

The Inclined Plane

A Flipped Lesson by Miss Logan

What is an inclined plane?

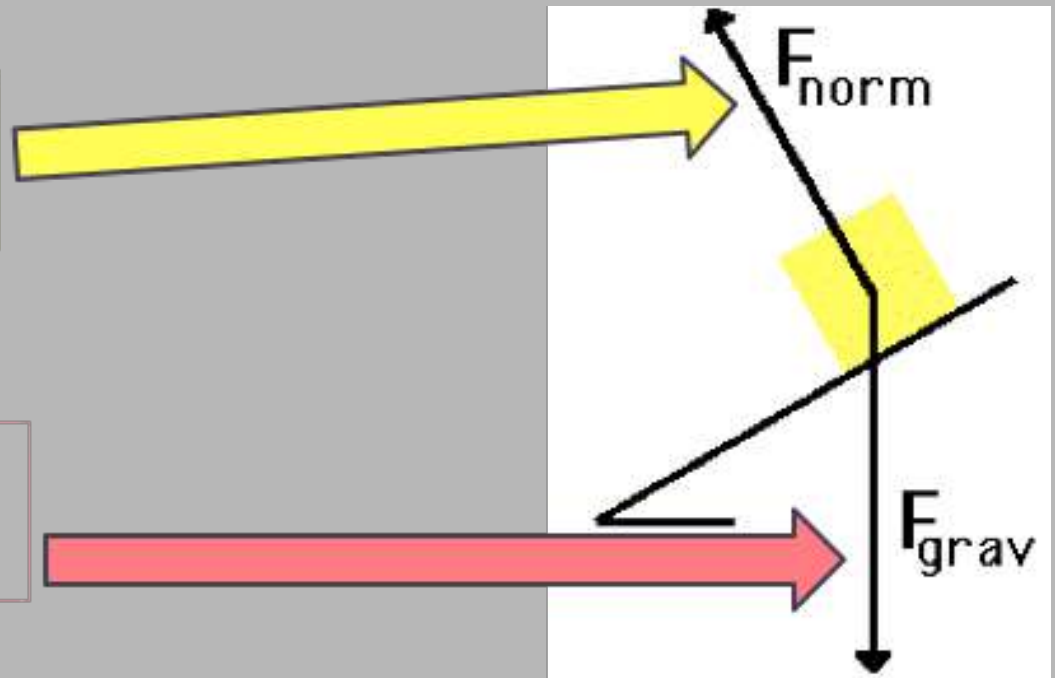
- An inclined plane is a simple machine
- A large, flat object is tilted slightly higher on one end than the other



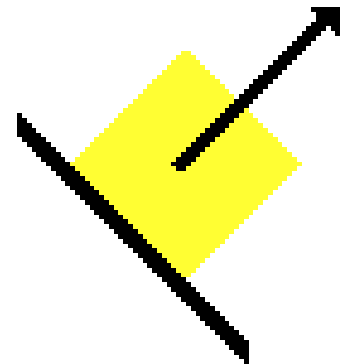
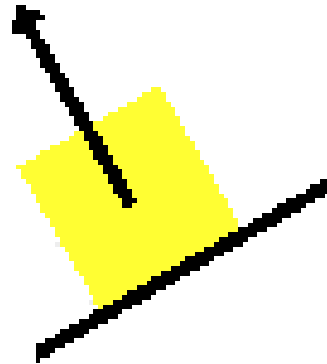
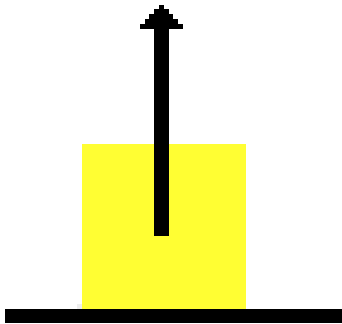
What's going on in an inclined plane?

