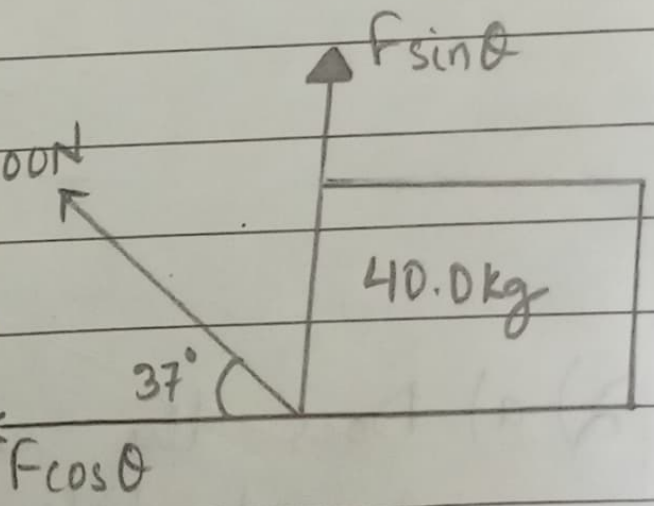
1) A student pulls a box of books on a smooth horizontal floor with a force of 100 N in a dirⁿ of 37° above the horizontal surface. If the mass of the box & the books is 40.0 kg, what is the

a) acclⁿ of the box :-

Ans) Since there is no friction, net force will be equal to $F \cdot \cos\theta$,

$F\cos\theta = ma$ { we get $F\cos\theta$ by resolving it }



$\Rightarrow 100 \times \cos 37^\circ = 40a$

$\Rightarrow 100 \times 0.7986 = 4a$

$\Rightarrow a = 1.99 \text{ m/s}^2$. [Ans]

$\simeq 2 \text{ m/s}^2$

b) the normal force on the box.

Ans) ~~$F_N = mg$~~.

$= 40 \times 9.8$

$= 392\ N$.

$M = 40\ kg$

$F = 100\ N$

Angle $\theta = 37^\circ$

$\sin 37^\circ = \frac{3}{5}$

$F_N = mg - F\sin\theta$

$F_N = 40 \times 9.8 - 100 \times \sin 37$

$F_N = 392 - \left(\frac{20}{100} \times \frac{3}{5}\right)$

$= 392 - 60$

$= 332\ N$.

2) a) Does the earth exert a force on every particle near its surface?

Ans) Yes.

b) Is this a long range force / contact force?

Ans) Long range force.

c) What is the magnitude of this force on a particle of mass m? What is the dirⁿ of this force?

Ans) The magnitude of mass m is $g = (9.80 m/s^2)$

Dirⁿ of the force = Downwards.

d) Two obj. A & B having respective masses 2 kg & 10 kg, are both dropped from a tower & fall while interacting solely with the earth (since air resistance is negligible)

i) What then is the gravitational force on A by the earth? What is the gravitational force on B by the earth?

Ans) Gravitational force on A by the earth = 20 N
Gravitational force on B by the earth = 98 N

ii) What is the acclⁿ of the falling obj. A? What is the acclⁿ of the falling obj. B?

Ans) Both have same acclⁿ 9.8 m/s².