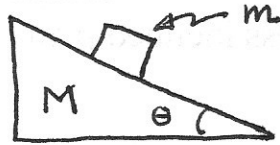


Newton's Laws Homework Set

1. How could a 50 kg object be lowered from a roof as slowly as possible using a cord with a breaking strength of 200N without breaking the cord?
2. Three separate but equal masses are connected with stretchless strings of negligible mass and move along a horizontal surface. If one mass is pulled with an applied force F , find the tension force in each of the other two strings connecting the masses and find the acceleration of all of the masses.
3. Two blocks of given mass are in contact on a frictionless horizontal table. A horizontal force is applied to one block, F . Find the acceleration of both blocks and the force between them.
4. A block of mass M is projected up a frictionless inclined plane with a speed V_0 . The angle of incline is given as θ .
 - a. How far up the plane does it go?
 - b. How much time does it take to get there?
5. A right triangular wedge of mass M and angle θ , supporting a cubical block of mass m on its side, rests on a horizontal table, as shown.



- a. What horizontal acceleration a must M have relative to the table to keep m stationary relative to the wedge, assuming frictionless contacts?
 - b. What horizontal force F must be applied to the wedge to achieve this result, assuming a frictionless table top?
 - c. Suppose no horizontal force is supplied to M and both surfaces are frictionless. Find the resulting acceleration of each mass relative to the table.
6. A block of mass M hangs from a uniform rope of length L and mass m . Find an expression for the tension in the rope as a function of the distance y measured vertically downward from the top of the rope.
 7. A uniform flexible chain of length l , with weight per unit length λ , passes over a small, frictionless, massless pulley. It is released from a rest position with a length of chain x hanging from one side and a length $l-x$ from the other side. Find the acceleration a as a function of x .
 8. A simple accelerometer can be made by suspending a small object from a string attached to a fixed point in an accelerating object - to the ceiling of a passenger car, for example. When there is an acceleration, the object will deflect and the string will make some angle with the vertical. Find the acceleration of the object in terms of the angle the string makes to the vertical.
 9. Find the acceleration and tension in an Atwood's machine. Two different masses connected by a string over a pulley which is at rest.

