Answer on Question #64417-Physics-Mechanics-Relativity

A mass of $m = 10$ kg hangs from one end of a $l = 1\ m$ long light rod that is pivoted $d = 0.3\ m$ from that end.

(a) What force must be applied at the $s = 0.6\ m$ mark to balance the rod?

(b) If force of $F_1 = 20N$ is hung from the $d_1 = 0.5\ m$ mark what force must be hung from the $l = 1\ m$ mark to balance the rod?

Solution

(a) Taking moments about the pivot:

$$Wd = F(s - d)$$

$$F = W\frac{d}{(s-d)} = mg\frac{d}{(s-d)} = 10 \cdot 10\frac{0.3}{(0.6-0.3)} = 100\ N.$$

(b) Taking moments about the pivot:

$$Wd = F_1(d_1 - d) + F(l - d)$$

$$F = \frac{Wd - F_1(d_1 - d)}{l - d} = \frac{10 \cdot 10 \cdot 0.3 - 20(0.5 - 0.3)}{1 - 0.3} = 37\ N.$$