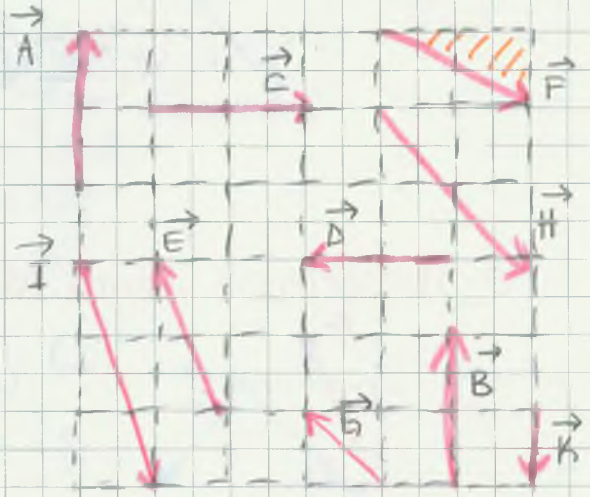


- VEKTÖRLER -

Vektörel	Skaler
1- Başlangıç noktası	1- Büyüklük
2- Doğrultu	2- Birim
3- Yönü	→ Hız
4- Sıddeti	→ Kütle
→ Hız	→ Alınan yol
→ Ağırlık ($m \cdot g$)	→ Enerji
→ Yer değiştirme	→ Güç
→ Kuvvet	→ Zaman
→ İvme	→ Basınç
→ Momentum	→ Akım
→ İtme	



$\vec{A} = \vec{B}$ (Eşit vektör)
Başlangıç noktası ve yeri farklı olabilir.

Zıt vektör $\begin{cases} \vec{C} = -\vec{D} \\ -\vec{C} = \vec{D} \end{cases}$ $|\vec{C}| = |\vec{D}|$
Büyüklük

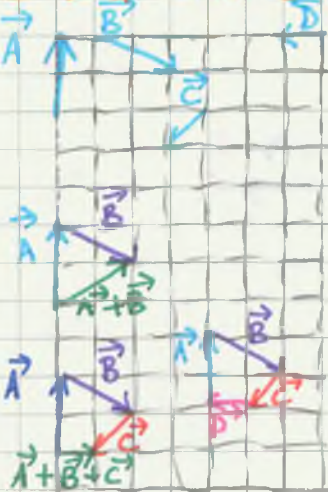
$|\vec{A}| = |\vec{D}| = |\vec{C}|$ $|\vec{E}| = |\vec{F}| = \sqrt{5}$

$|\vec{I}| = \sqrt{10}$ $\vec{H} = -2\vec{G}$ $|\vec{H}| = |2\vec{G}|$

$-2\vec{K} = \vec{B} = \vec{A}$ $|2\vec{K}| = |\vec{A}| = |\vec{D}| = |\vec{C}|$

- VEKTÖRLERDE TOPLAMA İŞLEMİ -

1- İÇİ, İÇİ EKLEME YÖNTEMİ

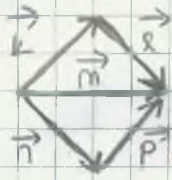


1- $\vec{A} + \vec{B} = (\vec{A} + \vec{B}) = \vec{C}$

2- $\vec{A} + \vec{B} + \vec{C} = (\vec{A} + \vec{B} + \vec{C}) = -\vec{D}$

3- $\vec{A} + \vec{B} + \vec{C} + \vec{D} = 0$

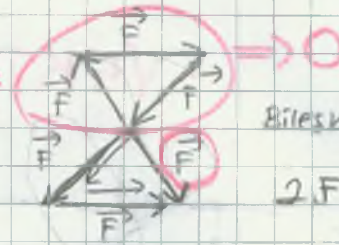
Örnek:



Bileşke = ?
 $\vec{k} + \vec{m} + \vec{n} + \vec{p} + \vec{l} = ?$

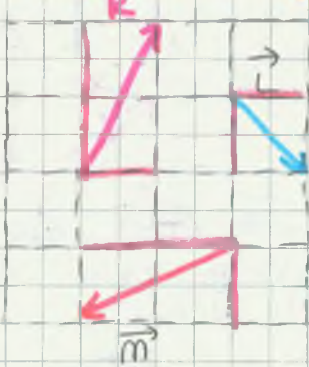
$3\vec{m}$

Örnek:



Bileşke = ?
 $2F$

2- Bileşenlerine Ayırma Yöntemi



1) $\vec{k} + \vec{l} + \vec{m}$

X Y

$\vec{k} \begin{Bmatrix} 1 \\ 2 \end{Bmatrix}$

$\vec{l} \begin{Bmatrix} 1 \\ -1 \end{Bmatrix}$

$+\vec{m} \begin{Bmatrix} -2 \\ -1 \end{Bmatrix}$

$\underline{\underline{R \quad 0 \quad 0}}$

(Bileşke)

2) $\vec{k} - \vec{l} = \vec{k} + (-\vec{l})$

K: 1, 2

-L: -1, +1

$+$
 $\underline{\underline{K-L: 0, 3}}$

3) $\vec{k} + \vec{l} - 2\vec{m}$

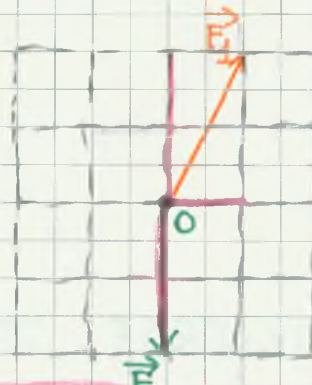
K: 1, 2

L: 1, -1

-2m: +4, +2

$+$
 $\underline{\underline{K+L-2m = +6, +3}}$

4)



1- Noktasal O cisim dengede oldu göre;
 2- // // sabit hızla hareket ettiğine göre F_3 nedir?

Dengede = sabit hız $\Rightarrow \vec{R} = 0$ olur

$F_1: 1, 2$

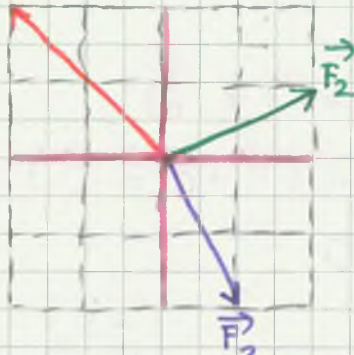
$F_2: 0, -2$

$F_3: x, y$

$\underline{\underline{R: 00}}$

F_3
 $(-1, 0)$

5-



Sekildeki kuvvetlerin dengeleyeni nedir?

