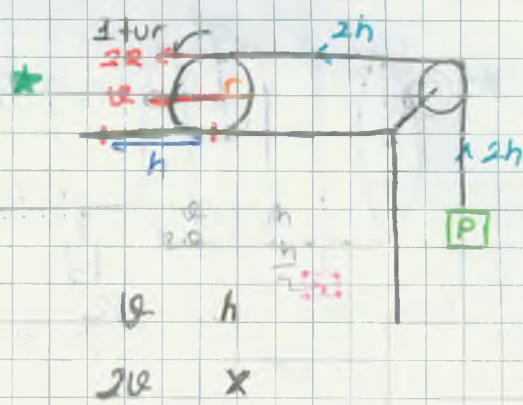
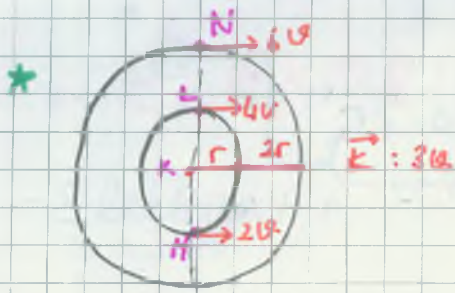
### 3- Kasnaklar



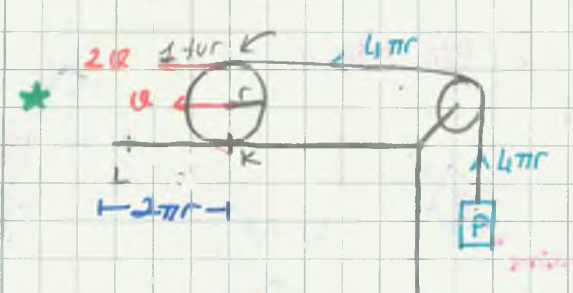
$$\omega_L \cdot 3r = \omega_L \cdot 2r$$



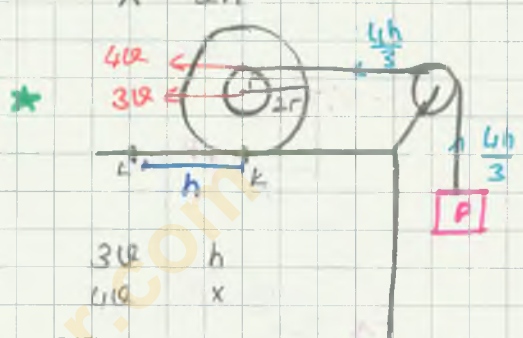




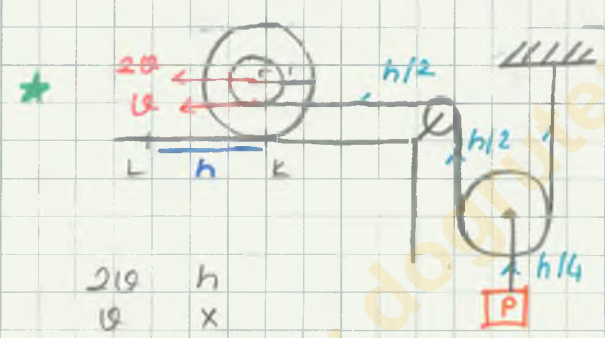
$$X = 2h$$



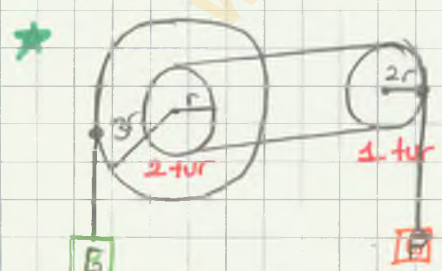
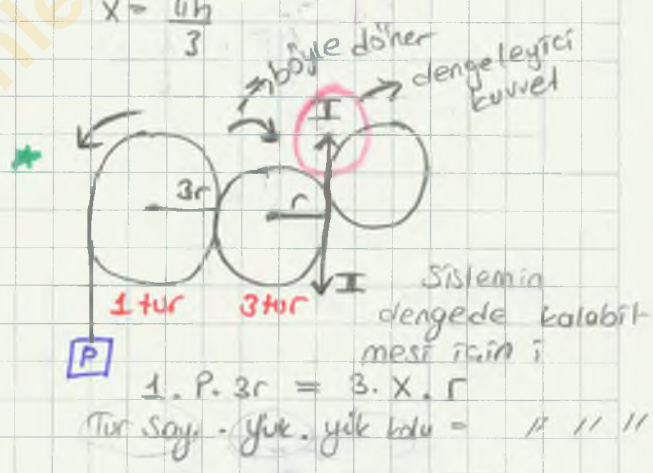
Kasnak K non L ye



$$X = \frac{4h}{3}$$



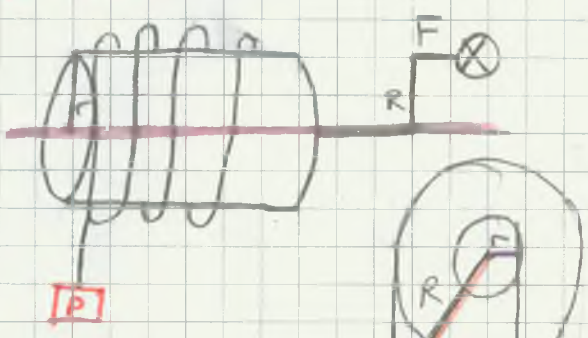
$$X = \frac{h}{2}$$



Dengede ise  $\frac{P}{G} = 1$

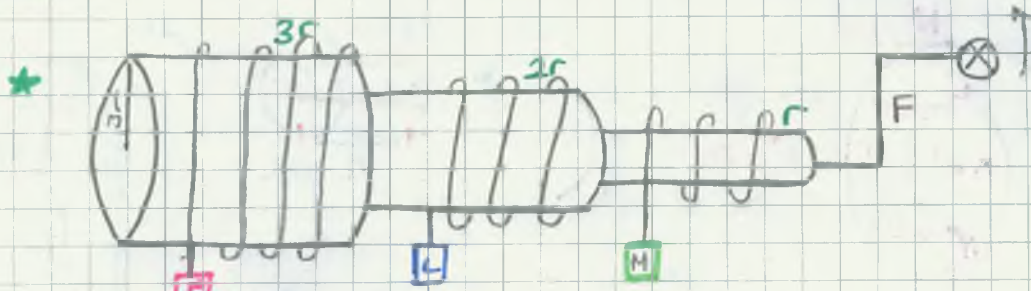
$$2 \cdot G \cdot 3r = 1 \cdot P \cdot 2r$$

### 4- Çıkrık



$$F \cdot R = P \cdot r$$





Dengede ise :

$$3r \cdot K + M \cdot r = L \cdot 2r$$

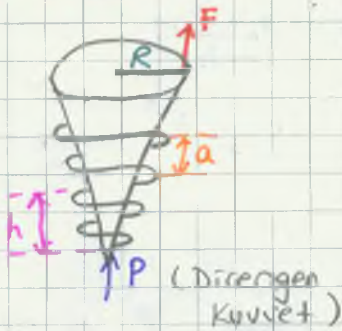
I.  $L > K$  ✓

II.  $K > M$

III.  $L > M$

Kesin ?

