Newton's Laws I

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Take $g = 10$ m s^{-1} when necessary.

1. State, in words and symbols, Newton's second law.
2. The resultant force on a body of mass 4.0 kg is 20 N. What is the acceleration of the body?
3. A body of mass 6.0 kg moves under the influence of two oppositely directed forces whose magnitudes are 60 N and 18 N. Find the magnitude and direction of the acceleration.
4. Two forces, 30 N and 40 N, are perpendicular to each other. Find the acceleration of a body of mass 25 kg when these forces act on it.
5. A body of mass 3.0 kg slides down a plane inclined at 30° to the horizontal. Find the acceleration of the body
   (a) if the plane is smooth,
   (b) if there is a constant frictional resistance of 9.0 N.
6. An ice hockey puck of mass 0.75 kg is struck and moves with an initial velocity of 24 m s^{-1} across the surface of a frozen lake. It travels 190 m before coming to rest. Calculate
   (a) the average deceleration of the puck,
   (b) the average frictional force on the puck.
7. An eccentric fisherman weighs a 4 kg sea bass in the lift of a tall building, using a weighing machine (a hook and spring). Calculate the indicated weight when the lift is
   (a) stationary,
   (b) accelerating upwards at 2.5 m s^{-2},
   (c) accelerating downwards at 3.0 m s^{-2},
   (d) moving upwards with a constant velocity of 4.0 m s^{-1}.
8. A hot air balloon with its basket and passengers has a mass of 1150 kg. When stationary in still air, 100 kg of ballast is thrown out. Calculate
   (a) the resultant force on the balloon,
   (b) the initial acceleration of the balloon.