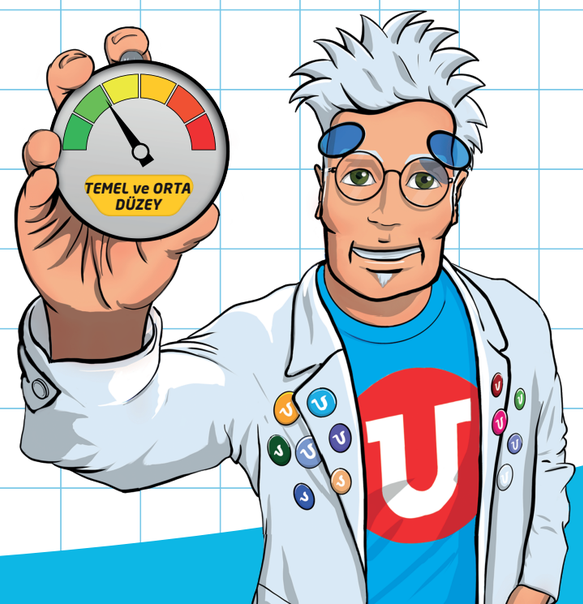
1.ÜNİTE

AYT Temel ve Orta Düzey Fizik Soru Bankası

Bir Boyutta Sabit İvmeli Hareket

OKTAY KURT



BİR BOYUTTA SABİT İVMELİ HAREKET

BİR BOYUTTA SABİT İVMELİ HAREKET

SERBEST DÜŞME

AŞAĞIDAN YUKARIYA DÜŞEY ATIŞ

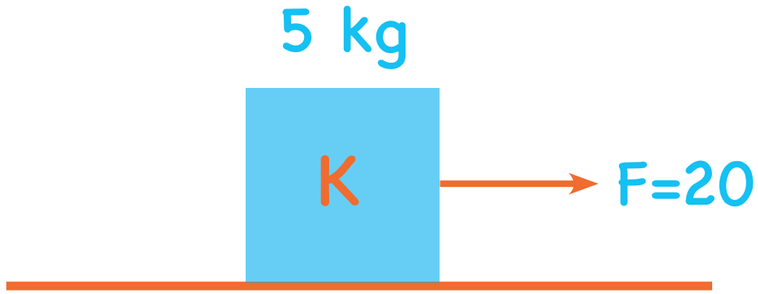
YUKARIDAN AŞAĞIYA DÜŞEY ATIŞ

LİMİT HIZ

Bir Boyutta Sabit İvmeli Hareket

- Ayt'de son üç yılda hiç soru gelmedi.
- En son 2017' de 1, 2016'da 2 soru geldi.

Bir Boyutta Sabit İvmeli Hareket

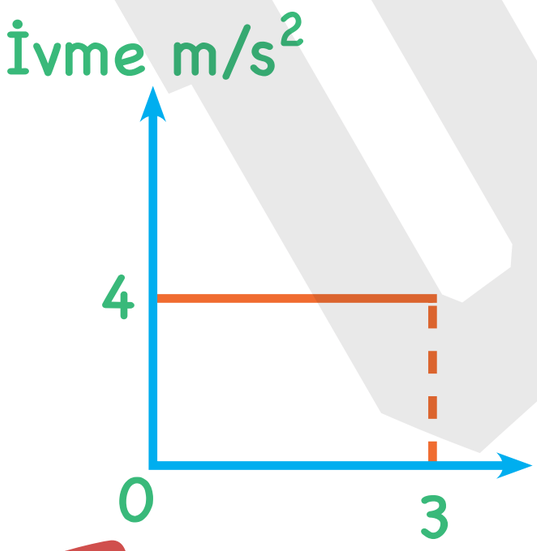


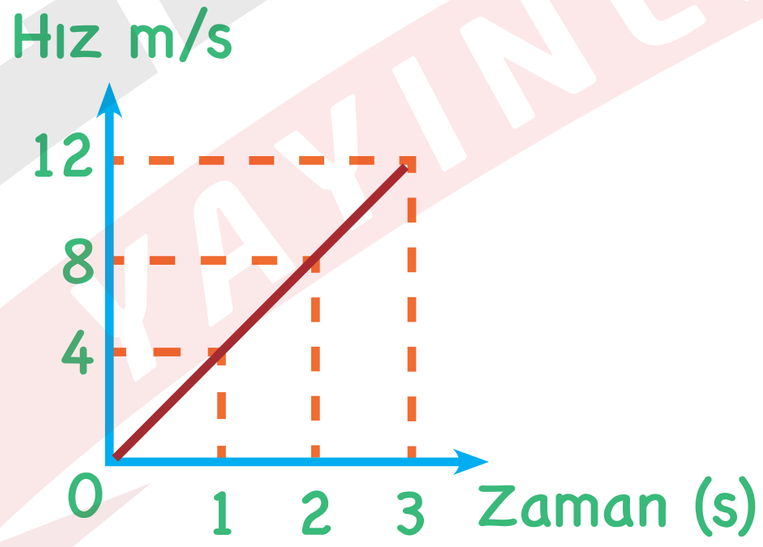
$F_{net} = m.a$

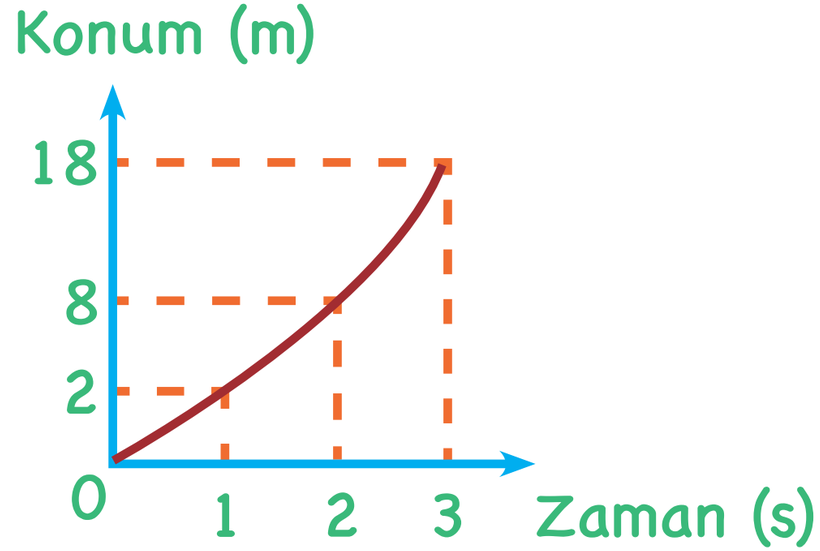
$20 = 5.a$

$a = 4\ m/s^2$

Zaman	0	1	2	3
Hız	0	4	8	12



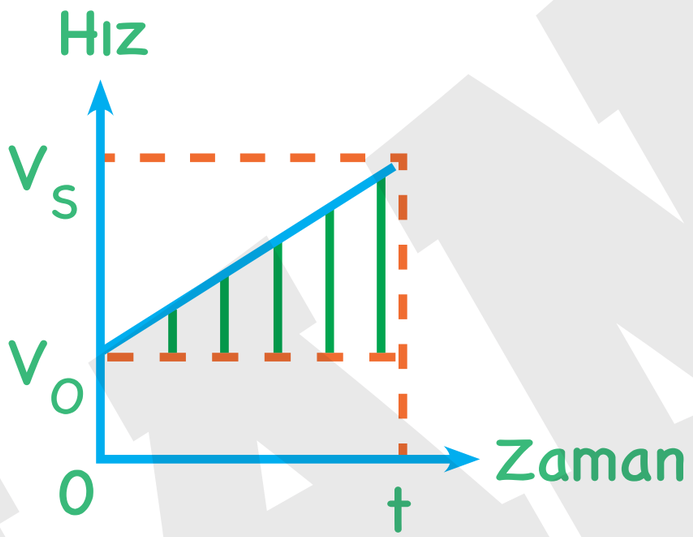




$$a = \frac{\Delta v}{t}$$

$$a = \frac{V_s - V_o}{t}$$

$$V_s = V_o + at$$

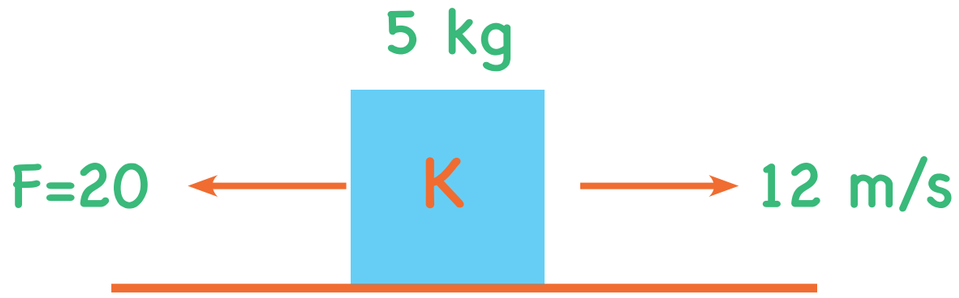


$$\Delta x = V_o t + \frac{V_s - V_o}{2} . t$$

$$\Delta x = V_o t + \frac{at . t}{2}$$

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

$$V_s^2 = V_o^2 + 2a\Delta x$$

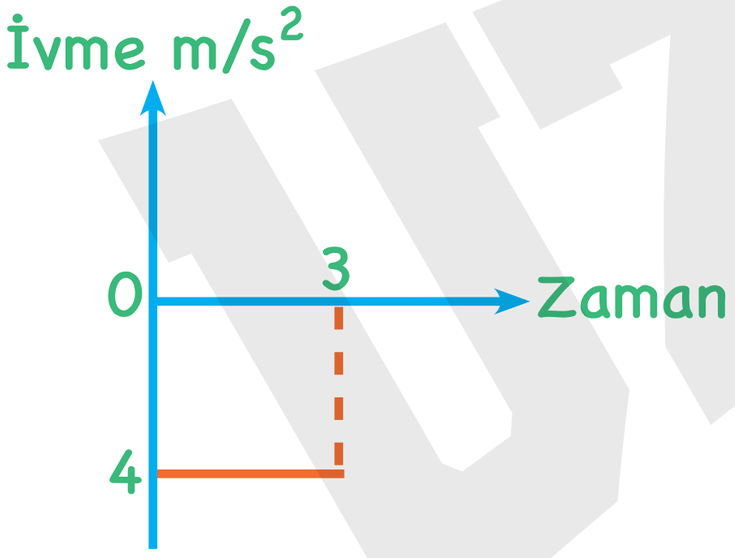


$F_{net} = m.a$

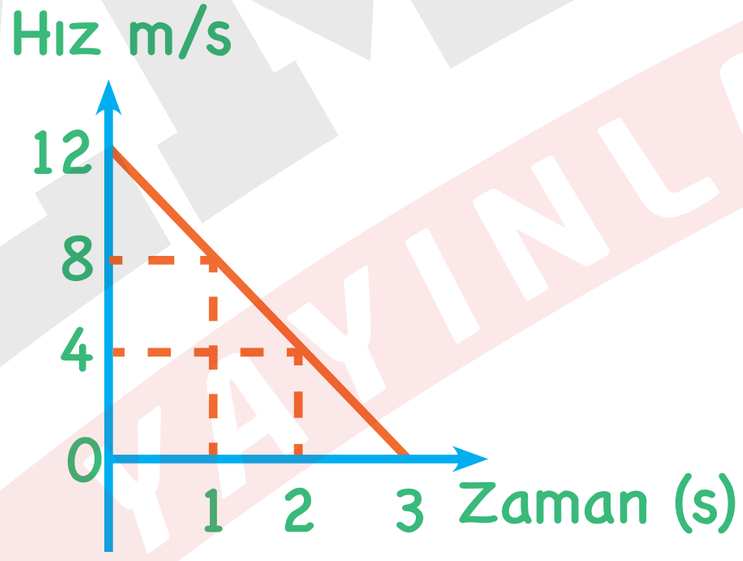
$-20 = 5.a$

$a = -4\ m/s^2$

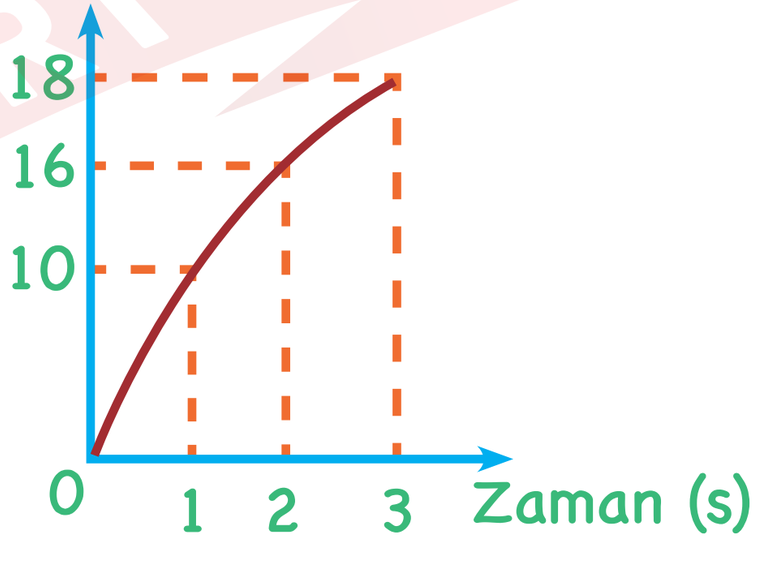
Zaman	0	1	2	3
Hız	12	8	4	0



$V_s = V_0 - at$



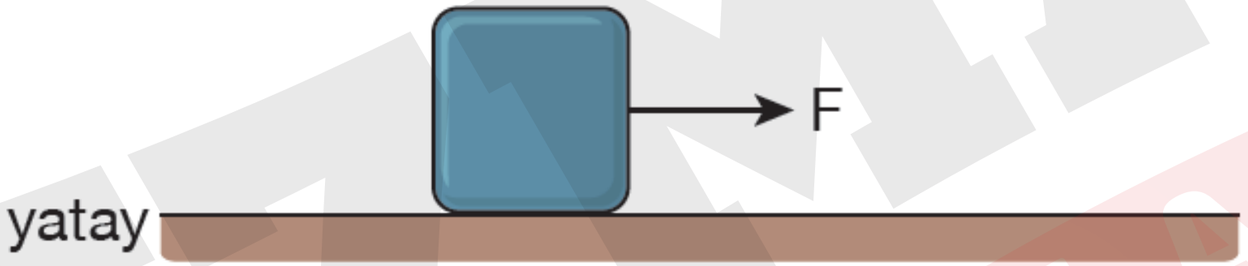
$\Delta x = V_0 t - \frac{1}{2} a t^2$



$V_s^2 = V_0^2 - 2a\Delta x$

Örnek:

Sürtünmesi önemsiz yatay düzlemde durmakta olan 5 kg kütleli cisme büyüklüğü 10 N olan yatay kuvvet şekildeki gibi uygulanıyor.



Buna göre, cismin harekete başladıktan 3 s sonra hızının büyüklüğü kaç m/s olur?

A) 2 B) 3 C) 4 D) 6 E) 9

Örnek:

Doğrusal bir yolda 10 m/s büyüklüğünde hızla hareket eden bir otomobil hızlanmaya başlayarak hızının büyüklüğünü 5 saniyede 20 m/s'ye çıkarıyor.

Buna göre, otomobilin hızlandığı 5 s boyunca aldığı yol kaç metredir?