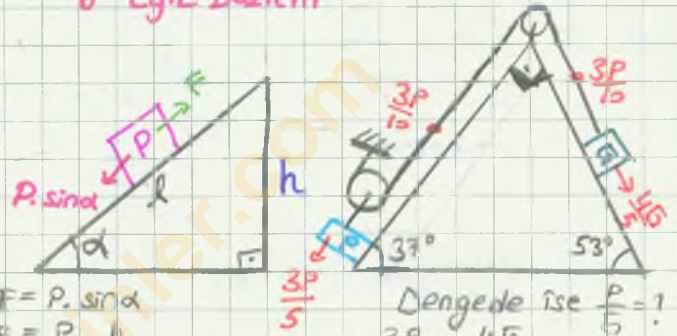
### 5- Vida



- ①  $h = n \cdot a$   
 ↓ ↓  
 tur vida  
 sayısı adımı

②  $F \cdot 2\pi r = P \cdot a$   
 Kuvvetten kazanç =  $\frac{P}{F} = \frac{2\pi r}{a}$

### 6- Eğik Düzlem



$$F = P \cdot \sin \alpha$$

$$F = P \cdot \frac{h}{l}$$

$$\frac{P}{F} = \frac{l}{h} > 1$$

Kuvvetten kazanç var.

Dengede ise  $\frac{P}{F} = 1$

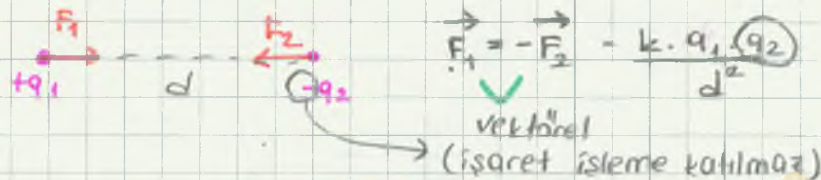
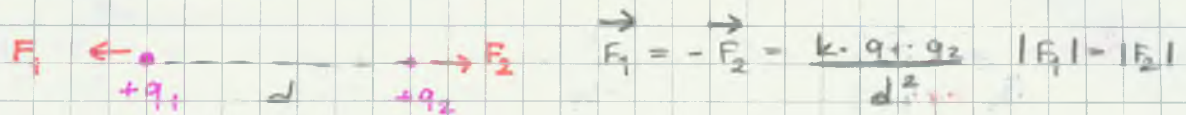
$$\frac{3F}{10} = \frac{4\sqrt{5}}{5}$$

$$\frac{P}{5} = \frac{4}{3}$$

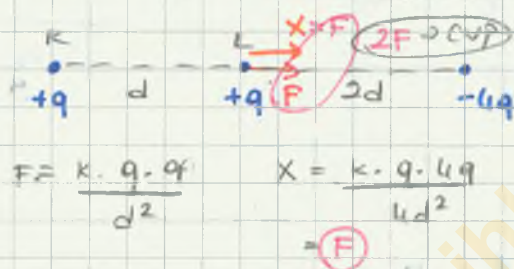


# - ELEKTRİK -

## - Elektriksel Kuvvet - (Coulomb Kuvveti)



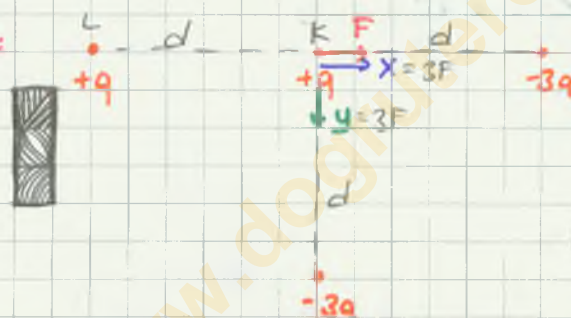
Örnek:



K'nın L'ye uyguladığı kuvvet F ise L'ye etki eden bileşke kuvvet?

$\frac{k \cdot q \cdot q}{d^2} = F$

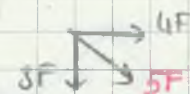
Örnek:



L'nin K'ye uyg. kuvvet F ise K'daki bileşke kaç F dir?

$F = \frac{k \cdot q \cdot q}{d^2}$   $X = \frac{k \cdot q \cdot 3q}{d^2} = 3F$

$Y = \frac{k \cdot q \cdot 3q}{d^2} = 3F$



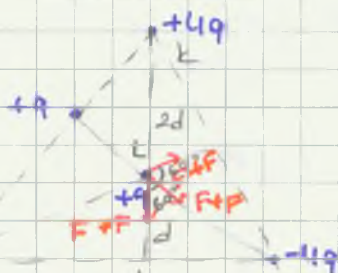
Örnek:



+q nun O'ya uyg. kuvvet F ise O'daki bileşke?



Örnek:



K'nın L'ye uyg. F ise L'deki bileşke?



$15^2 + 20^2 + 100 + 15^2 + 3600$

$\frac{3500}{15}$





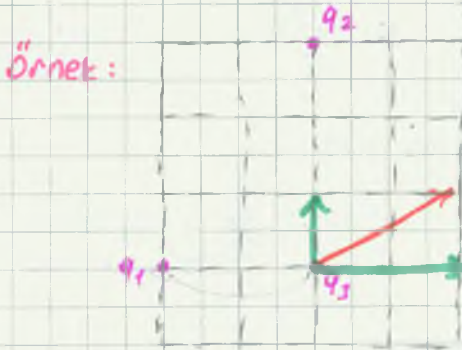
Örnek:  $q$  yüklü cisim neye kapırsa dengede kalır?

Aynı yönlü  $\Rightarrow$  araya koy  
Zıt //  $\Rightarrow$  dışarı küçük olan tarafa



Örnek:  $+q$  yüklü cisim  $K$  dan kaç  $d$  uzakta dengede kalır?

$$|F_1| = |F_2| \quad \frac{k \cdot q \cdot q}{x^2} = \frac{k \cdot q \cdot 4q}{(x+d)^2}$$



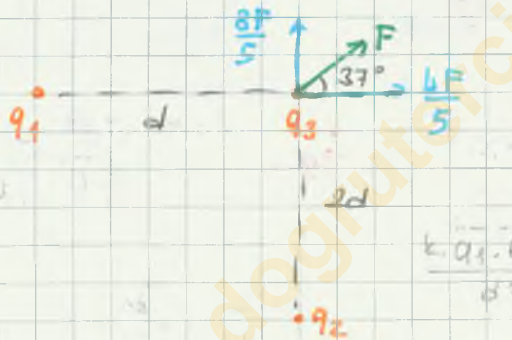
Örnek:

$$\frac{q_1}{q_2} = ? \quad \frac{F_1}{F_2} = \frac{k \cdot q_1 \cdot q_3}{4} = 2$$

$$\frac{k \cdot q_2 \cdot q_3}{9} = 1$$

$$\frac{k \cdot q_1 \cdot q_3}{4} = 2$$

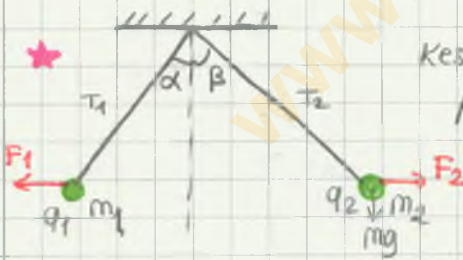
Örnek:



$$\frac{q_1}{q_2} = ?$$

$$\frac{\frac{3F}{5}}{\frac{4F}{5}} = \frac{k \cdot q_1 \cdot q_2}{4d^2} = \frac{k \cdot q_1 \cdot q_3}{d^2}$$

$$\frac{k \cdot q_1 \cdot q_3}{d^2} = \frac{4F}{5}$$



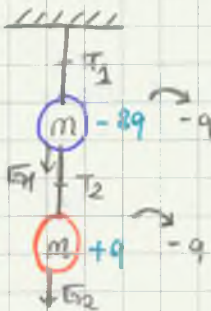
kesin ifadeler: 1-  $q_1$  ve  $q_2$  aynı işaretli  
 $\beta > \alpha \Rightarrow$