$\vec{R} = 0$

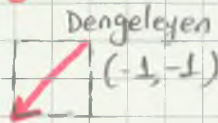
$F_1: -2, 2$

$F_2: 2, 1$

$F_3: 1, -2$

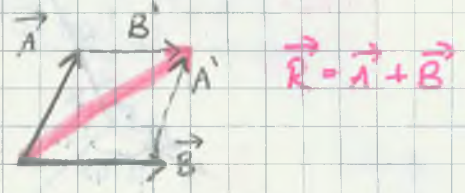
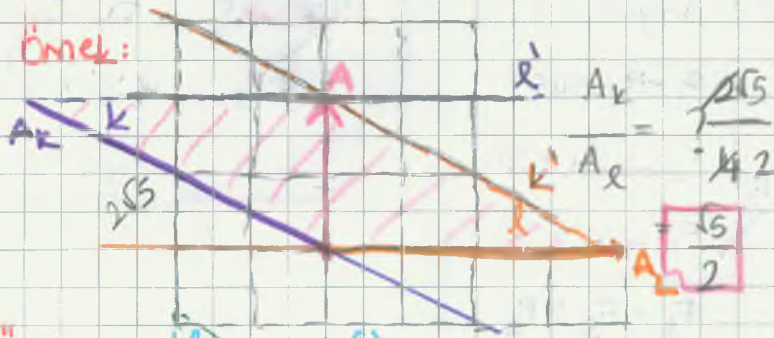
Dengeleyen: $-1, -1$

$+$
 $\underline{\underline{00}}$

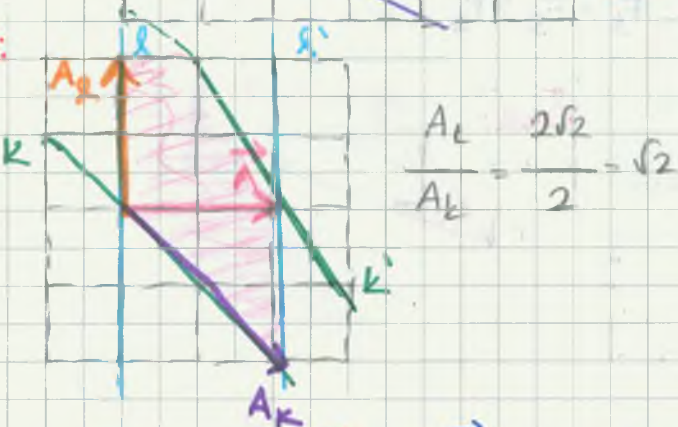


3) Paralel Kenar Yöntemi

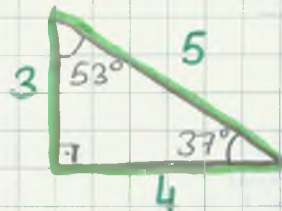
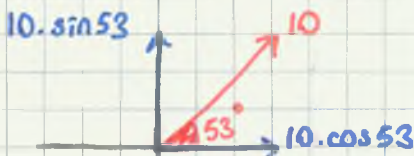
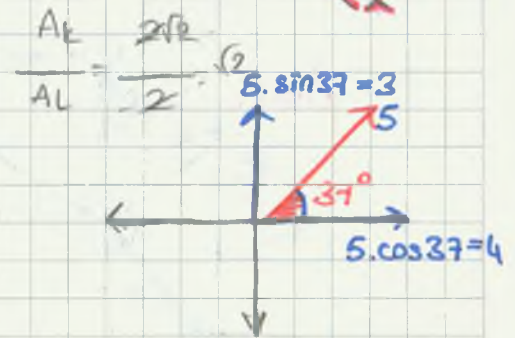
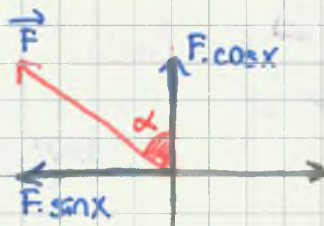
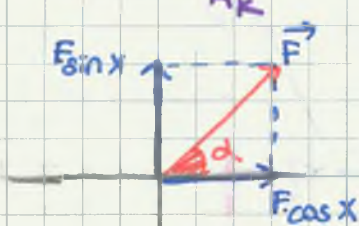
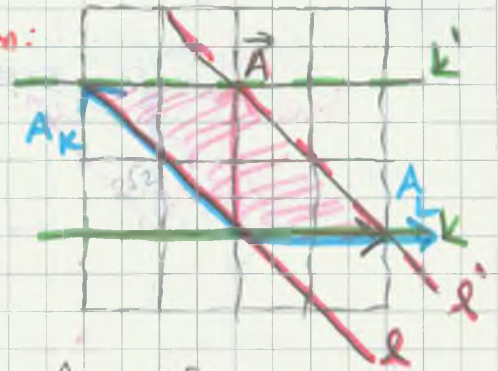
Örnek:



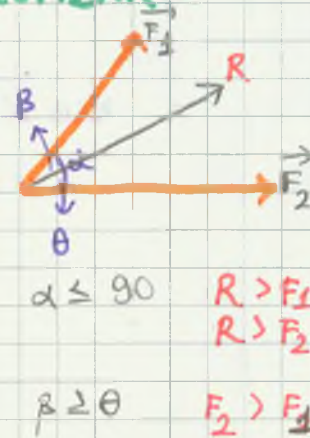
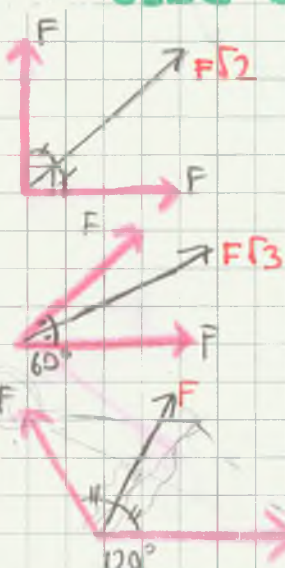
Örn:



