21-S-4-1-AG-060

If a human forearm weighs $X\ kg$ and your biceps can pull with a maximum force of $F\ Newtons$, what is the maximum weight of a textbook that you can carry if you want to have zero moment around the attachment point of F_E? If the book was heavier than you calculated, which direction would the moment be pointed? Take $r_1 = A\ m$, $r_2 = B\ m$, and $r_3 = C\ m$.

ANSWER:

We know that the magnitude of a moment is

$$M_O = \sum Fd$$

Therefore,

$$0 = M_{F_E} = F_B \cdot r_1 - W_A \cdot r_2 - W_B \cdot r_3 = F \cdot A - X \cdot g \cdot B - W_B \cdot C$$

$$W_B = \frac{F \cdot A - X \cdot B}{C}$$

If the book is heavier than the calculated weight, the moment would no longer be zero. Instead, it would be negative and going into the page.