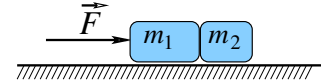


Tutorial #3 : Dynamics of a point — November 2023 (2 sessions) —

Exercise 1 : Two masses m_1 and m_2 are arranged, as shown in the figure below, on a horizontal plane on which they can slide without friction. A horizontal force \vec{F} is applied to m_1 .

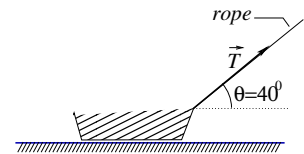
Express as a function of the data (m_1, m_2, \vec{F} or \vec{g})

- a) the net force (i.e. the resultant force) exerted on the whole system [$m_1 + m_2$].
- b) the force exerted by m_1 on m_2 .
- c) the force exerted by m_2 on m_1 .
- d) the force exerted by m_1 on the ground.



Exercise 2 :

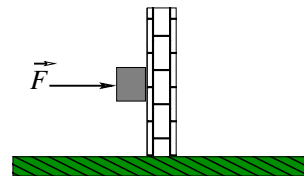
A sled weighing 8 kg is pulled at constant speed by a rope across a horizontal plane. What force T is exerted on the sled if the coefficient of kinetic friction μ_c is 0.20 and the rope makes an angle $\theta = 40^\circ$ with the plane? For the acceleration of gravity, take $g = 9.8 \text{ m/s}^2$.



Exercise 3 : A brick weighing 24 N is pressed against a rough vertical wall by a force \vec{F} , as shown, figure opposite.

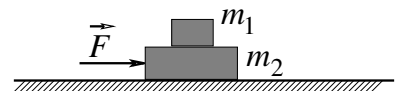
The coefficient of static friction between the brick and the wall is $\mu_s = 0.6$.

- a) What forces does the wall exert on the brick?
- b) In addition to forces found in a), what are the other forces applied to the brick?
- c) Find the magnitude of the minimum value of \vec{F} to prevent the brick from sliding down the wall.



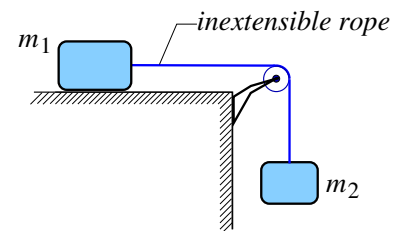
Exercise 4 : A block of mass $m_1 = 4 \text{ kg}$ is placed on a block of mass $m_2 = 5 \text{ kg}$. To make m_1 slide on m_2 , a horizontal force of at least 12 N must be applied to it.

The system [$m_1 + m_2$] now res 0.6 and 0.4ts on a flat, horizontal and frictionless surface (figure opposite). a) Find the maximum horizontal force F that can be applied to m_2 so that the two masses move together with no relative movement between them. b) What is the acceleration of the two blocks?



Exercise 5 : (this exercise was proposed for the 2021 exam of Physics 1)

A mass $m_1 = 1.40 \text{ kg}$ is connected to a mass m_2 by an inextensible wire (غير قابل للإمتداد) of negligible mass (كتلة ضئيلة), as shown in the figure opposite. The coefficients of static and kinetic friction between m_1 and the horizontal surface are $\mu_s = 0.5$ et $\mu_c = 0.2$ respectively. Take $g = 9.8 \text{ m/s}^2$. a) To what maximum value $m_{2\text{max}}$ can m_2 be increased without movement? b) Will motion occur if $m_2 = 0.82 \text{ kg}$? If so, calculate the acceleration. We'll assume that the wire tension (قوة الشد للخيط) is the same in all of its points.



Exercise 6 : A 2 kg block lies on a plane inclined $\alpha = 20^\circ$ from the horizontal and is subjected to a $F = 11 \text{ N}$ force acting, as shown in the figure opposite, at an angle $\beta = 35^\circ$ to the plane. Friction between the block and the plane is neglected, and we'll take $g = 9.8 \text{ m/s}^2$. Find :

- a) the acceleration of the block.
- b) the force exerted by the plane on the block.

