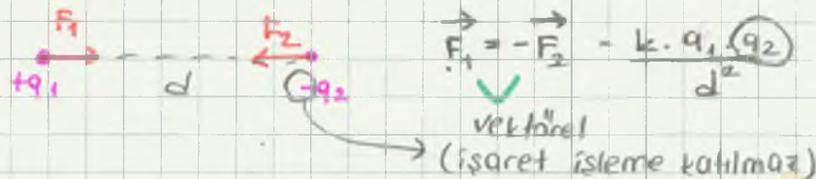
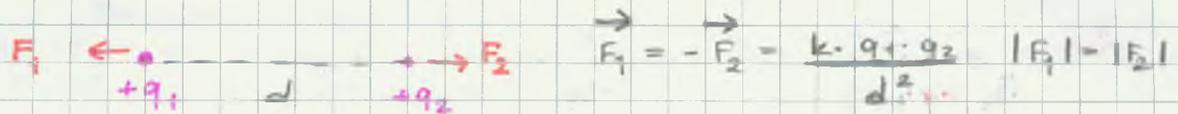
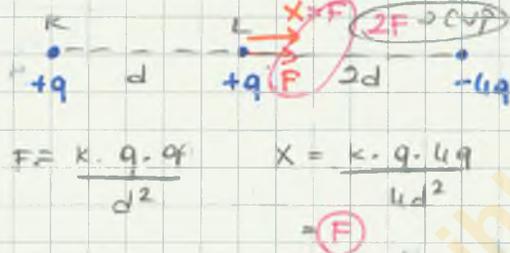


- ELEKTRİK -

- Elektriksel Kuvvet - (Coulomb Kuvveti)



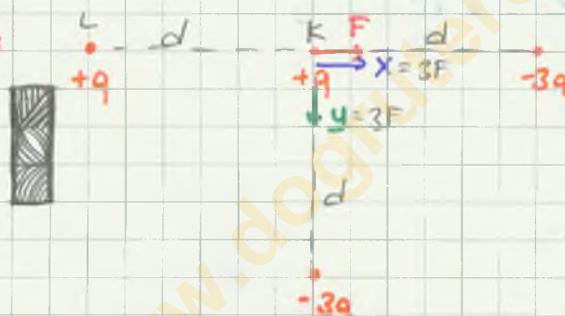
Örnek:



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

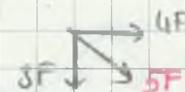
$\frac{k \cdot q \cdot q}{d^2} = F$

Örnek:



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

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



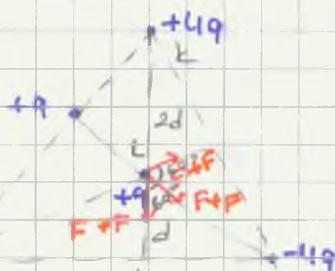
Örnek:



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



Örnek:

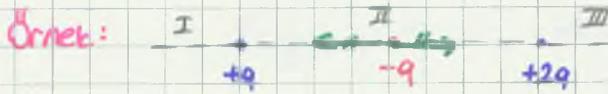


K'nın L'ye uyg. F ise L'deki bileşke?



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

$\frac{3500 \cdot 20}{15}$



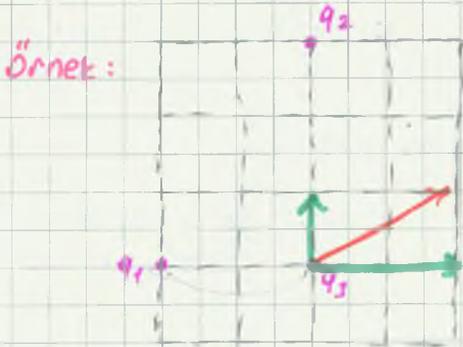
Örnek: q yüklü cisim neye kapırsa dengede kalır?

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



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

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

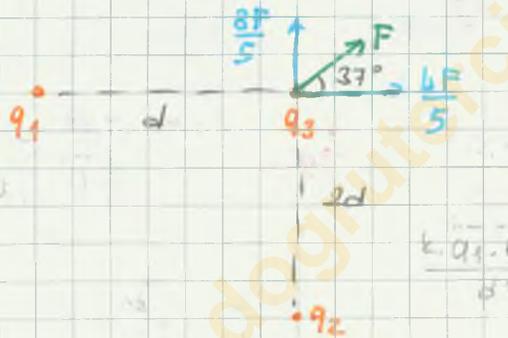


$$\frac{q_1}{q_2} = ? \quad \frac{F_1}{F_2} = \frac{k \cdot q_1 \cdot q_3}{4} = 2$$

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

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

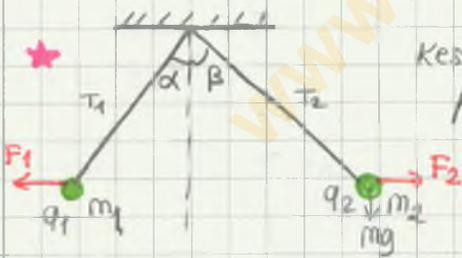
Örnek:



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

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

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



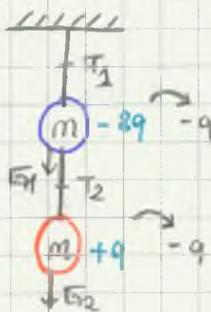
Kesin ifadeler: 1- q_1 ve q_2 aynı işaretli
 $\beta > \alpha \Rightarrow$

2- $|F_1| = |F_2|$

3- $m_1 > m_2$

4- $T_1 > T_2$

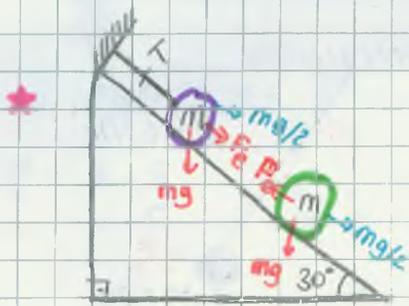
★



Kütleler birbirlerine dokundurulup aynı yerlere asılırsa;

T_1
Değişmez
 \downarrow
 $F_1 + F_2$ dir
her zaman





bergede: T kor. mg ?

