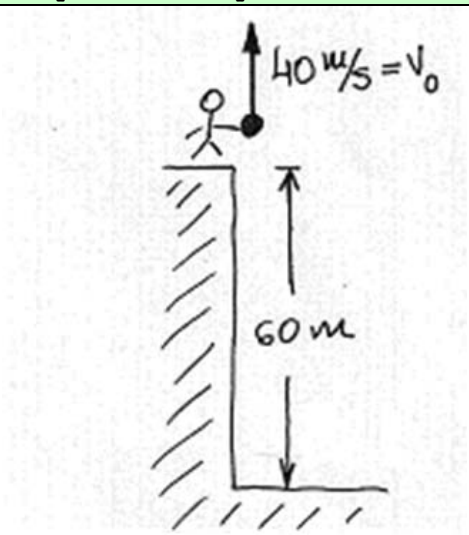
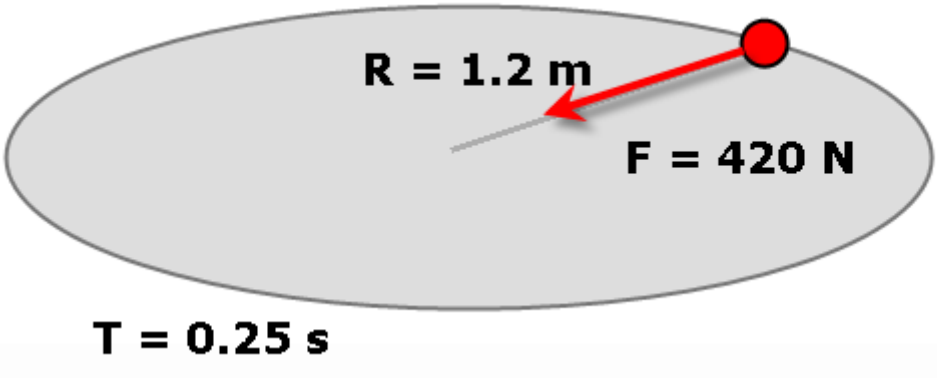
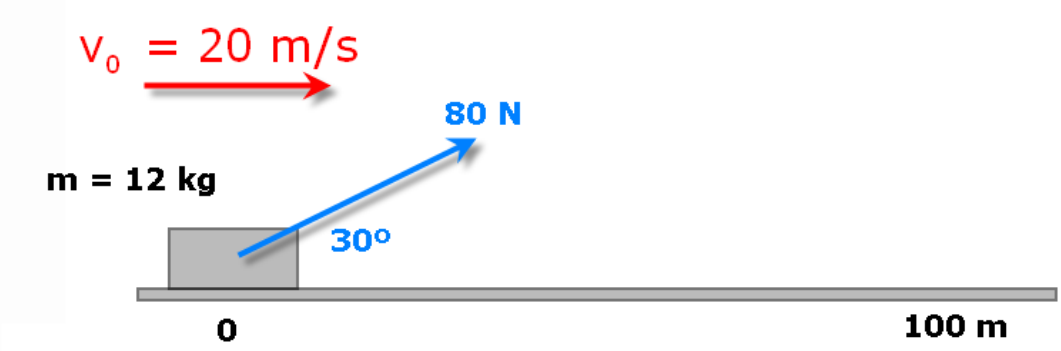
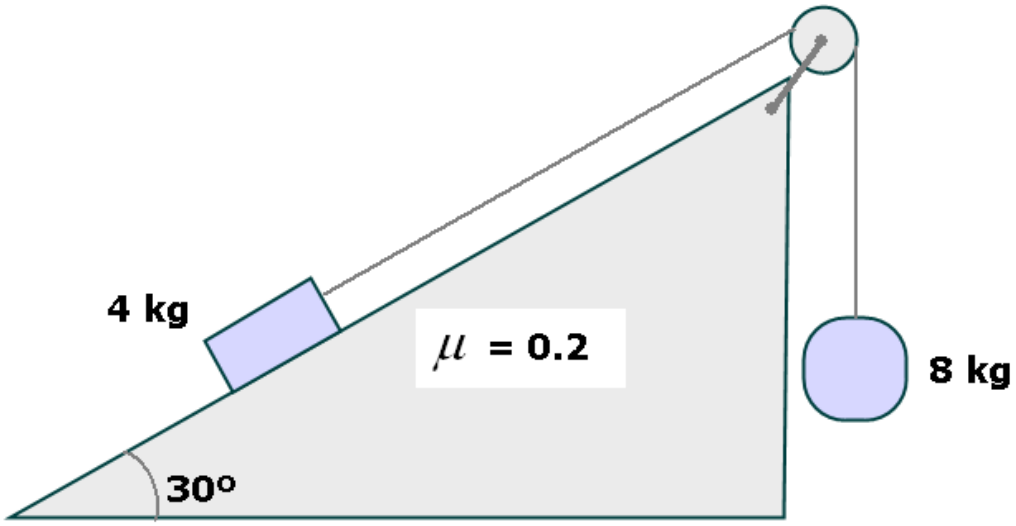
LIZARDI BHI	2009-10	Gaiak:	PUNTUAZIOA:
Fisika-Kimika	3. ebal	Zinematika-II	
2010-Apirila-15		Dinamika	
IZENA:			

