

Exercicis dinàmica domier

①

$$m = 4 \text{ kg}$$

$$\mu = 0,3$$

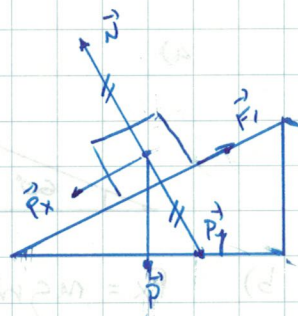
$$\vec{F} = 0$$

$$\alpha ?$$

$$P_x = mg \sin \alpha$$

$$P_y = mg \cos \alpha$$

$$F_r = \mu P_y = \mu mg \cos \alpha$$



$$\vec{P}_x - \vec{F}_r = 0$$

$$P_x = F_r$$

$$mg \sin \alpha = \mu mg \cos \alpha$$

$$\mu = \frac{\sin \alpha}{\cos \alpha} = \tan \alpha$$

$$\mu = \tan \alpha$$

$$\alpha = \tan^{-1} \mu = \tan^{-1} 0,3 = 16,69^\circ$$

②

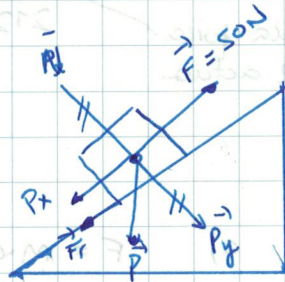
$$\alpha = 30^\circ$$

$$\vec{F} = 50 \text{ N}$$

$$m = 5 \text{ kg}$$

$$\mu = 0,2$$

$$a ?$$



$$\vec{F} - (\vec{P}_x + \vec{F}_r) = ma$$

$$50 - (mg \sin 30^\circ + \mu mg \cos 30^\circ) = ma$$

$$50 - (5 \cdot 9,8 \cdot \sin 30^\circ + 0,2 \cdot 5 \cdot 9,8 \cdot \cos 30^\circ) = 5a$$

$$50 - (24,5 + 8,49) = 5a$$

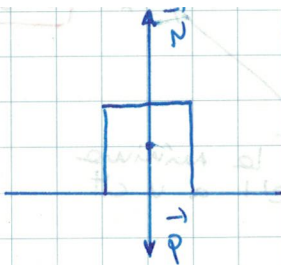
$$50 - 32,99 = 5a$$

$$17,01 = 5a$$

$$a = \frac{17,01}{5} = 3,40 \text{ m/s}^2$$

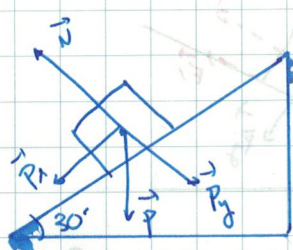
④

a)



$$\vec{N} = \vec{P} = mg = 10 \cdot 9,8 = 98 \text{ N}$$

b)



$$\vec{N} = \vec{P}_y = mg \cos \alpha = 10 \cdot 9,8 \cdot \cos 30^\circ$$

$$\vec{N} = 84,9 \text{ N}$$

c)



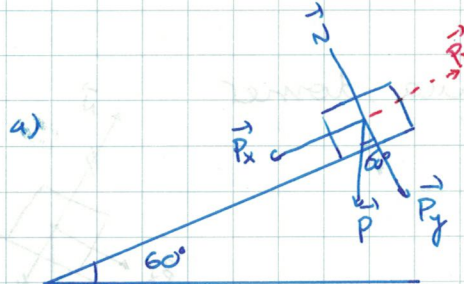
$$\vec{N} = 0 \text{ per-què no està sobre una superfície}$$

5

$$m = 250 \text{ kg}$$

$$\alpha = 60^\circ$$

$$\vec{F}_i = 0$$



b) $P_x = m g \sin \alpha = 250 \cdot 9,8 \cdot \sin 60^\circ = 2121,8 \text{ N}$