2-  $|F_1| = |F_2|$

3-  $m_1 > m_2$

4-  $T_1 > T_2$

★

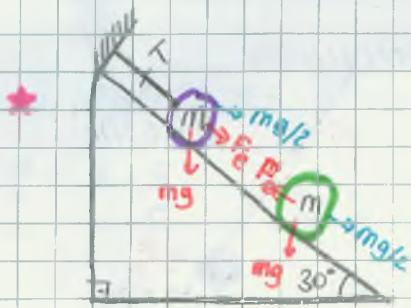


Kütleler birbirlerine dokundurulup aynı yerlere asılırsa;

$T_1$   
Değişmez  
 $\downarrow$   
 $T_1 + T_2$  dir  
her zaman







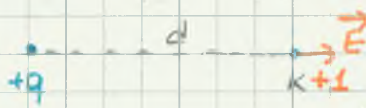
bergede:  $T$  kor.  $mg$ ?

$$F_e = \frac{mg}{2}$$

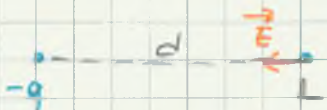
$$T = \frac{mg}{2} + F_e$$

$$\left. \begin{array}{l} F_e = \frac{mg}{2} \\ T = \frac{mg}{2} + F_e \end{array} \right\} \frac{mg}{2} + \frac{mg}{2} = mg$$

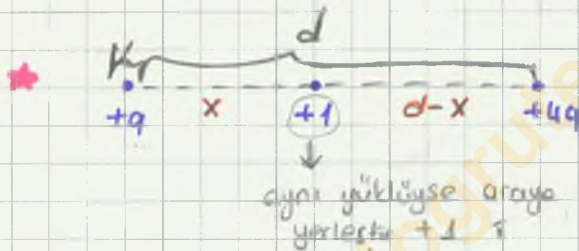
- Elektrik Alan - ( $\vec{E}$ )



$$E_K = ? = \vec{E}_K = \frac{k \cdot q}{d^2}$$



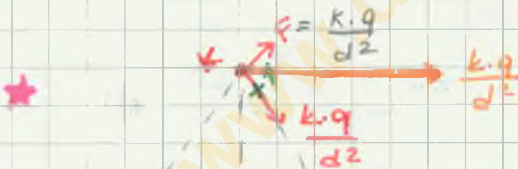
$$E_L = ? \quad \vec{E}_L = \frac{k \cdot q}{d^2}$$



K dan kac d uzakta elek. alan 0 dir?

$$\sqrt{\frac{k \cdot q}{x^2}} = \sqrt{\frac{k \cdot 4q}{(d-x)^2}}$$

$$\frac{1}{x} = \frac{2}{d-x}$$

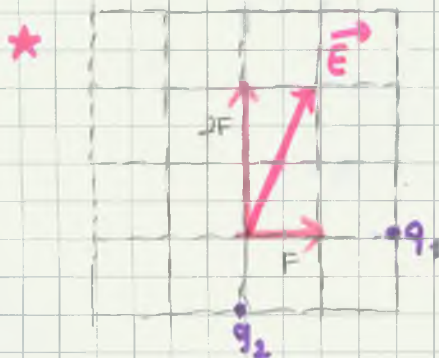
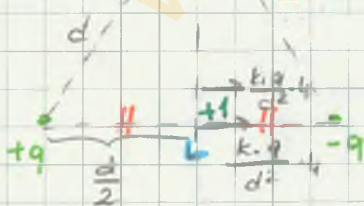


$$F_k = \frac{k \cdot q}{d^2}$$

$$F_L = \frac{4k \cdot q}{d^2}$$

$$\frac{F_k}{F_L} = \frac{1}{4}$$

← Eskenar ugen

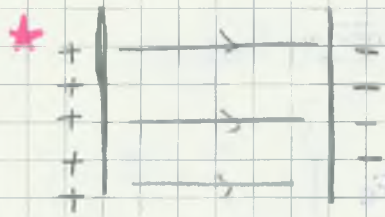


$$\frac{q_1}{q_2} = ?$$

$$E_1 = k \cdot \frac{q_1}{4} = 1$$

$$E_2 = k \cdot \frac{q_2}{1} = 2$$





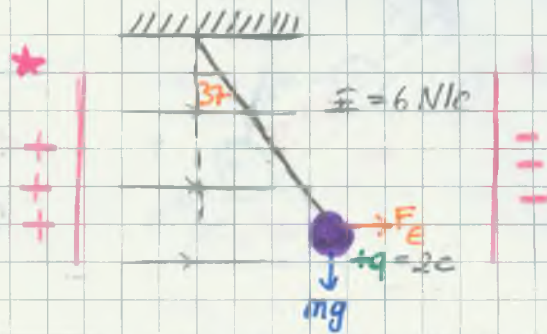
$$F = \frac{k \cdot q_1 \cdot q_2}{d^2}$$

$$q \cdot E = \frac{k \cdot q \cdot q}{d^2}$$

$$\vec{F} = q \cdot \vec{E}$$

$$N = C \cdot \vec{E}$$

$$\vec{E} = N/C$$



$$\tan 37^\circ = \frac{F_e}{mg} = \frac{3}{4} = \frac{q \cdot E}{m \cdot g} = \frac{3}{4} = \frac{2 \cdot 6}{m \cdot 10}$$

$$m = 1.6$$

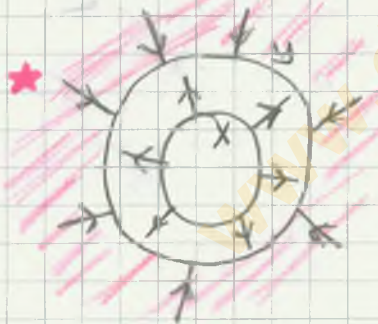
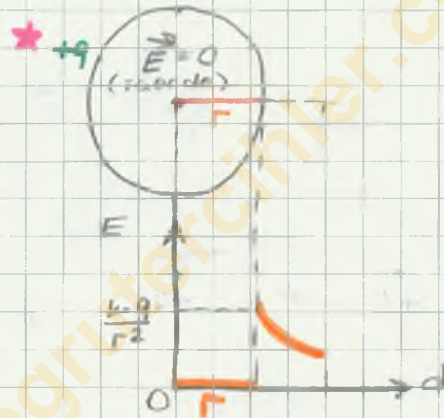


$$x = (+)$$

$$y = (-)$$

$$x + y = 0$$

$$q_x = q_y$$

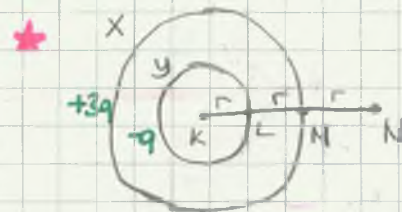


$$x = (+)$$

$$y = (-)$$

$$x + y = (-)$$

$$q_y > q_x$$

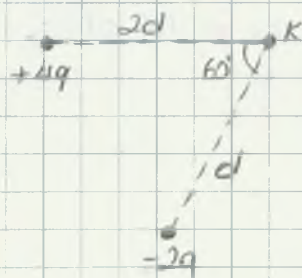


	X	Y	
K	0	0	
L	0	$\frac{k \cdot q}{r^2}$	
M	$\frac{k \cdot 3q}{4r^2}$	$\frac{k \cdot q}{4r^2}$	$\frac{k \cdot 2q}{4r^2}$
N	$\frac{k \cdot 3q}{9r^2}$	$\frac{k \cdot q}{9r^2}$	$\frac{k \cdot 2q}{9r^2}$



# - Elektriksel Potansiyel - (SKAIFER)

$$V = \frac{k \cdot q}{r}$$



$$V = \frac{k \cdot 4q}{2d} + \frac{k \cdot -2q}{d}$$



K'daki elektrik alan  $E$  potansiyel  $V$  old. göre arı küçülürse  $E$  ve  $V$  nasıl değişir?

