Newton's 2nd Law of Motion

$\Sigma F = m*a$

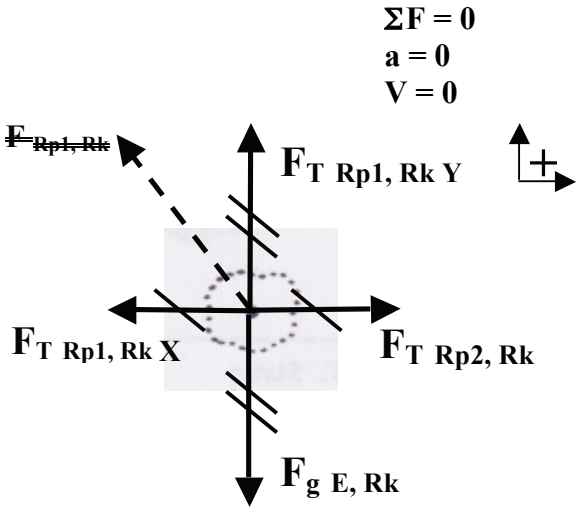
($\Sigma F = F_{net}$ *means the sum of all the forces acting on an object.*)

$\Sigma F = F_{net}$ = All the force acting in the same plane (X, Y, ||, ⊥) = m*a

Step 1 → Write $\Sigma F_X = m*a_X$ or $\Sigma F_{||} = m*a_{||}$
Step 2 → Replace ΣF with the names of the forces from the force diagram that are on the X-axis or the parallel axis
Step 3 → Repeat for the Y-direction. Write $\Sigma F_Y = m*a_Y$ or $\Sigma F\perp = m*a\perp$
Step 4 → Replace ΣF with the names of the forces from the force diagram that are on the Y-axis or the ⊥ axis.

Worksheet 1B

1. Static (Not on hillside) (a = 0)



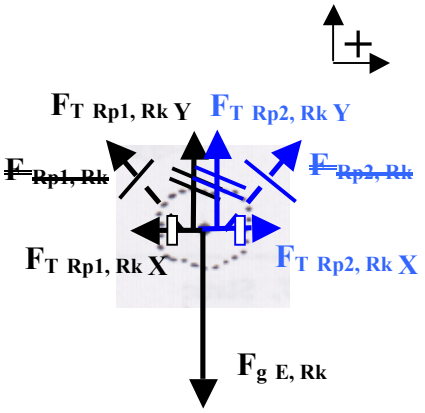
$$\Sigma F_X = m * a_X$$

$$F_{T\ Rp2,\ Rk} - F_{T\ Rp1,\ Rk\ X} = m * \cancel{a_X}^{\,0}$$

$$\Sigma F_Y = m * a_Y$$

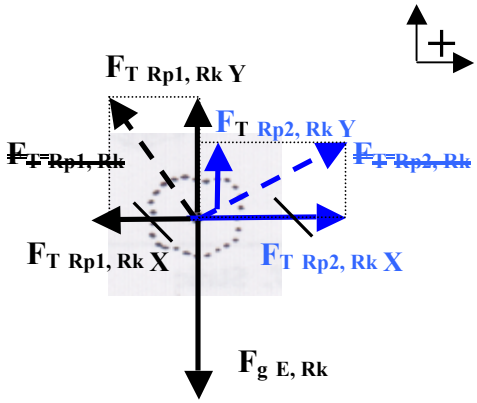
$$F_{T\ Rp1,\ Rk\ Y} - F_{g\ E,\ Rk} = m * \cancel{a_Y}^{\,0}$$

4. Static (Not on hillside) (a = 0)



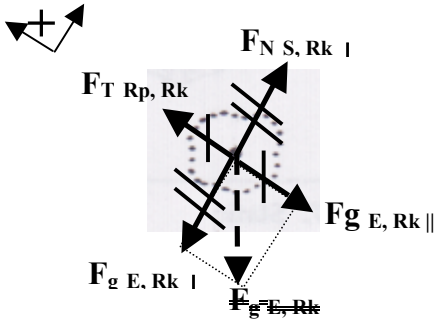
$\Sigma F_X = m*a_X$
$F_{T\ Rp2, Rk\ X} - F_{T\ Rp1, Rk\ X} = m*a_X^{0}$
$\Sigma F_Y = m*a_y$
$F_{T\ Rp2, Rk\ Y} + F_{T\ Rp1, Rk\ Y} - F_{g\ E, Rk} = m*a_y^{0}$

5. *Static* (Hillside No) (a = 0)



