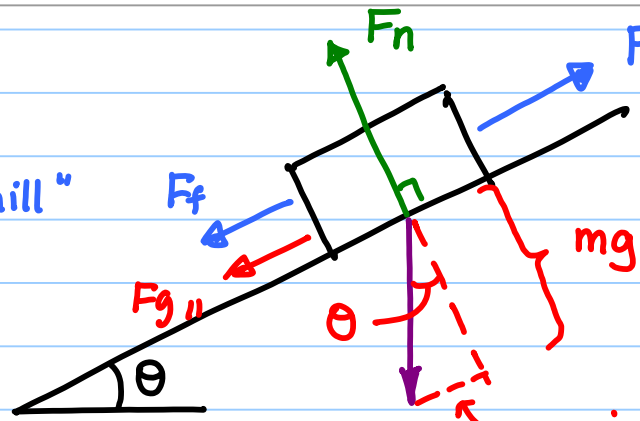
Forces on an Inclined Plane

Note Title 4/22/2016



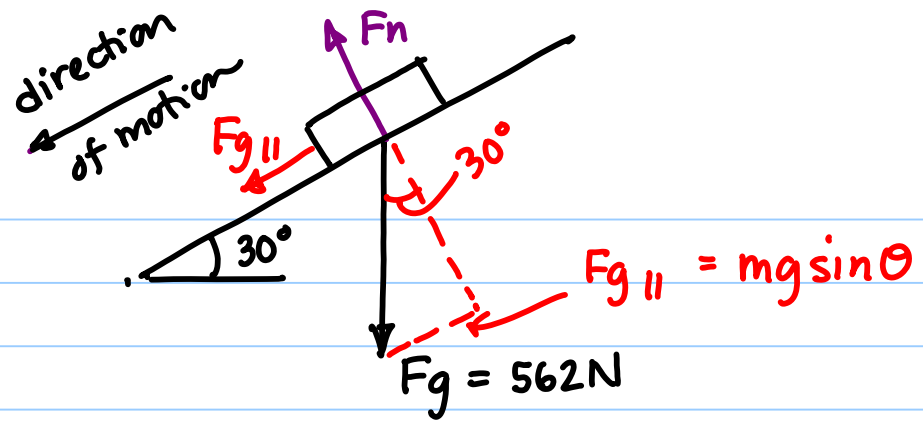
(drawn "uphill" when object moves down the slope)

(drawn "downhill" when object moves up the slope)

$F_{g\parallel}$ = parallel component of F_g

Example 1: A 562 N trunk is on a frictionless slope inclined at 30° above the horizontal.

Find the acceleration of the trunk as it moves down the slope.



$F_{net} = F_{app} - F_{opp}$ ($F_f = 0$, frictionless)

$ma = F_{g\parallel}$

$ma = mg\sin\theta$

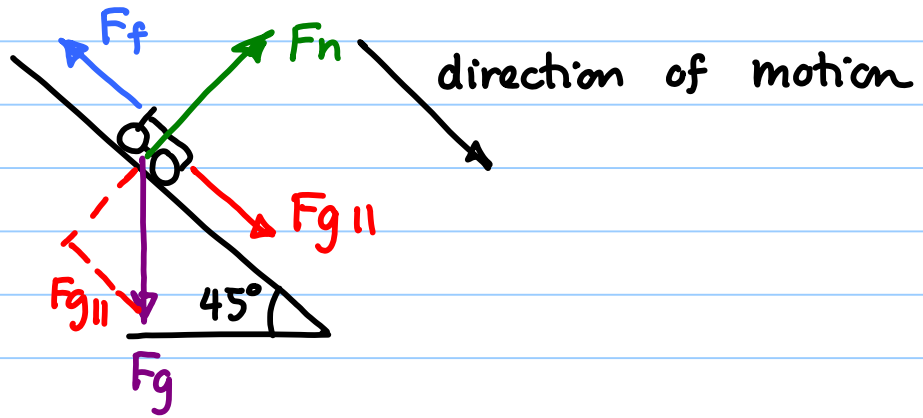
$a = g\sin\theta$

$a = (9.8)(\sin 30^\circ)$

$a = 4.9\ m/s^2$

★ We don't know the mass but we could calculate it since we know the weight. However, since both terms have mass in them we can divide by the mass and cancel them out.

Example 2 : A roller coaster car on the first drop is shown. The coeff. of friction (μ) between the car's wheels and the track is 0.05. Find the car's acceleration.



$$F_{net} = F_{app} - F_{opp}$$

$$ma = F_{g\,ll} - F_f$$

$$ma = mg\sin\theta - \mu F_n$$

$$\cancel{m}a = \cancel{m}g\sin\theta - \mu\cancel{m}g\cos\theta$$

"m" appears in every term so it can be canceled out

$$a = (9.8)\sin 45 - (0.05)(9.8)\cos 45$$

$$= 6.9296 - 0.3465$$

$$= 6.5831$$

$$= 6.58\ m/s^2 \quad \text{or} \quad 6.6\ m/s^2$$