The normal force is always perpendicular to the inclined surface

The gravitational force (WEIGHT) is always in downward direction



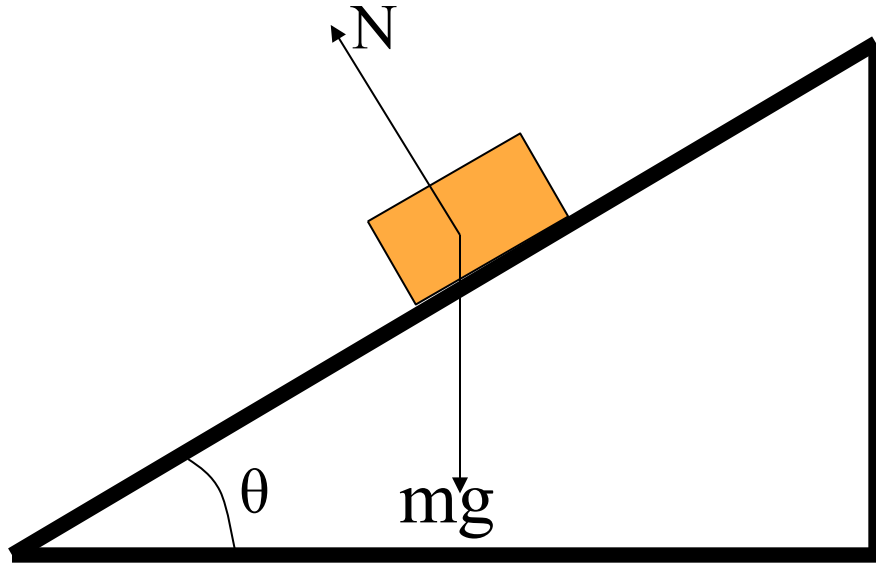
Normal Force



Normal forces are always directed perpendicular to the surface.

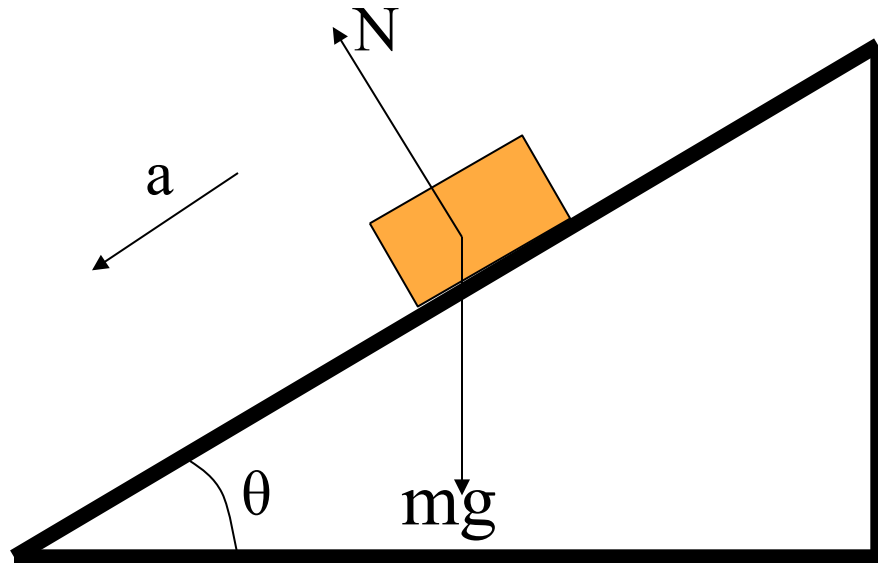
Inclined Planes

- Label the direction of N and mg .