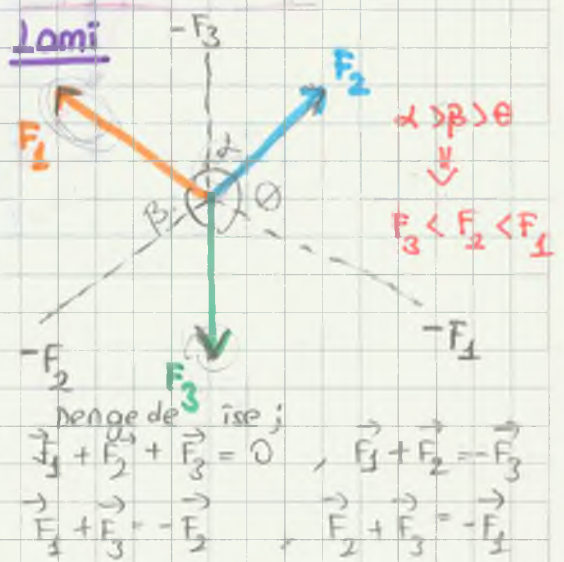
Örn:



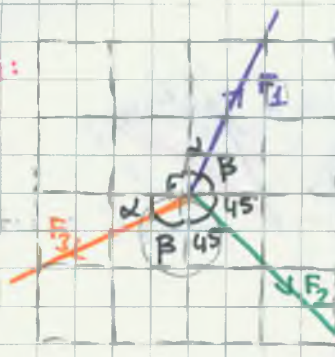
ÖZEL DURUMLAR



Lami



Örnek:



(Değerlerdir)

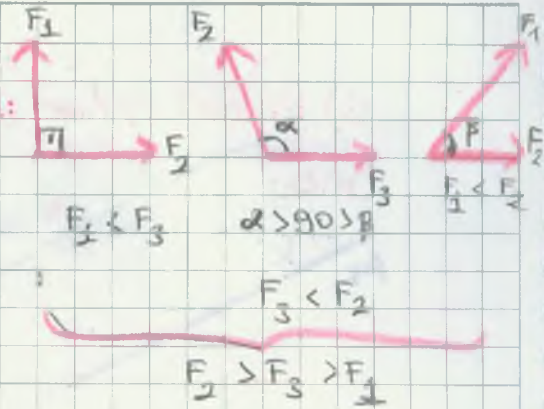
$$F_1 \rightarrow \beta + 45$$

$$F_2 \rightarrow 2\alpha + 90$$

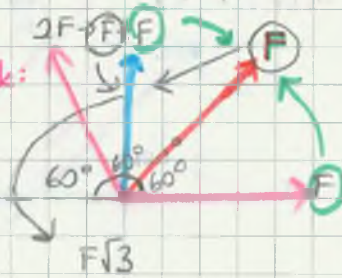
$$F_3 \rightarrow \beta + 45$$

$$F_1 = F_3 > F_2$$

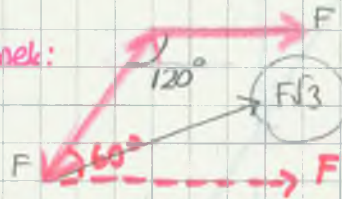
Örnek:



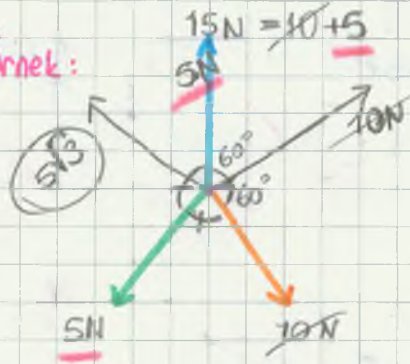
Örnek:



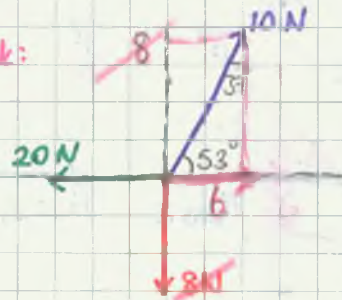
Örnek:



Örnek:

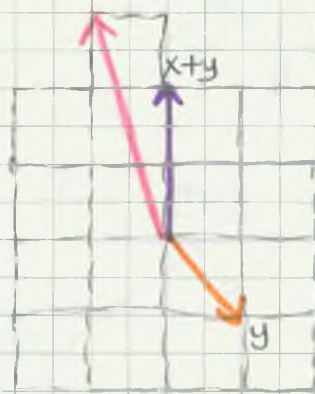


Örnek:



$$20 - 6 = 14$$

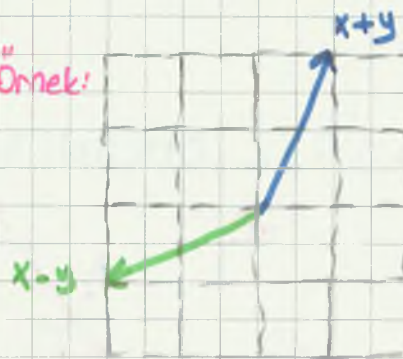
Örnek:



$$x = ?$$

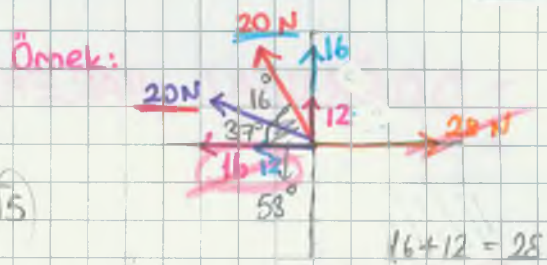
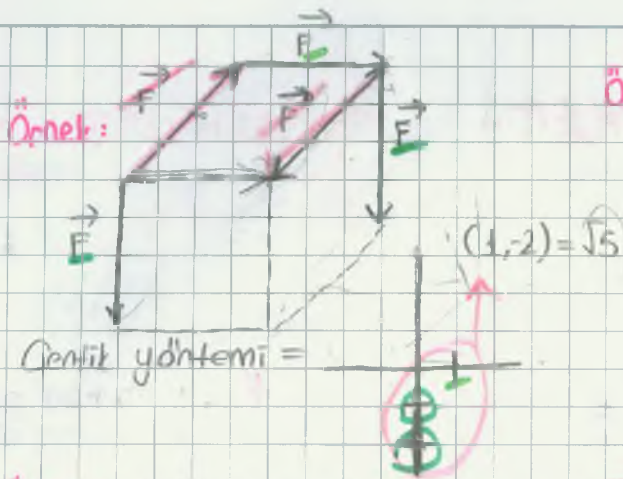
$$\begin{array}{r} x+y = 0,2 \\ -y = +1, -1 \\ \hline x = -1,3 \end{array}$$

