

APPLICATION OF NEWTON'S LAWS

1. a) A robot pushes a crate across a smooth floor. There is a rough patch in the floor and the robot must push with 12.5 N to overcome the patch. If it is able to maintain a constant velocity while pushing with 12.5 N, what is the force of friction between the rough floor and the crate? Draw a free-body diagram of the crate.

b) If the crate has a mass of 3.0 kg, what is the coefficient of friction?

2. a) A car coasts on a horizontal surface. It comes to a stop after 3 seconds. If the deceleration of the 1500 kg car was 1.5m/s^2 , what was the force of friction between the surface and the wheels? Include a free-body diagram.

b) What is the coefficient of friction between the wheels and the surface?

3.a) A 0.25kg bucket is attached by a rope to a pulley. What is the magnitude of the tension force in the rope if the bucket is at rest? Include a free-body diagram.

b) How will the tension force in the rope change if you fill the 10.0L bucket with water but the bucket remains in equilibrium?

c) Provided that the bucket is large enough, how many liters of water can you put in it if the rope cannot handle more than 250N?

4.A 2000 kg sailboat experiences an eastward force of 3000 N from the ocean's tide and a westward force of 4620N from the wind. Find the acceleration of the boat.

5. A 10.0-kg box is pulled horizontally along a horizontal surface with coefficient of kinetic friction of 0.30. If the pulling force is 35N east, what is the acceleration of the box? (magnitude and direction)

6. a) An 80.0-kg person jumps from a burning building into a net. Assume air resistance is 100 N. Find the acceleration of the person as they fall if the net is 30 m below.

b) Would this acceleration change if the net was 60m below? If yes how? If not, why?

c) Would the velocity of the person just before they hit the net change with the different height they jump from?

7. Identify the reaction force – magnitude and direction in each of the following examples:

a) A football is kicked with 500 N[N]

b) A book pushes down on the table with 2.5 N

c) A crane lifts a steel pipe with force of 600 N [up]

d) A gun forces a bullet with force of 1000N [left]

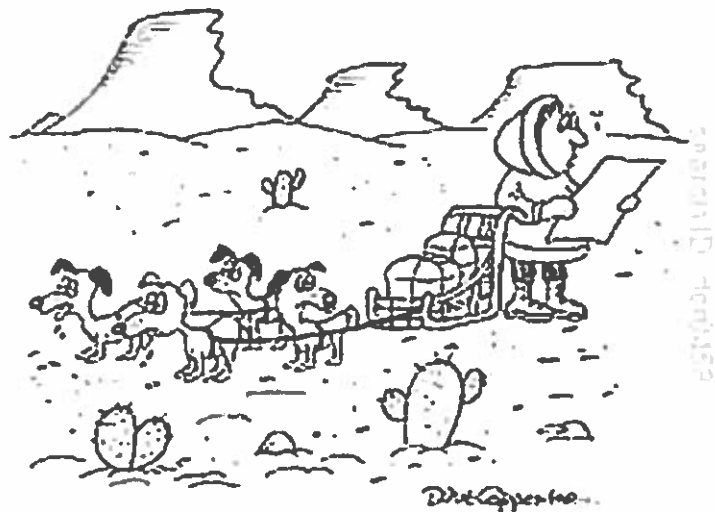
e)Earth pulls down on an apple with 10 N

8. a)What is the acceleration of a person with a parachute that together weight of 915N if their parachute experiences a force of air resistance 1027N [up]?

b) What is the person's mass if the parachute has mass of 9.4 kg?

9. What is the acceleration of a 10.0kg sled loaded with a 58.0-kg of supplies provided that the coefficient of friction between the rough snow and the sled is 0.25 and the dogs pulling the sled are exerting force of 228 N [East]?

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"Maybe I had better look at the map again..."

10. A 48.0-kg figure skater pushes her partner whose mass is 85.0 kg with force of 45 N [left]. Provided that both figure skaters were at rest before the force was applied, calculate the acceleration of each of the skaters.

11. How much force was needed to accelerate a 1400.0-kg object from rest to 27m/s in 5.8 seconds?

12. In your words or using a formula state five laws concerning forces: