



A metal beam is fixed into a wall and experiences two pairs of couple forces. If \vec{F}_1 has a magnitude of F_C and the beam experiences a total moment of M_T counterclockwise, find the magnitude of \vec{F} . Assume that the length of the beam is L and that the beam has negligible mass.

Find the magnitude of \vec{F}_2 .

Since \vec{F}_1 and \vec{F}_2 are couple forces, $||\vec{F}_2|| = ||\vec{F}_1|| = F_C$.

Find the magnitude of \vec{F} .

Assuming O is the bottom left corner of the beam in the image:

$$\Sigma M_O = M_T : F \cdot \frac{3}{5}L + F \cdot \frac{4}{5}d_1 - F_C \cdot d_1 = M_T$$

$$\Rightarrow F = 5 \frac{M_T + d_1 \cdot F_C}{3L + 4d_1}$$