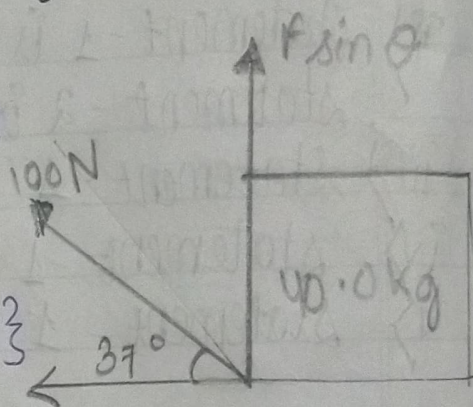


HOMEWORK

4 A student pulls a box of books on a smooth horizontal floor with a force of 100 N in a direction of 37° above the horizontal surface. If the mass of the box & the books is 40.0 kg. What is the acceleration of the box & the normal force on the box by the floor?

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

$$F \cdot \cos \theta = ma \quad \left\{ \begin{array}{l} \text{we get } F \cos \theta \\ \text{by resolving it} \end{array} \right.$$



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

$$\Rightarrow 100 \times 0.7986 = 4a$$

$$\Rightarrow a = 1.99 \text{ m/s}^2$$

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

$$m = 40 \text{ kg}$$

$$F = 100 \text{ N}$$

$$\text{Angle } \theta = 37^\circ$$

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

$$F_N = mg - F \sin \theta$$

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

$$F_N = 392 - (100 \times \frac{3}{5}) = 392 - 60 = 332 \text{ N}$$

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

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

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

The magnitude of mass m is $g = (9.80 \text{ m/s}^2)$
Direction of the force = downwards.

d) Two objects 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)

a) What then is the gravitational force on A by the earth? What is the gravitational force on B by the earth?
gravitational force on A by the earth $\rightarrow 20 \text{ N}$
gravitational force on B by the earth $\rightarrow 98 \text{ N}$

b) What is the acceleration of the falling object A & what is the acceleration of the falling object B?
Both have same acceleration 9.8 m/s^2 .