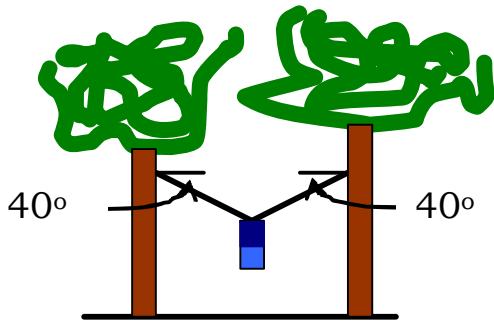


**Handout: Problems I, II and III**

1. On a camping trip you stretch a rope between two trees and hang your backpack from the middle of it to keep it safe from bears. The mass of your backpack is 36.0 kg and each half of the rope makes an angle of  $40.0^\circ$  with the horizontal.
  - a) Find the amount of weight supported by each half of the rope.
  - b) Find the magnitude of the tension in each rope.



2. A 2.5 kg brick is pulled at a constant speed across a table by a cord that makes an angle of  $20^\circ$  with the horizontal. There is 7.0 N of force in the cord.
  - a) Calculate the force of friction between the brick and the table.
  - b) Calculate the magnitude of the normal force.
3. Joey moves a 26 kg wagon at a constant speed by pushing on the handle that makes an angle, theta, with the horizontal. Joey exerts a force of 54 N on the handle and the force of friction on the wagon is 34 N.
  - a) Calculate the angle the handle of the wagon makes with the horizontal.
  - b) What is the magnitude of the normal force acting on the wagon?
4. A 10 N block is held motionless on a frictionless inclined plane which makes an angle of  $30^\circ$  with the horizontal. What force would be needed to hold the block in position?
5. An object weighing 600 N is pulled up a frictionless incline at a constant speed using a rope. If the incline makes an angle of  $42.0^\circ$  with the horizontal, what is the magnitude of the force that is applied to the rope?
6. A 10 kg object, starting from rest, slides down a frictionless incline with a constant acceleration of  $2.0 \text{ m/s}^2$ . What angle does the incline make with the horizontal?
7. An object with a mass of 7.2 kg is allowed to slide from rest down an inclined plane. The plane makes an angle of  $30^\circ$  with the horizontal and is 65 m long. The coefficient of friction between the plane and the object is 0.45. What is the velocity of the object at the bottom of the plane?
8. A piano is accelerating down a ramp that is inclined at an angle of  $38.5^\circ$  above the horizontal. The acceleration is  $4.62 \text{ m/s}^2$ . What is the coefficient of friction between the piano and the ramp?

## Answers

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- Each half of the rope supports half of the weight of the backpack, 176 N.
  - The tension in each rope is 274 N.
- The force of friction is 6.6 N, in a direction opposite to the motion of the brick.
  - The magnitude of the normal force is 22 N.
- The handle makes an angle of  $51^\circ$  with the horizontal.
  - The normal force is  $3.0 \times 10^2$  N.
- A 5.0 N force exerted up the incline would be needed.
- It is 401 N.
- The incline makes an angle of  $12^\circ$ .
- The velocity of the object is  $-12$  m/s.
- The coefficient of friction is 0.193.