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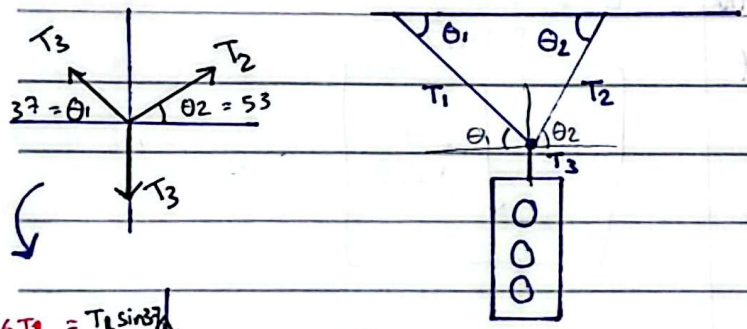
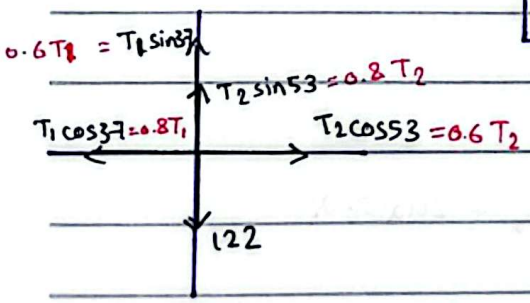
Ex 5.4: A traffic light weighing 122N hangs from a cable tied to two other cables fastened to a support as . The upper cables make angles of $\theta_1 = 37°$ and $\theta_2 = 53°$ with the horizontal. These upper cables are not as strong as the vertical cable and will break if the tension in them exceeds 100N. Does the traffic light remain hanging in this situation, or will one of the cables break?





$\vec{\Sigma F} = 0$ [Equilibrium]

$\rightarrow \Sigma F_x = 0$

$\rightarrow \Sigma F_y = 0$

$\Sigma F_x = 0$

$0.8 T_1 - 0.6 T_2 = 0$

$0.8 T_1 = 0.6 T_2$

$T_1 = 0.75 T_2$ (I)

$\Sigma F_y = 0$

$0.6 T_1 + 0.8 T_2 - 122 = 0$ (II)

$0.6 (0.75) T_2 + 0.8 T_2 = 122$

$0.45 + 0.8 T_2 = 122$

$1.25 T_2 = 122$

$T_2 = 97.6 \ N$

$T_1 = 0.75 T_2 = 0.75 (97.6)$

$T_1 = 73.2 \ N$

$\Rightarrow$ The cord can support the traffic light.

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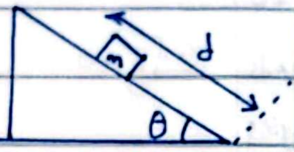
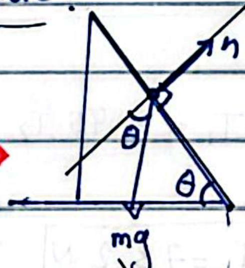
Ex 5.6 Ex A car mass m is on an icy driveway inclined at an angle θ as in figure:

(A) Find the acceleration of the car, assuming the driveway is frictionless.

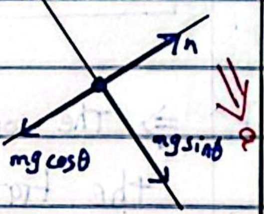
(B) Suppose the car is released from rest ($v_{0x}=0$) at the top of the incline (منحدر) and the distance from the car's front bumper to bottom (قاع) of the incline is d. How long ($t = ??$) does it take the front bumper to reach the bottom of the hill, and what is the car's speed ($v_{fx} = ??$) as it arrives there?





cos θ : القريب من الزاوية [المحور]

sin θ : البعيد من الزاوية



$\Sigma F_y = 0$ [Equilibrium]

$n - mg\cos\theta = 0$

$\boxed{n = mg\cos\theta}$ → مش رح نحتاج هذه المعادلة بنحتاج (n) فقط في حال طلبها مني او في حال الإحتكاك f .

$\Sigma F_x = ma$

$mg\sin\theta - 0 = ma$

$\cancel{m}g\sin\theta = \cancel{m}a$

(A) $\boxed{a = g\sin\theta}$ ← لانه التسارع رح يطلع موجب، فهم قصدا يعني انه بيمكن استخدام معادلات الحركة

(B) $v_{0x} = 0$

$\Delta x = d$

$\Delta x = \cancel{v_0 t}^{(0)} + \frac{1}{2}a_x t^2$

$d = \frac{1}{2}(g\sin\theta)t^2$

$t^2 = \frac{2d}{g\sin\theta}$

$$\boxed{t = \sqrt{\frac{2d}{g\sin\theta}}}$$

$v_{fx} = ??$

$v_{fx}^2 = \cancel{v_{0x}^2}^{(0)} + 2a_x\Delta x$

$v_{fx}^2 = 2g\sin\theta\, d$

$$\boxed{v_{fx} = \sqrt{2gd\sin\theta}}$$

* طريقة حل المسائل الي زي هيك : ① نحدد اتجاه التسارع
② لما نرسم المحاور، لازم يكون واحد من المحاور مع إتجاه التسارع ..
③ نعمل [Free Body Diagram] نحلل القوى المؤثرة في الجسم .

