Inclined Planes

The normal force (F_N) is equal and opposite the gravitational force (F_g) of an object on a <u>level</u> surface.

What if the surface is not level, such as on an inclined plane?

Because the object is on an inclined plane, the object's gravitational force (F_g) will be broken into two perpendicular components:

1. Perpendicular component ($F_\perp$)

   The normal force is equal and opposite the perpendicular component. Unlike level surfaces, inclined planes do not support all of the object's weight. The perpendicular force is the component of the object's gravitational force (weight) the surface is supporting.

2. Parallel component ($F_\parallel$)

   The parallel force is the component of the gravitational force making the object accelerate down the incline.

Further examination of the diagram indicates:

- $F_{\parallel}$ and $F_{\perp}$ are the component vectors of F_g
- the vector triangle is a similar triangle to the triangle created by the incline, therefore $A = \theta$
- as the angle of the incline, A, increases, $F_{\parallel}$ increases and $F_{\perp}$ decreases

Since the vector triangle is a right triangle, we can use right-trig to find:

ex.
A 50 kg person on a frictionless skateboard rolls down a short hill inclined at 30° with the horizontal.

a.) What weight is the surface supporting?

b.) What force is making the person accelerate down the incline?

c.) What is the person's acceleration?

ex.
A block weighing 130 N rests on an inclined plane. The coefficient of friction between the block and plane is 0.62. If the angle of incline is 41°, find the following:

a.) the amount of weight supported by the surface

b.) the acceleration of the block

ex.
What is the acceleration of a block on a 25° incline? ($\mu = 0.21$)