A) 50 B) 60 C) 75 D) 90 E) 100

Örnek:

Doğrusal yolda 20 m/s büyüklüğündeki sabit hızla ilerleyen bir otomobilin sürücüsü frene basarak otomobilin 5 m/s^2 büyüklüğünde ivme ile yavaşlayarak durmasını sağlıyor.

Buna göre, otomobil duruncaya kadar kaç m yol alır?

A) 20 B) 30 C) 40 D) 60 E) 80

Örnek:

Doğrusal bir yolda hareket eden K ve L araçlarından K aracı 30 m/s büyüklüğündeki sabit hızla durmakta olan L aracının yanından geçerken L aracı 4 m/s^2 büyüklüğündeki ivme ile hızlanmaya başlıyor.

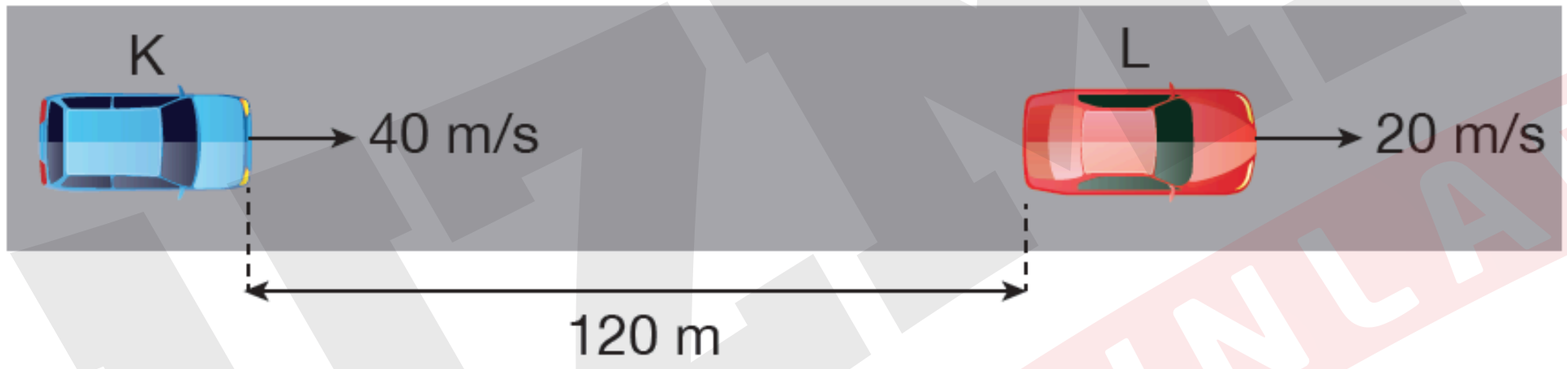
Buna göre, L aracı K aracı ile kaç saniye sonra yan yana gelir?

A) 3 B) 5 C) 10 D) 15 E) 30

Örnek:

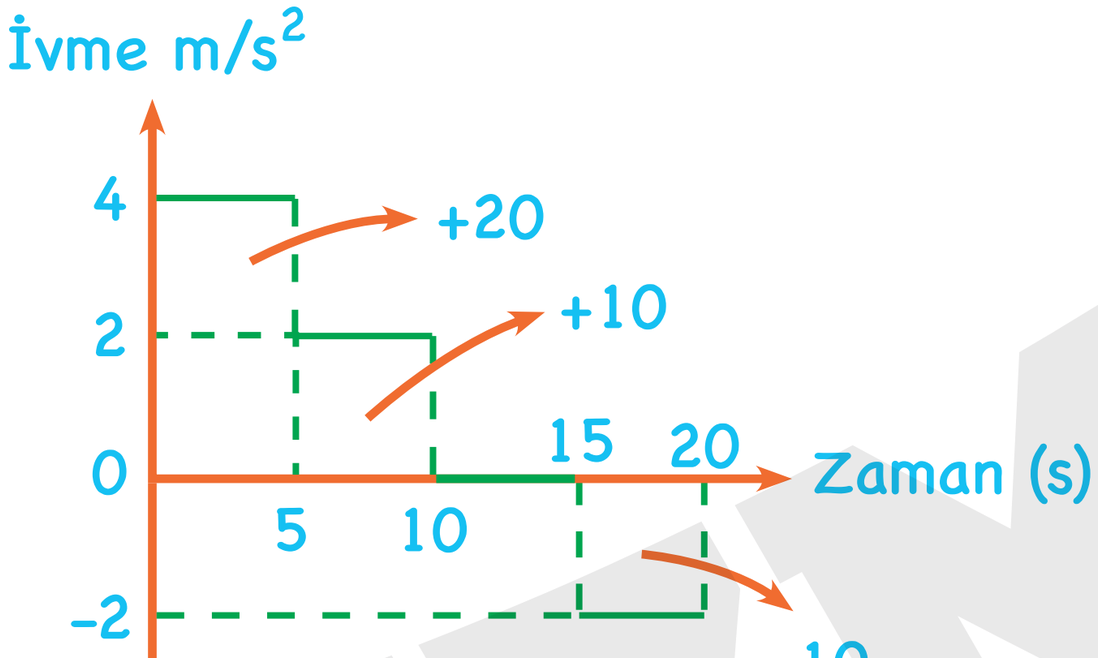
K ve L araçları, doğrusal bir yolda 40 m/s ve 20 m/s büyüklüklerindeki hızlarla aynı yönde hareket ediyor.

K aracı, L aracı ile aralarında 120 m uzaklık bulunduğu sırada sabit ivme ile yavaşlamaya başlıyor.

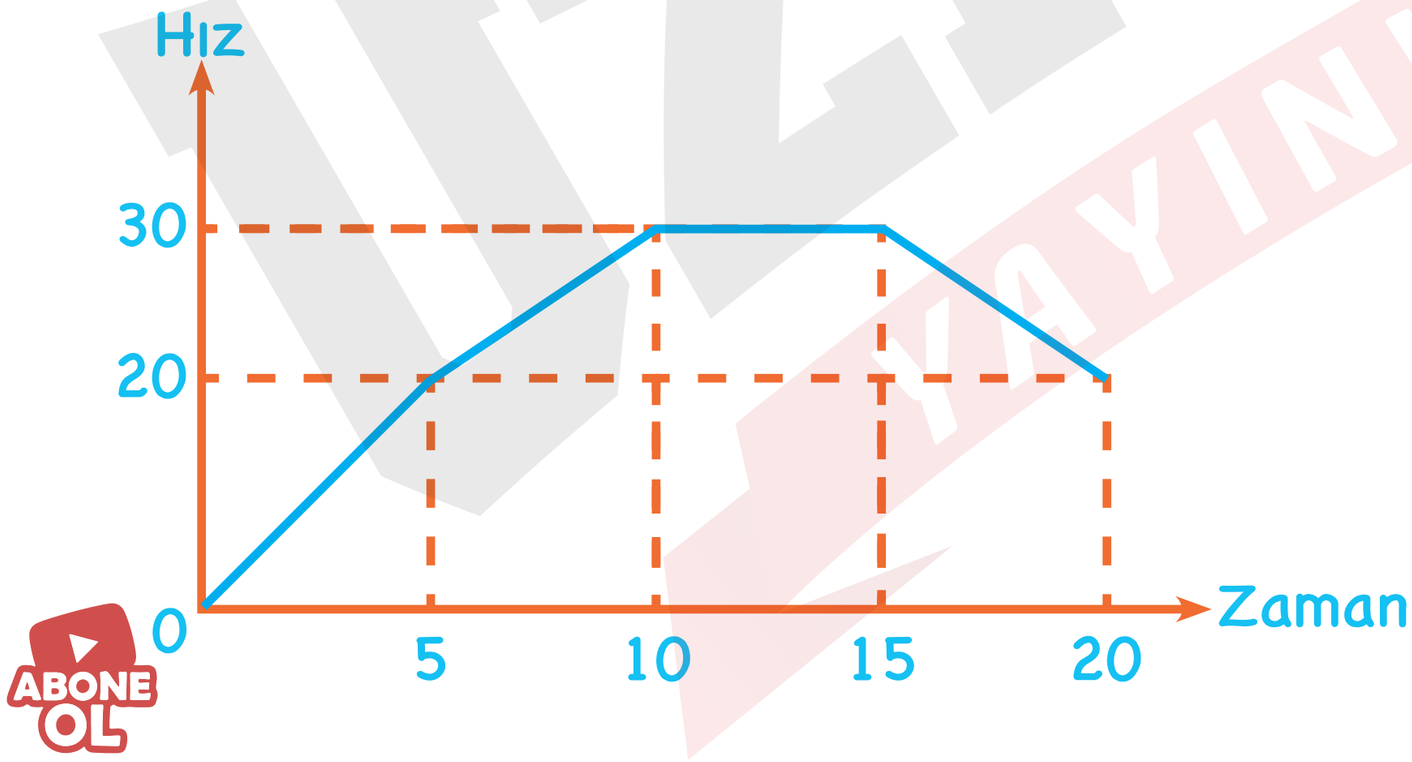


K aracının L'ye çarpmaması için yavaşlama ivmesi en az kaç m/s^2 olmalıdır?

A) $\frac{3}{5}$ B) 1 C) $\frac{5}{3}$ D) 2 E) 5



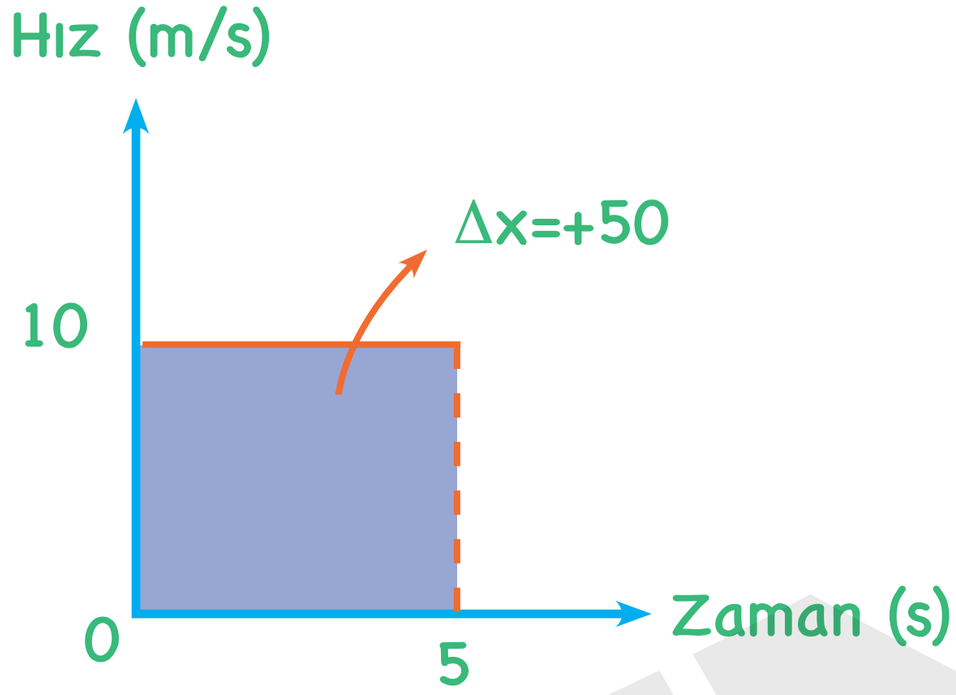
İvme - zaman grafiklerinde alan hız değişimine eşittir.



