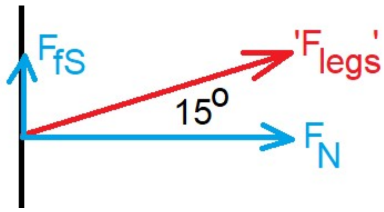
5-17)

Part B)

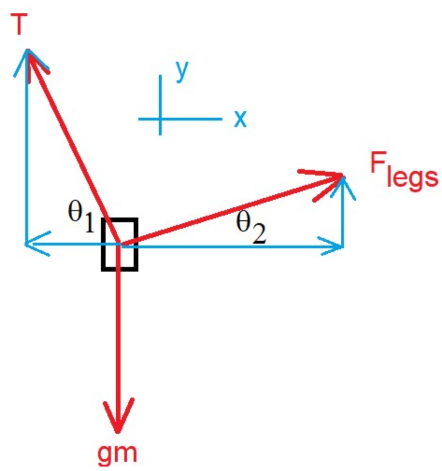


The way this problem is presented, the answer to Part B is very obvious, if we can assume that she is about to slip, *i.e.,* that we're at the minimum value of μ_S. The force incorrectly labeled as F_{Legs} is the sum of the normal (to the right) and frictional (upward) forces exerted by the wall on the woman.

That means that

$$\mu_S = \frac{F_{fS}}{F_N} = \tan(15^o) = 0.27 \quad .$$

Part A)



We're asked for the force she exerts on the wall, but instead we'll find the force the wall exerts on her; by the third law it will have the same magnitude and opposite direction. Since we've already taken care of the decomposition of the 'leg' force, let's go ahead and treat it as one force pointing up and to the right. NII then results in

$$\text{x:} \quad +F_{Legs}\cos(\theta_2) - T\cos(\theta_1) = ma_x = 0$$
$$\text{y:} \quad +F_{Legs}\sin(\theta_2) + T\sin(\theta_1) - gm = ma_y = 0$$

PID

Now the math; let's try substitution.

$$+F_{Legs}\cos(\theta_2) - T\cos(\theta_1) = 0 \quad \rightarrow \quad +F_{Legs} = \frac{T\cos(\theta_1)}{\cos(\theta_2)} = \frac{T\cos(59)}{\cos(15)} = 0.533\ T$$

$$(0.533\ T)\ \sin(\theta_2) + T\sin(\theta_1) = gm$$

$$T(0.533\ \sin(\theta_2) + \sin(\theta_1)) = gm$$

$$T = \frac{gm}{0.533\ \sin(\theta_2) + \sin(\theta_1)} = \frac{gm}{0.533\ \sin(15) + \sin(59)} = \frac{10(52)}{(0.533)(0.259) + 0.857}$$
$$= 523\ N$$

and then

$$F_{Legs} = 0.533\ T = 0.533(523) = 278\ N \quad .$$