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

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

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

- Elektrik Alan - (\vec{E})

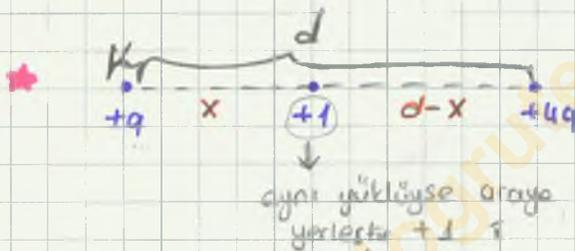


$+q$ d \vec{E}

$$E_k = ? = \vec{E}_k = \frac{k \cdot q}{d^2}$$

$-q$ d \vec{E}

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



K dan kaç d uzakta elek. alan 0 dir?

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

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

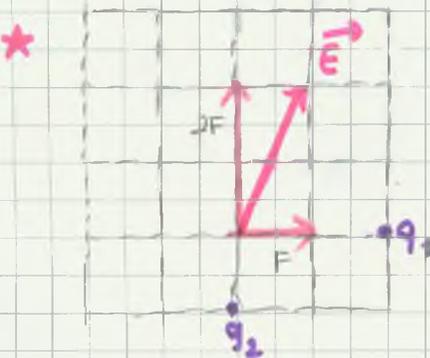


$$F_k = \frac{k \cdot q}{d^2}$$

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

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

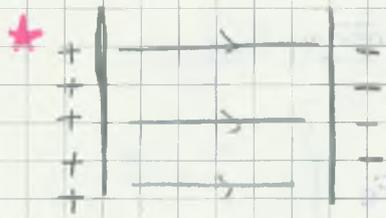
← Eskenar için



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

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

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



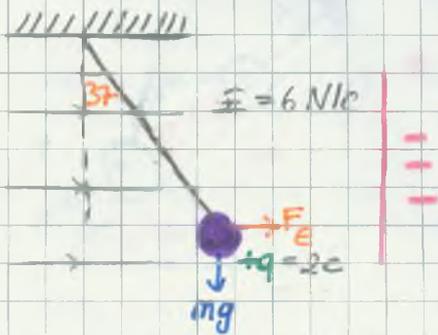
$$F = \frac{k \cdot q_1 \cdot q_2}{d^2}$$

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

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

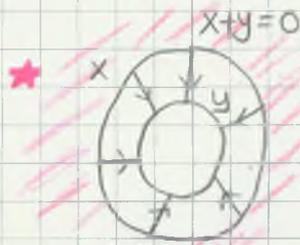
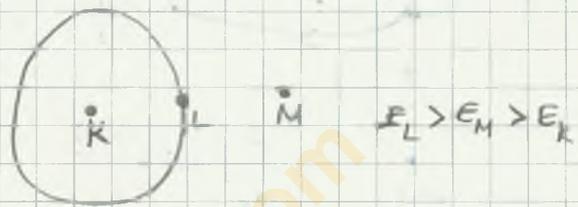
$$N = C \cdot \vec{E}$$

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



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

$$m = 1.6$$

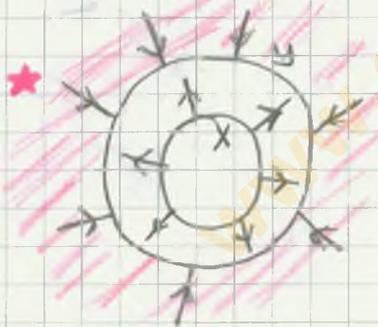
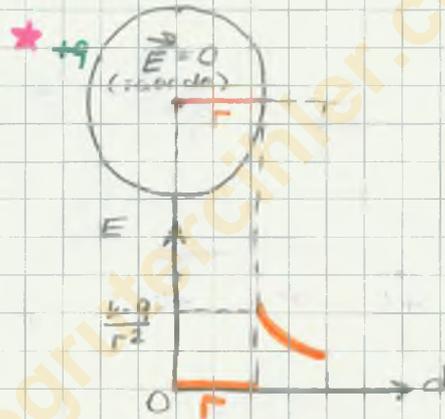