Örnek:

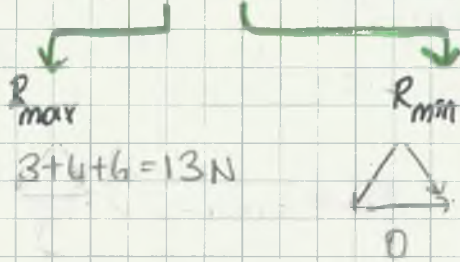


$$x = ?$$

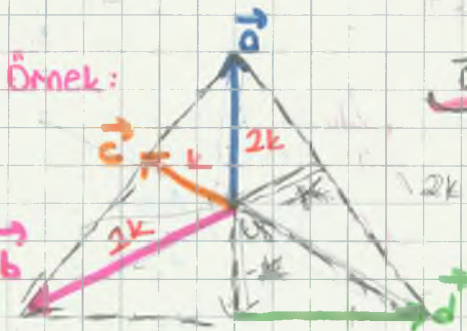
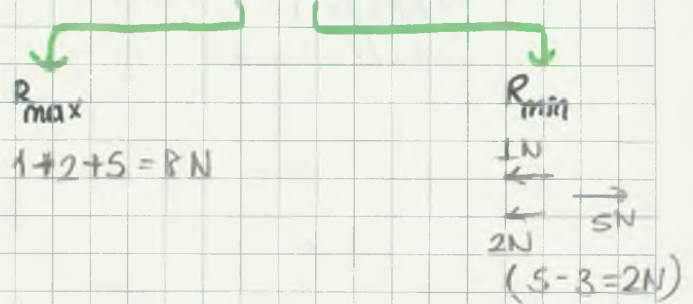
$$\begin{array}{r} x+y = 4,2 \\ x-y = -2, -1 \\ \hline 2x = -3,1 \\ x = -\frac{1}{2}, \frac{1}{2} \end{array}$$



Örnek: 3N, 4N ve 6N luk vektörlerin

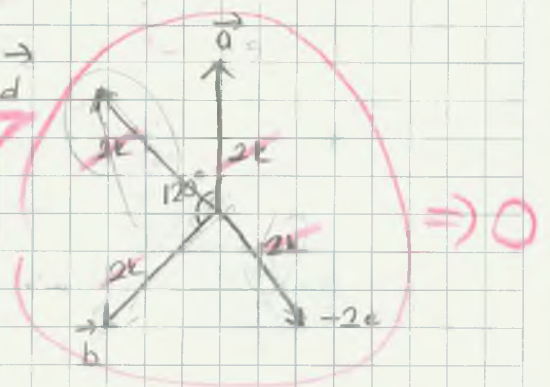


Örnek: 1N, 2N, 5N luk vektörlerin



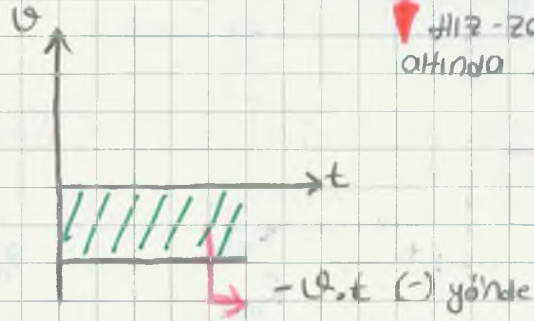
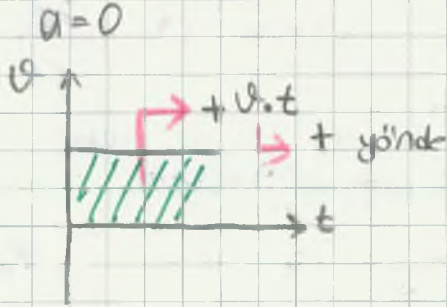
$$\vec{a} + \vec{b} - 2\vec{c} + \vec{d} = ? = \vec{d}$$

$2k - 2k$

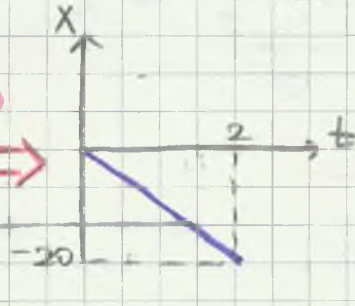
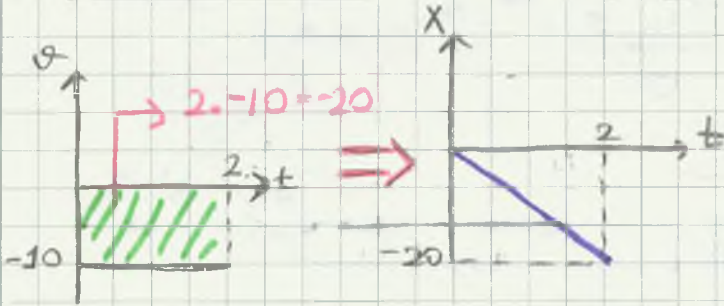
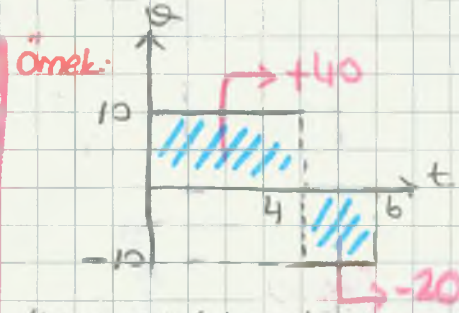
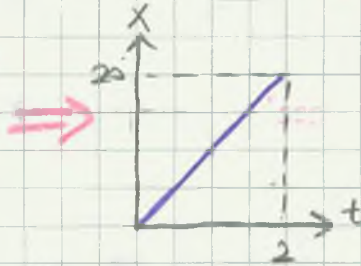
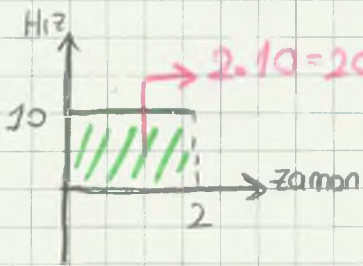


