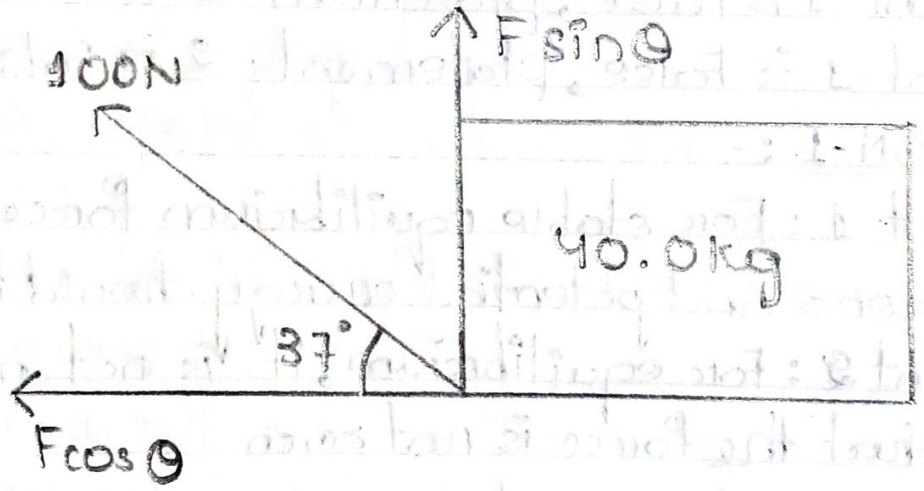
HW
19/7/21

ODM CONNECT APP HOMEWORK

Q1. A student pulls a box of books on a smooth horizontal floor with a force of 100N in a direction of 37° above the horizontal surface. If the mass of the box and the books is 40.0 kg, what is the acceleration of the box and the normal ~~force~~ force on the box by the floor?

Ans)



Ans) Since the floor is frictionless, there is no opposing friction force so net force will be equal to F.cosθ and the horizontal component of pulling force will be equals to ma.

$\Rightarrow F.\cos\theta = ma$

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

$\Rightarrow 40a = 100 \times 0.7986$

$\Rightarrow 40a = 79.86$

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

Now,

The normal force acting on the box is equal to

$$N = mg + F\sin(37^\circ)$$

$N = 40 \times 9.8 + 100 \times 0.6$

$N = 40 \times \frac{98}{10} + 10\cancel{0} \times \frac{6}{10}$

$\boxed{N = 392 + 60 = 452\ N}$

$\therefore$ The acceleration of the box is $1.99\ m/s^2$ and the normal force on the box by the floor is 452 N

Q2. In physics, the concept force is used to describe how the acceleration of a particle is affected by its interaction-s with other objects. According to its definition, the force F exerted on a particle, by one or more other objects is a quantity which depends on the properties of all the interacting objects. It is related to the acceleration a of the particle so that $F = ma$. Force is a very important concept in physics and has a meaning somewhat different from that associated with that word in everyday life. Every particle near

the surface of the earth interacts with the earth. If this is the only interaction affecting the particle, the resultant acceleration of any such particle is directed downward and has a magnitude g. (approximately equal to $9.80\ m/s^2$)

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

Ans) Yes, the earth exert a force on every particle near its surface, i.e. gravitational force.

b) Is this a long-range force or contact force?

Ans) It is a long-range force.

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

Ans) Magnitude of gravitational force on a particle of mass $m = mg$.
Direction of gravitational force is downward.

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

(1) 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 $= 2\ kg \times 9.8\ m/s^2$
$= 19.6\ N$

Gravitational force on B by the earth = 10 Kg × 9.8 m/s²
= 98 N

(2) What is the acceleration of the falling object A? what is the acceleration of the falling object B?

Ans) As the air resistance is negligible, means no air resistance, both object A and B will be falling with an acceleration of 9.8 m/s².