$$X = (+)$$

$$Y = (-)$$

$$X + Y = 0$$

$$q_x = q_y$$

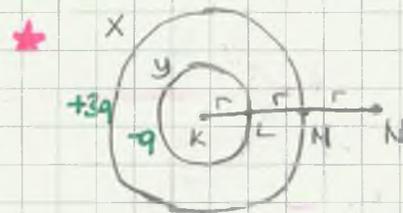


$$X = (+)$$

$$Y = (-)$$

$$X + Y = (-)$$

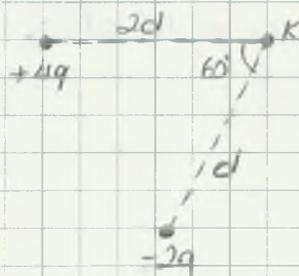
$$q_y > q_x$$



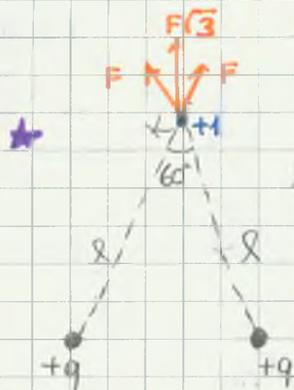
	X	Y	
K	0	0	
L	0	$\frac{k \cdot q}{r^2}$	
M	$\frac{k \cdot 3q}{4r^2}$	$\frac{k \cdot q}{4r^2}$	$\frac{k \cdot 2q}{4r^2}$
N	$\frac{k \cdot 3q}{9r^2}$	$\frac{k \cdot q}{9r^2}$	$\frac{k \cdot 2q}{9r^2}$

- 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 küçülmüşürse E ve V nasıl değişir?

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

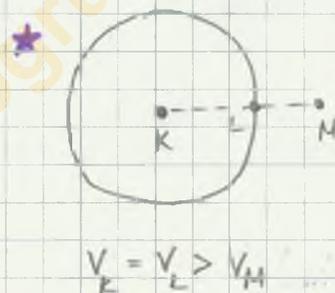
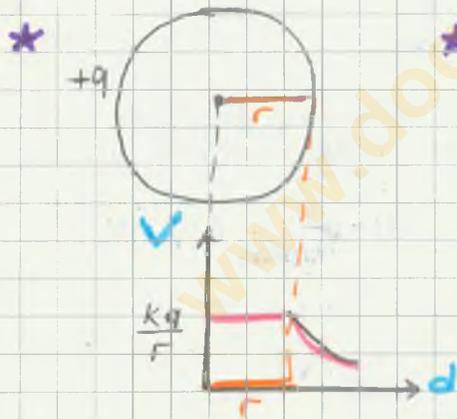
$$E \uparrow$$



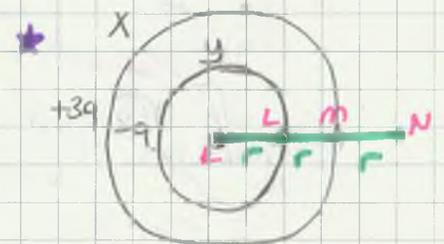
+q nun K'da oluşturduğu pot. V ise K'daki toplam potansiyel;

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

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



$$V_K = V_L > V_M$$



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

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

	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	$\frac{k \cdot 3q}{3r}$	$\frac{k \cdot -q}{-2r} = \frac{k \cdot 2q}{3r}$

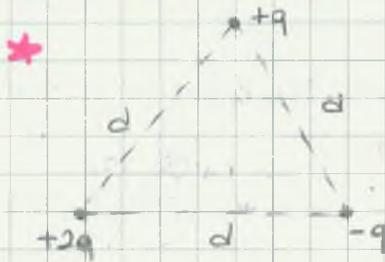
Elektriksel Potansiyel Enerji (SKALER)

Skaler büyüklüktür. İsoeteller işleme dahil edilir

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

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

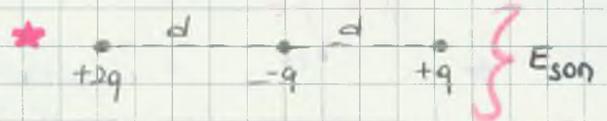
} $\Delta V \cdot q = E$



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?

$İş = \Delta E$ (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?

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

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

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

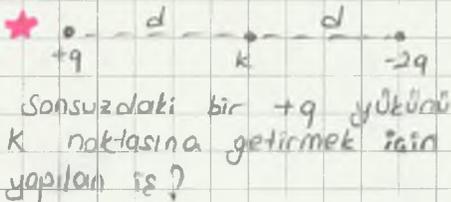
$$= q \left(\frac{k \cdot q}{2d} - \frac{k \cdot q}{d} \right)$$



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

$$W = q_{taşınan} \cdot (V_K - V_L)$$

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



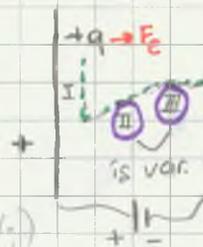
Sonsuzdaki bir $+q$ yükünü K noktasına getirmek için yapılan iş?

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

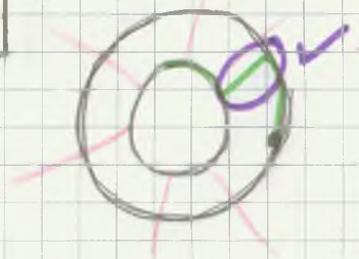
$$= q \cdot (V_K - \infty)$$

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

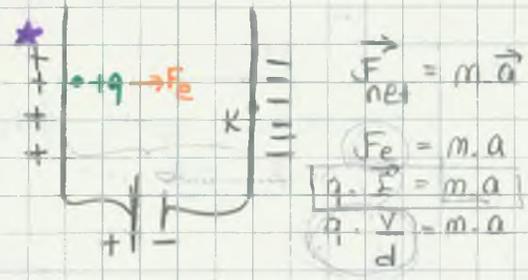
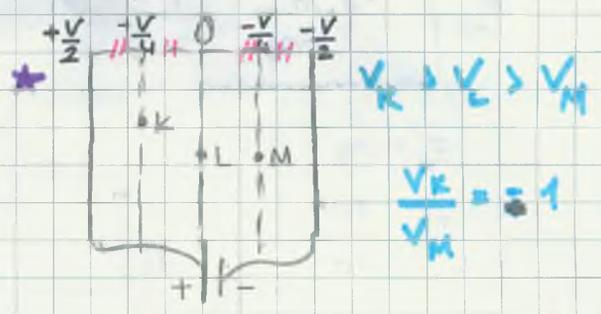
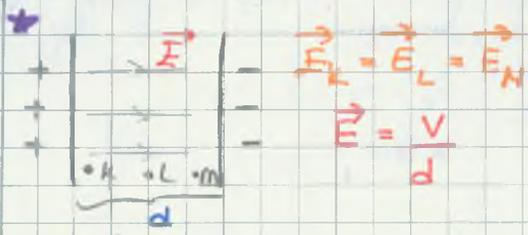
V_K



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



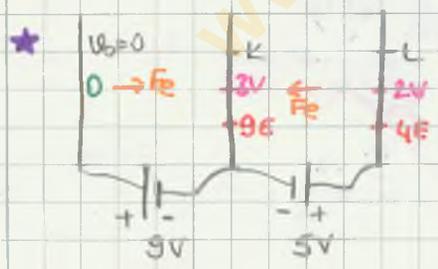
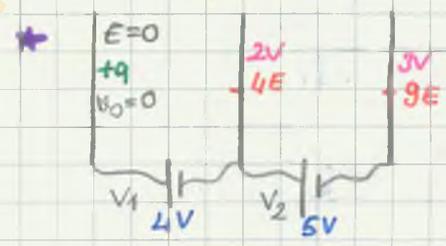
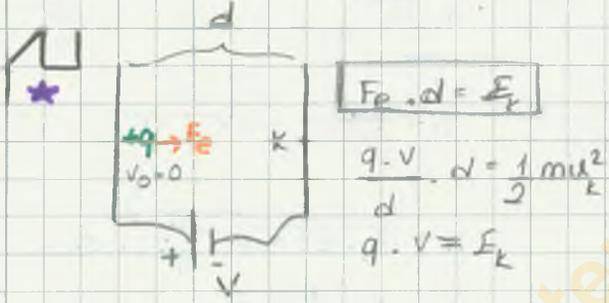
- Paralel Levhalar -



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

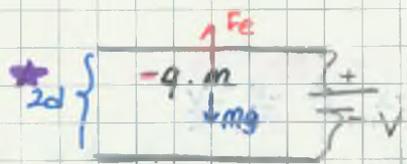
$x = \frac{1}{2} a t^2$ $x = \frac{1}{2} \frac{q \cdot V}{d \cdot m} t^2$

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



$\frac{V_1}{V_2} = \frac{1}{2}$ $\frac{V_1}{V_2} = \frac{1}{2}$

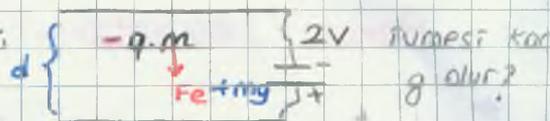
$F_1 \cdot d - F_2 \cdot x = 0$
 $\frac{q \cdot V_1}{d} \cdot d - \frac{q \cdot V_2}{2x} \cdot x = 0$



$$F_e = mg$$

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

Dengende ise :



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

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

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

$$5g = a$$



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

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

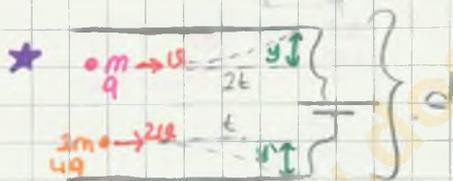


$$\frac{q \cdot V_1}{d_1} \cdot d_1 = \frac{1}{2} m v_k^2 \quad v_k = \sqrt{\frac{2qV_1}{m}}$$

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

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

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

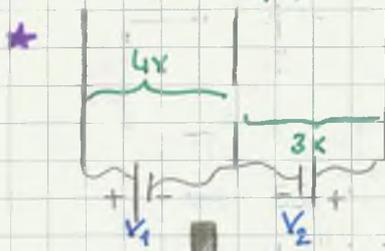


y' kaç y' dir?

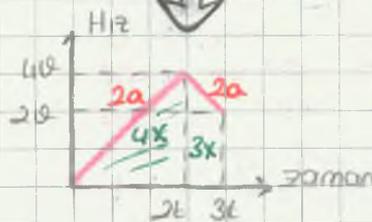
$$y = \frac{1}{2} \frac{q \cdot V}{d \cdot m} \cdot 4t^2$$

$$y' = \frac{2qV}{2d \cdot m}$$

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

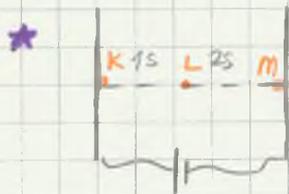


$$\frac{V_1}{V_2} = ?$$

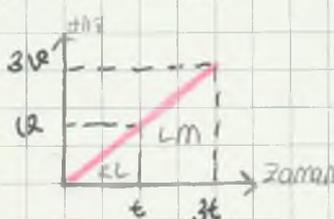


$$2a = \frac{q \cdot V_1}{4x \cdot m}$$

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



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



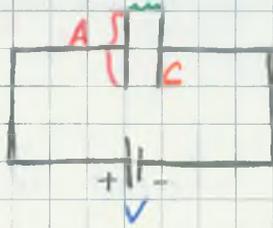
$$KL = \frac{a}{2} \quad LM = 2a$$

- KONDANSATÖRLER (SİĞAĞLAR) -

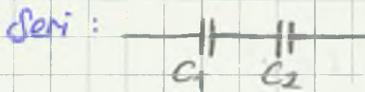
yük depolamaya yarayan devre elemanıdır "C" ile gösterilir. Birimi Farad'tır.