- DOĞRUSAL HAREKET -

- Sabit Hız -



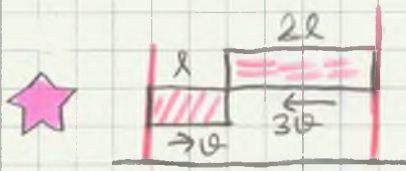
! Hız-zaman grafiği altında kalan alan; Δx



Alınan yol: (skaler) = 60 m: Δx
yer değiştirme (vektörel): 20 = Δx

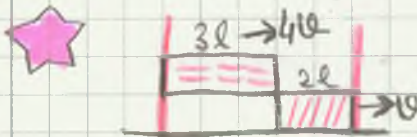
Ort. Sürat: $\frac{\Delta x}{t} = \frac{60}{6} \text{ m/s}$

Ort. Hız: $\frac{\Delta x}{\Delta t} = \frac{20}{6} \text{ m/s}$



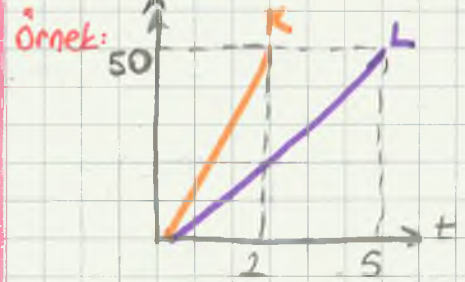
Birbirlerini tamamen geçmeleri için;

$$3l = 4v.t$$



Birbirlerini tamamen geçmeleri için;

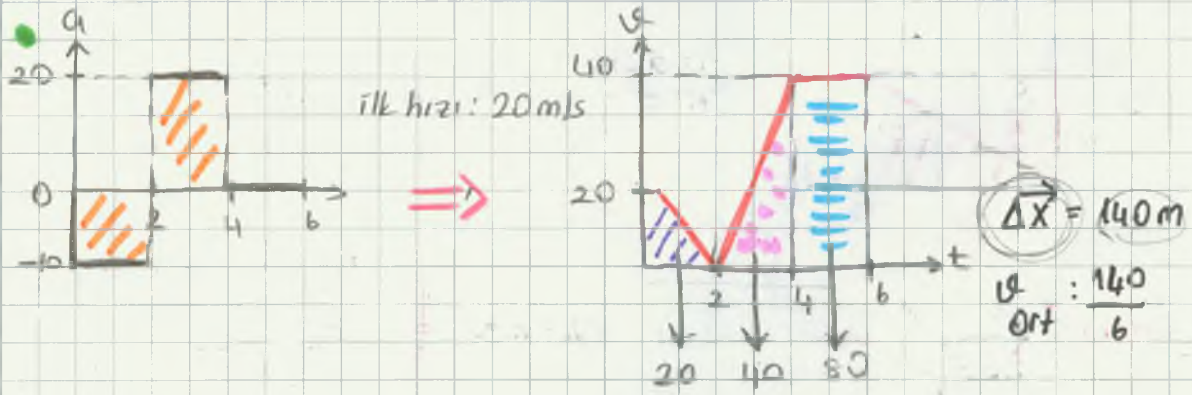
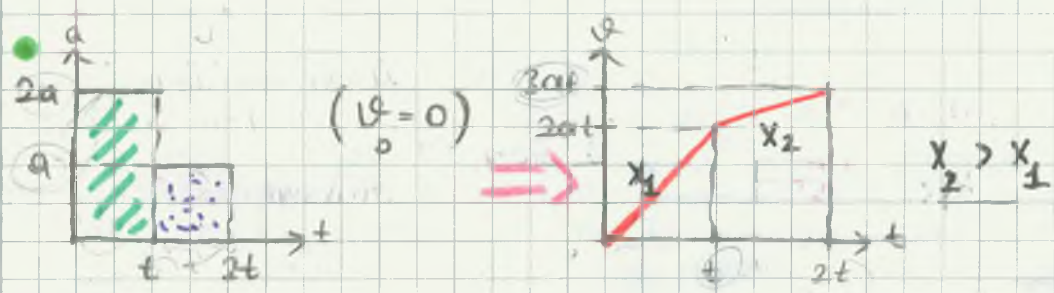
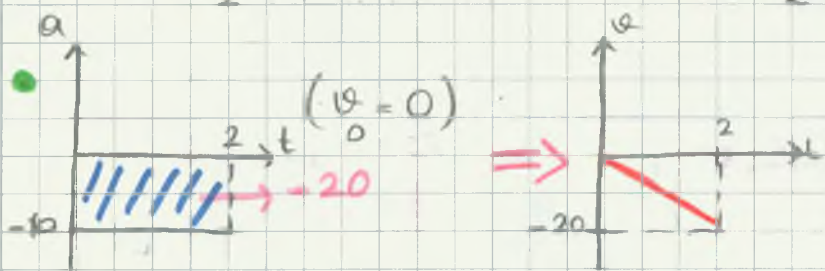
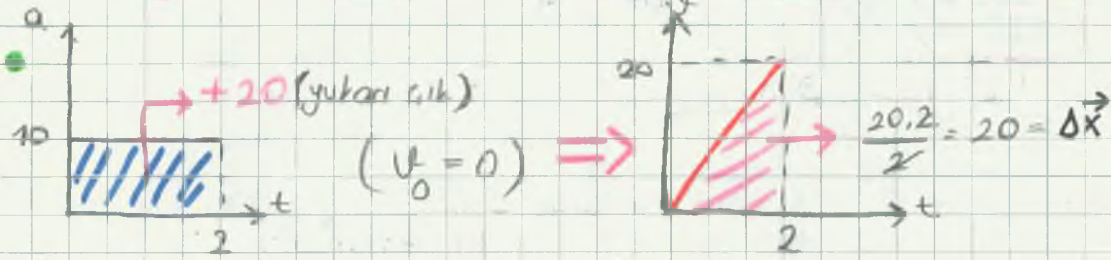
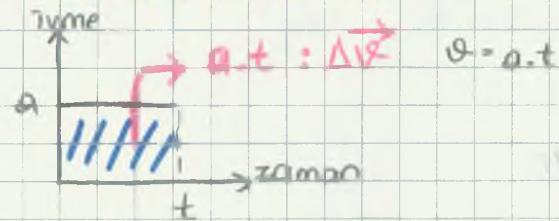
$$5l = 3v.t$$