Ariketa #1
Gorputz bat gorantz botatzen da 40 m/s-ko abiaduraz 60 m-ko altueratik. Kalkulatu: a) Posizio-bektore eta abiaduraren ekuazio bektorialak [1 PUNTU] b) Altuera maximoa [1 PUNTU] c) Abiadura lurra jotzean [0.5 PUNTU]


Ariketa #2
Higikaria mugitzen da beheko irudian adierazten den bezala. Kalkulatu: a) Maiztasuna [0.5 PUNTU] b) Abiadura lineala (m/s) eta angeluarra (rad/s eta rpm) [1 PUNTU] c) Azelerazioa eta masa [1 PUNTU]


Ariketa #3
Higikaria mugitzen da irudian agertzen den bezala. Hasierako abiadura 20 m/s-koa da. Kalkulatu: a) Indar normalaren balioa (0.5 PUNTU) b) Marruskadura-indarra eta marruskadura-koefizientea (1 PUNTU) c) Abiadura higikaria lehen aldiz x = 100 m posiziotik pasatzen denean (1 PUNTU)
 $a = -1.2\ m/s^2$

Ariketa #4
Kasu honetan kalkulatu: a) azelerazioa [1.5 PUNTU] b) tentsioak [1 PUNTU]


① @ Posizio-bektorearen ekuazioa

$$\vec{r} = (y_0 + v_{0y}t + \frac{1}{2}at^2)\vec{j} \ (m)$$

$y_0 = 60\ m$
$v_{0y} = 40\ m/s$
$a = -10\ m/s^2$

$$\boxed{\vec{r} = (60 + 40t - 5t^2)\vec{j} \ (m)}$$

Abiaduraren ekuazio bektoriala

$$\vec{v} = (v_{0y} + at)\vec{j} \ (m/s)$$

$v_{0y} = 40\ m/s$
$a = -10\ m/s^2$

$$\boxed{\vec{v} = (40 - 10t)\vec{j} \ (m/s)}$$

ⓑ Altuera maximoa → Baldintza: $v = 0$

$$40\frac{m}{s} - 10\frac{m}{s^2}t = 0 \rightarrow t = \frac{40\ m/s}{10\ m/s^2} \rightarrow t = 4s \text{ denean hartzen du altuera maximoa}$$

$$y = 60 + 40t - 5t^2 \xrightarrow[\text{denean}]{t=4s} \boxed{y = 140m} \text{ da altuera maximoa}$$

ⓒ Lurra jotzean → Baldintza: $y = 0$

$$60 + 40t - 5t^2 = 0 \rightarrow 5t^2 - 40t - 60 = 0 \rightarrow t^2 - 8t - 12 = 0$$

$$t = \frac{8 \pm \sqrt{64 + 48}}{2} \begin{cases} \nearrow t \text{ negatiboa} \\ \searrow t = 9{,}29\ s \end{cases}$$

Abiadura:

$$\vec{v} = (40 - 92{,}9)\vec{j} \ (m/s) \rightarrow \boxed{\vec{v} = -52{,}9\vec{j} \ (m/s)}$$

negatiboa: abiadura beherantz

② ⓐ Maiztasuna

$$f = \frac{1}{T} = \frac{1}{0.25\ s} \rightarrow \boxed{f = 4\ Hz}$$

ⓑ Abiadura lineala

$$v = \frac{2\pi R}{T} = \frac{2\pi \times 1{,}2\ m}{0{,}25\ s} \rightarrow \boxed{v = 30{,}16\ \frac{m}{s}}$$

