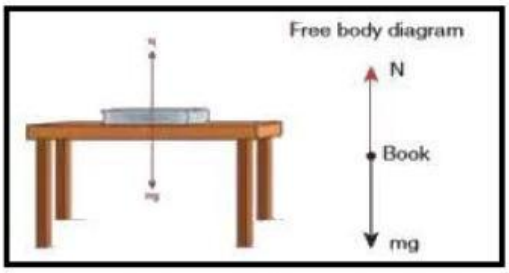
Look at the following images and free body diagrams for the different physical situations shown below. Determine if the forces are balanced or not and if given the magnitudes of the forces, calculate the net force in each direction. Then determine whether the object will speed up, slow down, or remain at constant speed for each scenario.

Helpful Information

- Net Force in x-direction = rightward forces - leftward forces
- Net Force in y-direction = upward forces - downward forces
- If the net force =0 N, the forces are balanced along this direction.
    - the object must be at rest or maintaining constant speed.
- If the net force ≠ 0 N, the forces are not balanced along this direction.
    - the object must be speeding up or slowing down.

In the picture shown below, a book is at rest on a table. A free body diagram of the normal force and weight of the book is shown.



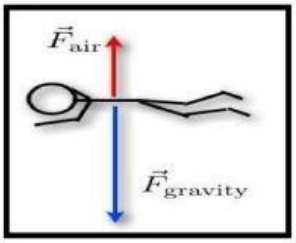
Are forces balanced in the x-direction?

In the x direction, is the object speeding up, slowing down, moving at a constant speed, or at rest?

Are forces balanced in the y-direction?

In the y-direction, is the object speeding up, slowing down, moving at a steady speed, or at rest?

In the picture shown below, a skydiver falls for 1.0 seconds but hasn't reached terminal velocity. A free body diagram is shown below.



F_{air}= 300 N

F_{grav}= 500 N

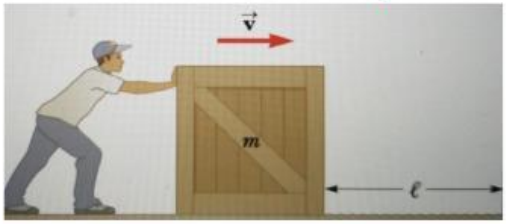
What is the net Force in the x-direction?

In the x direction, is the object speeding up, slowing down, or not moving in this direction?

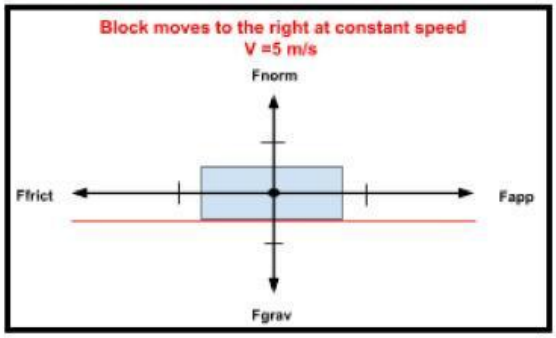
What is the net Force in the y-direction?

In the y-direction, is the object speeding up, slowing down, maintaining constant speed, or at rest?

In the picture shown below, a block rests on a rough surface and a man is pushing on the block as it moves to the right at constant speed. A free body diagram of the forces are drawn below the picture.



A free body diagram of the forces



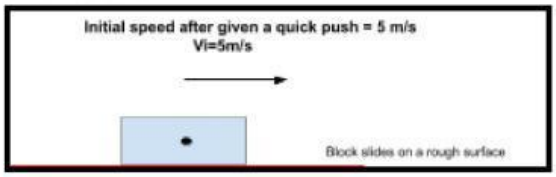
Are forces balanced in the x-direction?

In the x direction, is the object speeding up, slowing down, moving at a constant speed, or at rest?

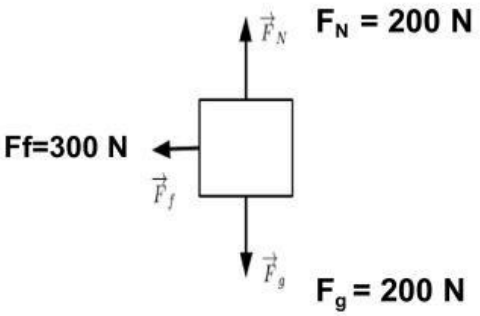
Are the forces balanced in the y-direction?

In the y-direction, is the object speeding up, slowing down, or not moving along this direction?

In the picture shown below, a block slides on a surface with friction after it is given an initial push. The block eventually comes to a stop. A free body diagram is shown below.



A free body diagram of the forces



What is the net Force in the x-direction?