$$v_x = \frac{50}{2}$$

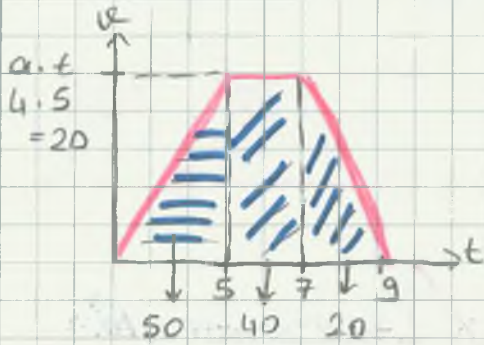
$$v = \frac{50}{5}$$

- İVMELİ HAREKET -





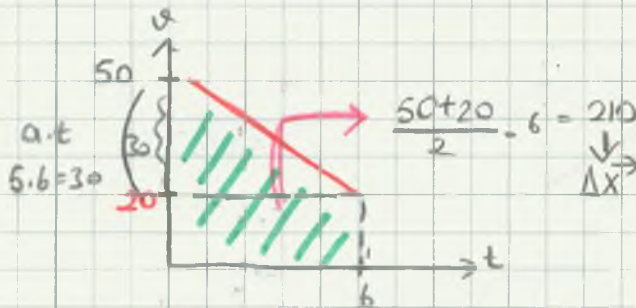
Örnek: İlk hızı 0 olan bir araç 5 sn boyunca 4 m/s^2 lik ivmeyle hızlanıp 2 sn sabit hızla gittikten sonra 2 sn de duruyor.



$$\Delta X = 110$$

$$v_{\text{ort}} = \frac{110}{9}$$

Örnek: İlk hızı 50 m/s olan bir araç 5 m/s^2 lik ivmeyle 6 sn yavaşlıyor.
a) son hızı? b) Ortalama hızı? c) yer değıştirmesi?



$$v_{\text{son}} = 20 \text{ m/s}$$

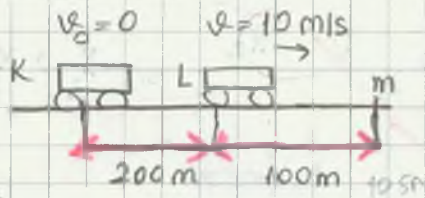
$$v_{\text{ort}} = \frac{210}{6}$$

$$x = \frac{1}{2} a t^2$$

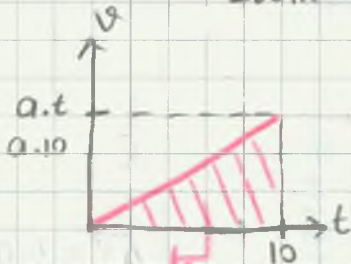
$$100 = 0 + 2 \cdot a \cdot 300$$

$$10t + \frac{1}{2} a t^2 = 100$$

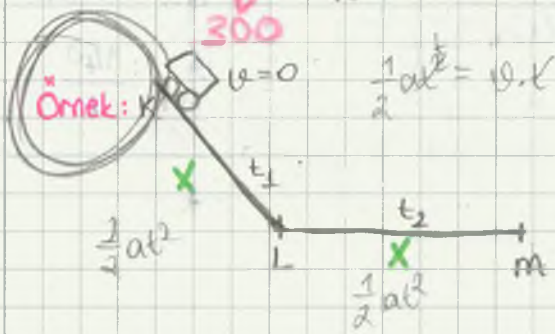
Örnek:



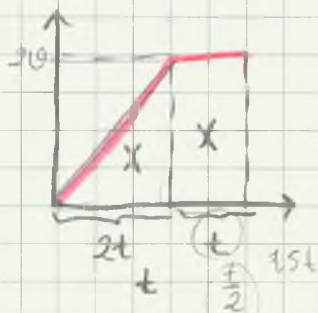
L aracı 10 m/s sabit hızla giderken K aracı a ivmesiyle hızlanıp L aracını m noktasında yakalar. Buna göre a=?

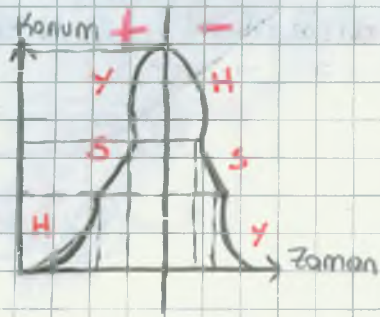


$$\frac{10 \cdot a \cdot 10}{2} = 300 \quad a = 6 \text{ m/s}^2$$



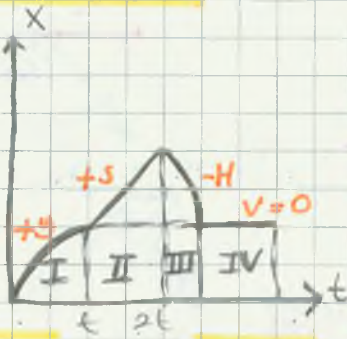
$$KL = 2m \Rightarrow \frac{t_1}{t_2} = ? = \frac{2t}{t} = 2$$



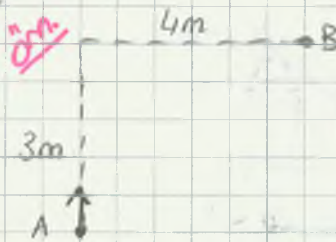
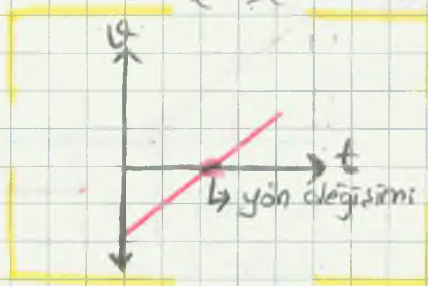


Hızlanıyorsa = Hız ve ivme vektörleri aynı yönlü
 Yavaşlıyorsa // // // // zıt yönlü

Örnek:



- ✓ I - İlk hızı vardır.
- ✓ II - III aralığında hız ve ivme aynı yönlüdür.
- ✓ III - 2t anında yön değiştirmiştir.
- ✗ IV - IV aralığında sabit hızdır.



