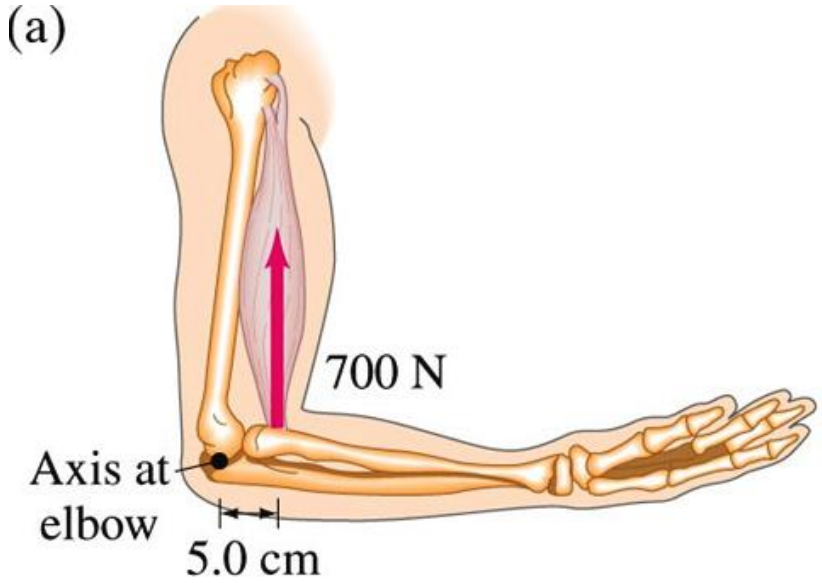
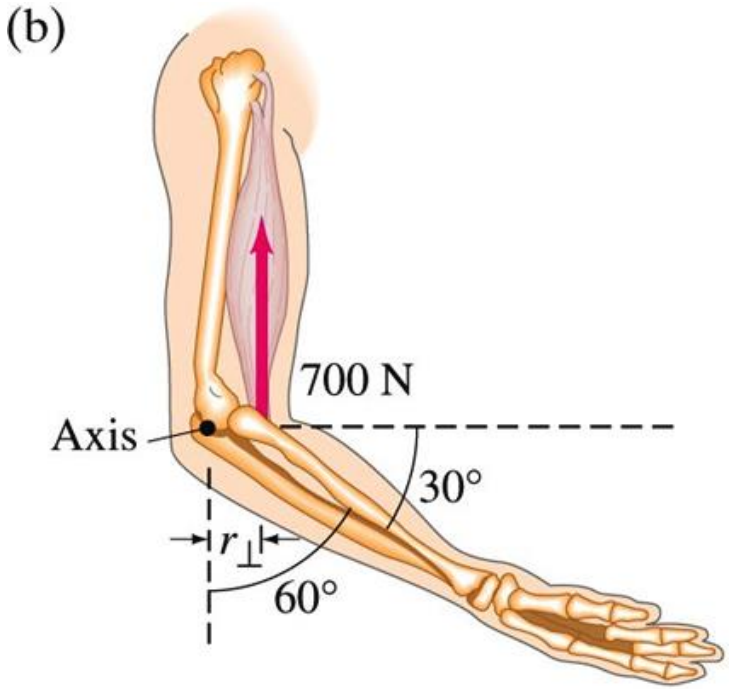
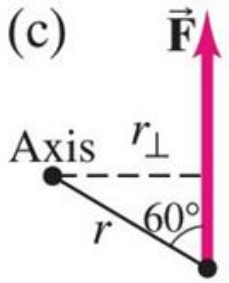
# Example 8.8: Biceps Torque