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

↓
dielektrik katsayısı



- Esdeğer Sığa -

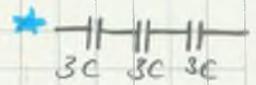


$$C_{es} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

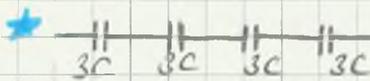
$$= \frac{C_1 \cdot C_2}{C_1 + C_2}$$



$$C_{es} = 2C$$

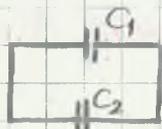


$$C_{es} = \frac{3C}{3} = C$$

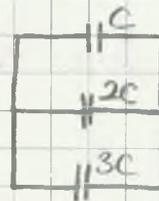


$$C_{es} = \frac{3C}{4}$$

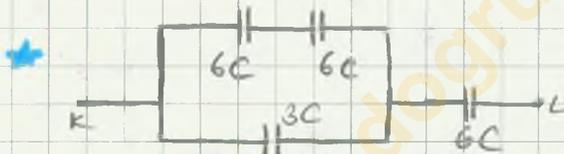
Paralel :



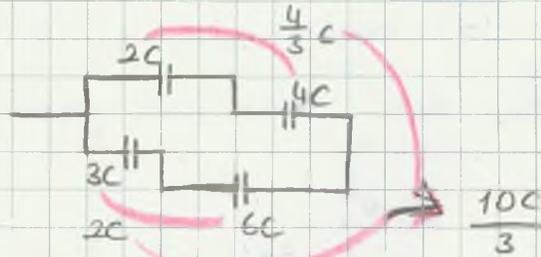
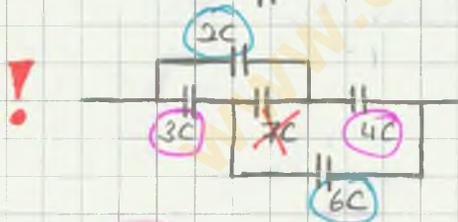
$$C_{es} = C_1 + C_2$$