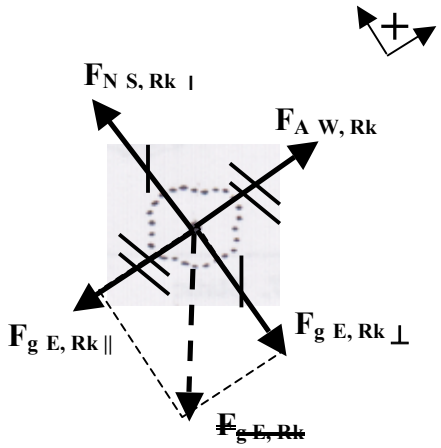
$\Sigma F_X = m*a_X$
$F_{net\ Y} = m*a_y$

7. *Static* (Hillside yes) (a = 0)



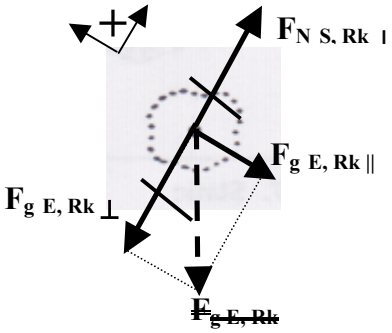
$F_{net\ \parallel} = m*a_{\parallel}$
$F_{net\ \perp} = m*a_{\perp}$

8. *Static* (Hillside yes) (a = 0)



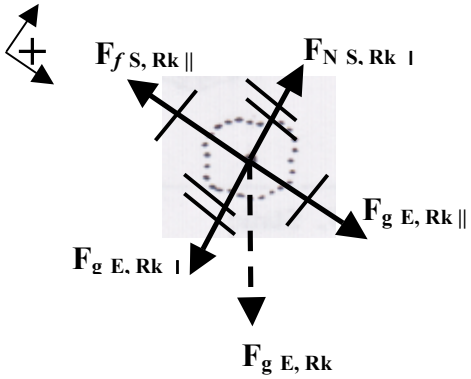
$F_{net\parallel} = m*a_{\parallel}$
$F_{net\perp} = m*a_{\perp}$

9. (Hillside yes) (a ↘)



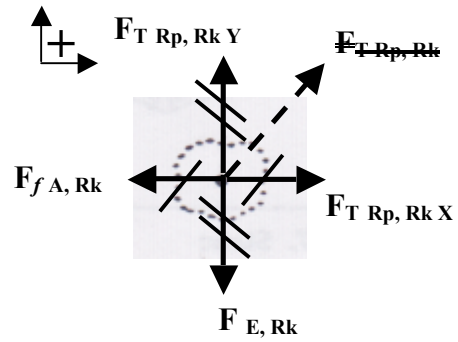
$F_{net\ \parallel} = m*a_{\parallel}$
$F_{net\ \perp} = m*a_{\perp}$

10. (Hillside yes) (a = 0)



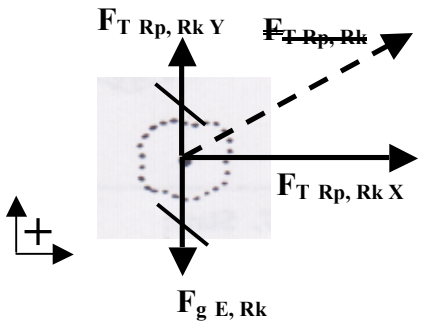
$F_{net\ \parallel} = m*a_{\parallel}$
$F_{net\ \perp} = m*a_{\perp}$

18. (Hillside No) (a = 0)



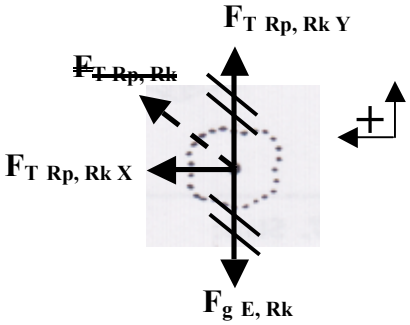
$F_{net\ X} = m * a_X$
$F_{net\ Y} = m * a_Y$

19. (Hillside No) (a_X = 2g)



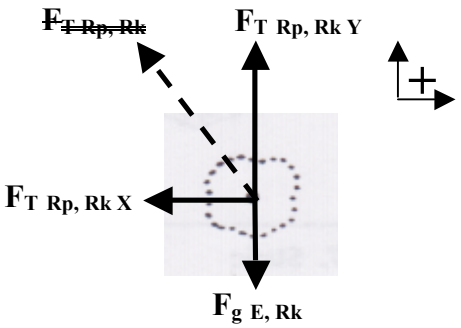
$F_{net\ X} = m * a_X$
$F_{net\ Y} = m * a_Y$