$$V \rightarrow - \text{ (sbt) }$$

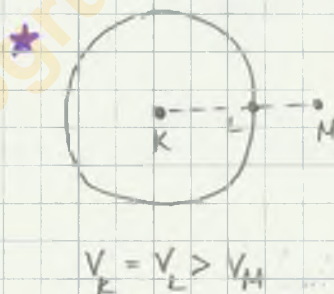
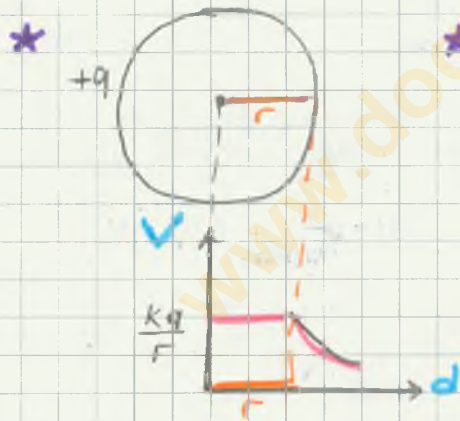
$$E \uparrow$$



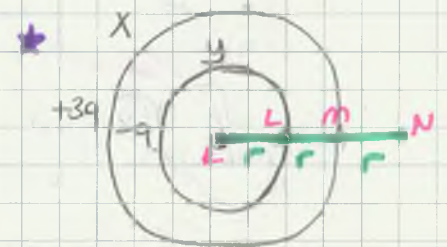
+q nun K'da oluşturduğu pot.  $V$  ise K'daki toplam potansiyel;

$$\frac{k \cdot q}{d} = V$$

$$\frac{k \cdot q}{d} + \frac{k \cdot -4q}{2d} = \frac{-kq}{d} \Rightarrow -V$$



$$V_K = V_L > V_M$$



$$V_X \text{ (yüzey)} = \frac{k \cdot 3q}{2r}$$

$$V_Y \text{ (yüzey)} = \frac{k \cdot -q}{r}$$

	X	Y
K	$\frac{k \cdot 3q}{2r}$	$\frac{k \cdot -q}{r} = \frac{k \cdot q}{2r}$
L	$\frac{k \cdot 3q}{2r}$	$\frac{k \cdot -q}{r} = \frac{k \cdot q}{2r}$
M	$\frac{k \cdot 3q}{2r}$	$\frac{k \cdot -q}{2r} = \frac{k \cdot q}{2r}$
N	$\frac{k \cdot 3q}{3r}$	$\frac{k \cdot -q}{-2r} = \frac{k \cdot 2q}{3r}$



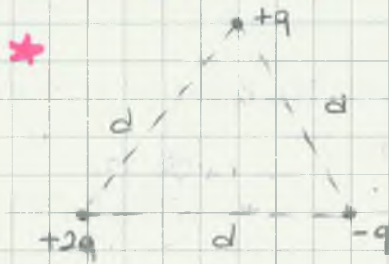
## Elektriksel Potansiyel Enerji (SKALER)

Skaler büyüklüktür. İsoreseller işleme dahil edilir

$$E = k \cdot \frac{q_1 \cdot q_2}{d}$$

$$V = k \cdot \frac{q}{d}$$

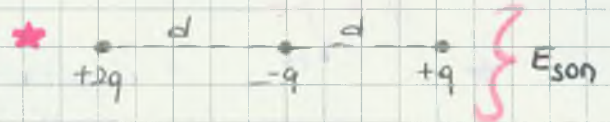
$$\Delta V \cdot q = E$$



Sistemin elek. pot. enerjisi?

$$k \cdot \frac{2q^2}{d} + k \cdot \frac{-q^2}{d} + k \cdot \frac{-2q^2}{d}$$

$$E = -k \cdot \frac{q^2}{d} = E_{ilk}$$



Yandaki şekilden yukarıdaki şekle getirmek için yapılan iş?

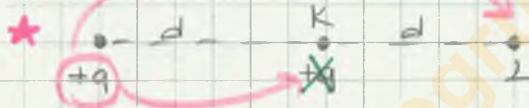
$\text{İş} = \Delta E$  (enerji değişimi)

$$= E_{son} - E_{ilk}$$

$$= k \cdot \frac{-2q^2}{d} + k \cdot \frac{-q^2}{d} + k \cdot \frac{2q^2}{2d}$$

$$= E_{son} = -k \cdot \frac{2q^2}{d}$$

$$E_{son} - E_{ilk} = \frac{-k \cdot 2q^2}{d} - \left( -k \cdot \frac{q^2}{d} \right)$$



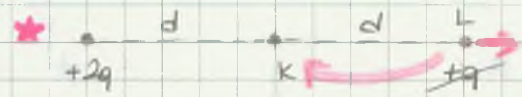
K'deki  $+q$  yükünü L noktasına taşımak için elek. kuvvetlerin yaptığı iş?

$$E = q \cdot \Delta V$$

$$W = q_{taşınan} \cdot (V_{son} - V_{ilk})$$

$$= +q (V_L - V_K)$$

$$= q \left( \frac{k \cdot q}{2d} - \frac{k \cdot q}{d} \right)$$



L'deki  $+q$  yükü K'ya taşımak için elek. kuvvetlere karşı yapılan iş?

$$W = q_{taşınan} \cdot (V_K - V_L)$$

$$= q \left( \frac{k \cdot 2q}{d} - k \cdot \frac{2q}{2d} \right)$$



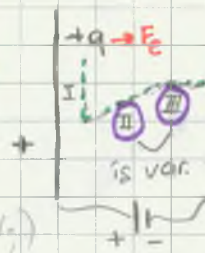
Sonsuzdaki bir  $+q$  yükünü K noktasına getirmek için yapılan iş?

$$W = q_T \cdot (V_S - V_i)$$

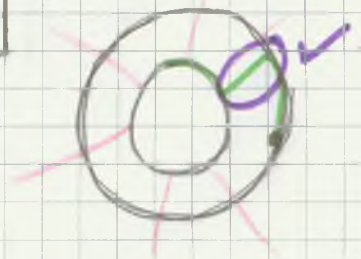
$$= q (V_K - \infty)$$

$$= q \left[ \left( \frac{k \cdot q}{d} + k \cdot \frac{-2q}{d} \right) - 0 \right]$$

$$V_K$$

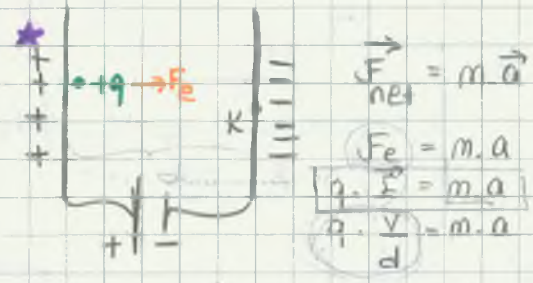
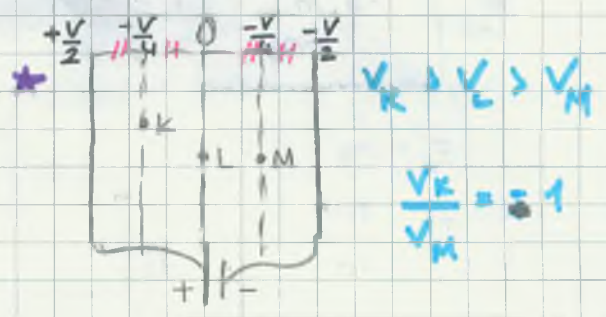
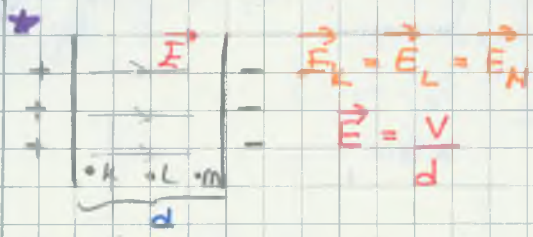


