**FREE-BODY DIAGRAMS (FBDs)**

- Free-body diagrams are diagrams used to show the relative magnitude and direction of all forces acting upon an object in a given situation.
- Knowing that $F_N$ is a force exerted by a surface of contact, it is customary not to draw this surface or the ground.
- FBD shows only an object (usually a dot with a rectangle around it) and forces (arrows) acting on the object.
- Length of the arrows should be relative to the magnitude of the forces.
- Direction of the arrows should show exact direction of the forces.

Practice: Assume that the object is stationary and friction is negligible unless stated otherwise.

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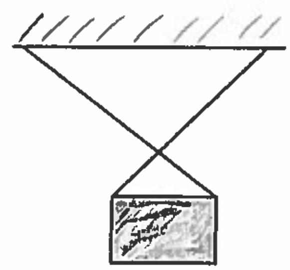
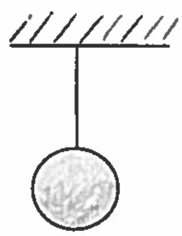
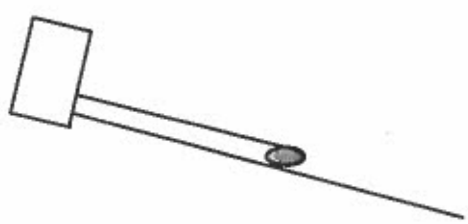
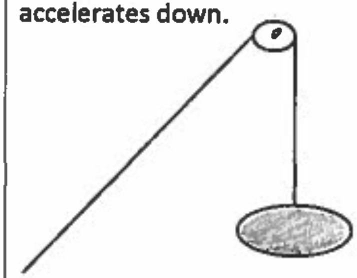
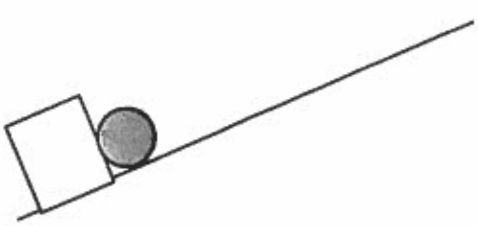
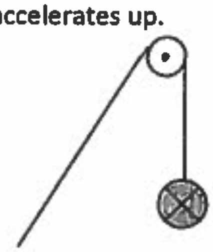
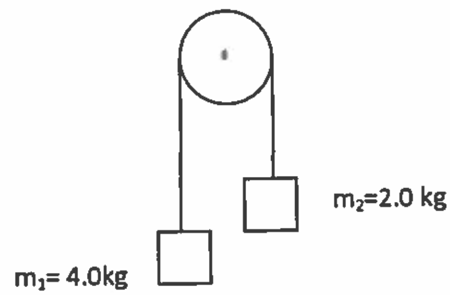
|---|---|
| 1. A free - falling ball.  | 5.  |
| 2.  | 6.  |
| 3.  | 7. An object is hung over a frictionless pulley and accelerates down.  |
| 4.  | 8. An object is hung over a frictionless pulley and accelerates up.  |

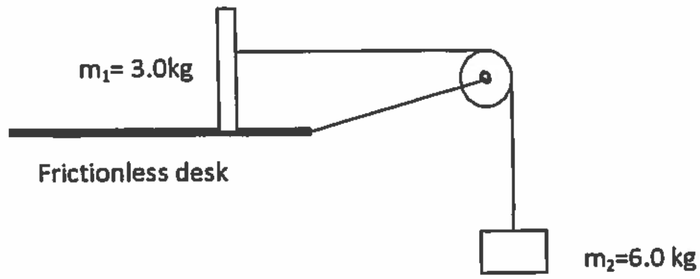
**Homework:**

1. Consider the following scenario:




a) State your assumptions.
b) Draw FBDs for each block.
c) Find the tension in the rope. **(26 N)**
d) Find the magnitude and direction of the acceleration of each block. **( 3.3m/s$^2$[up for $m_2$ and down for $m_1$])**

2. Consider the following scenario:




a) State your assumptions.

b) Draw FBDs for each block.

c) Find the tension in the rope. **(20 N)**

d) Find the magnitude and direction of the acceleration of each block.**(6.5 $m/s^2$[right for $m_1$ and down for $m_2$])**

3. Consider a 10.0-kg object on a 25°-inclined plane. What is the minimal coefficient of friction required to keep the object at rest? **($\mu_s \geq 0.47$)**

4. What is the force parallel with the inclined plane required to accelerate an object by 10 $m/s^2$?
The coefficient of static friction between the surfaces is 0.2 and the object is at rest and its weight is 49N.
$\theta$=10.**($F_{\text{pull or push}}$ = 51 N)**