21-S-5-4-AG-076

A m-kg dancer is balancing their entire weight on one foot. In this position, the tibia bone pushes down on the astragalus while the Achilles tendon pulls up. What are the forces exerted by the tibia and the Achilles tendon? Take $d_A = D_1$ cm and $d_N = D_2$ cm.

ANSWER:

First, we must determine the normal force exerted by the floor onto the toes.

$$F_N = mg$$

Then, we equate the moments around the connection point of the tibia to find F_A.

$$F_A = \frac{F_N \cdot D_2}{D_1}$$

Then, we sum the vertical forces and rearrange to solve for F_T.

$$F_T = F_N + F_A$$