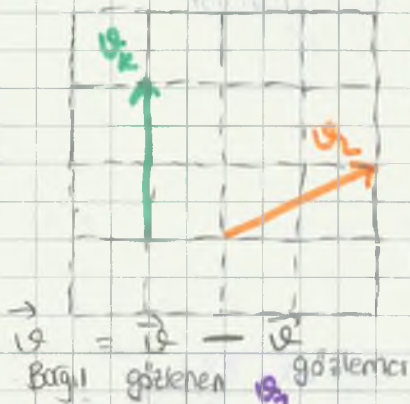
$$\Delta x = 7$$

$$\Delta \vec{x} = 5$$

$$v = 7/2$$

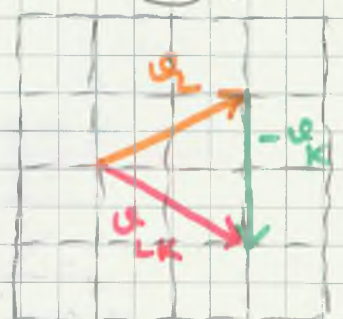
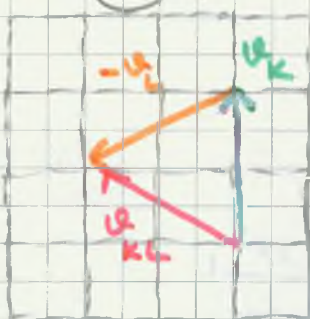
$$\vec{v} = 5/2$$

- BAĞIL HAREKET -



1- K'nin L'ye göre hızı:

2- L'nin K'ye göre hızı:



Örnek:

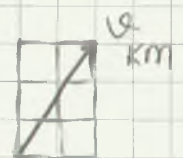


K'nin L'ye göre hızı: v_1 , L'nin M'ye göre hızı: v_2 , K'nin M'ye göre hızı?

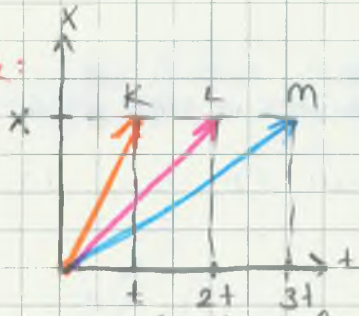
$$K-L = 0,2$$

$$L-M = 2,1$$

$$K-M = 2,3$$



Örnek:

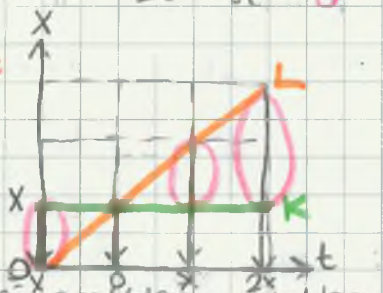


K'nin L'ye göre hızı ve
ise M'nin L'ye göre hızı
kaçtır?

$$K-L = \frac{x}{t} - \frac{x}{2t} = \frac{x}{2t} = v$$

$$M-L = \frac{x}{3t} - \frac{x}{2t} = \frac{-x}{6t} = \frac{-v}{3}$$

Örnek:

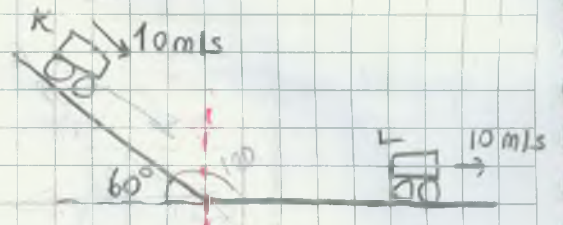


Hangi aralıklarda yaklaşıyorlar / uzaklaşıyorlar?

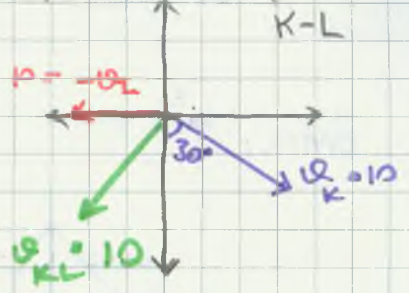
I yaklaşıyor.

II, III uzaklaşıyor.

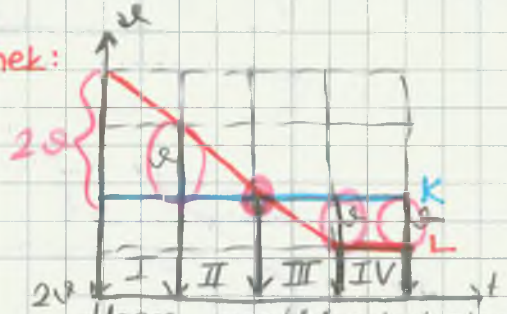
Örnek:



K'nin L'ye göre hızı?



Örnek:



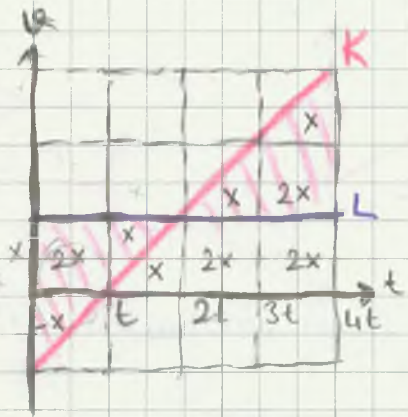
Hangi aralıklarda hızlanıyor / yavaşlıyor / görüyor?

I ve II yavaşlıyor

III hızlanıyor

IV sabit

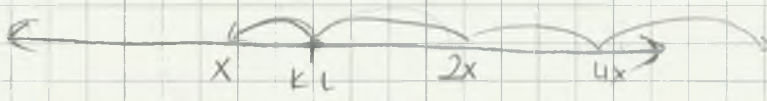
Örnek:



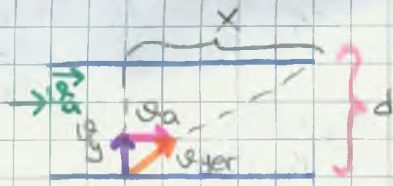
Başlangıçta yan yana olan K, L aralıkları hangi aralıklarda yaklaşıyor, uzaklaşıyor?