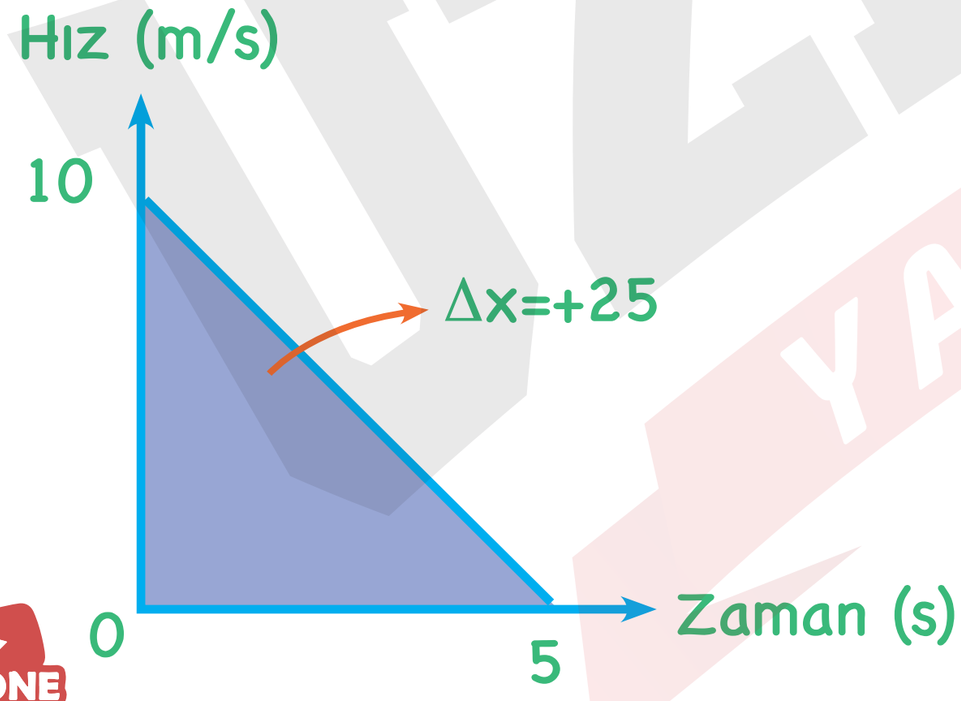
Hız - Zaman grafiğinden

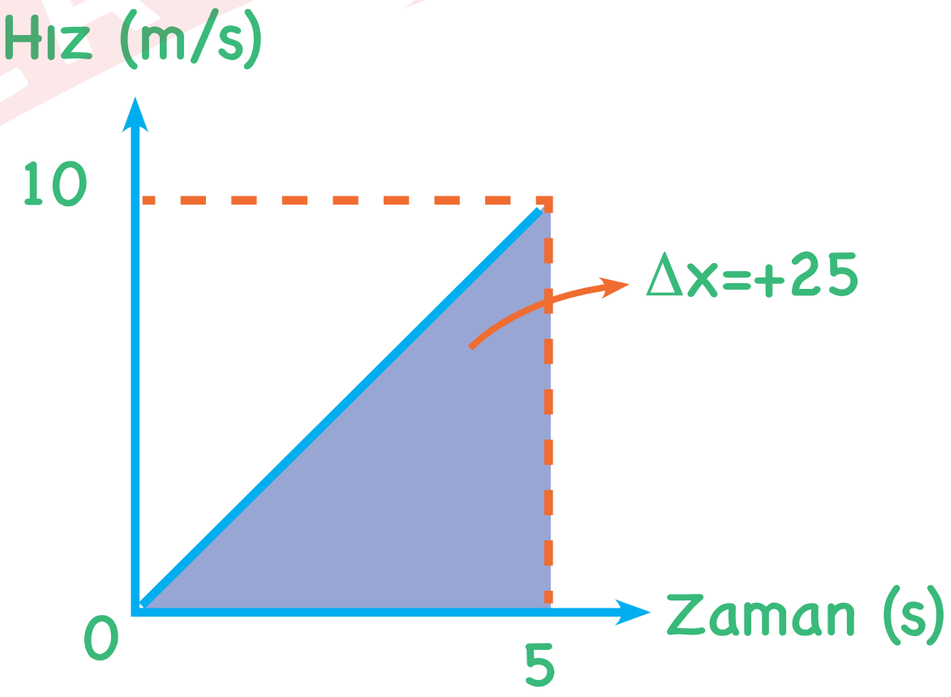
$$a=\frac{V_s-V_o}{t}$$

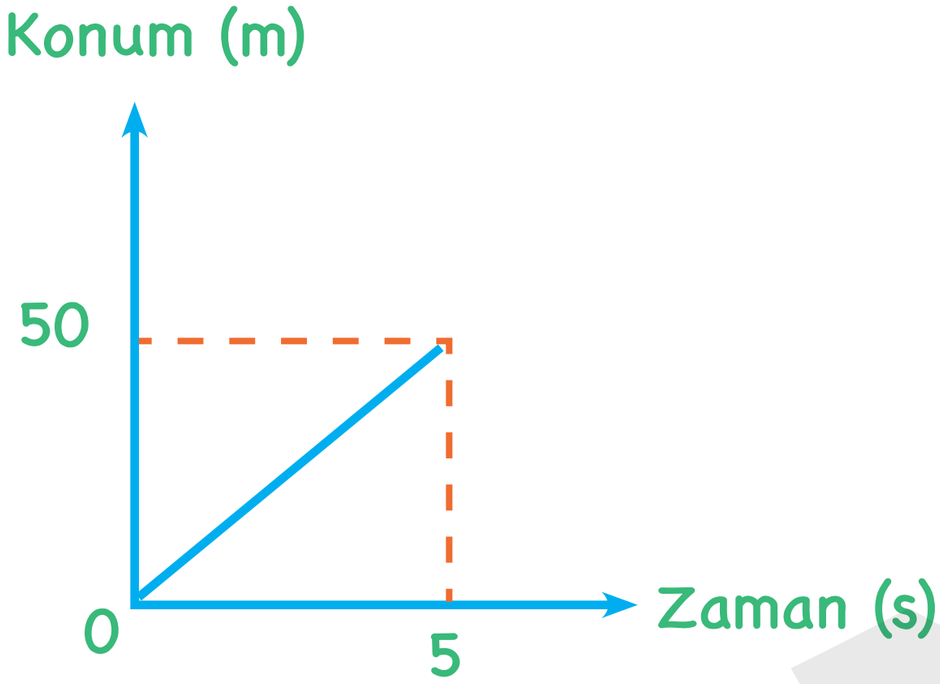
matematiksel modeliyle ivme - zaman grafiğine geçilebilir.

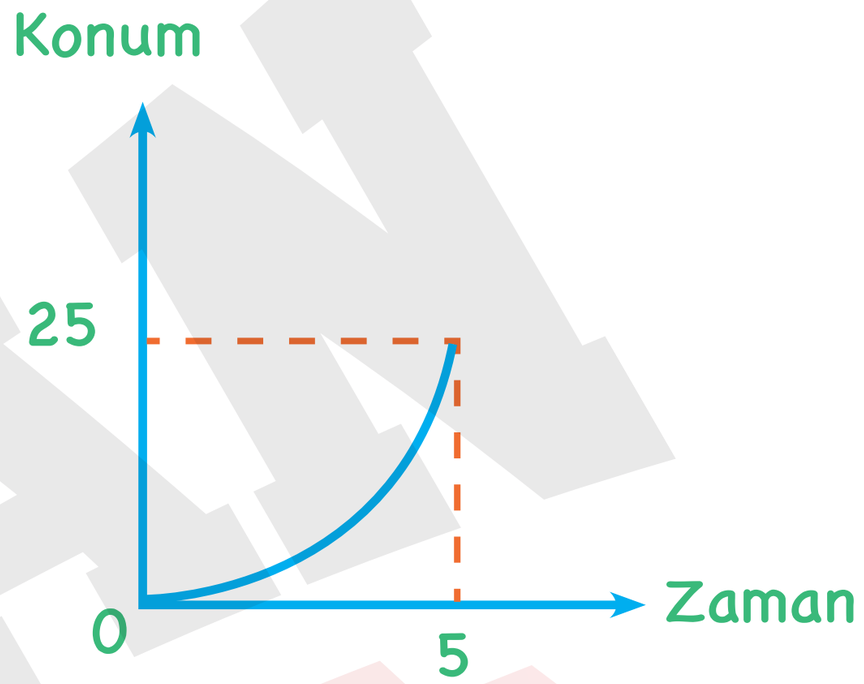


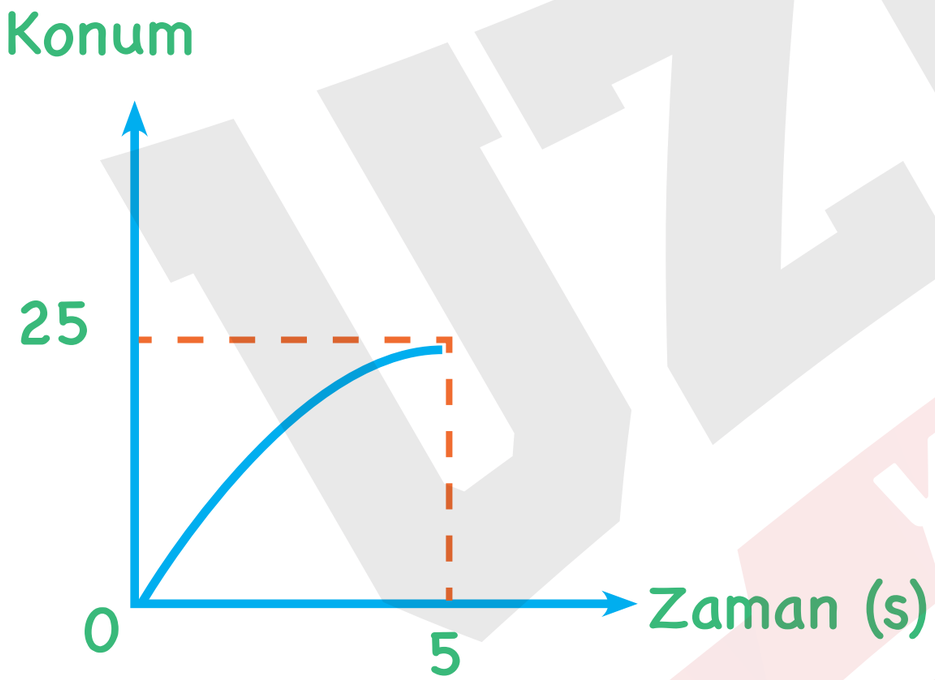
➜ Hız - Zaman grafiklerinde alan yerdeğiştirmeye eşittir.