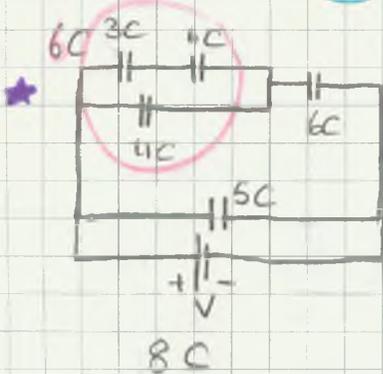
$$C_{es} = 6C$$



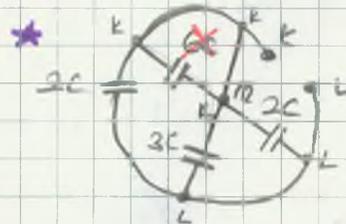
$$C_{es} = 3C$$



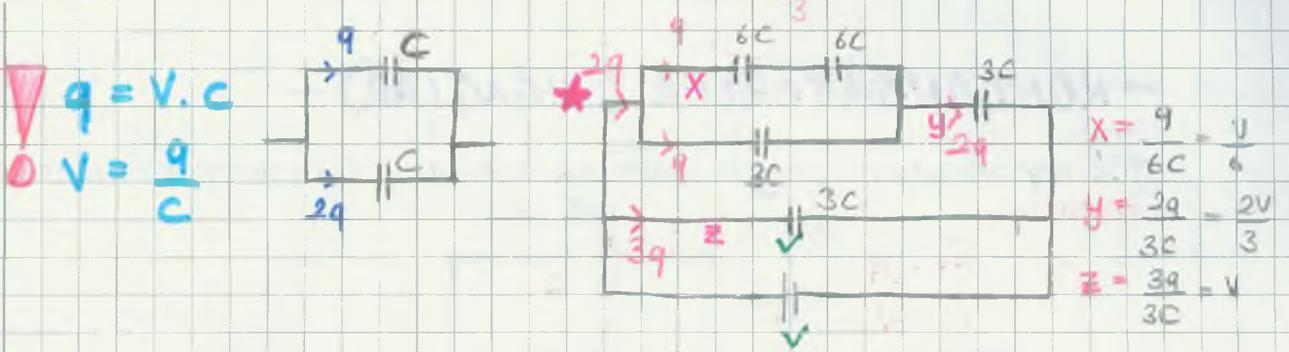
$$\frac{10C}{3}$$



$$8C$$



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



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

- Kondansatörlerde Enerji -

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

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

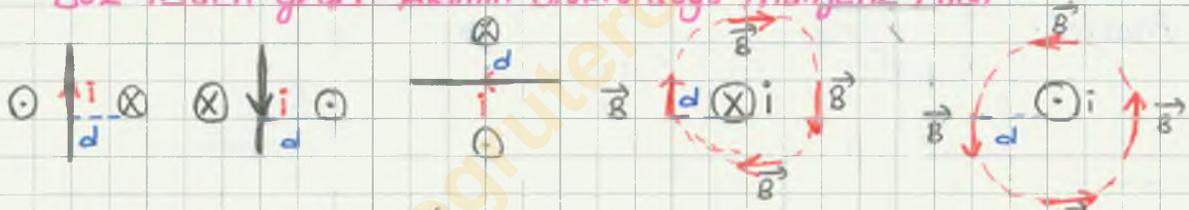
$$E = \frac{q^2}{2C}$$

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

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

- MANYETİZMA -

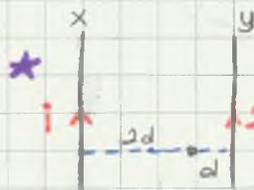
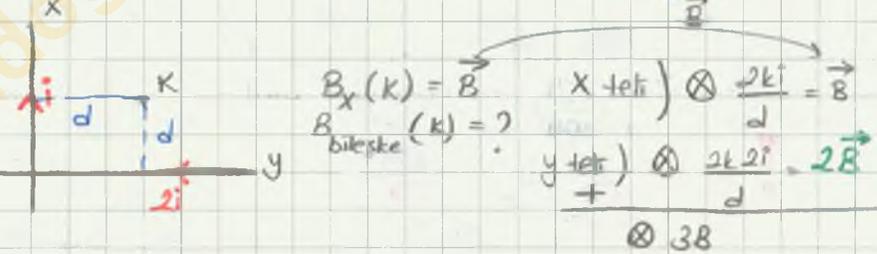
- Düz Telde Geçen Akımın Oluşturduğu Manyetik Alan -



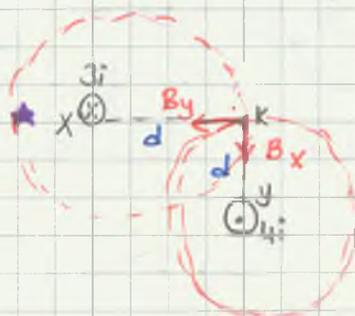
$\vec{B} = \frac{2 \cdot k i}{d}$

↓
Manyetik Alan

⊙ → metre

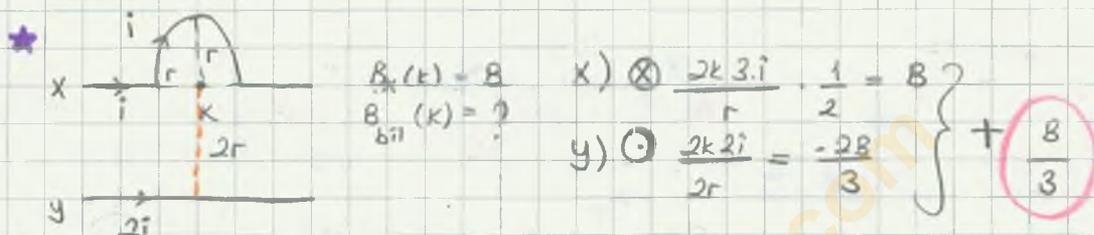
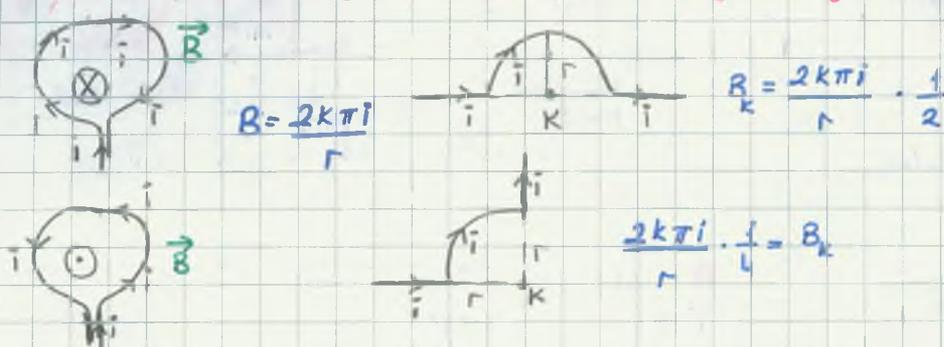


