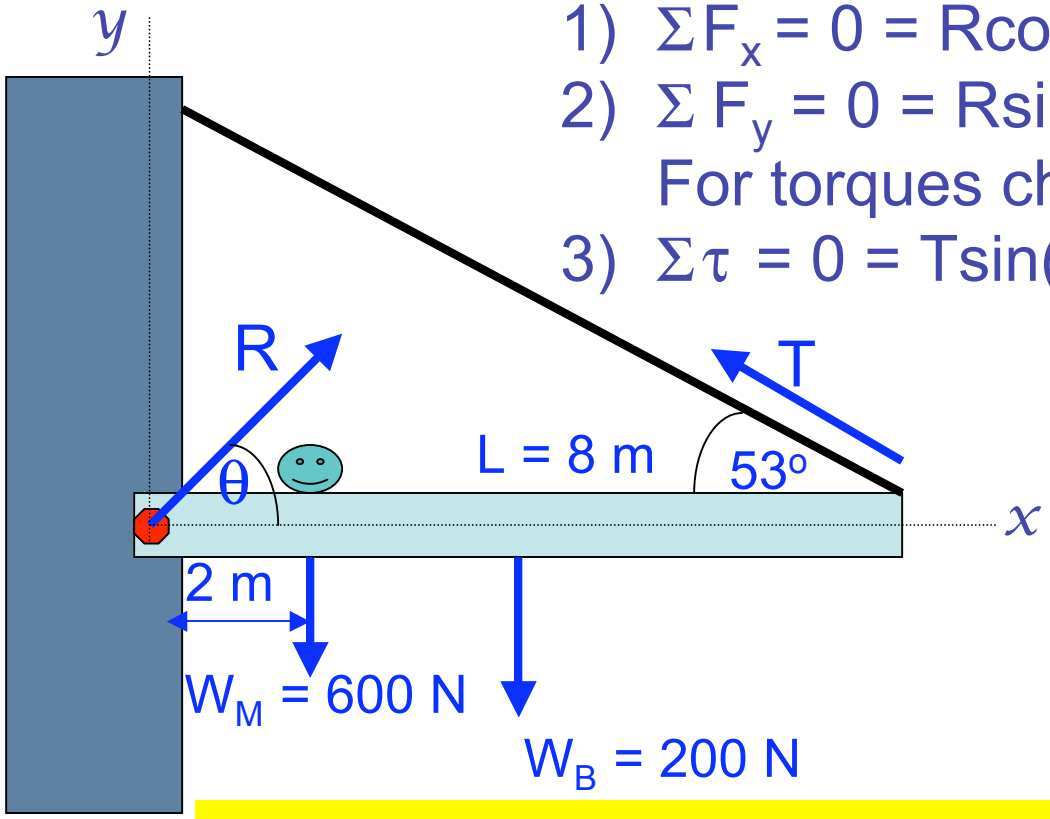
Beam In Rotational Equilibrium

1) A uniform horizontal beam has a length 8.00 m and a weight 200 M
2) The beam is free to rotate a pivot in a wall at one end of the beam
3) The other end of the beam is attached by a cable making a 53^o angle
4) A man of weight 600 N is standing on the beam 2.00 m from the wall
5) What is the tension ***T*** in the cable, and the force ***R*** exerted by the pivot?



1) $\Sigma F_x = 0 = R\cos\theta - T\cos(53)$
2) $\Sigma F_y = 0 = R\sin\theta + T\sin(53) - 800$

   For torques choose rotation axis at pivot

3) $\Sigma\tau = 0 = T\sin(53)*L - W_B*L/2 - W_M*2$

3 Equations and 3 Unkowns

1) R magnitude of pivot force
2) T tension in cable
3) θ angle of pviot force

Numerical solution:

1) R = 581 N
2) T = 313 N
3) θ = 71.1^o

Best choice is rotation axis at pivot. Why?