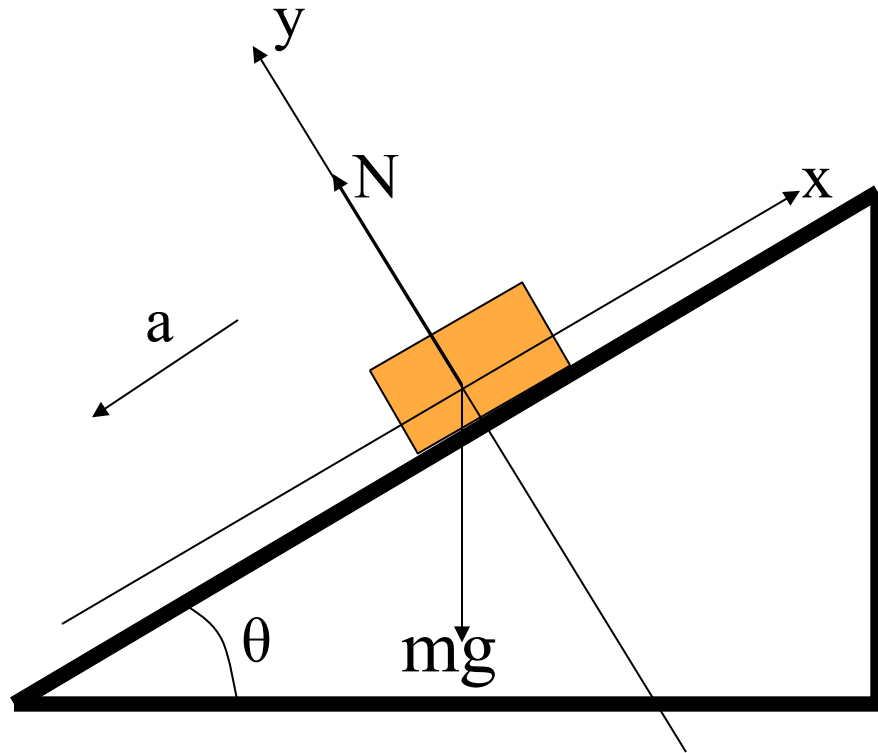
Inclined Planes

- Mark the direction of acceleration a .



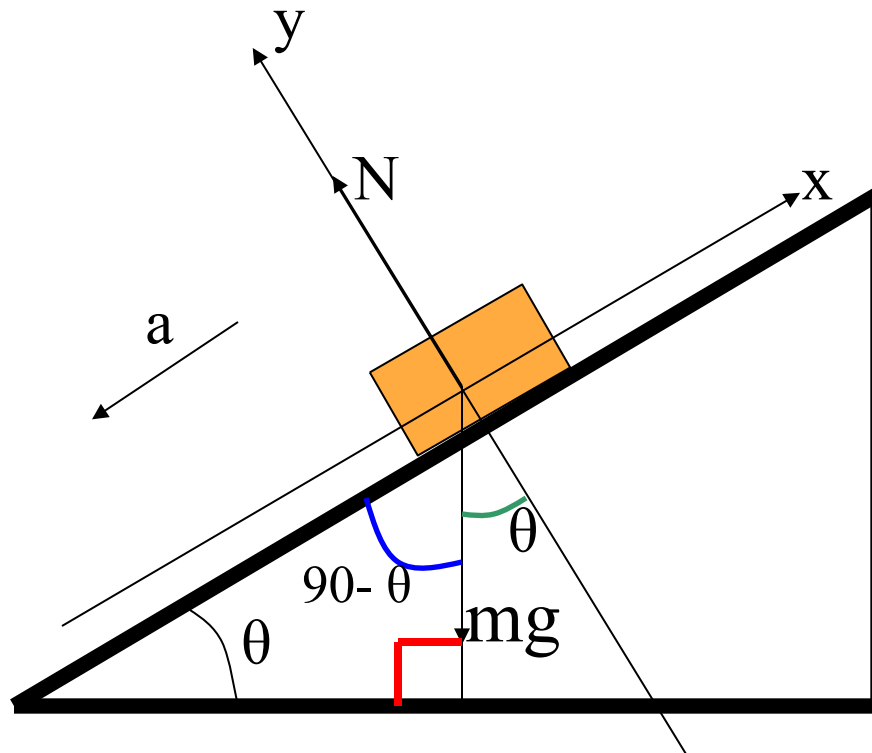
Inclined Planes

- Choose the coordinate system with x in the same or opposite direction of acceleration and y perpendicular to x .



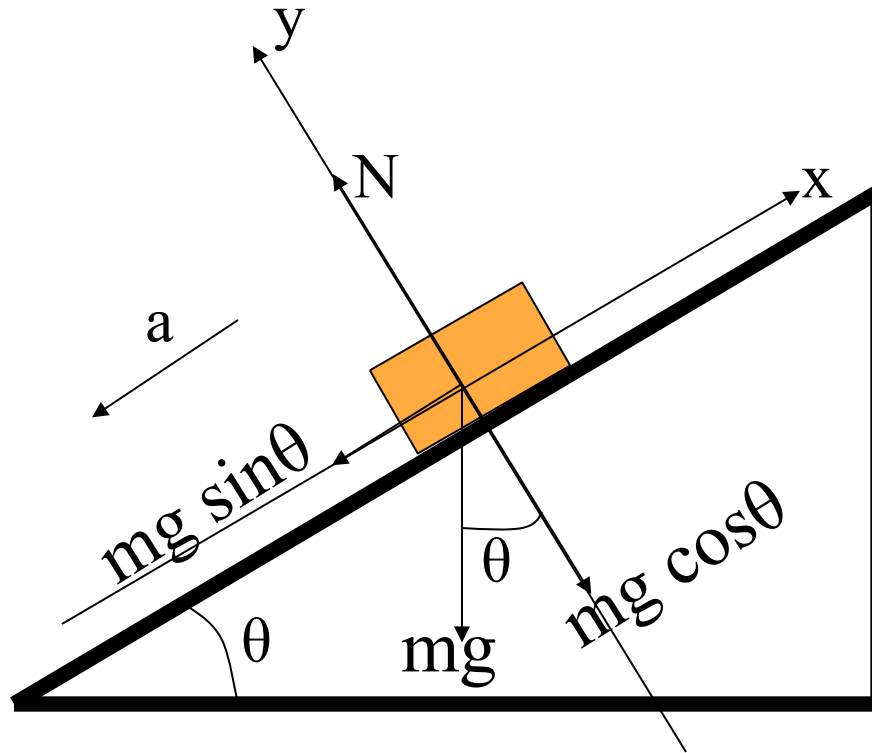
Inclined Planes

- Now some trigonometry



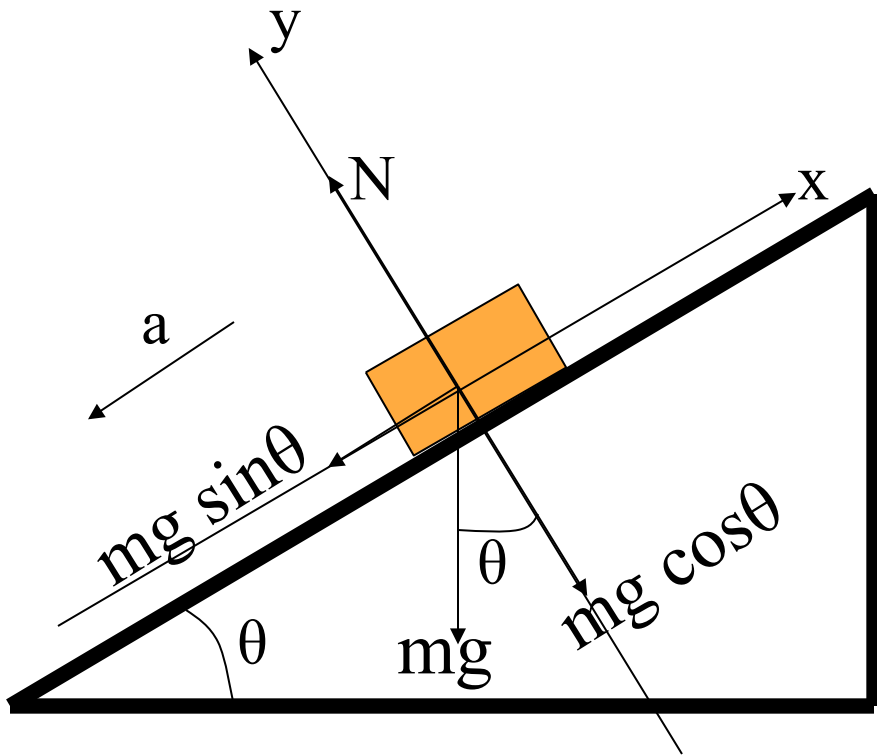
Inclined Planes

- Replace the force of gravity with its components.



Inclined Planes

- Use Newton's second law for both the x and y directions



$$\Sigma F_x = ma_x = -ma$$

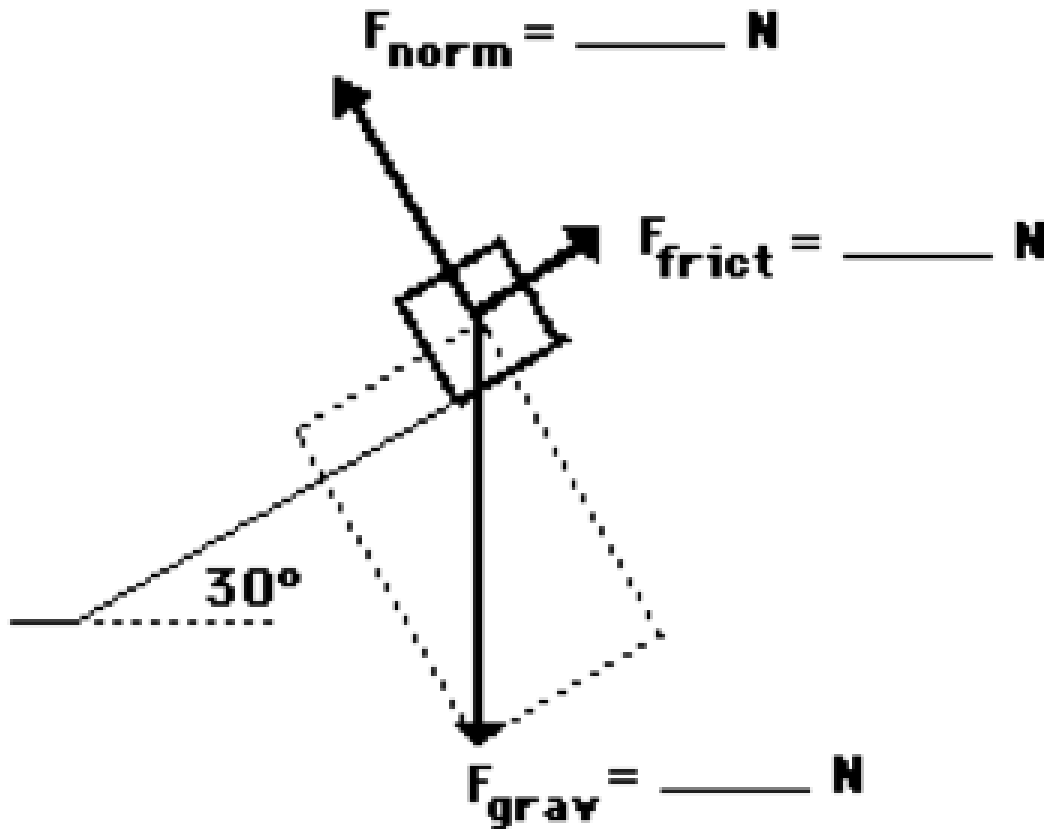
$$\Rightarrow -mg \sin \theta = -ma$$

$$\Sigma F_y = ma_y = 0$$

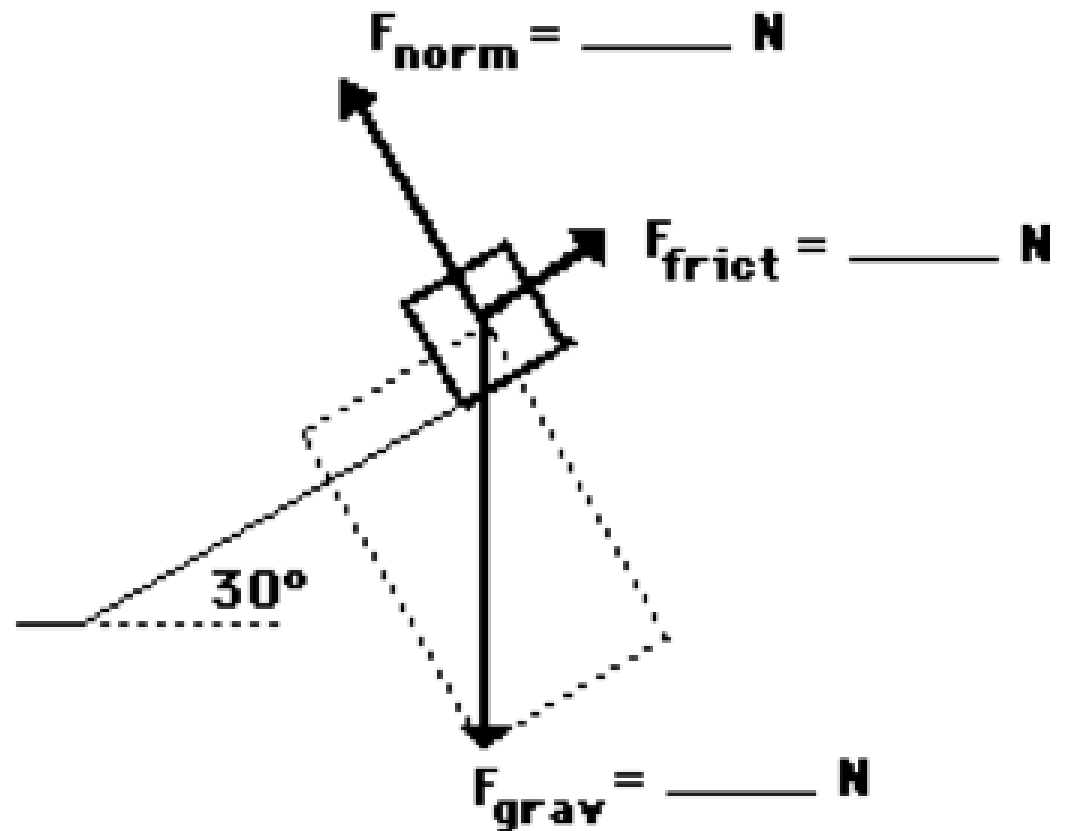
$$\Rightarrow N - mg \cos \theta = 0$$

The force and acceleration in the x-direction have a negative sign because they point in the negative x-direction.