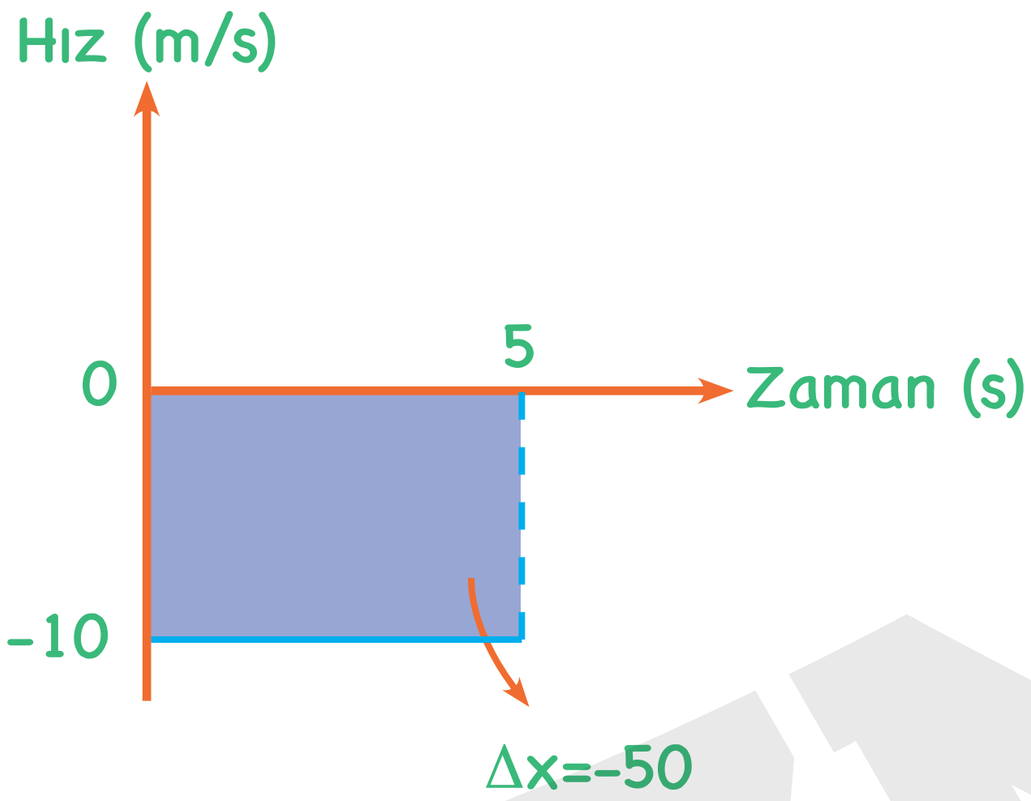


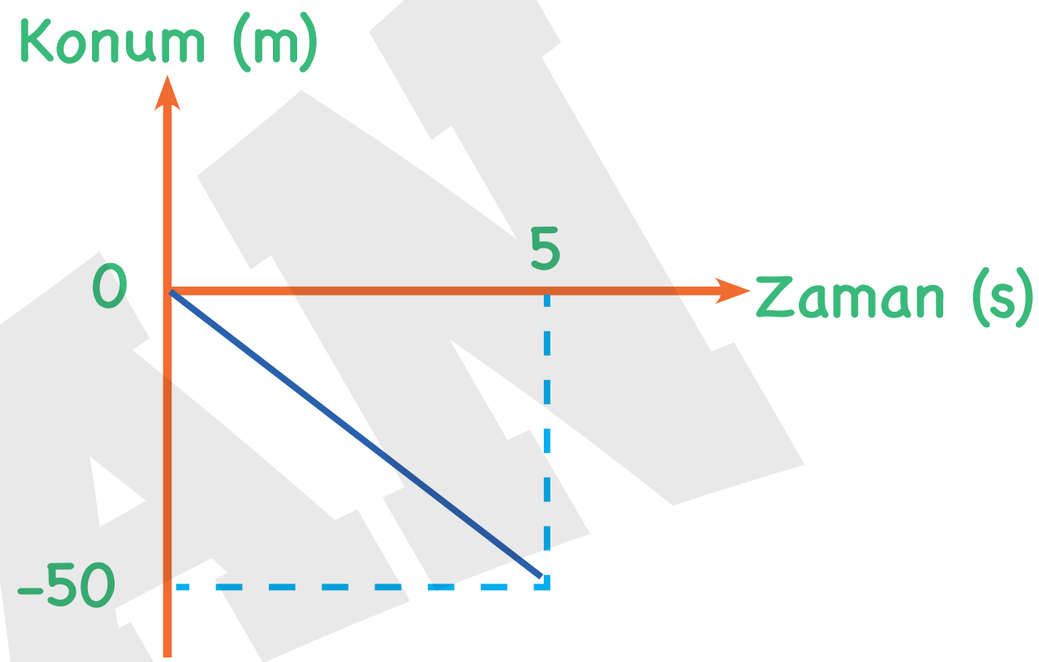


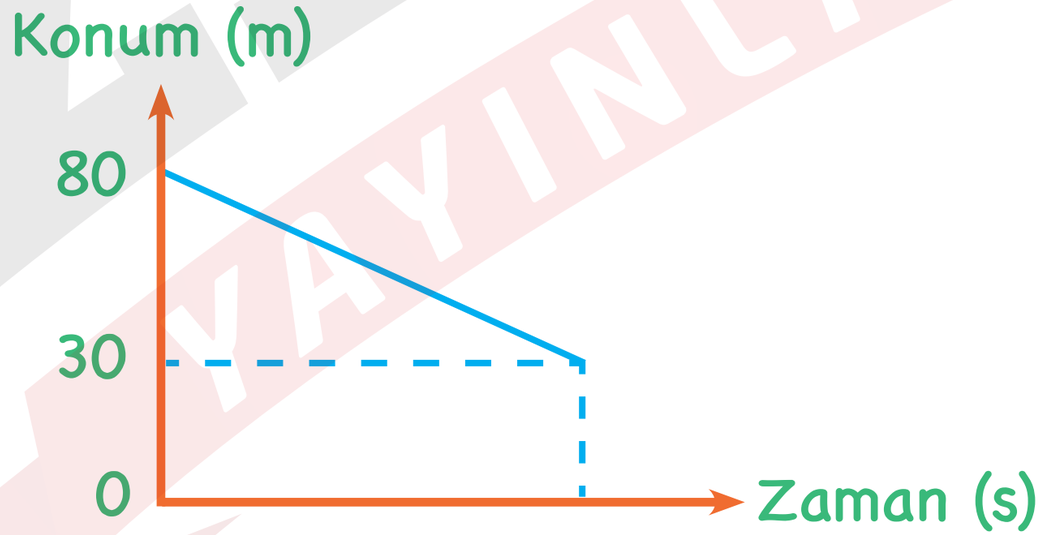


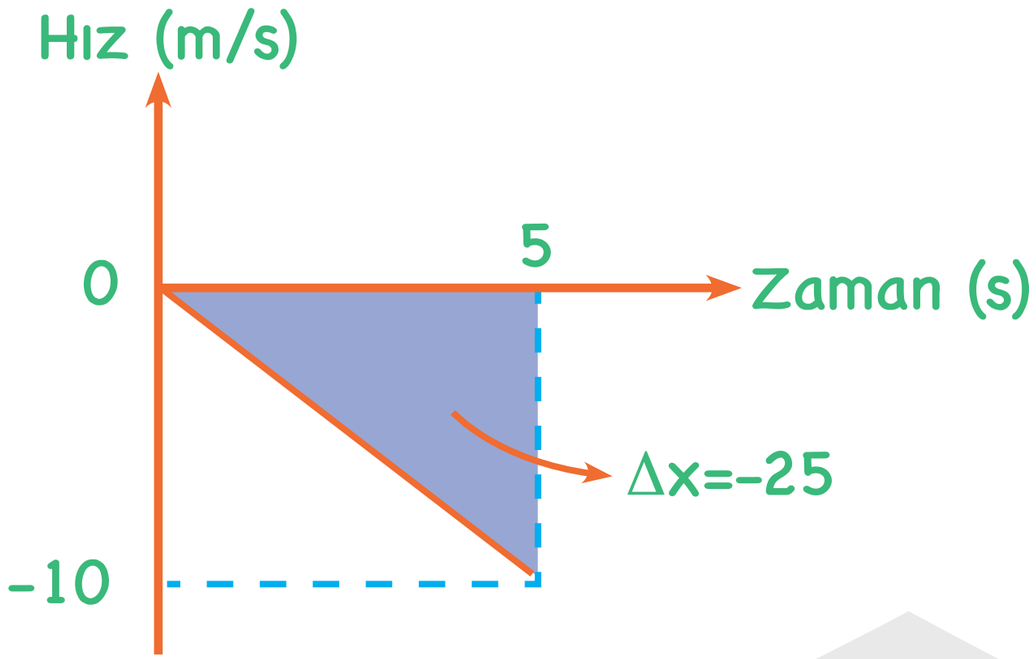


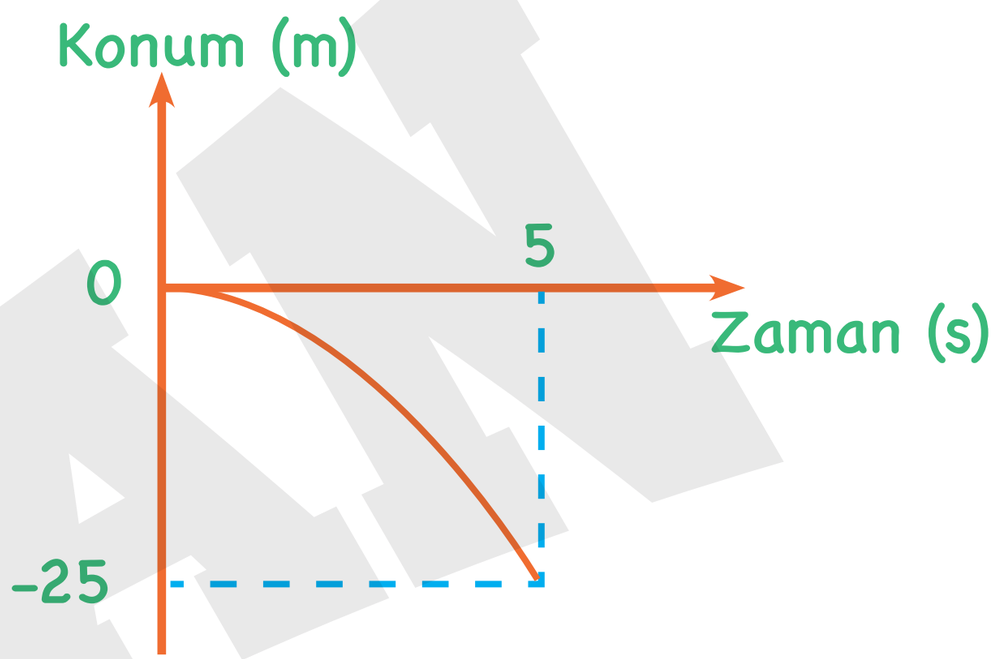


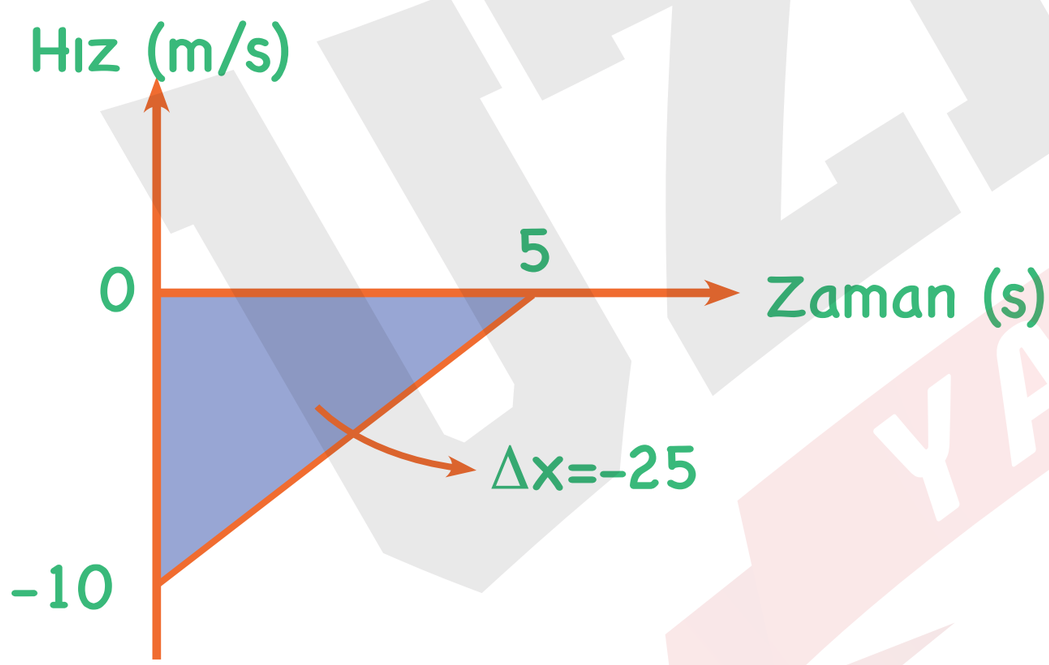

Hız (m/s)
0
5
Zaman (s)
-10
Δx=-50

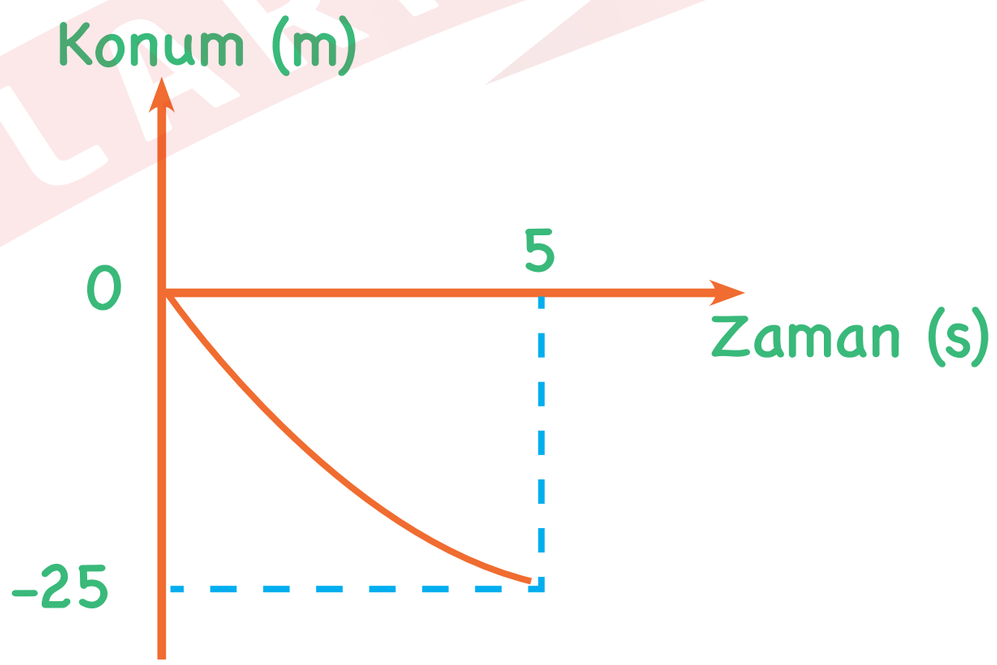

Konum (m)
0
5
Zaman (s)
-50


Konum (m)
80
30
0
Zaman (s)

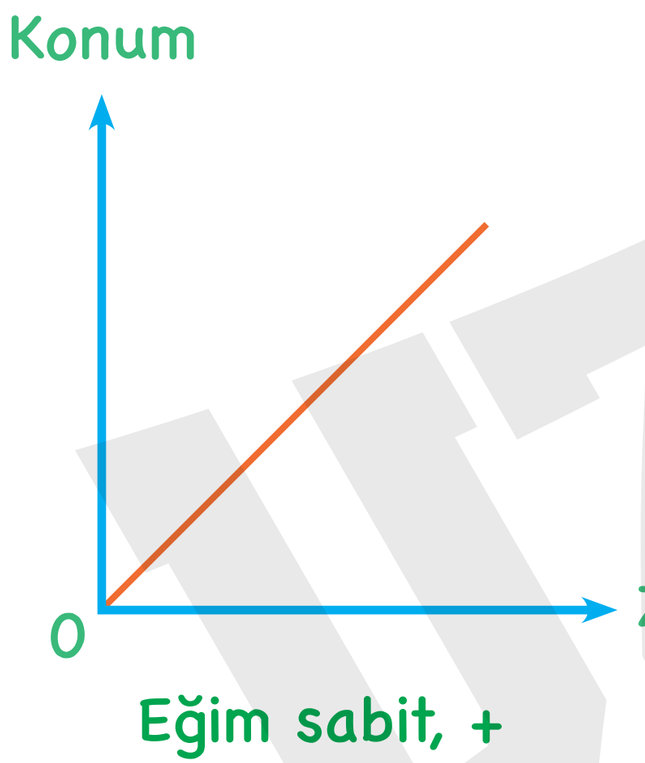

Hız (m/s)
0
5
Zaman (s)
Δx=-25
-10

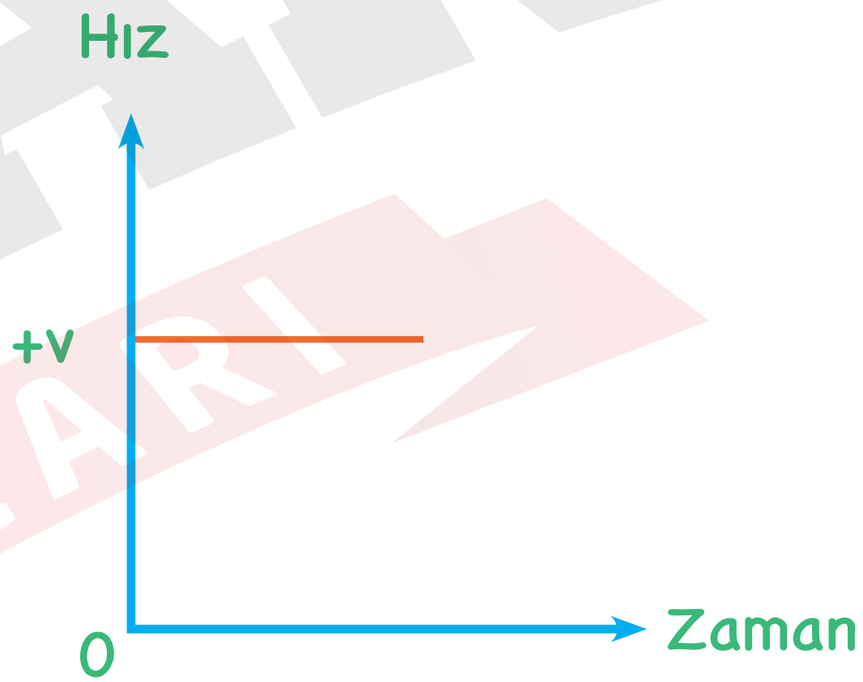

Konum (m)
0
5
Zaman (s)
-25

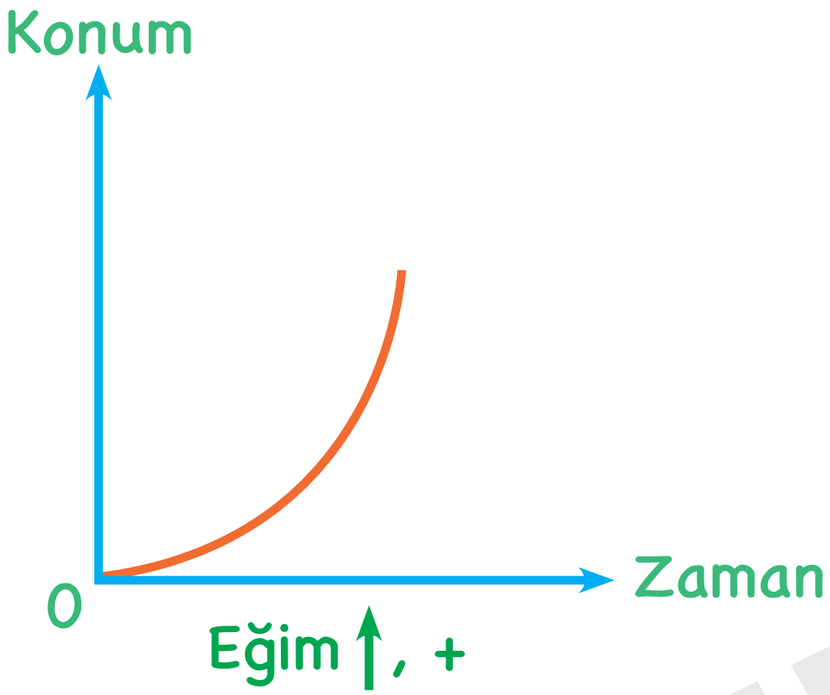

Hız (m/s)
0
5
Zaman (s)
Δx=-25
-10

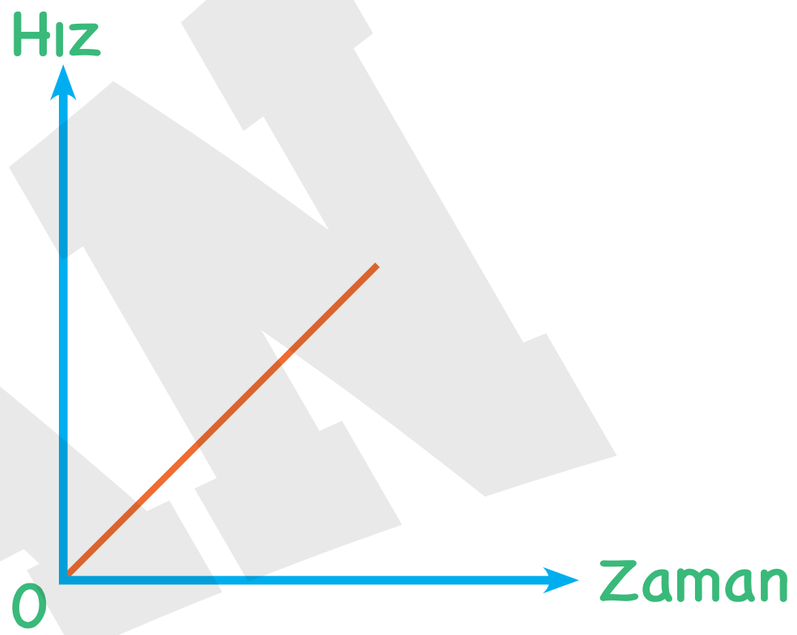

Konum (m)
0
5
Zaman (s)
-25

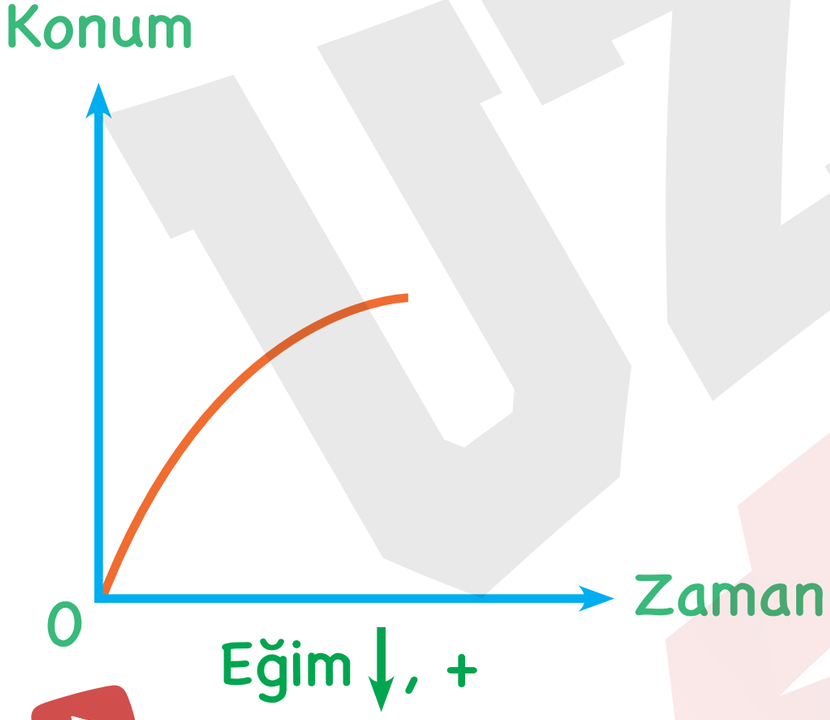
Konum - Zaman grafiklerinden
Hız - Zaman grafiklerine eğim (diklik) ile geçilebilir.

