

51. (a) For computing torques, we choose the axis to be at support 2 and consider torques which encourage counterclockwise rotation to be positive. Let m = mass of gymnast and M = mass of beam. Thus, equilibrium of torques leads to

$$Mg(1.96 \text{ m}) - mg(0.54 \text{ m}) - F_1(3.92 \text{ m}) = 0 .$$

Therefore, the upward force at support 1 is $F_1 = 1163 \text{ N}$ (quoting more figures than are significant – but with an eye toward using this result in the remaining calculation).

- (b) Balancing forces in the vertical direction, we have

$$F_1 + F_2 - Mg - mg = 0$$

so that the upward force at support 2 is $F_2 = 1.74 \times 10^3 \text{ N}$.