	0	t	2t	3t	4t	
K	-x	0	3x	8x		→ yan yana
L	2x	4x	6x	8x		
	0	3x	1x	3x	0	

uzaklaşıyor uzaklaşıyor yaklaşıyor yaklaşıyor



- NEHİR PROBLEMLERİ -



Nehrin genişliği : d Akıntı hızı : v_a
 v_y : yüzücünün suya göre hızı

v_{yer} : Yere göre hız

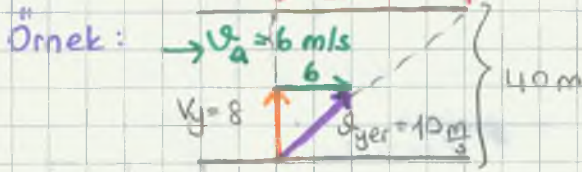
$$\vec{v}_a + \vec{v}_y = \vec{v}_{yer}$$

x : sürüklenme miktarı

Karşıya geçme süresi :

$$d = v_{düşey} \cdot t$$

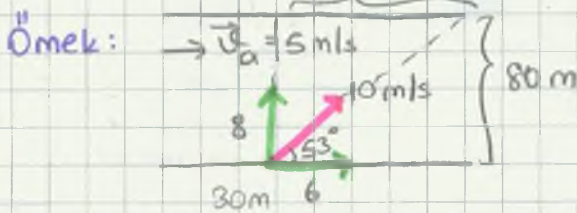
$$X = v_{yatay} \cdot t$$



8 m/s = suya göre hız
 10 m/s = yere // "

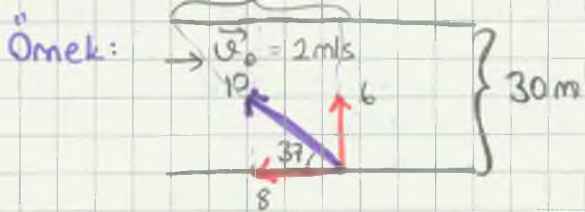
$$d = v_{düşey} \cdot t \quad X = v_{yatay} \cdot t$$

\downarrow 5sn



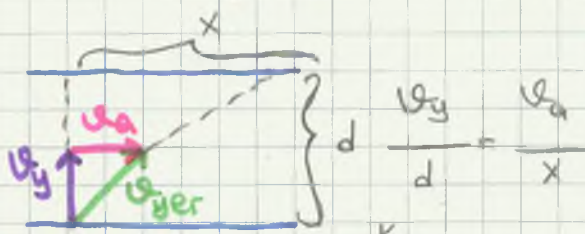
$$d = v_{düşey} \cdot t \quad X = v_{yatay} \cdot t$$

\downarrow 10 \downarrow 6t \downarrow 10

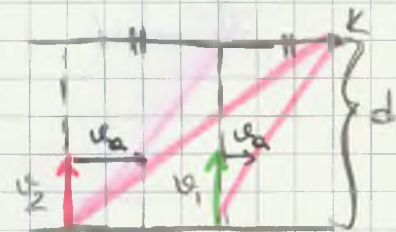


$$d = v_{düşey} \cdot t \quad X = v_{yatay} \cdot t$$

$30 = 6 \cdot t = 5 \quad X = (8-2) \cdot 5 = 30$



Örnek:

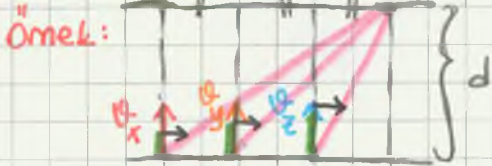


x ve y K noktasında kıyıya
 çıkıyorlar. Buna göre $\frac{v_1}{v_2}$?

y) $\frac{v_2}{d} = \frac{v_a}{x} \quad v_2 = \frac{v_a \cdot d}{x}$

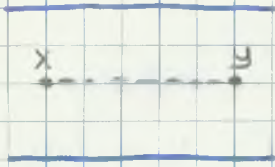
x) $\frac{v_1}{d} = \frac{v_a}{2x} = v_1 = \frac{v_a \cdot d}{2x}$

$$\frac{v_1}{v_2} = \frac{1}{2}$$



$$v_z > v_y > v_x$$

Örnek:



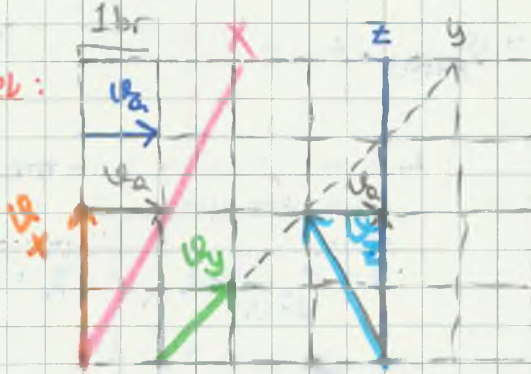
X noktasından yüzmeye başlayan bir yüzücü 3 sn de y nokt. varıp 5 sn de tekrar X nokt. geri dönmektedir. Buna göre $v_y = ?$
 v_a

$$\begin{aligned} X \rightarrow Y & l = (v_y + v_a) \cdot 3 \\ Y \rightarrow X & l = (v_y - v_a) \cdot 5 \end{aligned}$$

$$l = 3v_y + 3v_a = 5v_y - 5v_a$$

$$8v_a = 2v_y \quad \frac{v_y}{v_a} = 4$$

Örnek:



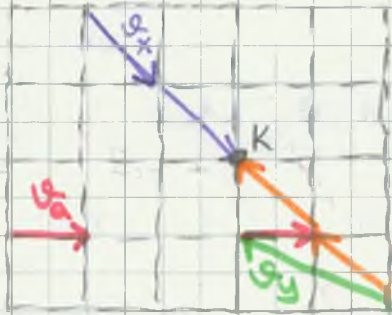
v_x ve v_a suya göre (v_a yı ekle)
 v_y yere göre, (direk karşıya çık)

1- Karşı kıyıya çıktıkları noktalar?

2- // // ulaşma süreleri arasındaki ilişki? (düşey hız)

$$\left. \begin{aligned} X &= 2 \\ Y &= 1 \\ Z &= 2 \end{aligned} \right\} t_x = t_z < t_y$$

Örnek:



v_x : yere göre v_y : suya göre
hızlar oldu. na göre X ve Y nerde karşılaşırlar?

K, 2s sonra karşılaşırlar.