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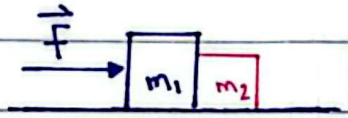
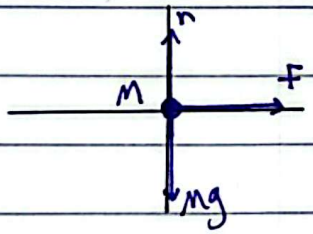
Ex 5.7 Two blocks of masses m_1 and m_2, which $m_1 > m_2$, are placed in contact with each other on a frictionless, horizontal surface as figure. A constant horizontal force $\vec{F}$ is applied to m_1 as shown.

(A) Find the magnitude of the acceleration of the system.



$\Rightarrow$ system (same a)

$m_1 + m_2 = M$



* مش عندي نحلل القوى على محور y مش رح نحتاجها.

$\Sigma F_x = ma$

$F = Ma \Rightarrow \boxed{a = \frac{F}{M}}$ $\quad a = \frac{F}{m_1 + m_2}$

(B) Determine the magnitude of contact force between the two blocks.

$F_2 = m_2 a$

$\boxed{F_2 = \frac{m_2 F}{m_1 + m_2}}$

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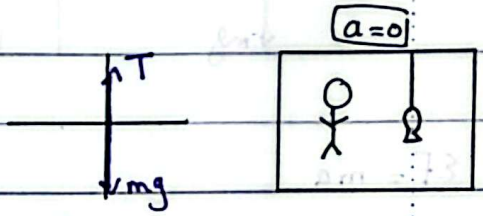
Ex 5.8 A person weighs a fish of mass m on a spring scale attached to the ceiling of an elevator as illustrated

(A) Show that if the elevator accelerates either upward or downward, the spring scale gives a reading that is different from the weight of the fish.

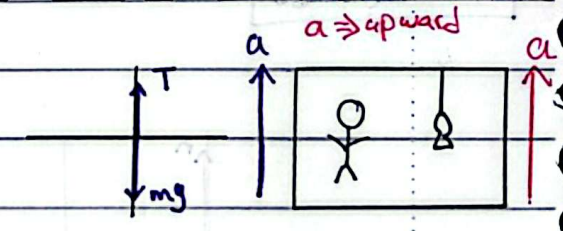
* اي شي معلق عن قوة الشد وليس الوزن.

* The scale reads $\Rightarrow T$



$\Sigma F_y = m\cancel{a} = 0$

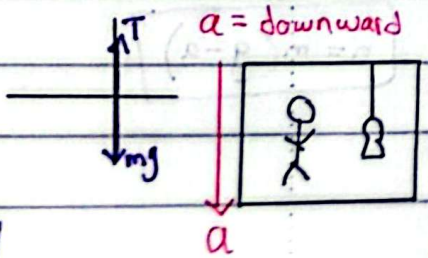
$T - mg = 0$ $\quad \boxed{T = mg}$



$\Sigma F = ma$

$T - mg = ma \Rightarrow T = ma + mg$

$\boxed{T = m(a+g)}$



$\Sigma F = ma$

$mg - T = ma$

$T = mg - ma$

$\boxed{T = m(g-a)}$

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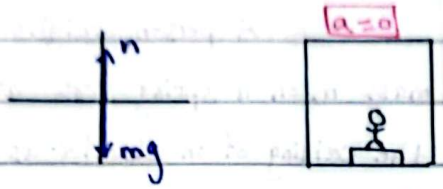
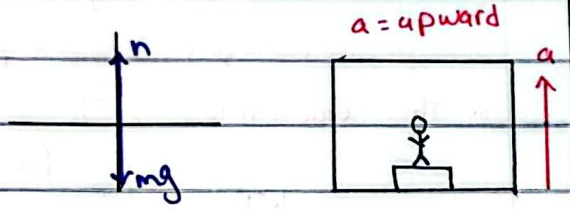
[scale reads = n] الميزان يقرأ وزنك



$\Sigma F = ma = 0$

$n - mg = 0$

$\boxed{n = mg}$

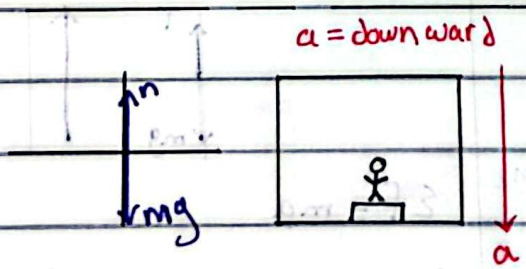


$\Sigma F = ma$

$n - mg = ma$

$n = ma + mg$

$\boxed{n = m(a+g)}$



$\Sigma F = ma$

$mg - n = ma$

$n = mg - ma$

$\boxed{n = m(g-a)}$

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