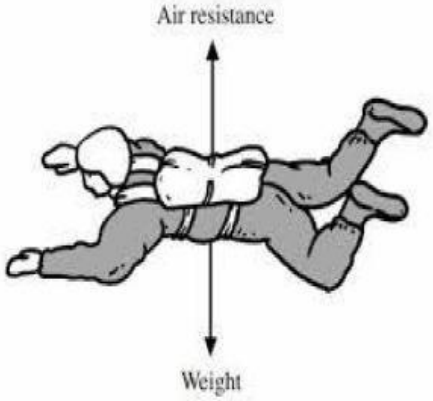
In the x direction, is the object speeding up, slowing down, moving at a constant speed, or at rest?

What is the net Force in the y-direction?

In the y-direction, is the object speeding up, slowing down, or not moving along this direction?

In the picture shown below, a skydiver has fallen long enough to reach terminal velocity. The length of the arrows are equal.

A free body diagram is shown below.



Are forces balanced in the x-direction?

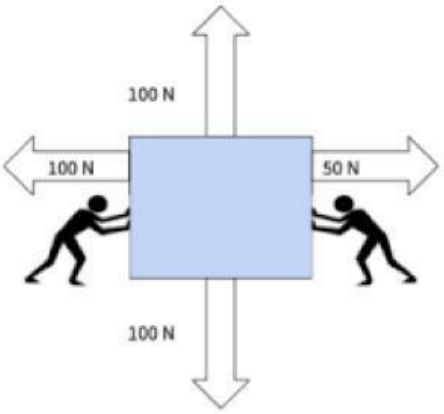
In the x direction, is the object speeding up, slowing down, or not moving along this direction?

Are forces balanced in the y-direction?

In the y-direction, is the object speeding up, slowing down, maintaining constant speed, or at rest?

In the picture shown below, a block rests on a surface and two men are pushing the block in opposite directions with unequal force. The man on the right is stronger.

A free body diagram is shown below.



What is the net force in the x-direction?

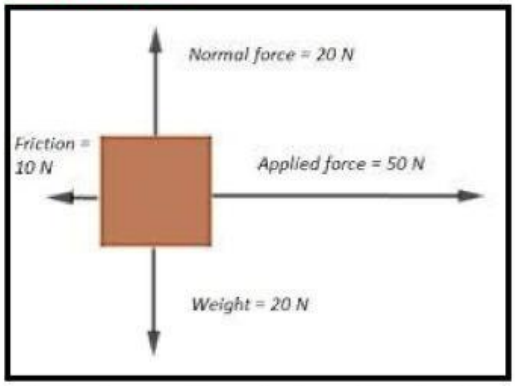
In the x direction, is the object speeding up, slowing down, maintaining constant speed, or at rest?

What is the Net force in the y-direction?

In the y-direction, is the object speeding up, slowing down, or not moving along this direction?

The picture shown below describes a 2kg block that is being pushed to the right along a frictional surface.

A free body diagram of the forces are drawn below.



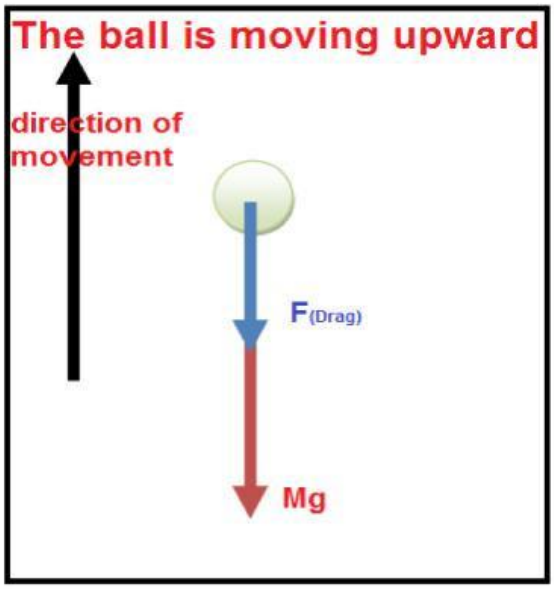
What is the net force in the x-direction?

In the x direction, is the object speeding up, slowing down, maintaining constant speed or at rest?

What is the Net force in the y-direction?

In the y-direction, is the object speeding up, slowing down, or not moving along this direction?

The free body diagram shown below describes the forces acting on a ball after it is thrown upwards.



Are forces balanced in the x-direction?

In the x direction, is the object speeding up, slowing down, or not moving along this direction?

Are forces balanced in the y-direction?

In the y-direction, is the object speeding up, slowing down, maintaining constant speed, or at rest?