Answer on question #54199, Physics / Solid State Physics

Question A uniform bar,12 ft long weighs 10 kg. A 5 kg is at one end and an 8 kg weigh is 2 ft from the other end. At what point will the bar be supported so that the system will remain horizontal?

Solution Let us suppose, that support is x ft from the center of bar closer to 5 kg. Then, equation of balance is

$$(6-x)\cdot 10 + 5\cdot\frac{6-x}{12}\cdot\frac{6-x}{2} = (6+x-2)\cdot 8 + 5\cdot\frac{6+x}{12}\cdot\frac{6+x}{2}$$

$$60 - 10x + \frac{5}{24}(6-x)^2 = 32 + 8x + \frac{5}{24}(6+x)^2$$

$$60 - 10x = 32 + 8x + 5x$$

$$28 = 23x$$

$$x = \frac{28}{23}\,ft = 1\frac{5}{23}\,ft$$

Hence, bar should be supported at $1\frac{5}{23}$ ft from the center towards the 10 kg.