Abiadura angeluarra

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{0{,}25\ s} \rightarrow \boxed{\omega = 25{,}13\ \frac{rad}{s}}$$

$$\omega = 25{,}13\ \frac{rad}{s} \times \frac{60\ s}{1\ min} \times \frac{1\ bir}{2\pi\ rad} \rightarrow \boxed{\omega = 240\ b.m.}$$

ⓒ Azelerazioa

$$a = \frac{v^2}{R} = \frac{(30{,}16\ m/s)^2}{1{,}2\ m} \rightarrow \boxed{a = 758\ \frac{m}{s^2}}$$

Masa

$$F = m \times a \rightarrow m = \frac{F}{a} = \frac{420\ N}{758\ m/s^2} \rightarrow \boxed{m = 0{,}55\ kg}$$

③ @ Indar normala (N)

$F_y = F_x \sin 30° = 80N \times \sin 30° \rightarrow F_y = 40N$

Y ardatzean:

$F_T = m \times a = 0$

$N + F_y - P = 0 \rightarrow N = 120N - 40N$

$\boxed{N = 80\ N}$

ⓑ Marruskadura - indarra (F_r)

$F_x = F \cdot \cos 30° \rightarrow F_x = 69,28\ N$

Newton-en ekuazioa aplikatuz:

$F_{tot} = m \times a \longrightarrow F_x - F_r = m \times a \rightarrow 69,28N - F_r = 12Kg \times (-1,2 \frac{m}{s^2})$

$69,28N - F_r = -14,4N \longrightarrow F_r = 69,28N + 14,4N \rightarrow \boxed{F_r = 83,68\ N}$

Marruskadura - koefizientea:

$F_r = \mu . N \rightarrow \mu = \frac{F_r}{N} = \frac{83,68N}{80\ N} \rightarrow \boxed{\mu = 1,05}$

ⓒ Abiadura $x = 100\ m$ denean

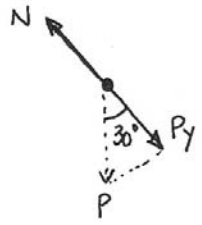
$x = x_0 + v_0 t + \frac{1}{2} a t^2 \rightarrow 100 = 20t - 0,6\ t^2 \rightarrow$

$\rightarrow 0,6\ t^2 - 20t + 100 = 0$

$t = \frac{20 \pm \sqrt{400 - 240}}{1,2} = \frac{20 \pm 12,65}{1,2} \rightarrow$ Lehen aldiz: $t = 6,13\ s$ denean

$v = v_0 + at \longrightarrow v = 20 - 1,2\ t\ (m/s) \xrightarrow{t = 6,13s} \boxed{v = 12,64 \frac{m}{s}}$

④ ⓐ Azelerazioa



Lehenengoz indar normala (N) kalkulatuko dugu

$P = 40N$

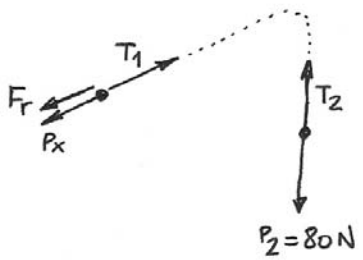
$P_y = P.\cos 30° \longrightarrow P_y = 34,64N$

$N = P_y \longrightarrow N = 34,64N$

Jarraian, marruskadura-indarra

$F_r = \mu N \longrightarrow F_r = 0,2 \times 34,64N \longrightarrow F_r = 6,93N$

Azkenik, Newton-en ekuazioa aplikatuko dugu:



$P_x = P.\sin 30° \longrightarrow P_x = 20N$

$F_{tot} = m \times a$

$\downarrow$

$F_{tot} = P_2 - T_2 + T_1 - F_r - P_x$

$F_{tot} = 80N - 20N - 6,93N$

$F_{tot} = 53,07N$

$$a = \frac{F_{tot}}{m} = \frac{53,07N}{8Kg + 4Kg} \longrightarrow \boxed{a = 4,42\ m/s^2}$$

ⓑ Tentsioak

Newton-en ekuazioa gorputz bakar bati aplikatuko diogu:

$F_{tot} = m \times a$

$\downarrow$

$80N - T_2 = 8Kg \times 4,42 \frac{m}{s^2}$

$80N - T_2 = 35,36N$

$\boxed{T_1 = T_2 = 44,64\ N}$