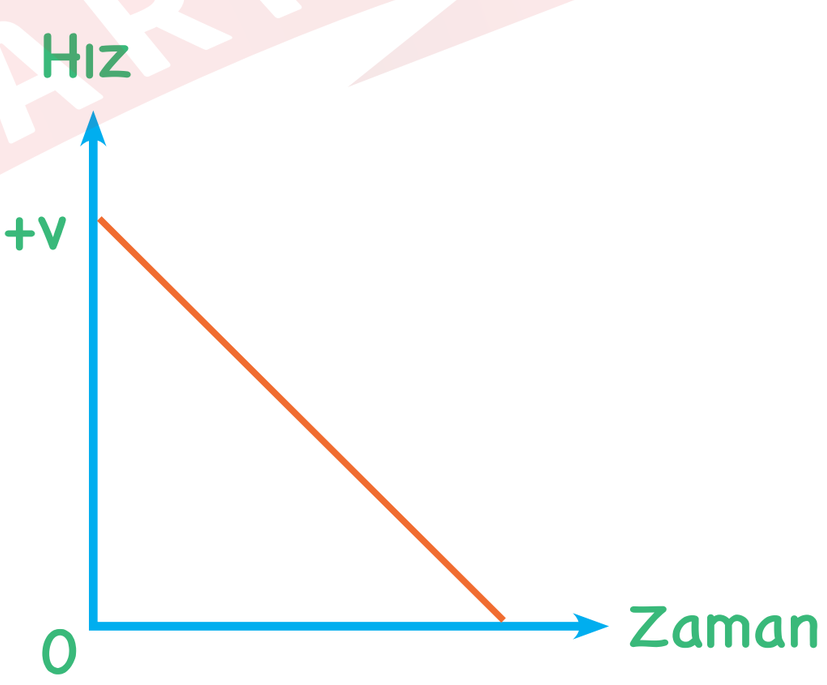


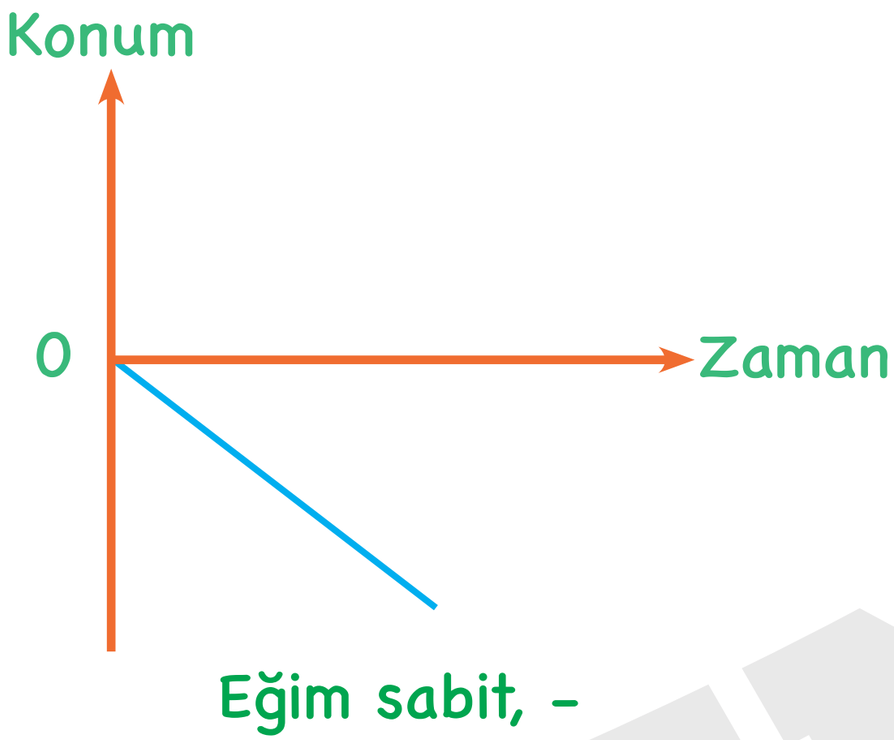












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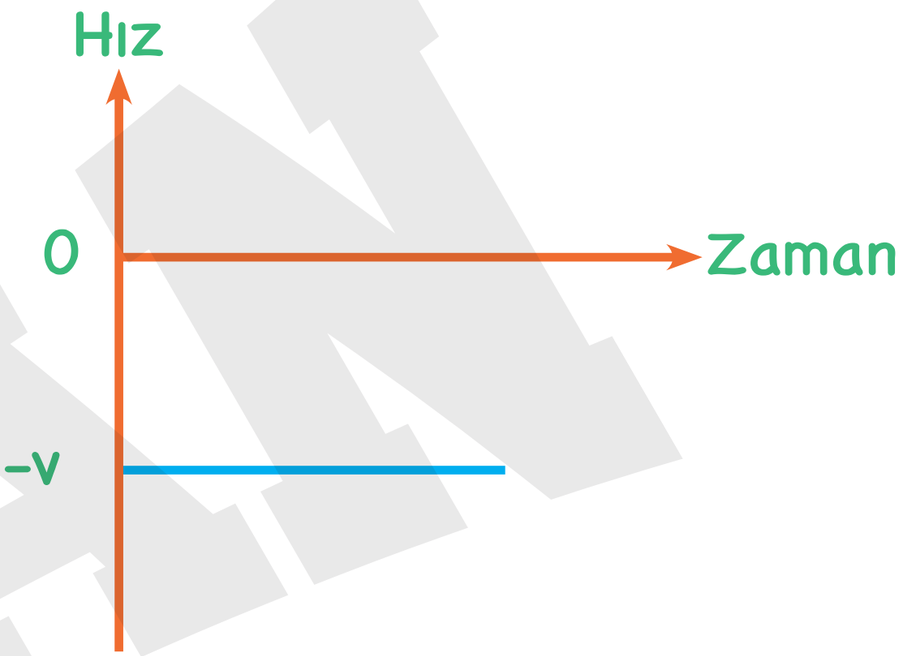
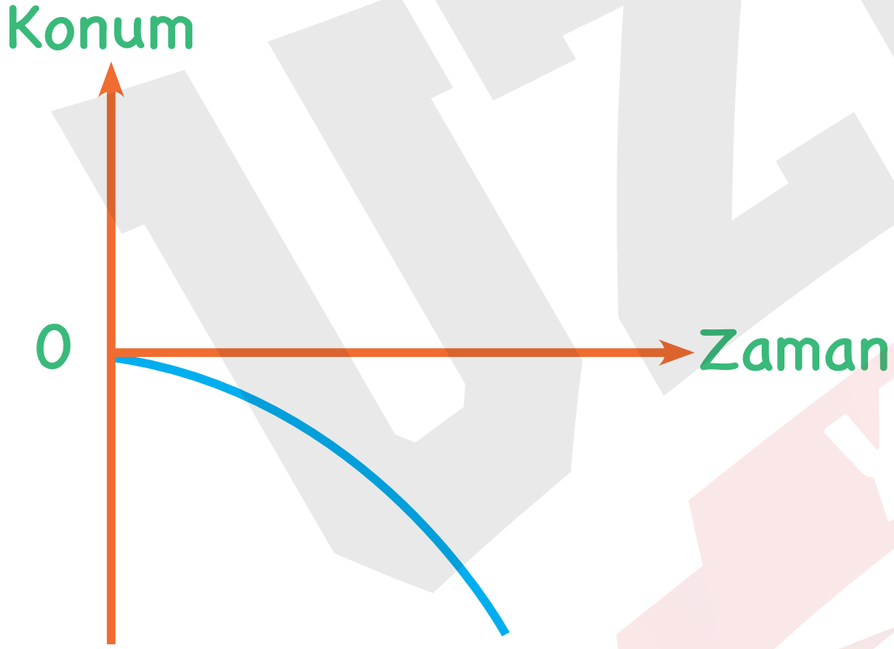
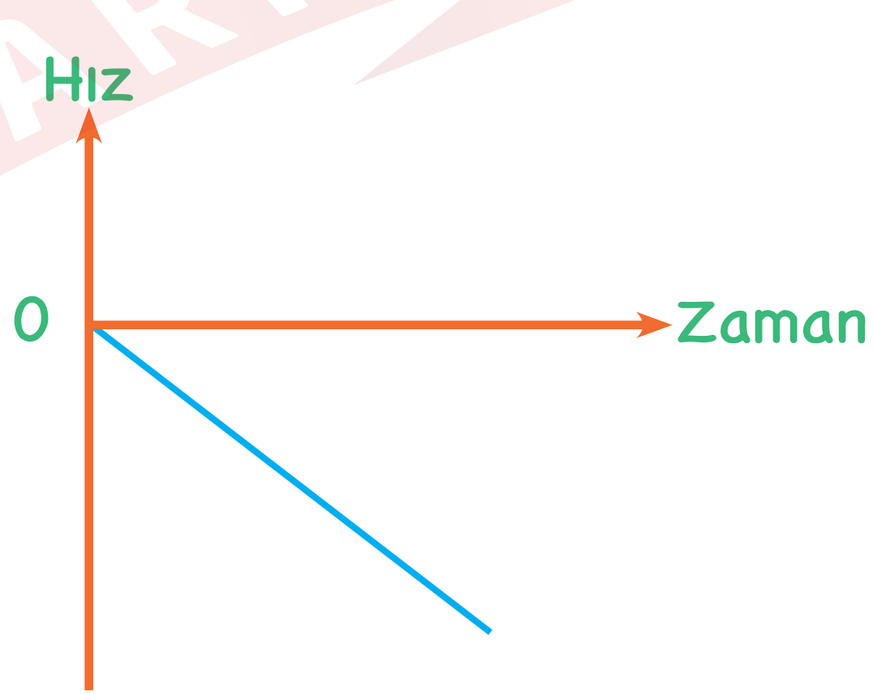
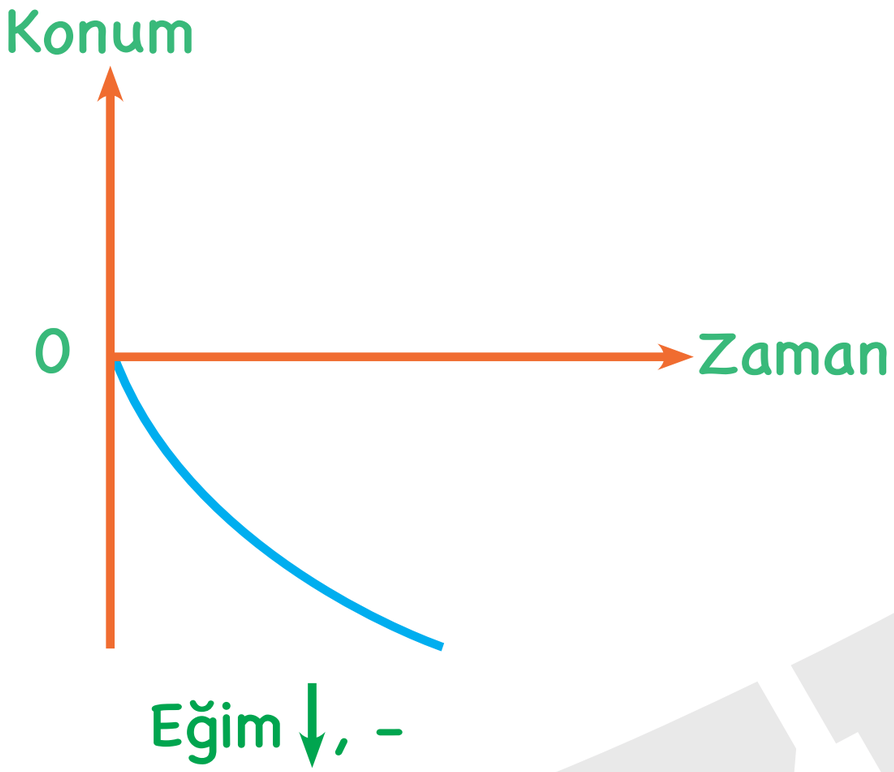
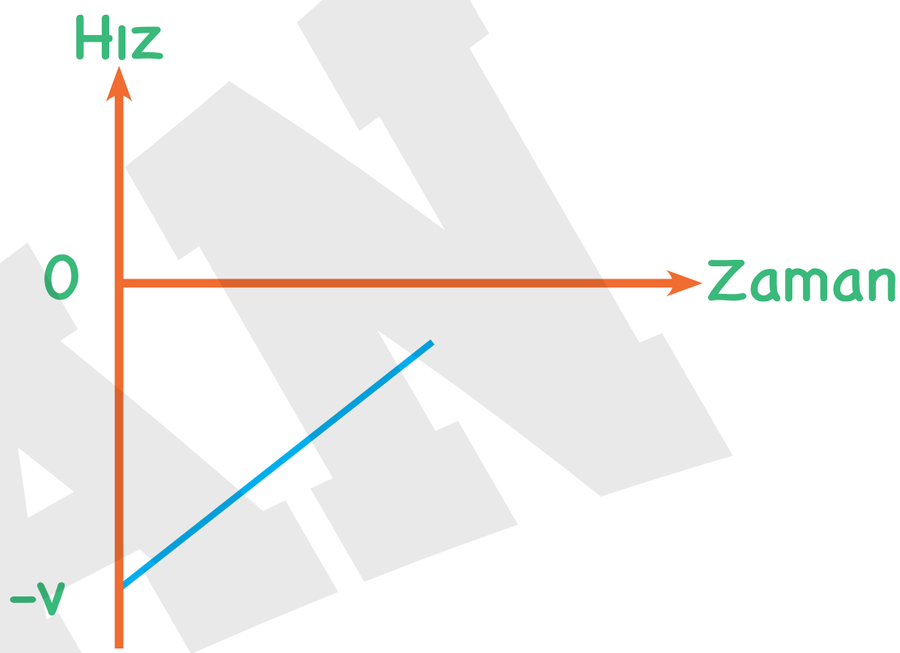




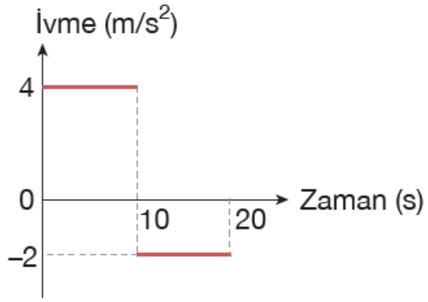
Eğim ↑, -





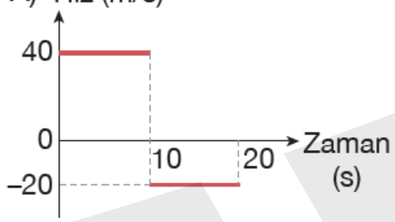


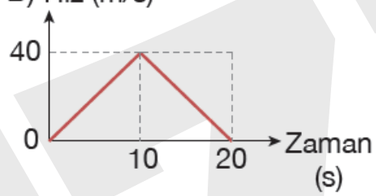
Örnek:

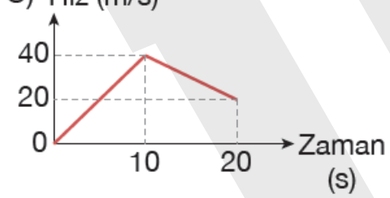


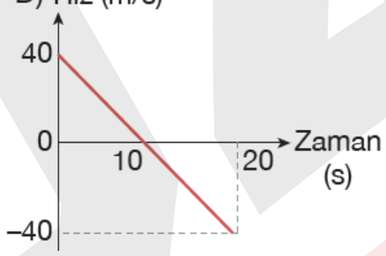
Doğrusal bir yolda duran bir otobüsün ivme-zaman grafiği şekildeki gibidir.

