

Dynamics

1. A boy exerts a 36 N horizontal force as he pulls a 52 N sled across a cement sidewalk at a constant speed. What is the coefficient of friction between the sidewalk and the metal sled runners?
2. A 50 kg bucket is being lifted by a rope. The rope is guaranteed not to break if the tension is 500 N or less. The bucket started at rest, and after being lifted 3.0 m, it is moving at 3.0 m/s. Assuming that the acceleration is constant, is the rope in danger of breaking?
3. A car brakes to a halt. What forces act on the car? What are the other parts of the action-reactions pairs to which those forces belong? On what objects are they exerted?
4. A 4500 kg helicopter accelerates upward at 2.0 m/s^2 . What lift force is exerted by the air on the propellers?
5. A force of 40.0 N accelerates a 5.0 kg block at 6.0 m/s^2 along a horizontal surface.
 - a. How large is the frictional force?
 - b. What is the coefficient of friction?
6. A spring is stretched by a mass hooked to the end. The mass is 200 g and the spring constant is 7.5 N/m. How much has the spring been stretched?
7. As a baseball is being caught, its speed goes from 30.0 m/s to 0.0 m/s in about 0.0050 s. The mass of the baseball is 0.145 kg.
 - a. What is the baseball's acceleration?
 - b. What are the magnitude and direction of the force acting on it?

- c. What is the magnitude and direction of the force acting on the player who caught it?
8. The gravitational force between two electrons 1.00 m apart is 5.42×10^{-71} N. Find the mass of an electron.
9. Two bowling balls each have mass of 6.8 kg. They are located next to each other with their centres 21.8 cm apart. What gravitational force do they exert on each other?
10. A 1.25 kg book in space has a weight of 8.35 N. What is the value of the gravitational field at that location?
11. The asteroid Ceres has a mass of 7.0×10^{20} kg and a radius of 500 km.
- What is the gravitational field strength on the surface?
 - How much would a 85 kg astronaut weigh on Ceres?
12. A car with mass of 725 kg is moving at 100 km/h to the east.
- What is the magnitude and direction of its momentum?
 - A second car with mass 2175 kg, has the same momentum. What is its velocity?
13. A 0.144 kg baseball is pitched horizontally at 38.0 m/s. After the bat hits it, it moves at the same speed, but in opposite direction.
- What was the momentum of the ball before it hit the bat? After it hit the bat?
 - What was the change in momentum of the ball?
 - What was the impulse delivered by the bat?
 - If the bat and ball were in contact for 0.80 ms (milliseconds), what was the average force the bat exerted on the ball?
14. A 0.105 kg hockey puck moving at 24 m/s is caught and held by a 75 kg goalie at rest. With what speed does the goalie slide on the ice?
15. A 35.0 g bullet moving at 475 m/s strikes a 2.5 kg block of wood at rest. The bullet passes through the block, leaving at 275 m/s. How fast is the block moving when the bullet leaves?

Dynamics

- 0.69
- Yes... force of tension on the rope is equal to 565 N
- Force of friction; Forces of gravity and normal force; gravity is exerted on ground while the other two are exerted on the car
- 5.3×10^4 N
- a. 10 N b. 0.20
- 0.26 m
- a. -6.0×10^3 m/s² b. 8.7×10^2 N, opposite the original path of the ball. c. 8.7×10^2 m/s², towards the player.
- 9.01×10^{-31} kg
- 6.5×10^{-8} N
- 6.68 N/kg
- a. 0.19 N/kg b. 16 N
- a. 2.01×10^4 kg·m/s, east b. 9.25 m/s
- a. 5.47 kg·m/s; -5.47 kg·m/s b. -10.9 kg·m/s c. -10.9 kg·m/s d. 1.37×10^4 N
- 3.4×10^{-2} m/s
- 2.8 m/s