$B_x(k) = B$
 $B_{bt}(k) = ?$
 $B_{bt}(k) = ?$
 $B_{bt}(k) = ?$

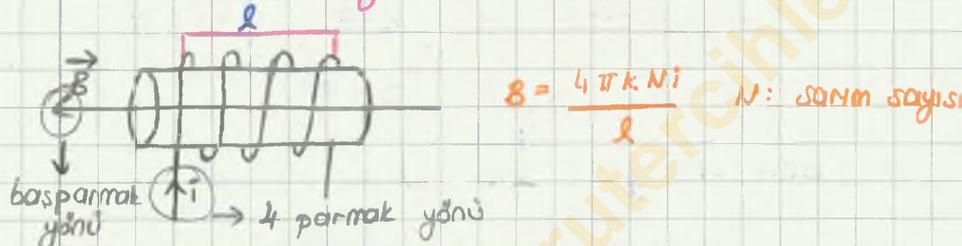


$B_x(k) = 3B$
 $B_{bt}(k) = ?$
 $B_{bt}(k) = ?$

- Dairesel Telden Gelen Akımın Oluşturduğu Manyetik Alan -

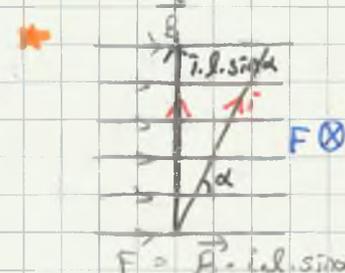
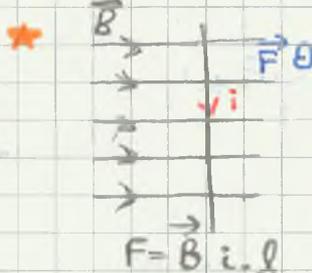
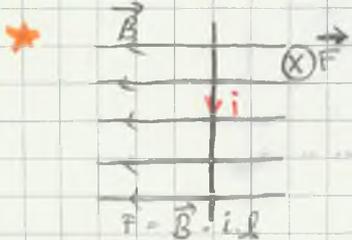
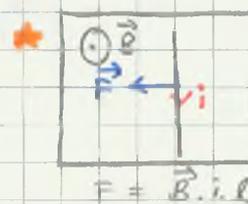
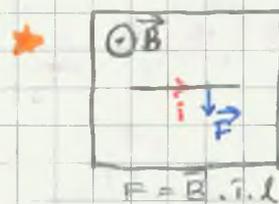
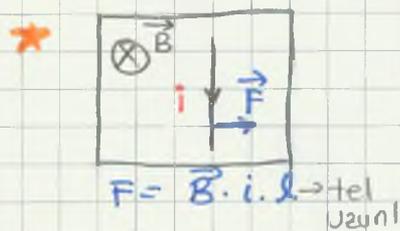


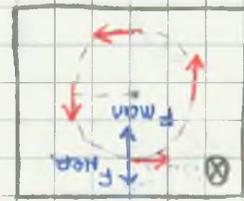
- Bobinin Manyetik Alanı -



- Manyetik Kuvvet -

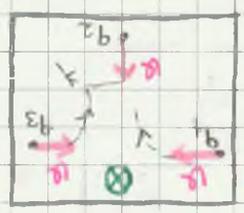
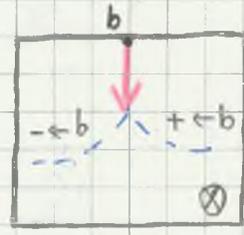
Manyetik kuvvetin oluşabilmesi için üzerinden akım geçen bir telin manyetik alan içerisinde bulunması gerekmektedir. Bu tel üzerine etkiyen manyetik kuvvetin yönü sağ el kuralıyla bulunur. Kurala göre; 4 parmak manyetik alanı, bas parmak akımı, avuç içi manyetik kuvvetin yönünü gösterir.



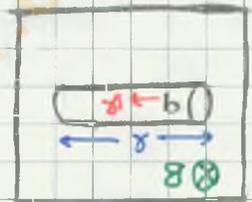


$F_{mean} = F_{Hier}$
 $q \cdot B = \frac{I}{\mu_0} \cdot \frac{2\pi r}{l}$

$r = \frac{M \cdot I}{p}$
 $q \cdot B = \frac{I}{\mu_0} \cdot \frac{2\pi r}{l}$



$q(+)$ \Rightarrow $F =$ Ausg. ist
 $q(-)$ \Rightarrow $F =$ Ausg. ist



$F = B \cdot I \cdot l$
 $q = \frac{I}{\mu_0} \cdot \frac{2\pi r}{l}$

4-pole: B
 2-pole: I

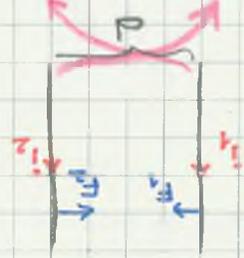
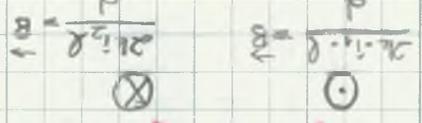
$F = q \cdot B$
 $q = \frac{I}{\mu_0} \cdot \frac{2\pi r}{l}$

- Paracarya Ethel eden Magnetik Kurvet -

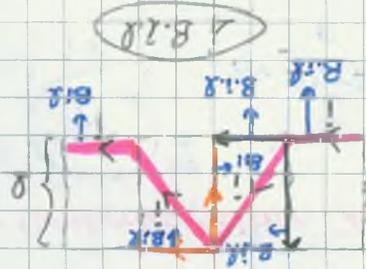
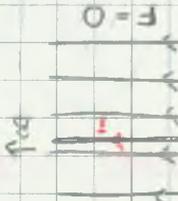
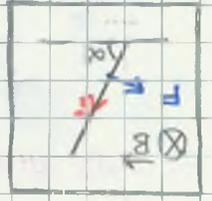
$y > z > x$
 $x = F$
 $y = 6F$
 $z = 5F$

$y - z = \frac{2I \cdot 2l}{\mu_0} = 4F$
 $x - z = \frac{2I \cdot l}{\mu_0} = 2F$
 $x - y = \frac{2I \cdot l}{\mu_0} = 2F$