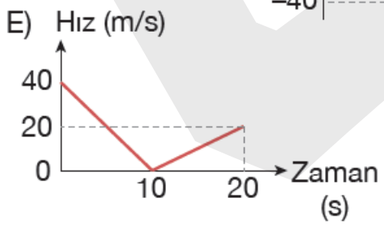
Buna göre, bu otobüsün 0-20 s zaman aralığı için hız-zaman grafiği aşağıdakilerden hangisidir?

A)


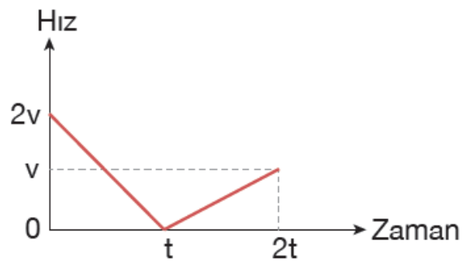
B)


C)


D)


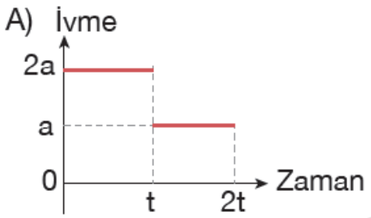
E)


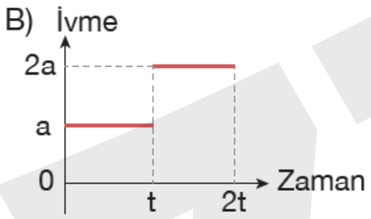
Örnek:

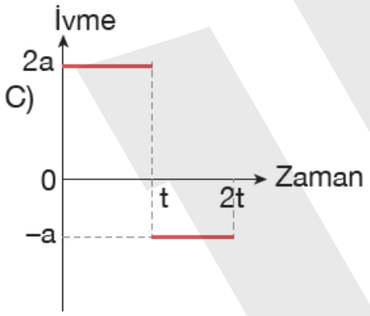


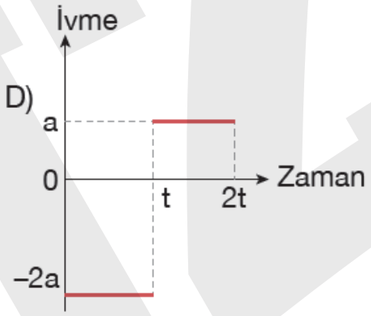
Doğrusal bir yolda hareket eden bir otobüsün hız-zaman grafiği şekildeki gibidir.

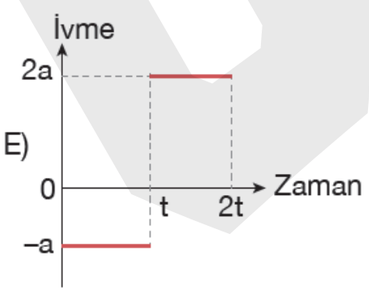
Buna göre, otobüsün 0-2t zaman aralığındaki ivme-zaman grafiği aşağıdakilerden hangisidir?

A)


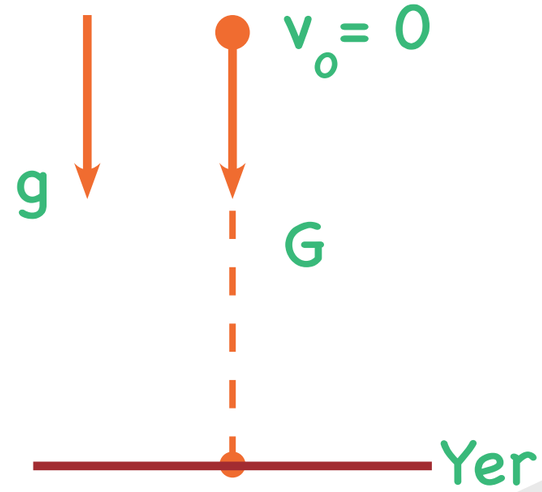
B)


C)


D)


E)


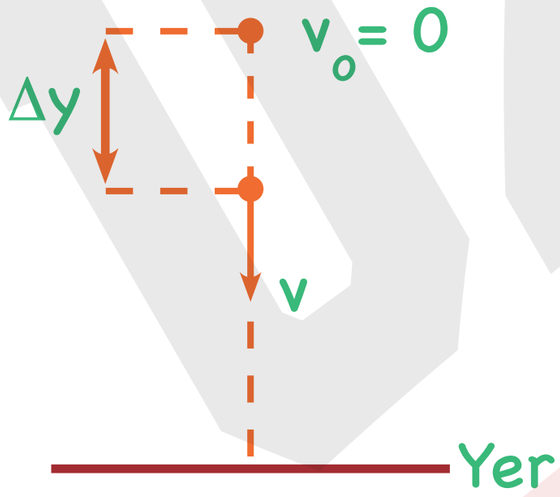
Serbest Düşme



$$v_s = v_0 + at \rightarrow v = gt$$

$$\Delta x = v_0 t + \frac{1}{2} gt^2 \rightarrow \Delta y = \frac{1}{2} gt^2$$

$$v_s^2 = V_0^2 + 2a\Delta x \rightarrow v^2 = 2g\Delta y$$



$v = gt$

$v_1 = gt = v$

$v_2 = g.2t = 2v$

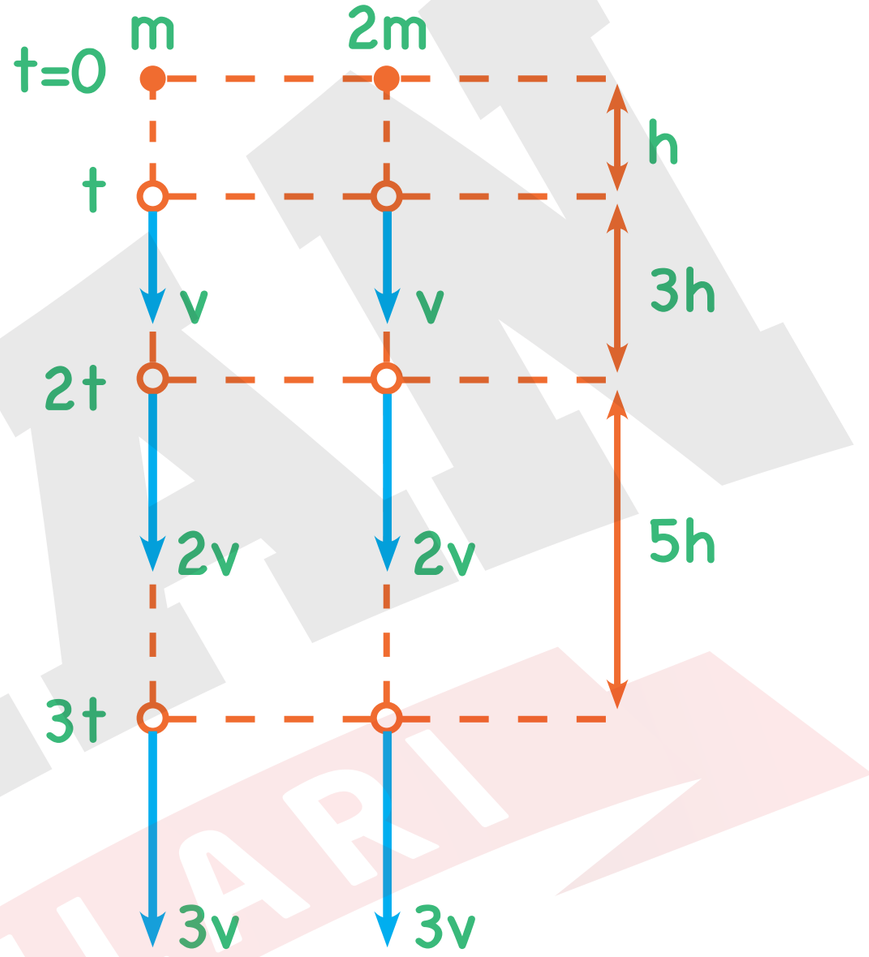
$v_3 = g.3t = 3v$

$$\Delta y = \frac{1}{2} g t^2$$

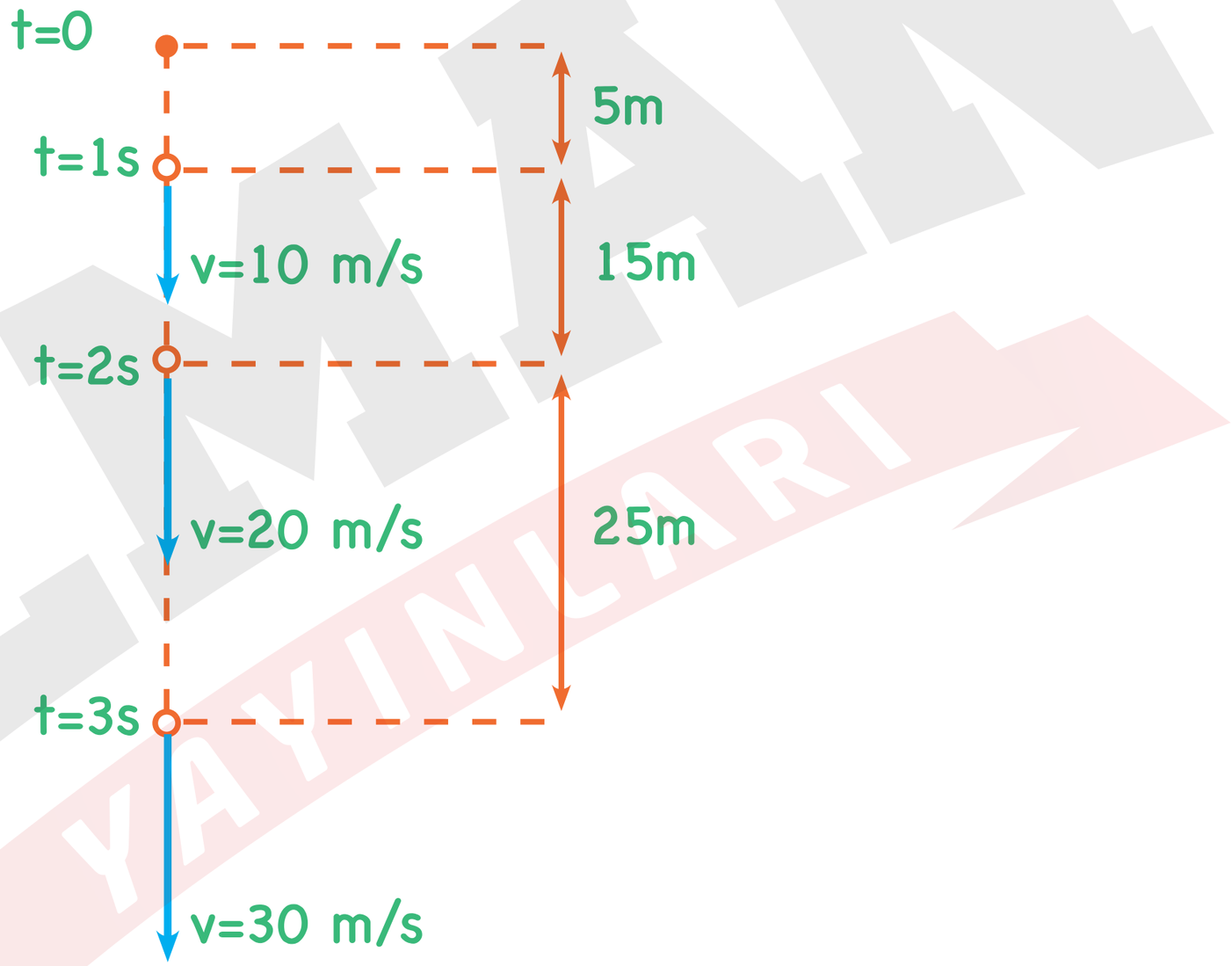
$$= \frac{1}{2} g t^2 = h$$

$$= \frac{1}{2} g 4t^2 = 4h$$

$$= \frac{1}{2} g 9t^2 = 9h$$

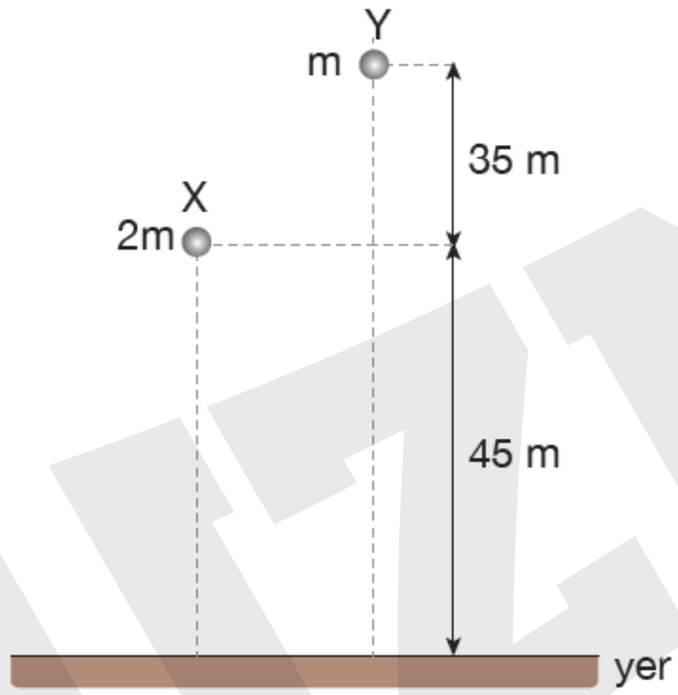


$g = 10\ m/s^2$ ise



Örnek:

Kütleleri sırasıyla 2m ve m olan X ve Y cisimleri şekildeki konumlarından serbest bırakılıyor.