İş için  $\vec{F}$  ve  $\vec{E}$  aynı doğrultuda olması lazım





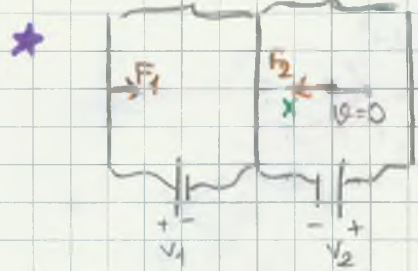
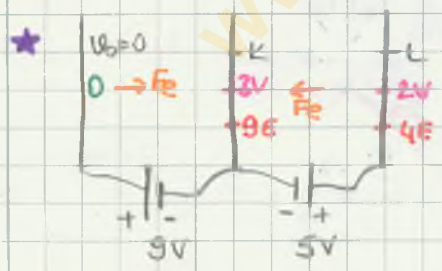
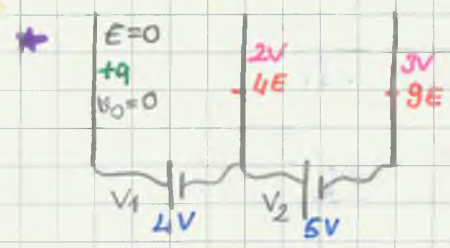
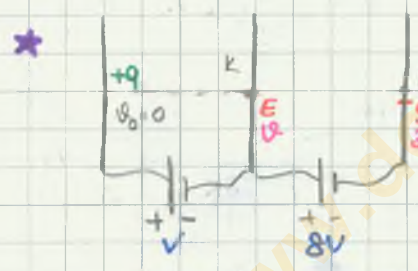
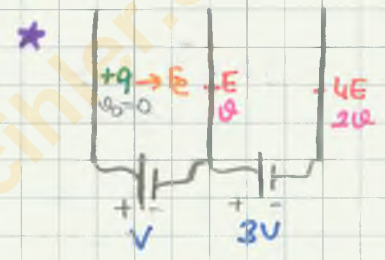
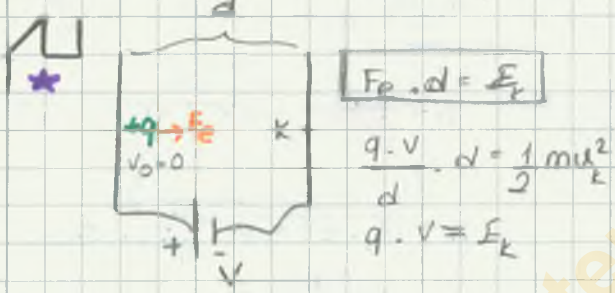
- Paralel Levhalar -



$Q = \frac{q \cdot V}{d \cdot m}$

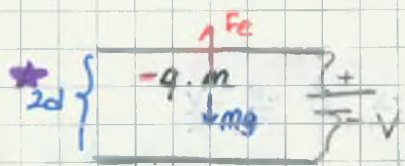
$x = \frac{1}{2} a t^2$   $x = \frac{1}{2} \frac{q \cdot V}{d \cdot m} t^2$

K naktasina datha gabuk carp tam?  $t \downarrow$   $a \uparrow$   $\rightarrow$   $F_{e \uparrow} \rightarrow q \uparrow \vee d \downarrow m \downarrow$



$\frac{V_1}{V_2} = \frac{1}{2}$   $\frac{V_1}{V_2} = \frac{1}{2}$   
 $F_1 \cdot d - F_2 \cdot x = 0$   
 $\frac{q \cdot V_1}{d} \cdot d - \frac{q \cdot V_2}{2x} \cdot x = 0$

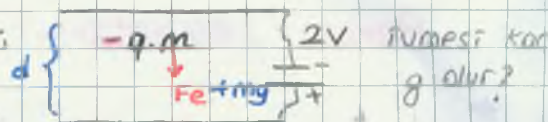




$$F_e = mg$$

$$mg = \frac{q \cdot V}{2d}$$

Dengandise:

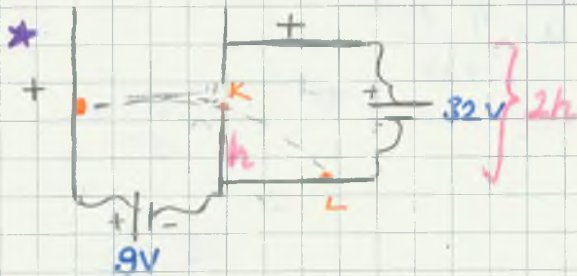


$$F_e + mg = F_{net} = m \cdot a$$

$$\frac{q \cdot 2V}{d} + mg = m \cdot a$$

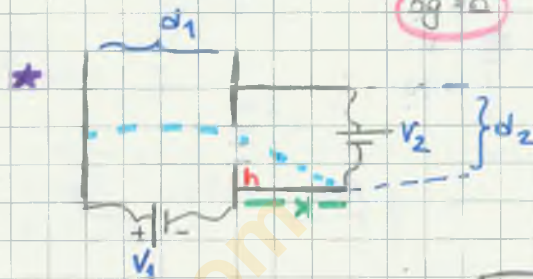
$$4mg + mg = m \cdot a \quad 5mg = ma$$

$$5g = a$$



$$\frac{V_K}{V_L} = ? \quad q \cdot 9V = \frac{1}{2} m v_K^2$$

$$q \cdot 9V + \frac{q \cdot 32V}{2k} = \frac{1}{2} m v_L^2$$

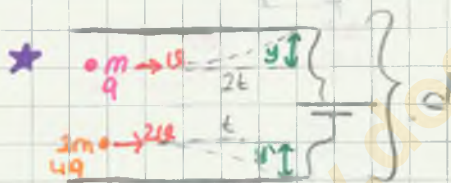


$$\frac{q \cdot V_1}{d_1} = \frac{1}{2} m v_K^2 \quad v_K = \sqrt{\frac{2qV_1}{m}}$$

$$h = \frac{1}{2} a t^2 \quad h = \frac{1}{2} \frac{q \cdot V_2}{d_2 \cdot m} \cdot t^2$$

$$x = v_K \cdot t = \sqrt{\frac{2qV_1}{m}} \cdot t$$

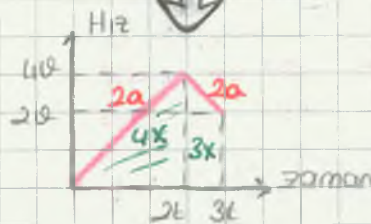
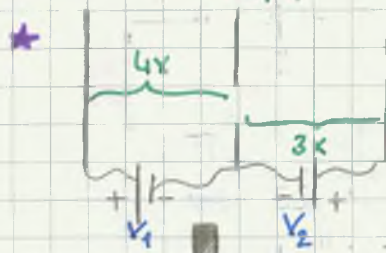
$$t = \sqrt{\frac{m}{2qV_1}} \cdot x \quad h = \frac{1}{4} \frac{V_2 \cdot x^2}{4d_2 \cdot V_1}$$



y' kaa y' dir?