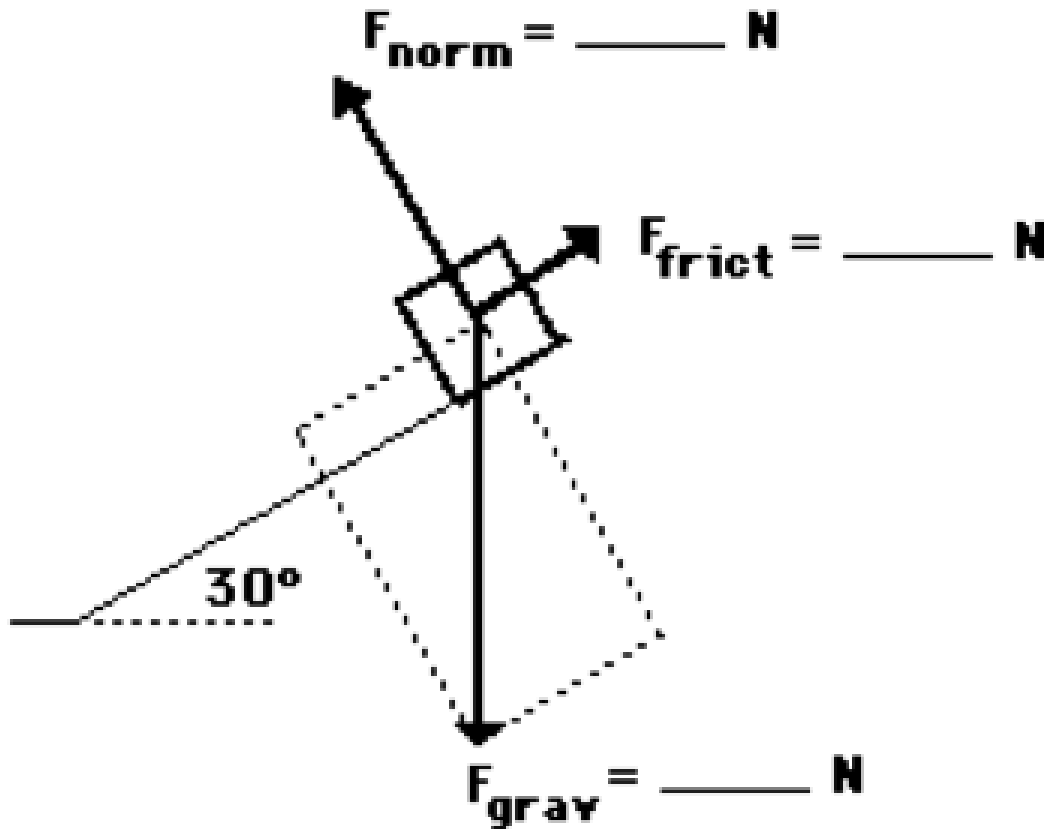
What are the components of Gravity?



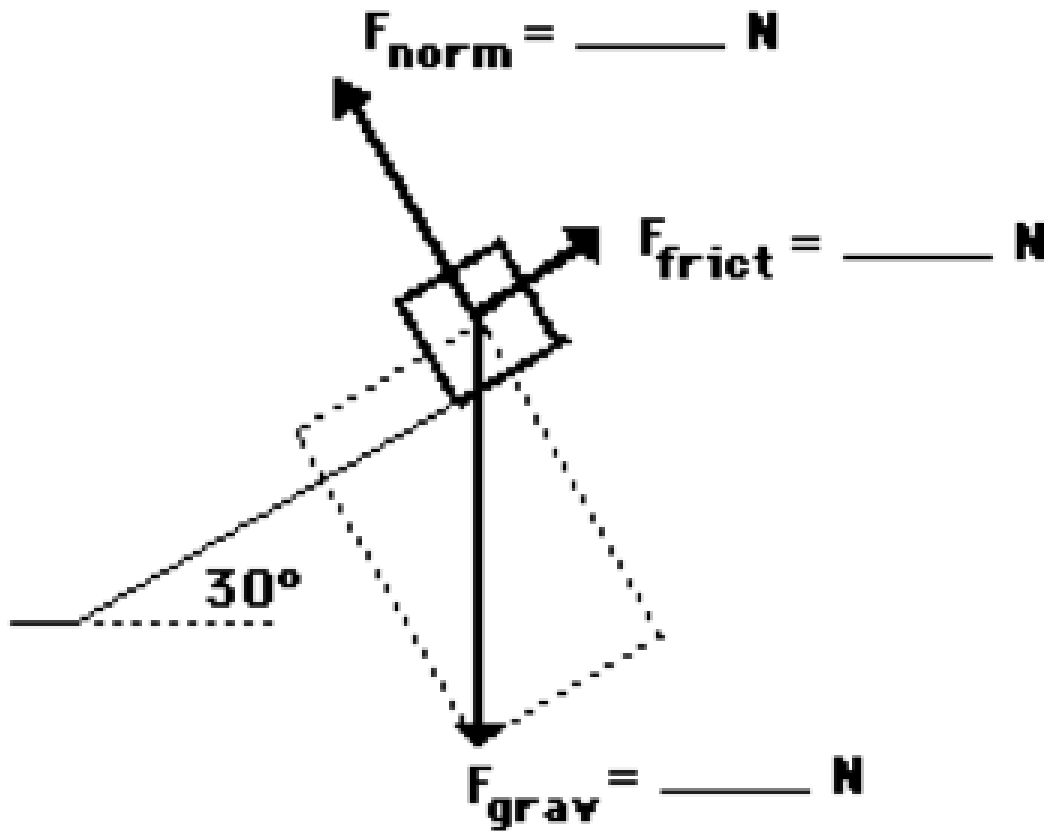
What is the Force Normal?