Sürtünmeler önemsiz olduğuna göre, cisimlerin yere çarpma hızlarının büyüklükleri oranı $\frac{v_X}{v_Y}$ kaçtır? ($g = 10\ m/s^2$)

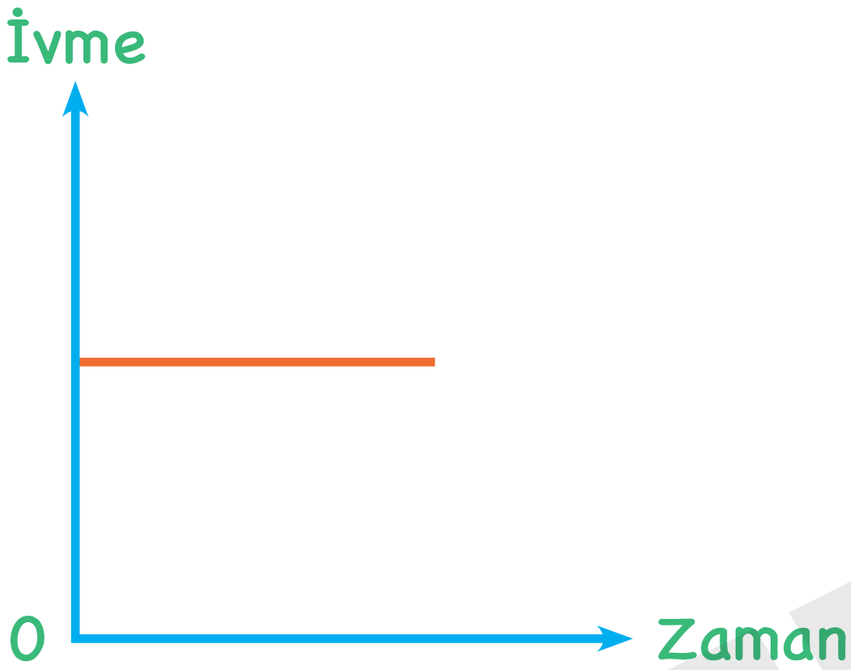
A) $\frac{2}{5}$ B) $\frac{1}{2}$ C) $\frac{3}{5}$ D) $\frac{2}{3}$ E) $\frac{3}{4}$

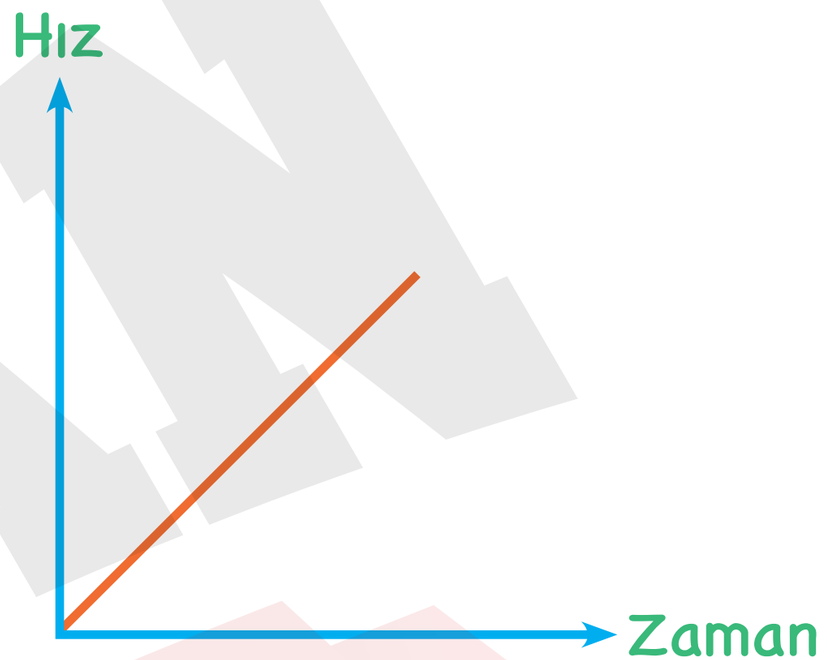
Örnek:

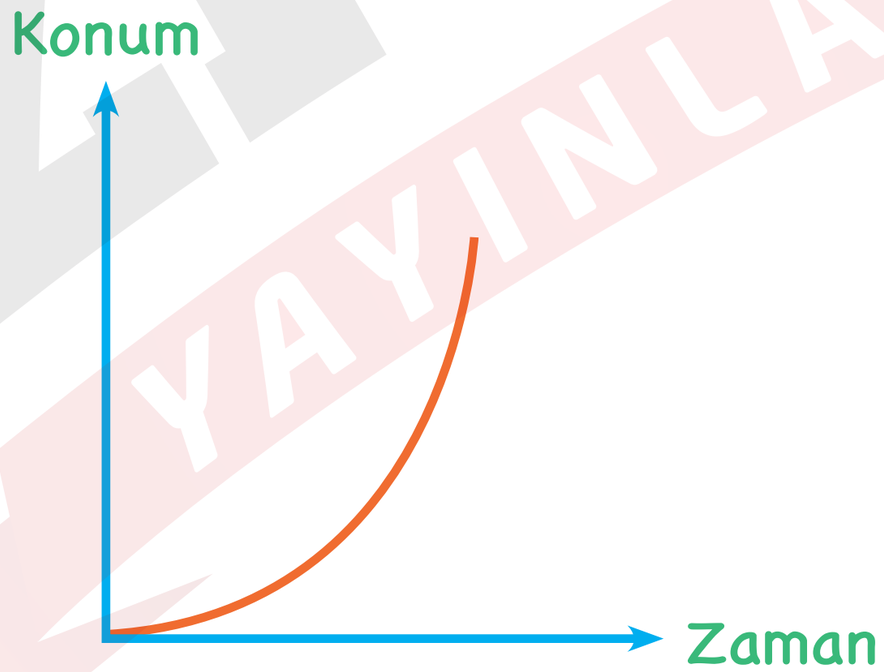
Bir gökdelenin tepesinden birer saniye arayla toplar serbest düşmeye bırakılıyor.

Sürtünme önemsenmediğine göre 3. top serbest düşmeye bırakılırken 1. top ile 2. top arasındaki uzaklık kaç m olur?
($g = 10\ m/s^2$)

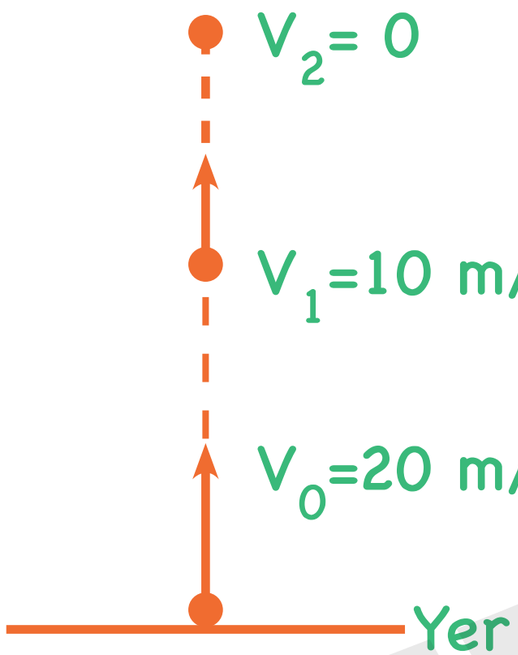
A) 5 B) 15 C) 20 D) 25 E) 35







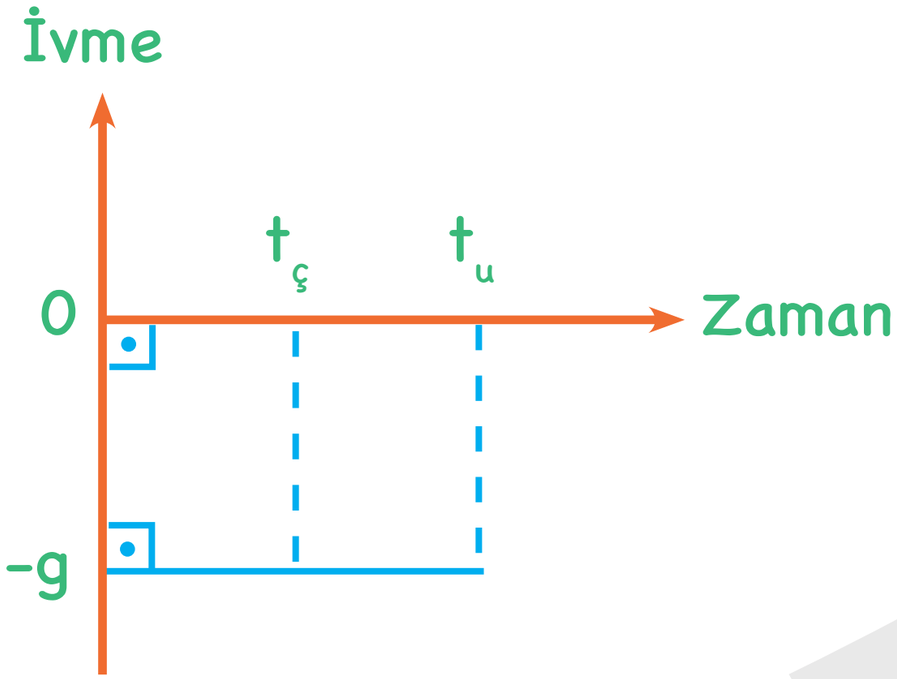
Aşağıdan Yukarıya Düşey Atış

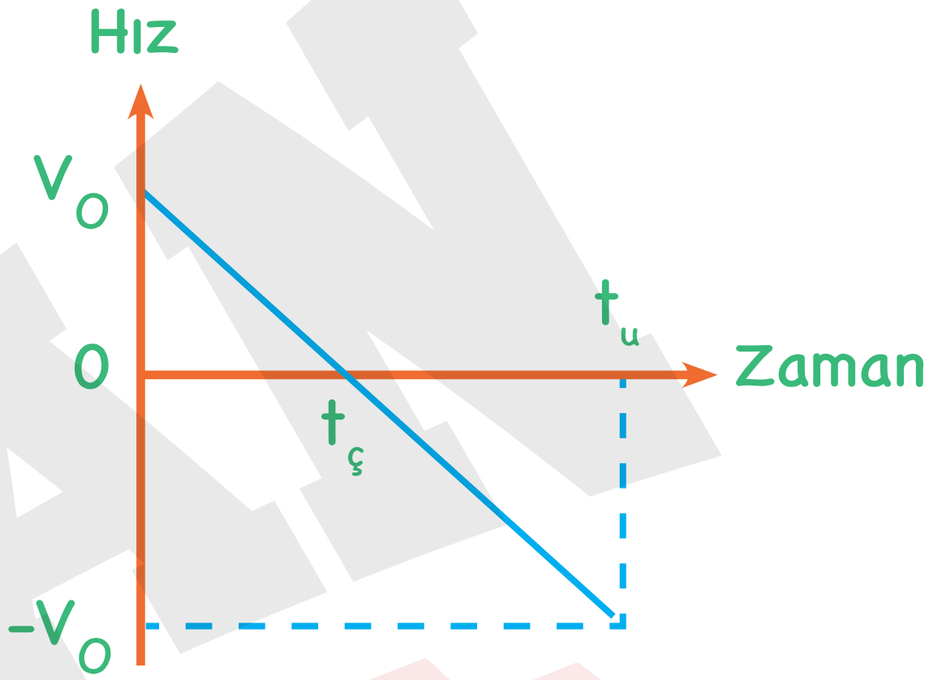


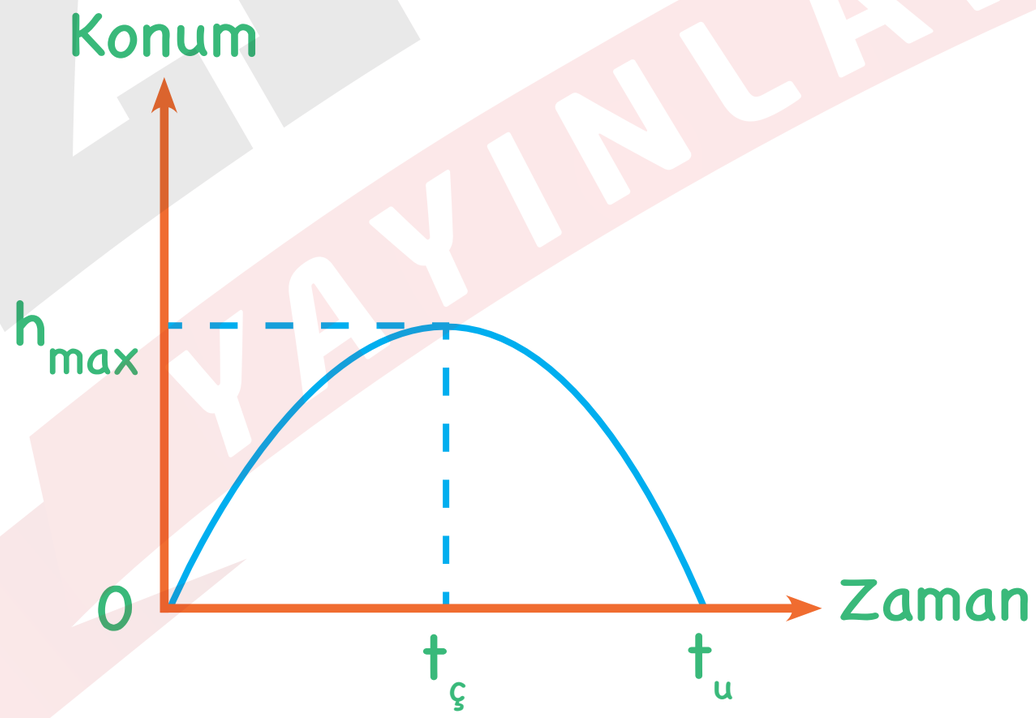
$$V_s = V_0 + at \rightarrow V = V_0 - gt$$

$$\Delta x = V_0 t + \frac{1}{2} a t^2 \rightarrow h = V_0 t - \frac{1}{2} g t^2$$

$$V_s^2 = V_0^2 + 2a\Delta x \rightarrow V^2 = V_0^2 - 2gh$$

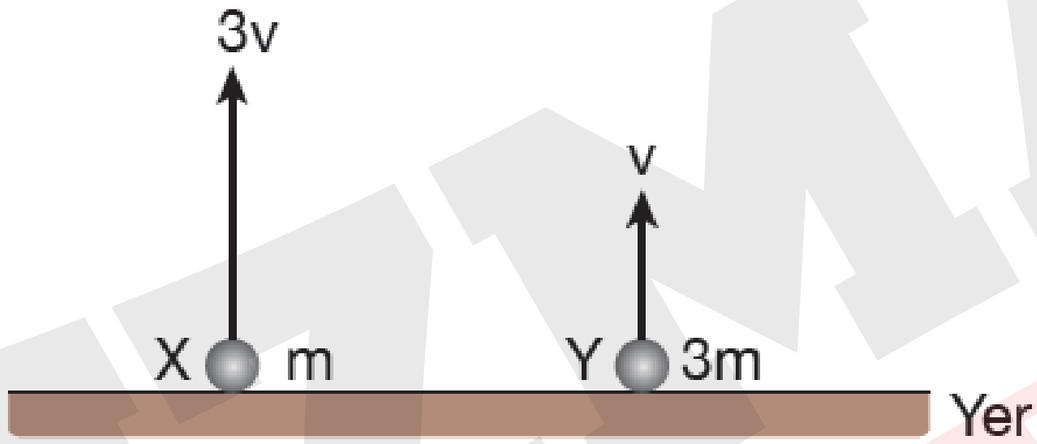

İvme
0
$t_ç$
t_u
Zaman
-g


Hız
V_0
0
t_u
Zaman
$t_ç$
$-V_0$


Konum
h_{max}
0
Zaman
$t_ç$
t_u

Örnek:

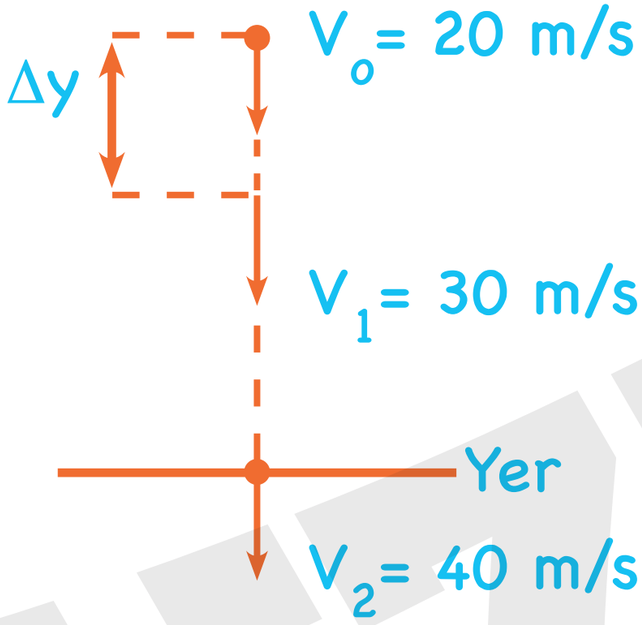
Kütleleri sırasıyla m, 3m olan X ve Y cisimleri büyüklükleri 3v, v olan hızlarla şekildeki gibi düşey olarak yukarıya atılıyor.