Força del seu pes

única força que actua

$$P_x = m a$$

$$2121,8 = 250 a$$

$$a = \frac{2121,8}{250} = \boxed{8,5 \text{ m/s}^2}$$

6

$$m = 1,5 \text{ t} = 1500 \text{ kg}$$

$$F = 9500 \text{ N}$$

a) $F = m \cdot a$

$$9500 = 1500 a$$

$$a = \frac{9500}{1500} = \boxed{6,3 \text{ m/s}^2}$$

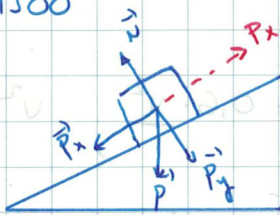
b) $\vec{F}_i = 500 \text{ N}$

$$\vec{F} - \vec{F}_i = m \cdot a$$

$$9500 - 500 = 1500 a$$

$$9000 = 1500 a$$

$$a = \frac{9000}{1500} = \boxed{6 \text{ m/s}^2}$$



$$P_x = m g \sin \alpha$$

$$P_x = 250 \cdot 9,8 \cdot \sin 45^\circ$$

$$P_x = \boxed{1732,4 \text{ N}}$$

7

$$m = 250 \text{ kg}$$

$$\alpha = 45^\circ$$

$$v \text{ ct} + \vec{F}_i = 0$$

$$\hookrightarrow \vec{F}_{\text{net}} = 0$$

única força que actua i la mínima per moure'l a v ct

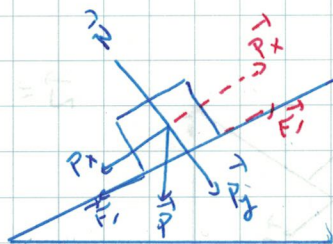
8

$$m = 1 \text{ t} = 1000 \text{ kg}$$

$$\alpha = 45^\circ$$

$$\mu = 0,2$$

a)



b) $\vec{F}_i = \mu \vec{N} = \mu P_y = \mu m g \cos \alpha = 0,2 \cdot 1000 \cdot 9,8 \cdot \cos 45^\circ = \boxed{1385,93 \text{ N}}$

c) $P_x = m g \sin \alpha = 1000 \cdot 9,8 \cdot \sin 45^\circ = \boxed{6929,64 \text{ N}}$

$$\vec{P}_x + \vec{F}_i = 6929,64 + 1385,93 = \boxed{8315,57 \text{ N}}$$

9)

$$\vec{F} = 4500 \text{ N}$$

$$\vec{F}_i = 1300 \text{ N}$$

$$m = 860 \text{ kg}$$

$$\vec{F} - \vec{F}_i = m \cdot a$$

$$4500 - 1300 = 860 a$$

$$a = \frac{3200}{860} = 3,72 \text{ m/s}^2$$

NRMA

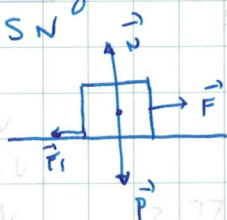
$$v = v_0 + a \Delta t$$

$$v = 3,72 \cdot 10 = \boxed{37,2 \text{ m/s}}$$

10)

$$m = 700 \text{ g} = 0,7 \text{ kg}$$

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



a) $a = 1,5 \text{ m/s}^2$

$$\vec{F} - \vec{F}_i = m a$$

$$5 - \vec{F}_i = 0,7 \cdot 1,5$$

$$-\vec{F}_i = 1,05 - 5$$

$$\vec{F}_i = \boxed{3,95 \text{ N}}$$

b) $\vec{F} - \vec{F}_i = m \cdot a$

$$5 - \vec{F}_i = 0,7 \cdot 0$$

$a = 0$ quan v ch

$$\vec{F}_i = \boxed{5 \text{ N}}$$

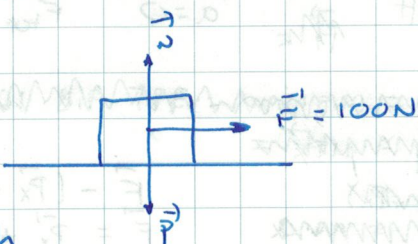
11)

$$m = 2 \text{ T kg}$$

$$t_0 = 0 \text{ s}$$

$$v_0 = 0 \text{ m/s}$$

$$v = 72 \text{ km/h}$$



$$\vec{F} = m a$$

$$100 = 2 a$$

$$a = \frac{100}{2} = 4 \text{ m/s}^2$$

$$v = v_0 + a \Delta t$$

$$20 = 0 + 4 \Delta t$$

$$\Delta t = \frac{20}{4} = \boxed{5 \text{ s}}$$

$$\frac{72 \text{ km}}{\text{h}} \cdot \frac{1 \text{ h}}{3600 \text{ s}} \cdot \frac{1000 \text{ m}}{1 \text{ km}} = 20 \text{ m/s}$$