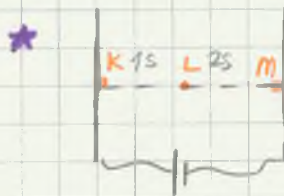
$$y = \frac{1}{2} \frac{q \cdot V}{d \cdot m} \cdot 4t^2$$

$$y' = \frac{1}{2} \frac{4q \cdot V}{d \cdot 2m} \cdot t^2$$

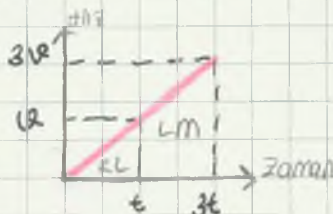


$$2a = \frac{q \cdot V_1}{4x \cdot m}$$

$$2a = \frac{q \cdot V_2}{3x \cdot m}$$



$$\frac{T_{KL}}{T_{LM}} = \frac{1}{2} \quad \frac{KL}{LM}$$



$$KL = \frac{a}{2} \quad LM = 2a$$

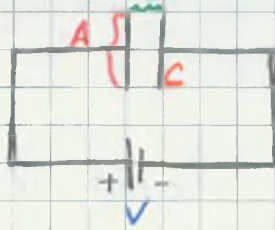


# - KONDANSATÖRLER (SİĞAĞLAR) -

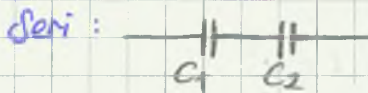
yük depolamaya yarayan devre elemanıdır "C" ile gösterilir. Birimi Farad'tır.

$$C = \epsilon_0 \cdot \frac{A}{d}$$

↓  
dielektrik katsayısı



## - Esdeğer Sığa -

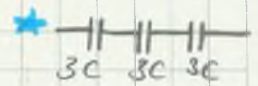


$$C_{es} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

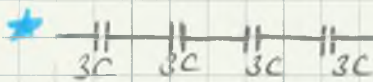
$$= \frac{C_1 \cdot C_2}{C_1 + C_2}$$



$$C_{es} = 2C$$

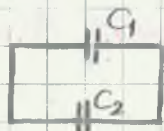


$$C_{es} = \frac{3C}{3} = C$$

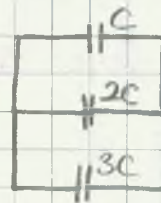


$$C_{es} = \frac{3C}{4}$$

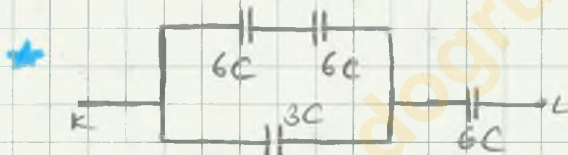
Paralel :



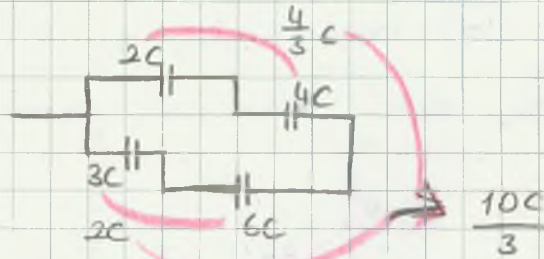
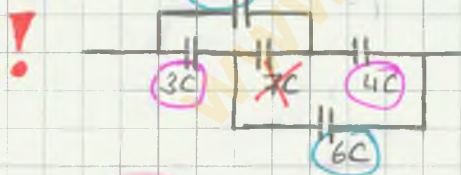
$$C_{es} = C_1 + C_2$$



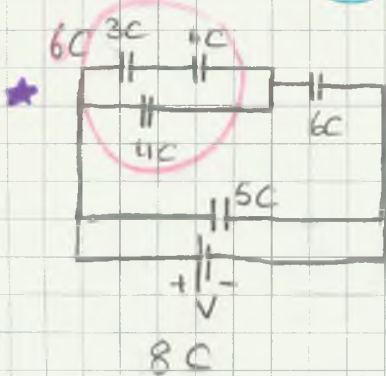
$$C_{es} = 6C$$



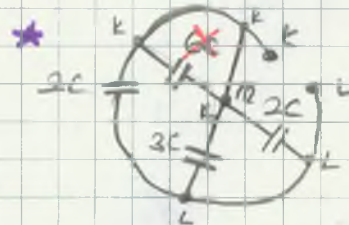
$$C_{es} = 3C$$



$$\frac{10C}{3}$$

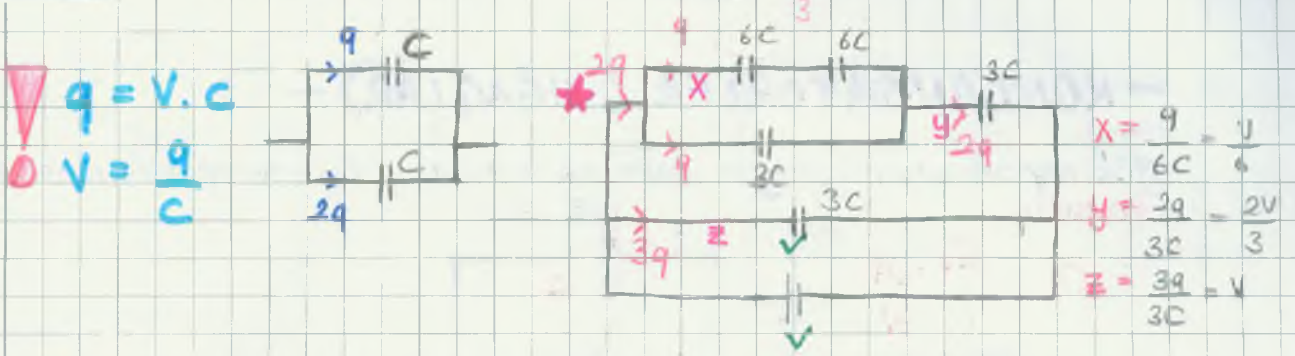


$$8C$$



$$3C + 2C + 2C = 7C$$





**NOT!** Bir kondansatöre üreteç bağlı ise potansiyeli, üreteç bağlı değilse üç miktarı değişmez.

**- Kondansatörlerde Enerji -**

$$E = \frac{1}{2} C V^2 \quad \left( V = \frac{q}{C} \right)$$

$$= \frac{1}{2} C \frac{q^2}{C^2}$$

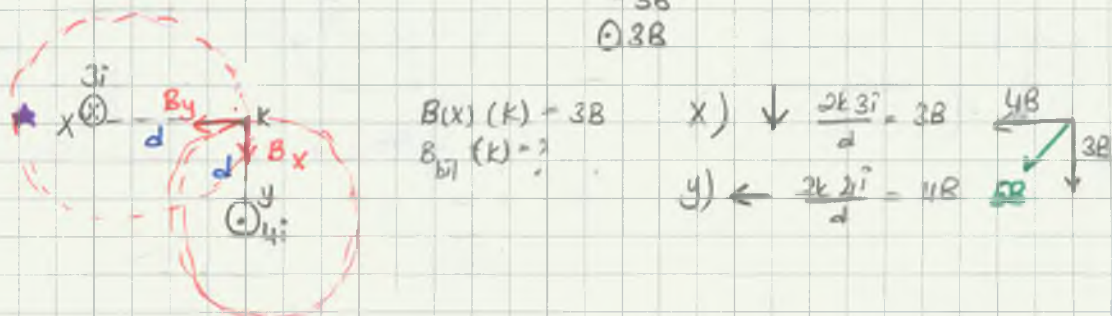
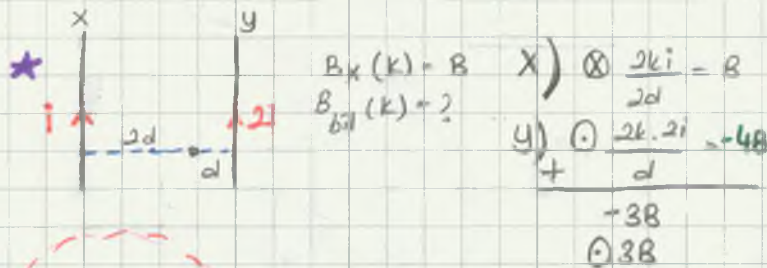
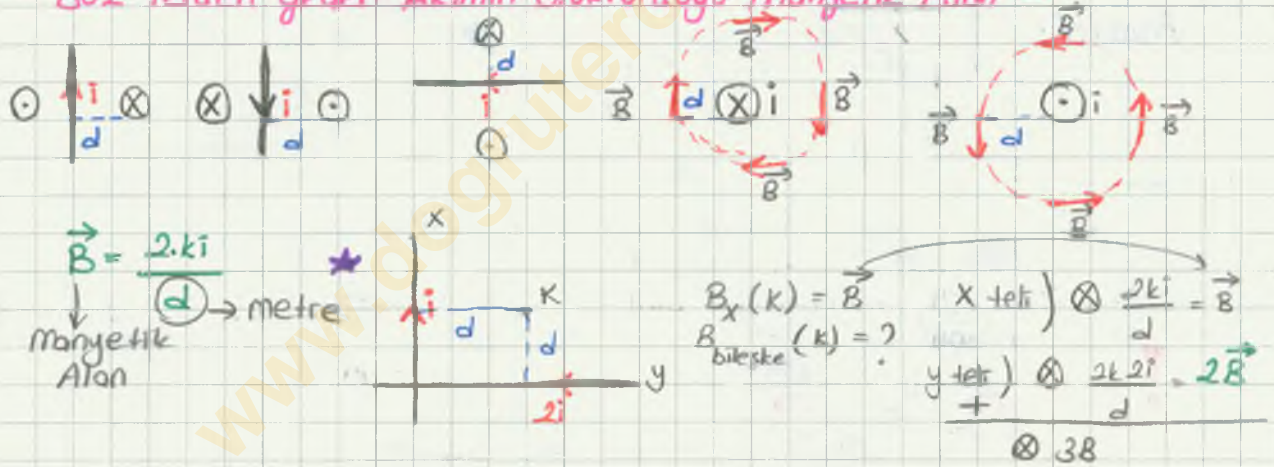
$$E = \frac{q^2}{2C}$$