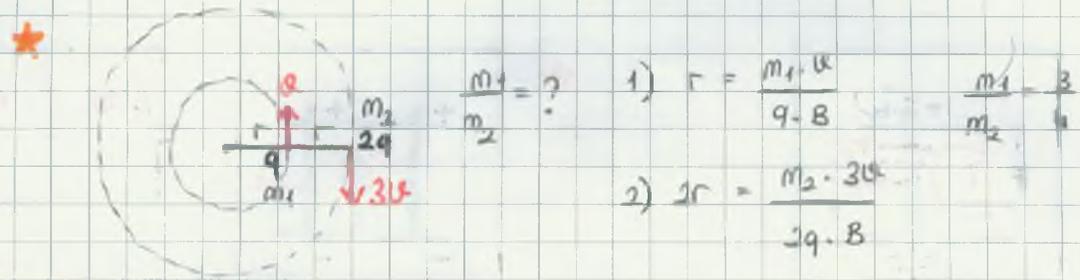
$|F_1| = |F_2|$
 $F_1 = \frac{d}{2\pi \cdot \frac{1}{2} \cdot r} \cdot I$
 $F_2 = \frac{d}{2\pi \cdot \frac{1}{2} \cdot r} \cdot I$



$F = B \cdot I \cdot d$

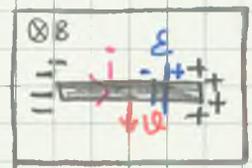


X u ue Z fellbrine ethel
 eden many. kuvvetler aras.
 istir?

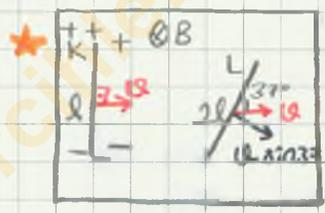


$r = \frac{m \cdot a}{q \cdot B}$ $r = \frac{m \cdot 2\pi r}{T \cdot q \cdot B}$ $T = \frac{f}{f}$
 $a = \frac{2\pi r}{T}$ $T = \frac{2\pi m}{q \cdot B}$ $f = \frac{q \cdot B}{2\pi m}$
 (T) Periyot
 1 tur için geçen süre

- Faraday Yasası -

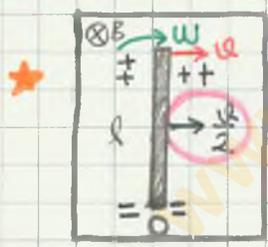


$\epsilon = B \cdot v \cdot l$

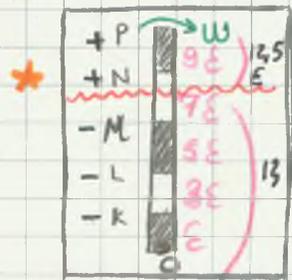


$\epsilon_k = B \cdot v \cdot l$
 $\epsilon_L = B \cdot v \cdot \sin 37^\circ \cdot 2l$

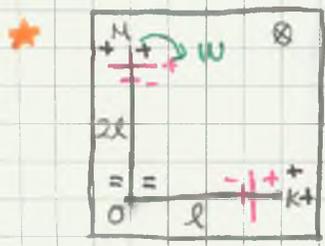
4 parmak : B
 Avuç içi : v
 Bas Parmak : (+)



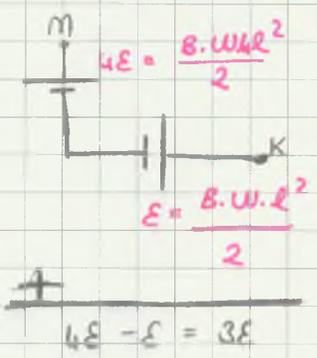
$\epsilon = B \cdot \frac{v}{2} \cdot l$
 (v = w · l)
 $\epsilon = \frac{B \cdot w \cdot l^2}{2}$

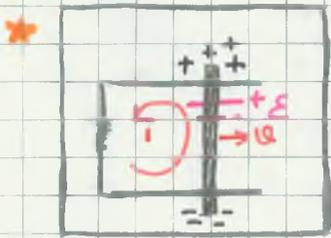


$\epsilon_{ok} = \frac{B \cdot w \cdot l^2}{2} = \epsilon$ 3ε
 $\epsilon_{ol} = \frac{B \cdot w \cdot l^2}{2} = 4\epsilon$ 5ε
 $\epsilon_{ok} = \frac{B \cdot w \cdot 9l^2}{2} = 9\epsilon$ 7ε
 $\epsilon_{ol} = \frac{B \cdot w \cdot 16l^2}{2} = 16\epsilon$ 9ε
 1) $\epsilon_{ok} = \epsilon$ ise $\epsilon_{pk}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



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





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

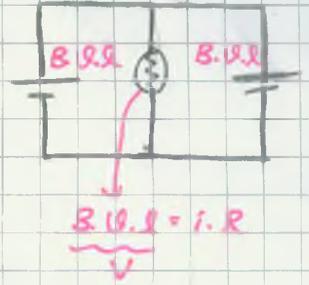
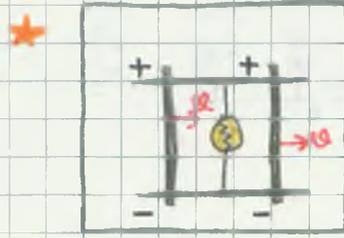
$$\epsilon = i \cdot R$$



$$V = i \cdot R$$

$$\epsilon = i \cdot R$$

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



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

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