Buna göre, cisimlerin çıkabileceği maksimum yükseklikler oranı $\frac{h_X}{h_Y}$ kaçtır? (Sürtünmeler önemsizdir.)

A) 9 B) 6 C) 3 D) 1 E) $\frac{1}{3}$

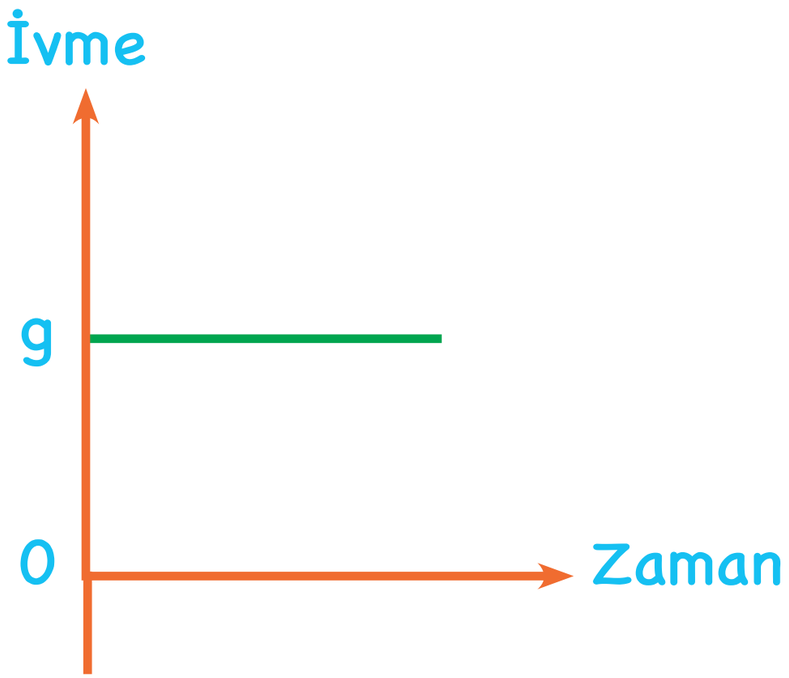
Yukarıdan Aşağıya Düşey Atış

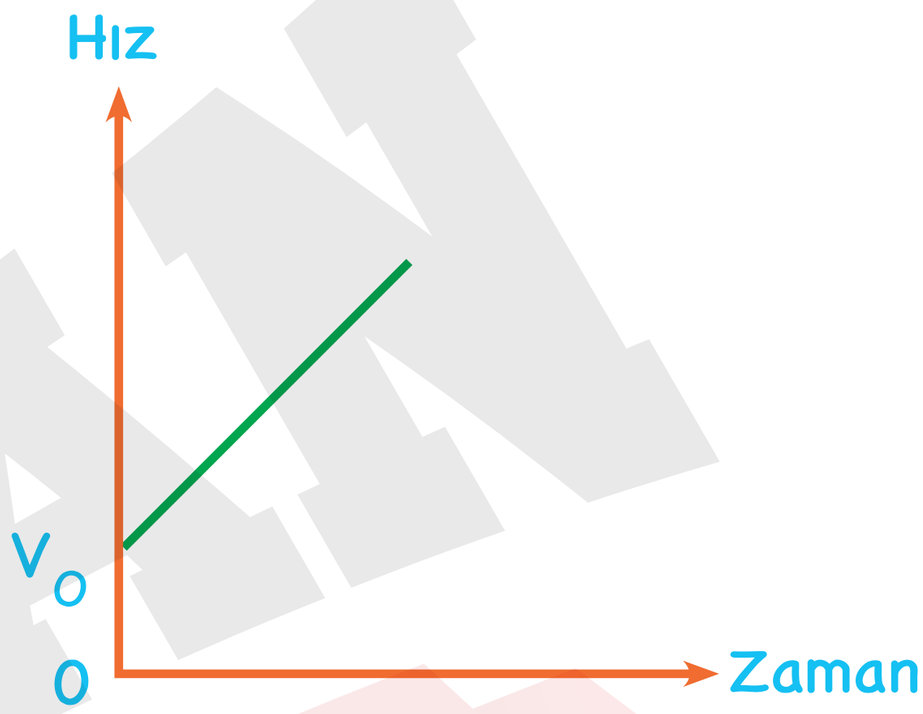


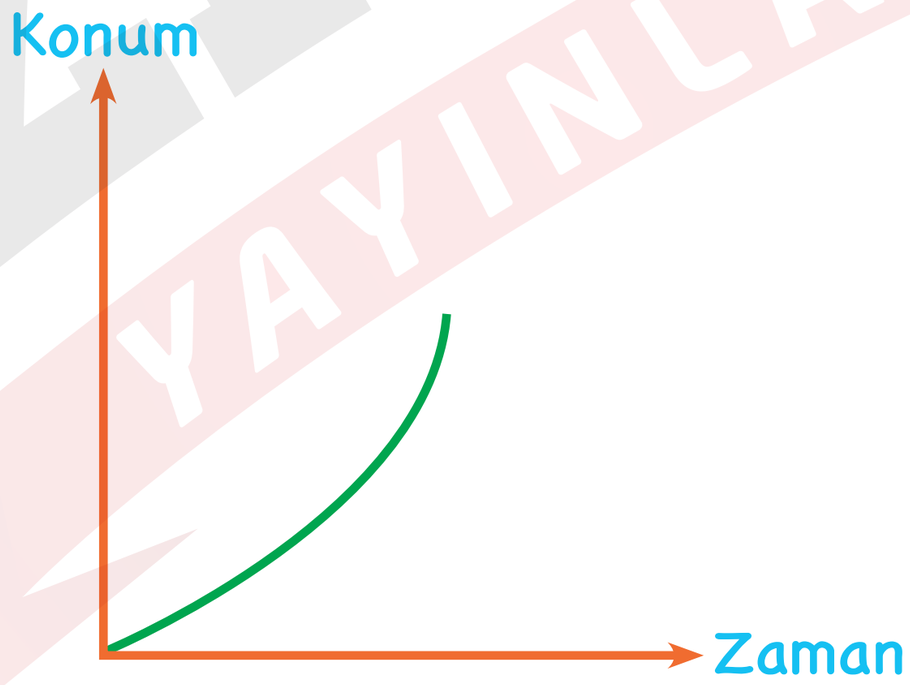
$$V_s = V_0 + at \rightarrow V = V_0 + gt$$

$$\Delta x = V_0 t + \frac{1}{2} a t^2 \rightarrow \Delta y = V_0 t + \frac{1}{2} g t^2$$

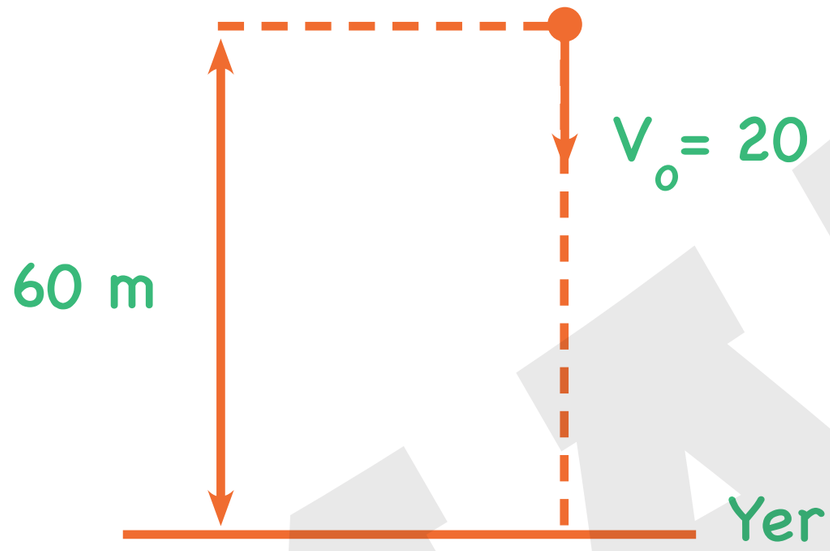
$$V_s^2 = V_0^2 + 2a\Delta x \rightarrow V^2 = V_0^2 + 2g\Delta y$$







Örnek:



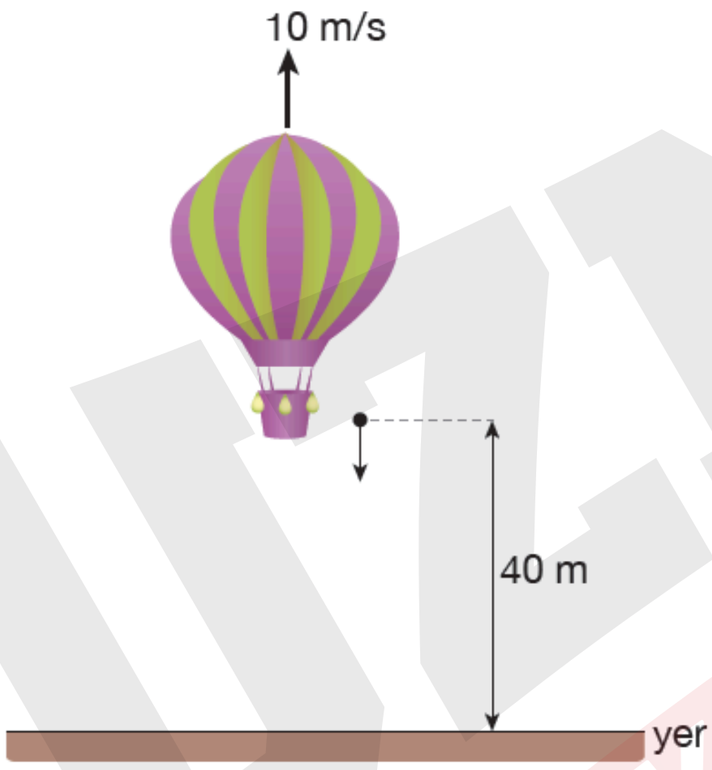
Hava direncinin önemsenmediği ortamda bir cisim yukarıdan aşağıya düşey olarak şekildeki gibi 20 m/s büyüklüğünde ilk hızla atılıyor.

Buna göre, cismin yere çarpış hızı kaç m/s olur ?
($g=10\ m/s^2$)

A) 25 B) 30 C) 40 D) 50 E) 60

Örnek:

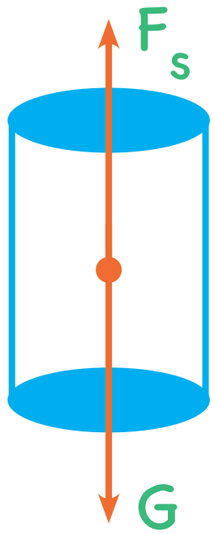
Sürtünmenin önemsenmediği bir ortamda yukarıya doğru 10 m/s büyüklüğündeki hızla yükselen bir balondan bir cisim balona göre 20 m/s büyüklüğünde hızla şekildeki gibi aşağıya doğru atılıyor.



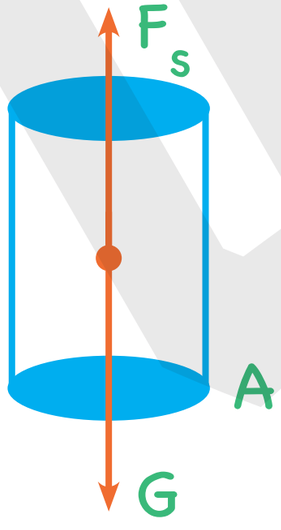
Buna göre, cisim yere kaç saniyede ulaşır? ($g = 10\ m/s^2$)

A) 1 B) 2 C) 3 D) 4 E) 5

Limit Hız



$v \uparrow F_s \uparrow$



$F_s = G \rightarrow F_{net} = 0$

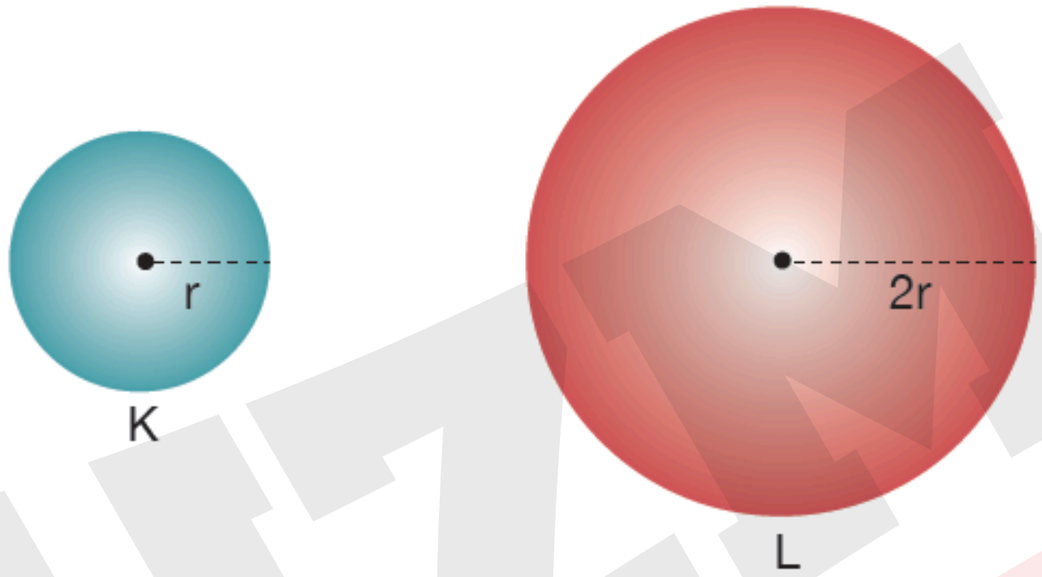
$a = 0$

$\Delta v = 0$

$kAv^2 = mg \rightarrow = v \sqrt{\frac{mg}{kA}}$

Örnek:

Yarıçapları r ve 2r olan K ve L kürelerinin kütleleri ve hava ile sürtünme katsayıları eşittir.



Küreler yeterince yükseklikten serbest bırakıldıklarında kürelerin ulaşacakları limit hızların büyüklükleri $\frac{v_K}{v_L}$ oranı kaçtır?

A) 4 B) 2 C) 1 D) $\frac{1}{2}$ E) $\frac{1}{4}$