$$E = \frac{1}{2} C V^2$$

$$E = \frac{1}{2} \cdot \frac{q}{V} \cdot V^2 \quad E = \frac{q \cdot V}{2}$$

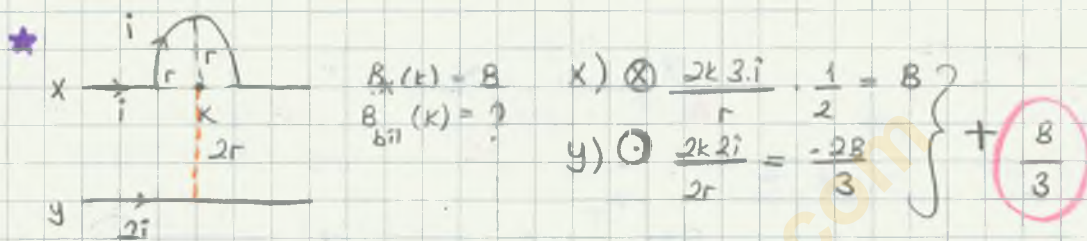
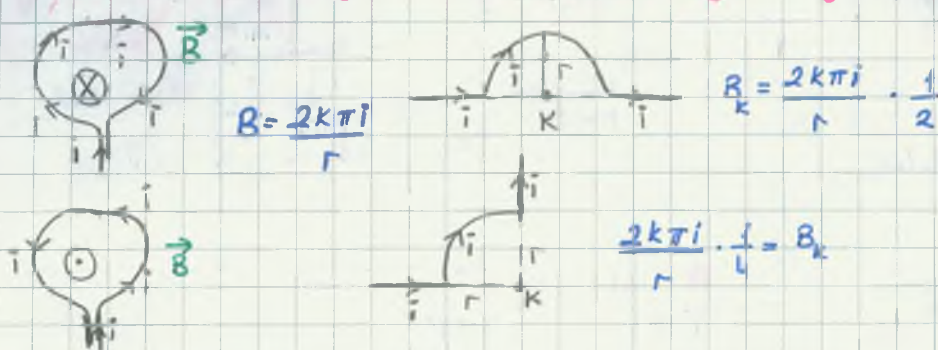
**- MANYETİZMA -**

**- Düz Telde Geçen Akımın Oluşturduğu Manyetik Alan -**

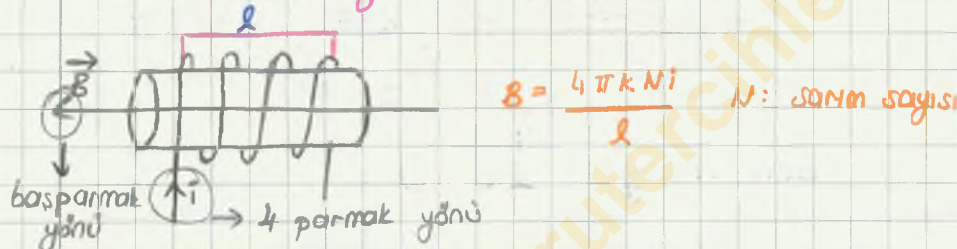




- Dairesel Telden Gezen Akımın Oluşturduğu Manyetik Alan -

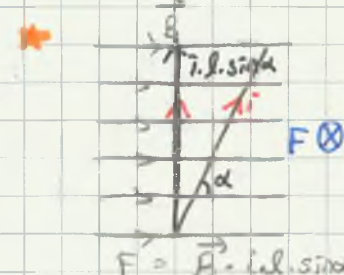
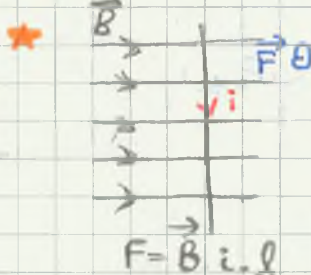
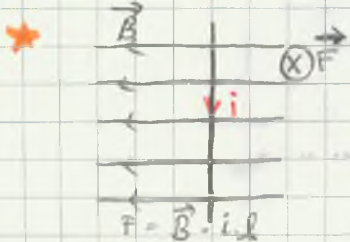
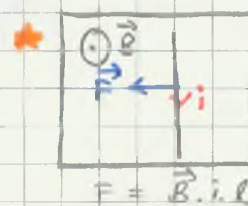
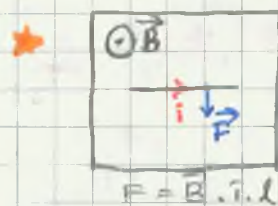
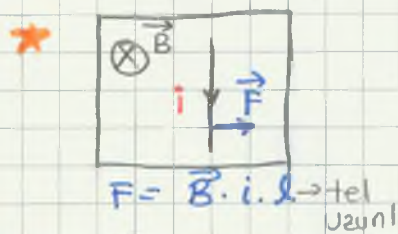


- Bobinin Manyetik Alanı -

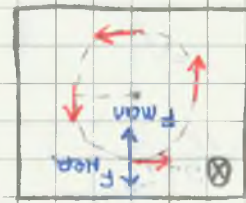


- Manyetik Kuvvet -

Manyetik kuvvetin oluşabilmesi için üzerinden akım geçen bir telin manyetik alan içerisinde bulunması gerekmektedir. Bu tel üzerine etkiyen manyetik kuvvetin yönü sağ el kuralıyla bulunur. Kurala göre; 4 parmak manyetik alanı, bas parmak akımı, avuç içi manyetik kuvvetin yönünü gösterir.