12)

$$m = 105 \text{ kg}$$

$$\Delta x = 25 \text{ m}$$

$$\Delta t = 12 \text{ s}$$

$$v_0 = 0 \text{ m/s}$$

$$t_0 = 0 \text{ s} \rightarrow t = 12 \text{ s}$$

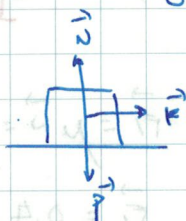
$$\vec{F}_i = 0$$

$$\Delta x = v_0 \Delta t + \frac{1}{2} a \Delta t^2$$

$$25 = \frac{1}{2} a \cdot (12)^2$$

$$50 = 144 a$$

$$a = \frac{50}{144} = 0,35 \text{ m/s}^2$$



$$\vec{F} = m \cdot a$$

$$\vec{F} = 105 \cdot 0,35$$

$$\vec{F} = \boxed{36,46 \text{ N}}$$

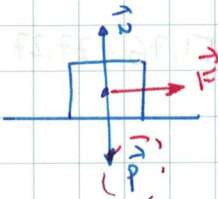
13)

$$m = 7,5 \text{ kg}$$

a) v ch $a = 0$ $\vec{F} = 0$

$$\vec{F} = \vec{P} = m \cdot g = 7,5 \cdot 9,8$$

$$\vec{F} = \boxed{73,5 \text{ N}}$$



(14)

$$m = 72 \text{ kg}$$

 $a = ?$

$$\alpha = 12^\circ$$

$$\vec{F}' = 0$$

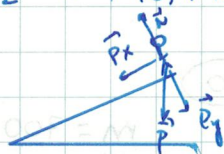
$$\vec{P}_x = mg \sin \alpha = 72 \cdot 9,8 \cdot \sin 12^\circ = 146,7 \text{ N}$$

$$\vec{P}_x = m \cdot a$$

$$146,7 = 72 a$$

$$a = 2,03 \text{ m/s}^2$$

uma
força que
atua



$$\Delta x = 136 \text{ m}$$

$$t_0 = 0 \text{ s}$$

$$v_0 = 0 \text{ m/s}$$

$$\Delta x = v_0 \Delta t + \frac{1}{2} a \Delta t^2$$

$$136 = 1,018 \cdot \Delta t^2$$

$$\Delta t = \sqrt{\frac{136}{1,018}} = 11,55 \text{ s}$$

$$v = v_0 + a \Delta t$$

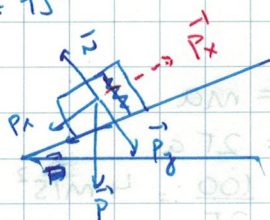
$$v = 2,03 \cdot 11,55$$

$$v = 23,54 \text{ m/s}$$

(15)

$$m = 375 \text{ kg}$$

$$\alpha = 15^\circ$$



$$\mu = 0,74$$

a) $\vec{F} = m \cdot a$
 $\vec{F} = 0$ $\vec{F}_{\text{tot}} = 0$

$\vec{F} = m \cdot a$
 $\vec{F} = 0$ $\vec{F}_{\text{tot}} = 0$

$$\vec{F} - (\vec{P}_x + \vec{F}_i) = 0$$

$$\vec{F} = \vec{P}_x + \vec{F}_i$$

$$\vec{F} = mg \sin \alpha + \mu mg \cos \alpha$$

$$\vec{F} = 375 \cdot 9,8 \cdot \sin 15^\circ + 0,74 \cdot 375 \cdot 9,8 \cdot \cos 15^\circ$$

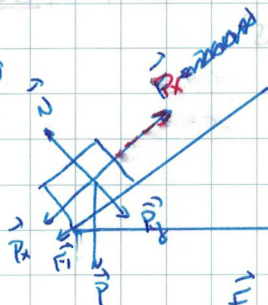
$$\vec{F} = 951,16 + 2626,84 = 3578 \text{ N}$$

$$a = 0,2 \text{ m/s}^2$$

b) $\vec{F} - (\vec{P}_x + \vec{F}_i) = m \cdot a$
 $\vec{F} - 3578 = 375 \cdot 0,2$
 $\vec{F} = 3578 + 75 = 3653 \text{ N}$

$$= 3653 \text{ N}$$

(16)



$$\alpha = 15^\circ$$

a) $\vec{F}_i = \mu \vec{N} = \mu \vec{P}_y = \mu mg \cos \alpha$

$$\vec{F}_i = 0,4 \cdot 20,41 \cdot 9,8 \cdot \cos 15^\circ$$

$$\vec{F}_i = 77,27 \text{ N}$$

$$\vec{F} = m \cdot g = 200 \text{ N}$$

$$m \cdot 9,8 = 200$$

$$m = \frac{200}{9,8} = 20,41 \text{ kg}$$

b) $\vec{F}_{\text{tot}} = \vec{P}_x + \vec{F}_i$

$$\vec{P}_x = mg \sin \alpha = 20,41 \cdot 9,8 \cdot \sin 15^\circ = 51,76 \text{ N}$$

$$\vec{P}_x + \vec{F}_i = 51,76 + 27,27 = 129,03 \text{ N}$$

(17)