22. (Hillside No) (a = ←)



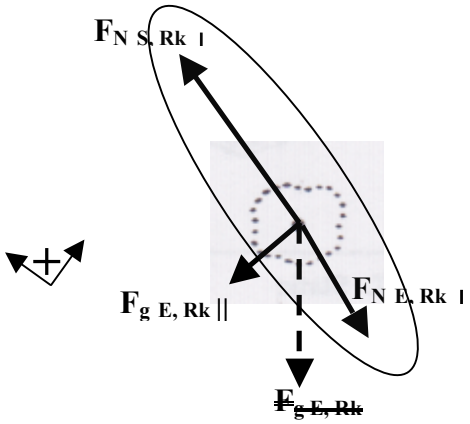
$F_{net\ X} = m * a_X$
$F_{net\ Y} = m * a_Y$

23. (Hillside No) (a = ↖)

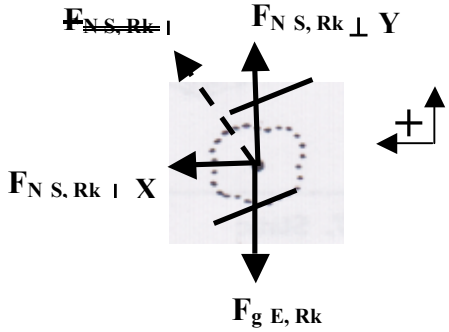


$F_{net\ X} = m*a_X$
$F_{net\ Y} = m*a_Y$

27. (Hillside Yes) (a = ←)