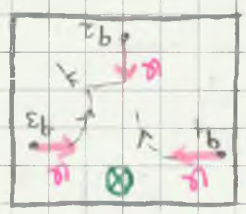
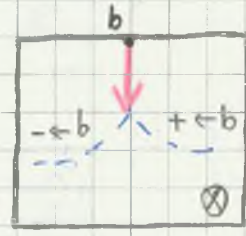




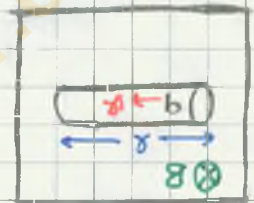


$F_{\text{Mitt}} = F_{\text{Herk}}$   
 $q \cdot B = \frac{r}{m \cdot v}$

$r = \frac{m \cdot v}{q \cdot B} = \frac{p}{q \cdot B}$



$q (+) \Rightarrow F = \text{Aussagen}$   
 $q (-) \Rightarrow F = \text{Anfangs}$



$F = B \cdot I \cdot l$   
 $l = \frac{F}{q}$   
 $q \cdot l = F$

format: B  
 Bos: U

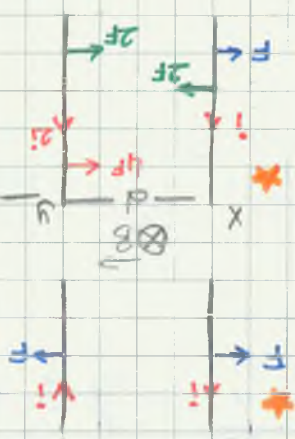
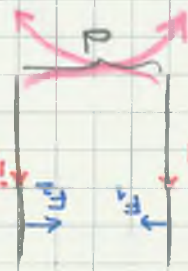
$B \cdot \frac{F}{q} \cdot l = F$   
 $F = q \cdot U \cdot B$

- Parallele Ebenen magnetische Kräfte

$y > z > x$   
 $x = F$   
 $y = 2F$   
 $z = 5F$

$|F_1| = |F_2|$

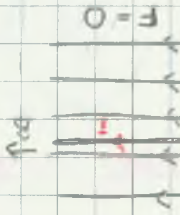
$F_1 = \frac{d}{2r_1} \cdot I$   
 $F_2 = \frac{d}{2r_2} \cdot I$   
 $\frac{d}{2r_1} \cdot I = \frac{d}{2r_2} \cdot I$   
 $r_1 = r_2$



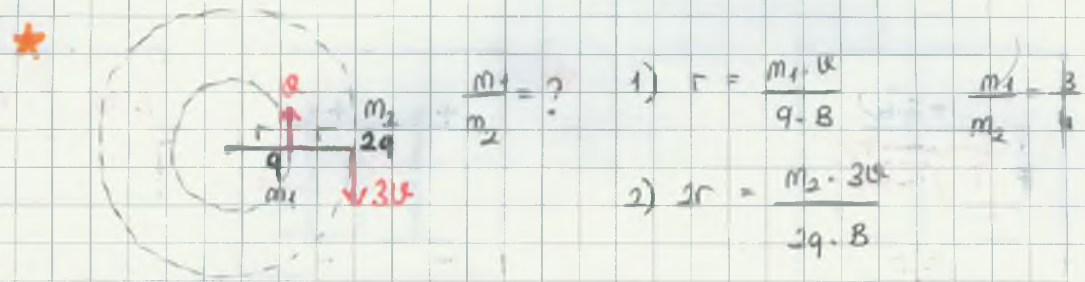
$x - y = \frac{d}{2r} \cdot I = 2F$   
 $x - z = \frac{d}{2r} \cdot I = F$

X, Y und Z teilweise oder  
 oder viele Kräfte

$F = B \cdot I \cdot d$

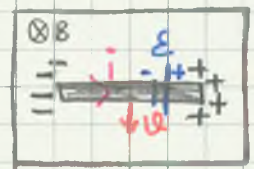




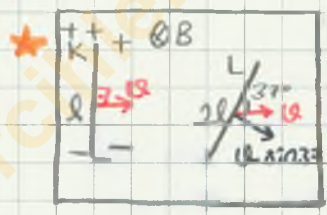


$r = \frac{m \cdot g}{q \cdot B}$        $r = \frac{m \cdot 2\pi r}{T \cdot q \cdot B}$        $T = \frac{f}{f}$   
 $\omega = \frac{2\pi r}{T}$        $T = \frac{2\pi m}{q \cdot B}$        $f = \frac{q \cdot B}{2\pi m}$   
 (T) Periyot  
 1 tur için geçen süre

**- Faraday Yasası -**

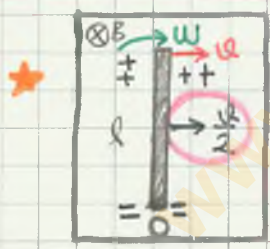


$\epsilon = B \cdot v \cdot l$

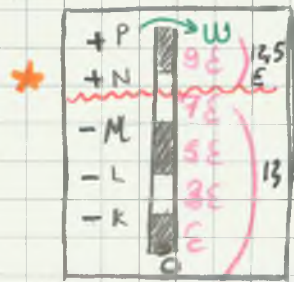


$\epsilon_k = B \cdot v \cdot l$   
 $\epsilon_L = B \cdot v \cdot \sin 37^\circ \cdot 2l$

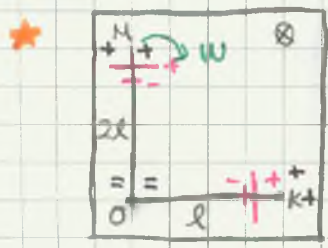
4 parmak : B  
 Avuç içi : v  
 Bas Parmak : (+)



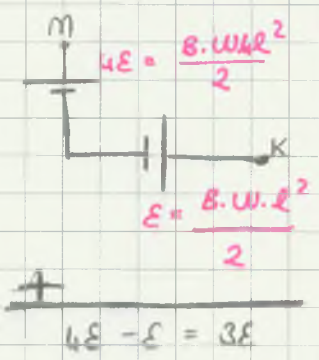
$\epsilon = B \cdot \frac{v}{2} \cdot l$   
 ( $v = w \cdot l$ )  
 $\epsilon = \frac{B \cdot w \cdot l^2}{2}$



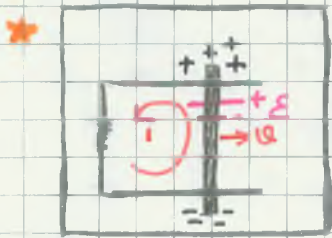
$\epsilon_{ok} = \frac{B \cdot w \cdot l^2}{2} = \epsilon$       3E  
 $\epsilon_{ol} = \frac{B \cdot w \cdot l^2}{2} = 4\epsilon$       5E  
 $\epsilon_{ok} = \frac{B \cdot w \cdot 9l^2}{2} = 9\epsilon$       7E  
 $\epsilon_{ol} = \frac{B \cdot w \cdot 16l^2}{2} = 16\epsilon$       9E  
 1)  $\epsilon_{ok} = \epsilon$  ise  $\epsilon_{pk} = ?$        $\epsilon_{op} = \frac{B \cdot w \cdot 25l^2}{2} = 25\epsilon$   
 2) Harflerin bulunduğu noktaların yük işaretleri?



$\epsilon_{ok} = \epsilon$  ise  
 $\epsilon_{kn} = ?$







$$\epsilon = B \cdot v \cdot l$$

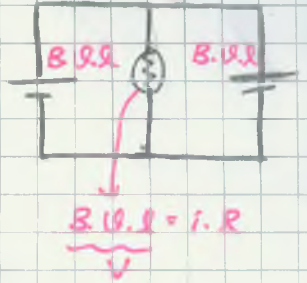
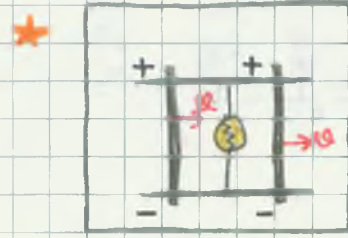
$$\epsilon = i \cdot R$$



$$V = i \cdot R$$

$$\epsilon = i \cdot R$$

$$B \cdot v \cdot l = i \cdot R$$



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