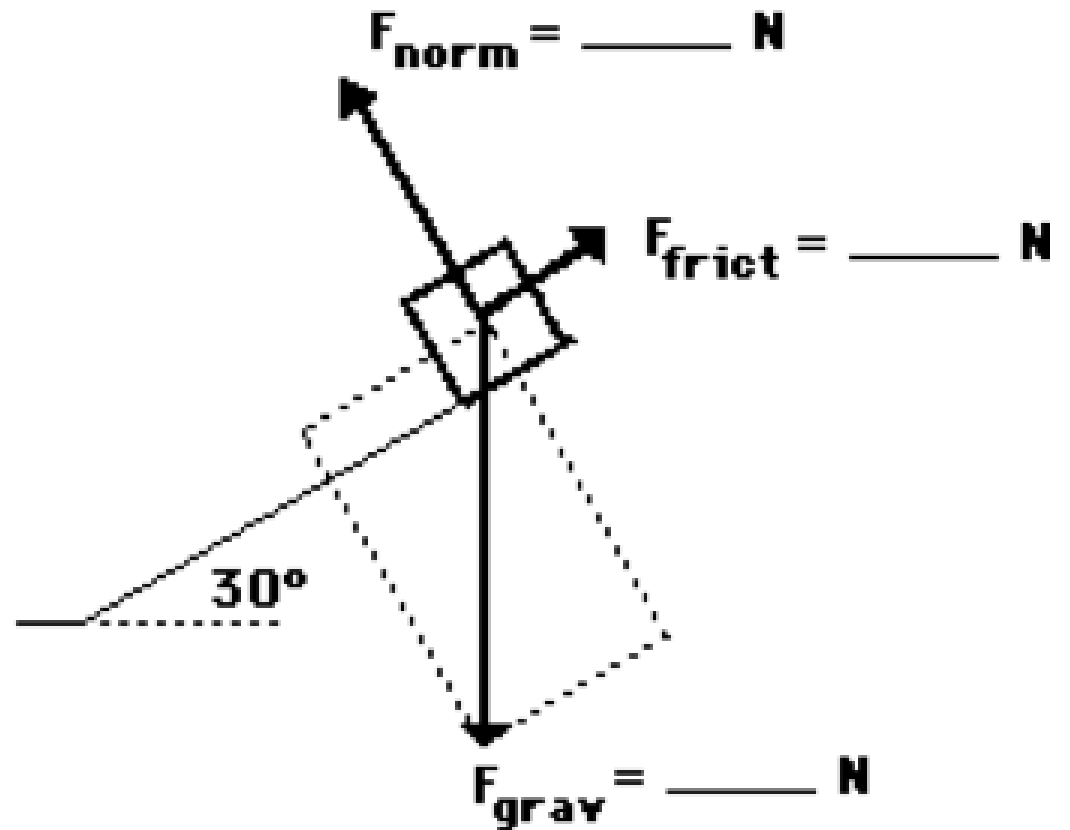
What is the force of Friction?



What is the Net Force?



What is the acceleration?



Follow Up Questions

- 1) Force Normal is always _____ to the surface.
- 2) Force of Gravity must be broken down into _____ and _____ components.
- 3) Draw force gravity, force normal, acceleration and friction vector arrows onto the inclined plane below.