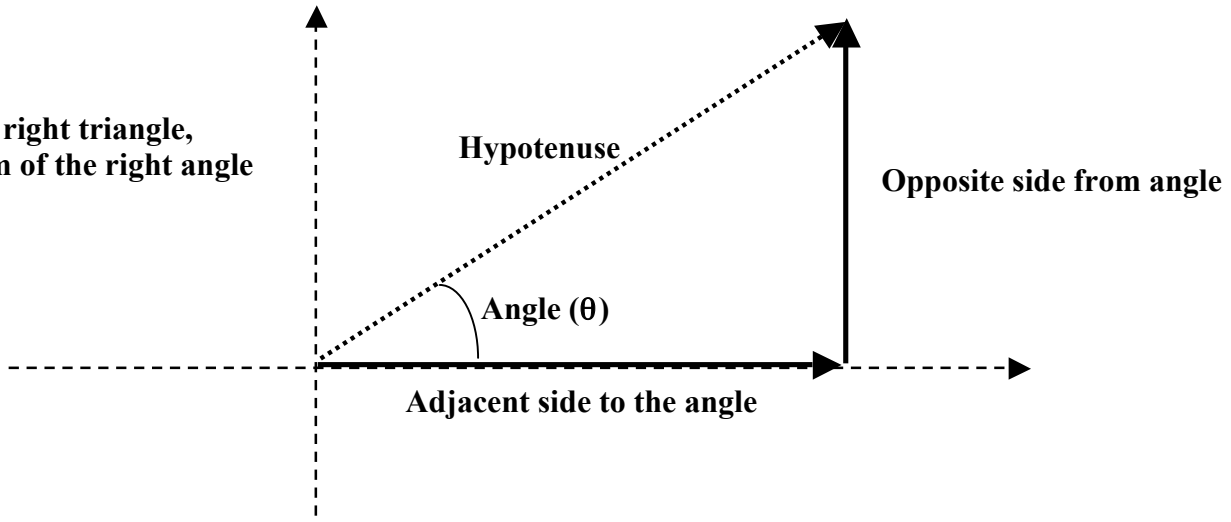


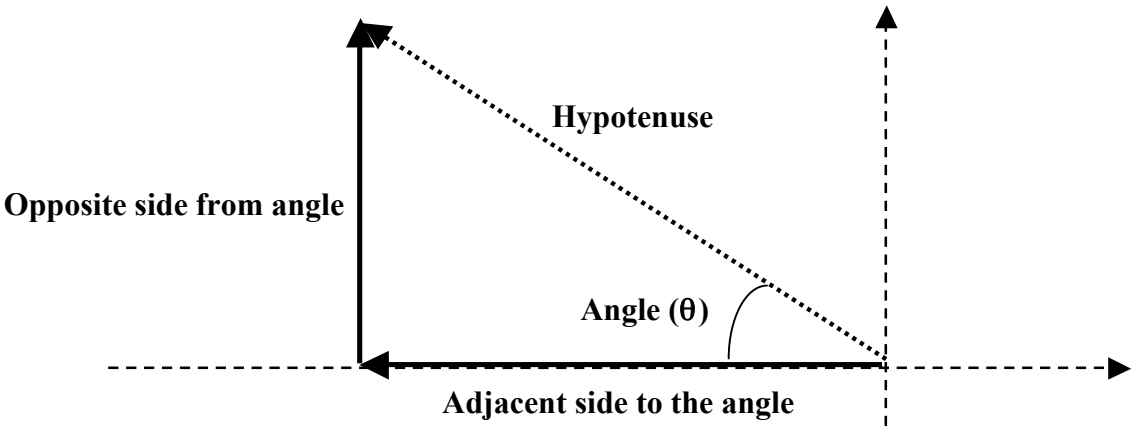
$F_{net\ \parallel} = m*a_{\parallel}$
$F_{net\ \perp} = m*a_{\perp}$

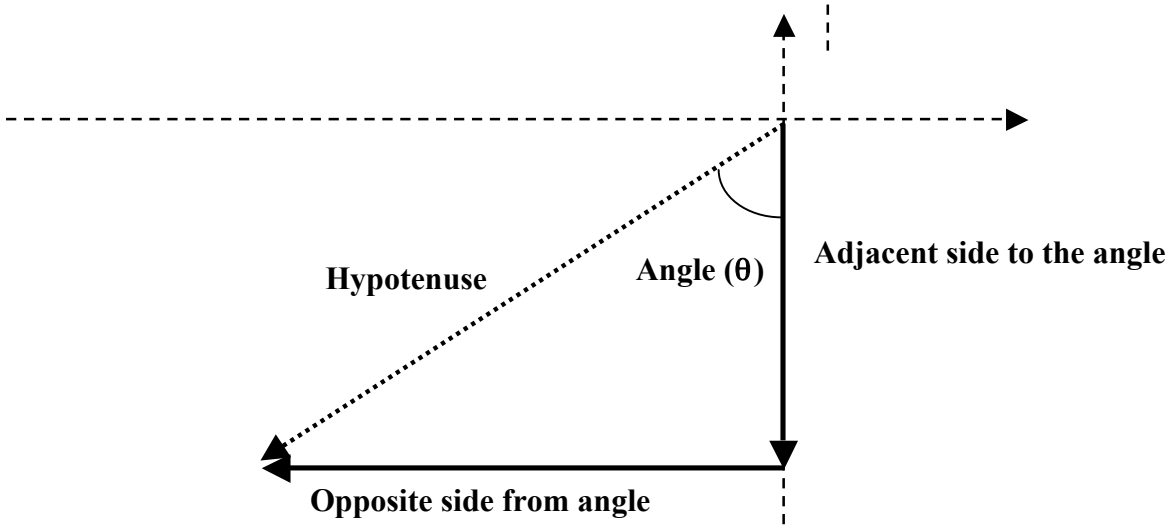


$F_{net} = m*a_X$
$F_{net} = m * a_{\perp}$

Hypotenuse =
Longest side of right triangle,
It is across from of the right angle





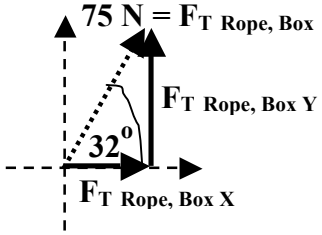


SOH CAH TOA

Sine is Opposite / Hypotenuse $\sin\theta = \text{Opp/Hyp}$

Cosine is Adjacent / Hypotenuse $\cos\theta = \text{Adj/Hyp}$

Tangent is Opposite / Adjacent $\tan\theta = \text{Opp/Adj}$



Finding Opposite side of triangle –
Sine: Sin (Angle θ)= Opposite Side / Hypotenuese
Use this form: Opp Side = Hyp * Sin (Angle)

$$F_{T\ Rope,\ Box\ Y} = F_{T\ Rope,\ Box} * \sin\theta$$

$$F_{T\ Rope,\ Box\ Y} = 75\ N * \sin(32^o)$$

$$F_{T\ Rope,\ Box\ Y} = 39.7\ N$$

Finding Adjacent side of triangle –
Cosine: Cos (Angle θ) = Adjacent / Hypotenuese
Use this form: Adj = Hyp * Cos (θ)

$$F_{T\ Rope,\ Box\ X} = F_{T\ Rope,\ Box} * \cos\theta$$

$$F_{T\ Rope,\ Box\ X} = 75\ N * \cos(32^o)$$

$$F_{T\ Rope,\ Box\ X} = 63.6\ N$$