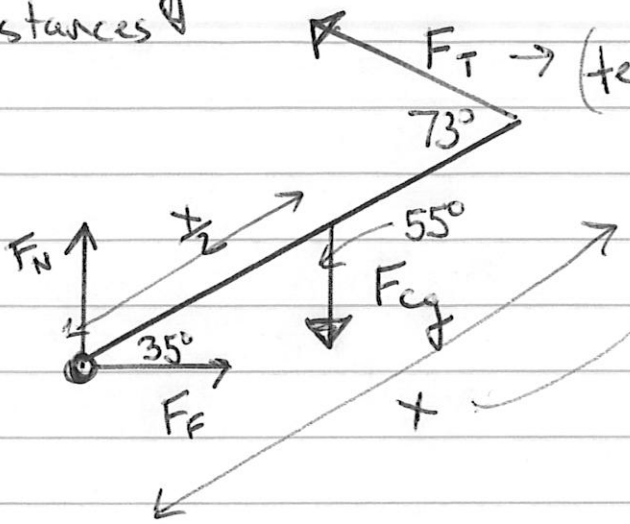
Solution # 19

19. Begin with a diagram of the pivit point and the lever arm (line on which forces act upon). Place along the lever arm all forces, angles and distances



Since the length of the beam was not given we will use X

F_N and F_F produce no torque because they pass through the pivit point ($r = 0$)

F_{cg} produces clockwise torque and F_T produces counter-clockwise torque

1. Solve for the first condition for static equilibrium first $\sum \tau = 0$

$$\tau_c = \tau_{cc}$$

the unknown!

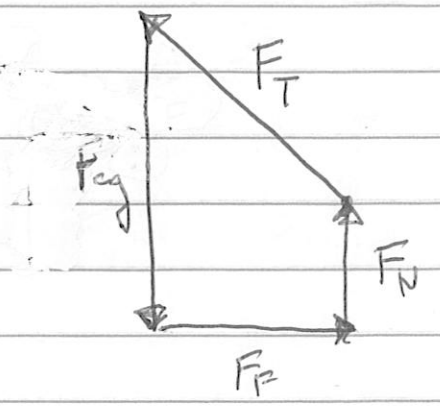
$$r_{cg} F_{cg} (\sin 55^\circ) = r_T F_T \sin 73^\circ$$

$$F_T = \frac{\left(\frac{X}{2}\right) mg (\sin 55^\circ)}{X (\sin 73^\circ)}$$

$$F_T = 10.91 \qquad \boxed{F_T = 11\ N}$$

2. Now we can solve for the second condition for static equilibrium $\Sigma F = 0$

We could add up all the forces : it would look something like this



the 4 forces add up to zero but no triangle to solve!

We can also use $\Sigma F_x = 0$ or $\Sigma F_y = 0$
Since F_F is on the x-axis we will use $\Sigma F_x = 0$

$$F_F = F_T \cos 73^\circ$$
$$= 10.81 (\cos 73^\circ)$$
$$= 8.6$$

$$\boxed{F_F = 8.6 \text{ N}}$$