

16. **REASONING AND SOLUTION** The net torque about an axis through the contact point between the tray and the thumb is

$$\begin{aligned}\Sigma \tau = F(0.0400 \text{ m}) - (0.250 \text{ kg})(9.80 \text{ m/s}^2)(0.320 \text{ m}) - (1.00 \text{ kg})(9.80 \text{ m/s}^2)(0.180 \text{ m}) \\ - (0.200 \text{ kg})(9.80 \text{ m/s}^2)(0.140 \text{ m}) = 0\end{aligned}$$

$$F = \boxed{70.6 \text{ N, up}}$$

Similarly, the net torque about an axis through the point of contact between the tray and the finger is

$$\begin{aligned}\Sigma \tau = T(0.0400 \text{ m}) - (0.250 \text{ kg})(9.80 \text{ m/s}^2)(0.280 \text{ m}) - (1.00 \text{ kg})(9.80 \text{ m/s}^2)(0.140 \text{ m}) \\ - (0.200 \text{ kg})(9.80 \text{ m/s}^2)(0.100 \text{ m}) = 0\end{aligned}$$

$$T = \boxed{56.4 \text{ N, down}}$$