

Regents Physics

Newton's 2nd Law

Objectives

- Explain the relationship between acceleration, net force, and mass of an object.
- Apply Newton's 2nd Law to solve a variety of problems.
- Understand the difference between mass and weight.
- Understand the conditions required for static equilibrium.

Newton's 2nd Law of Motion

the acceleration of an object is in the direction of and directly proportional to the net force applied, and inversely proportional to the object's mass.

Newton's 1st Two Laws Compared

Newton's 1st Law

An object at rest will remain at rest, and an object in motion will remain in motion, at constant velocity and in a straight line, unless acted upon by a net force.

subset of 2nd law

Newton's 2nd Law

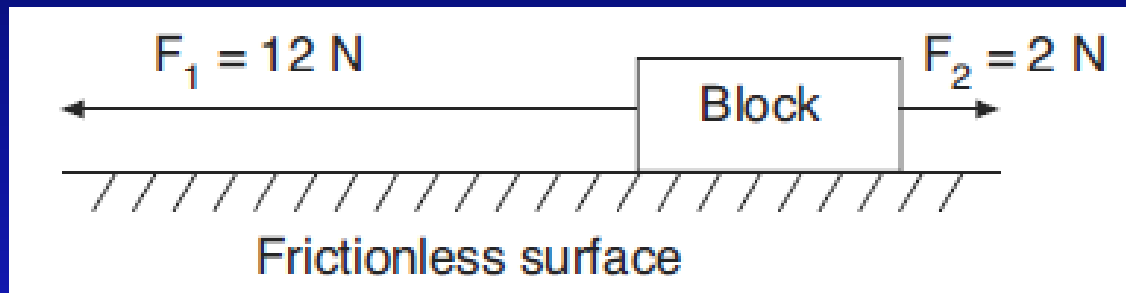
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Applying Newton's 2nd Law

1. Draw a free body diagram.
2. For any forces that don't line up with the x - or y -axes, break those forces up into components that do lie on the x - or y -axis.
3. Write expressions for the net force in x - and y -directions. Set the net force equal to ma , since Newton's 2nd Law tells us that $ma=F$.
4. Solve the resulting equations.

Sample Problem

Two forces, F_1 and F_2 , are applied to a block concurrently on a frictionless, horizontal surface as shown below.



cart

If the mass of the block is 5.0 kg, what is the acceleration of the block?

Mass vs. Weight

- Mass is the amount of “stuff” something is made up of. Mass is inertia. It remains constant.
- Weight (mg) is the force of gravity on an object.
 - Weight varies with gravitational field strength (g).

Static Equilibrium

- **Static equilibrium** occurs when there is no net force on an object (therefore acceleration is zero).

