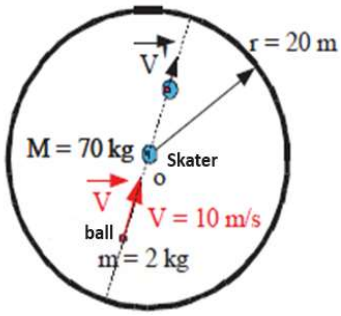
EXERCISE 1:

To determine the mass of an object M1, we throw it at a speed of 4 m/s against a stationary object M2 whose mass is known and is equal to 0.5 kg. We observe that the object M1 is thrown back at a speed of 2.48 m/s, while the struck object M2 acquires a speed of 0.54 m/s.
- Calculate the unknown mass M1.

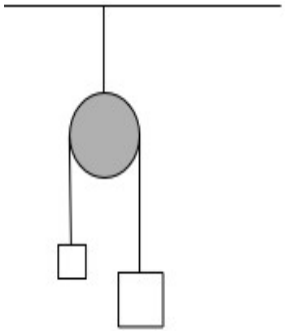
EXERCISE 2:



A skater of mass M = 70 kg is immobile in the center of a circular ice rink of radius r = 20 m. We throw a ball at him of a mass m = 2 kg. The ball has horizontal speed v = 10 m/s when the skater catches it. The skater-ball assembly begins to move, it is assumed to be frictionless.

- How long will it take to reach the edge of the rink?

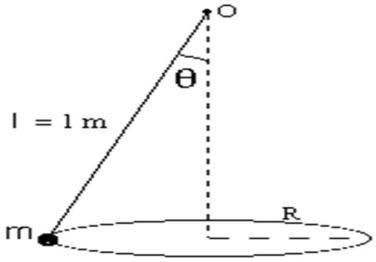
EXERCISE 3:



Two unequal masses are connected to each other by a rope (of negligible mass) passing over a pulley (negligible friction and mass) hung from the ceiling of a room. The masses are m1 = 1kg and m2 = 2 kg.

- Calculate the tension of the rope and the acceleration of the two masses.

EXERCISE 4:



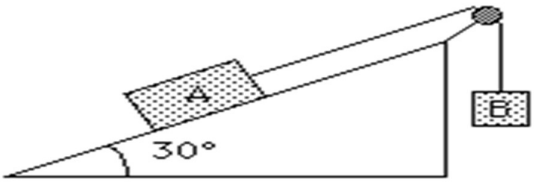
A point mass m = 200 grams is suspended from a massless wire whose length is 1 meter. The mass m rotates at a constant speed around a vertical axis with an angle θ that is equal to 30°.

1- What is the angular speed of the mass m?

2- If we double the mass m, by how much must we multiply the angular speed to keep the same angle θ?

3- What is the magnitude of the angular (kinetic) momentum of the system while the mass is rotating.

EXERCISE 5:



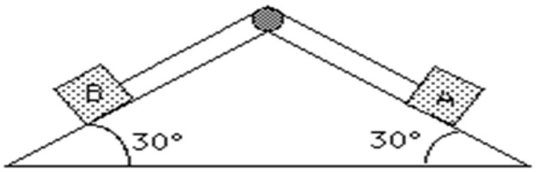
Two bodies A and B of mass mA = 2 kg and mB = 3 kg are connected by an inextensible rope of a negligible mass sliding without friction on a pulley of a negligible mass. Both bodies are initially at rest.

If we release the body B, a friction f = 2 N appears between the inclined plane and the body A

1- What distance will body A have traveled after 2 seconds?
2- Determine **μ** the coefficient of friction.

EXERCISE 6:

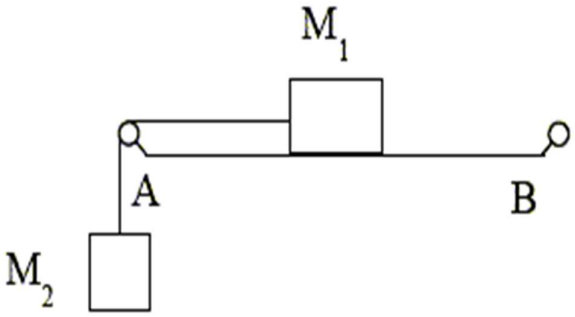
Two blocks A (10 kg) and B (20 kg), initially at rest, are connected by a rope of a negligible mass which passes over a pulley (without sliding and of a negligible mass).



- Draw the force diagram on each block and calculate the acceleration of the blocks.

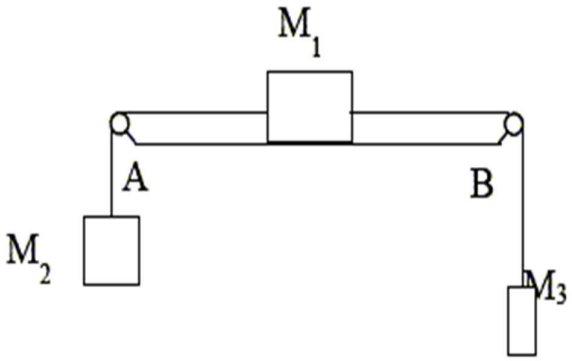
EXERCISE 7:

On a horizontal plane AB, we placed a mass M1 = 5 kg. M1 is connected to a mass M2 by a rope of a negligible mass passing at A over a frictionless pulley. In case of horizontal stress on M1, a friction force appears between M1 and the plane AB, which takes a maximum value of 5 N.



1- Give the maximum value of M2 so that M1 remains immobile.

We take M2 = 3 kg. We complete the system with a mass M3 connected to M1 by a rope of negligible mass and passing through the pulley B without friction.



2- Give the minimum and maximum values that M3 can take so that the system remains immobile.

NB: We take g = 9.81 m/s² . For exercises 5 and 6, the friction forces are neglected.