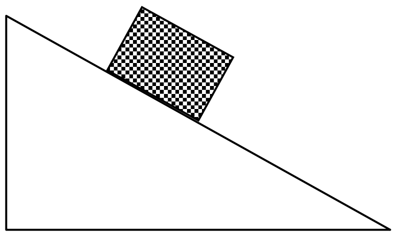
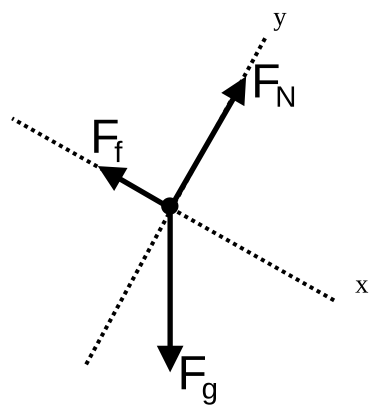
Reading Part 2 – Tilting Axis, Decomposing Forces, and Sum of Force Equations

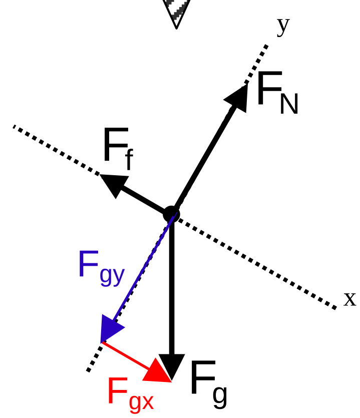
Consider the block at rest on a ramp.





As before, we use a **point** to represent the object. Note that we have rotated the coordinate axes as shown above so that the x-axis is ***parallel to the surface of the ramp*** (the likely direction of motion).

Next, break any force vector that is not parallel to the coordinate axes (in this case, the force of gravity, F_g) into its **x** and **y** components. See the diagram at right. Note that the **x**-component and **y**-component form the sides of a **right triangle** with the original force vector, F_g as the hypotenuse.



In this case, the **y**-component cancels out the normal force, so the object does not accelerate up or down. The **x**-component of F_g is opposed by the force of friction. If these forces have the same magnitude, the object will stay put.

Now we can express these forces mathematically. Since the motion of the object in question does not have changing motion (it is moving at constant velocity), the forces must sum to zero.

Sum (Σ) of forces in the x-direction (along the x-axis):

$$\Sigma F_x = F_f + F_{gx} = 0$$

Sum (Σ) of forces in the y-direction (along the y-axis):

$$\Sigma F_y = F_N + F_{gy} = 0$$