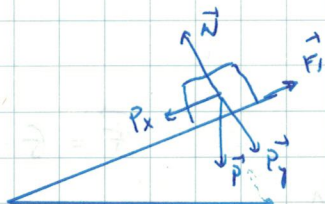
$$\vec{P} = 6,6 \text{ N}$$

$\forall \text{ ch}$

$$\alpha = 28^\circ$$

$$\vec{F}_f ?$$

$$\mu ?$$



$$\begin{aligned} \vec{P}_x + \vec{F}_f &= 0 \\ P \sin \alpha + F_f &= 0 \\ 6,6 \cdot \sin 28^\circ &= F_f \\ F_f &= \boxed{3,09 \text{ N}} \end{aligned}$$

$$\begin{aligned} F_f &= \mu P_y \\ 3,09 &= \mu \cdot 6,6 \cdot \cos 28^\circ \\ \mu &= \frac{3,09}{5,83} = \boxed{0,53} \end{aligned}$$

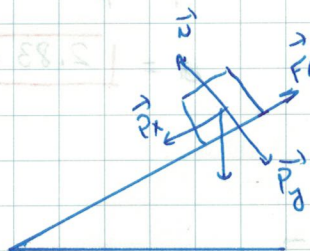
(18)

$$m = 20 \text{ kg}$$

$$\Delta x = 5 \text{ m}$$

$$\alpha = 30^\circ$$

$$\mu = 0,3$$



$$\begin{aligned} \vec{P}_x - \vec{F}_f &= m \cdot a \\ 20 \cdot 9,8 \cdot \sin 30^\circ - 0,3 \cdot 20 \cdot 9,8 \cdot \cos 30^\circ &= 20 \cdot a \\ 98 - 50,92 &= 20a \\ 47,08 &= 20a \\ a &= \frac{47,08}{20} = \boxed{2,35 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} v^2 &= v_0^2 + 2a\Delta x \\ v &= \sqrt{2 \cdot 2,35 \cdot 5} \\ v &= \sqrt{23,5} = \boxed{4,84 \text{ m/s}} \end{aligned}$$

$$\begin{aligned} \Delta x &= v_0 \Delta t + \frac{1}{2} a \Delta t^2 \\ 5 &= \frac{1}{2} \cdot 2,35 \cdot \Delta t^2 \\ \Delta t &= \sqrt{\frac{5}{1,175}} = 2,06 \text{ s} \end{aligned}$$

$$\begin{aligned} v &= v_0 + a \Delta t \\ v &= 0 + 2,35 \cdot 2,06 \\ v &= 4,84 \text{ m/s} \end{aligned}$$

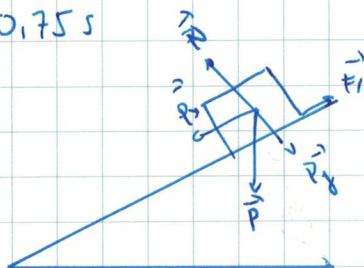
(19)

$$\Delta x = 90 \text{ cm} = 0,9 \text{ m}$$

$$m = 1 \text{ kg}$$

$$\alpha = 30^\circ$$

$$\Delta t = 0,75 \text{ s}$$



$$\begin{aligned} \Delta x &= v_0 \Delta t + \frac{1}{2} a \Delta t^2 \\ 0,9 &= \frac{1}{2} a \cdot (0,75)^2 \\ 1,8 &= a \cdot 0,5625 \\ a &= \frac{1,8}{0,5625} = \boxed{3,2 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} \vec{P}_x - \vec{F}_f &= m \cdot a \\ m \cdot g \sin \alpha - \mu m \cdot g \cos \alpha &= m \cdot a \\ 4,9 - 8,49 \mu &= 3,2 \\ 8,49 \mu &= 4,9 - 3,2 \\ \mu &= \frac{1,7}{8,49} = \boxed{0,2} \end{aligned}$$

(20)

$$m = 2500 \text{ kg}$$

$$\alpha = 15^\circ$$

$$\mu = 0,4$$

$$m \cdot a + a = 0$$

$$\vec{F} = (P_x + F_f) \sin \alpha = 0$$

$$\vec{F} = \vec{P}_x + \vec{F}_f$$

$$\vec{F} = m g \sin \alpha + \mu m g \cos \alpha$$

$$\vec{F} = 2500 \cdot 9,8 \cdot \sin 15^\circ + 0,4 \cdot 2500 \cdot 9,8 \cdot \cos 15^\circ$$

$$\vec{F} = 6341,06 + 9466,07$$

$$\vec{F} = \boxed{15807 \text{ N}}$$