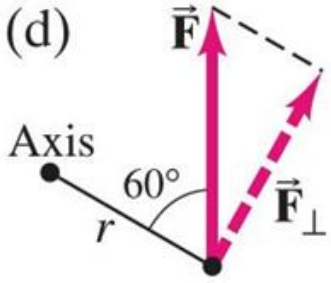



$\tau = r_\perp F = 35 \text{ m N}$

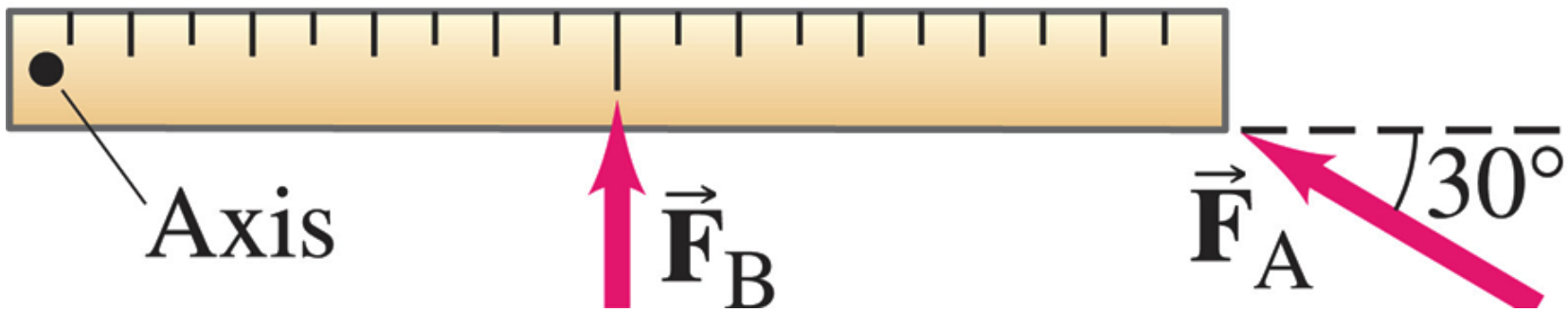



$\tau = r_\perp F = 30 \text{ m N}$



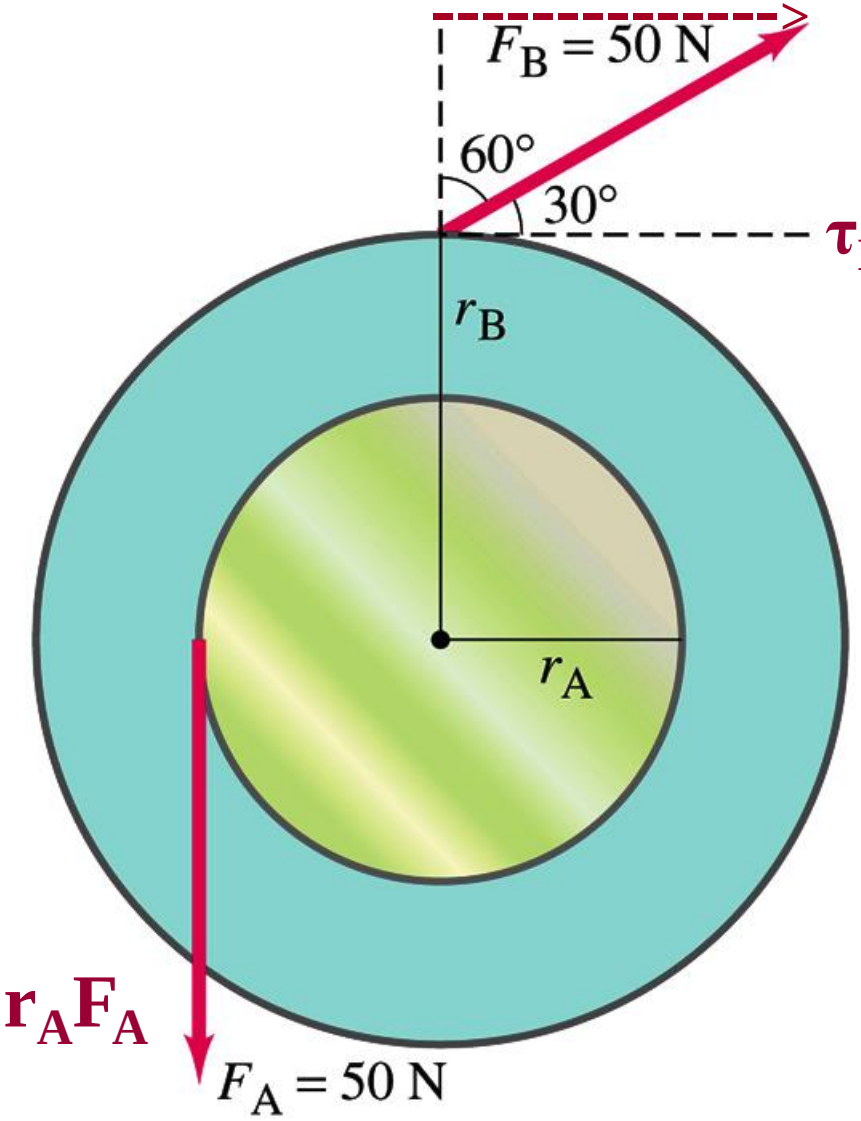
# Exercise B – Section 8.4




**If the two forces exert the same torque about the axis shown, what is the relationship between the magnitudes of the two forces?**

# Example

Two thin disk-shaped wheels, radii $r_A$ = **30 cm** & $r_B$ = **50 cm**, are attached to each other on an axle through the center of each. Calculate the net torque on this compound wheel due to the 2 forces shown, each of magnitude **50 N**.




$\tau_B = -r_B F_B \cos 60^o$

$\tau_A = +r_A F_A$

$\tau = \tau_A + \tau_B$

$= -6.7$ m N

# Problem 8.25

$\tau_A$ = - (0.24 m)(18 N)

= - 4.32 m N

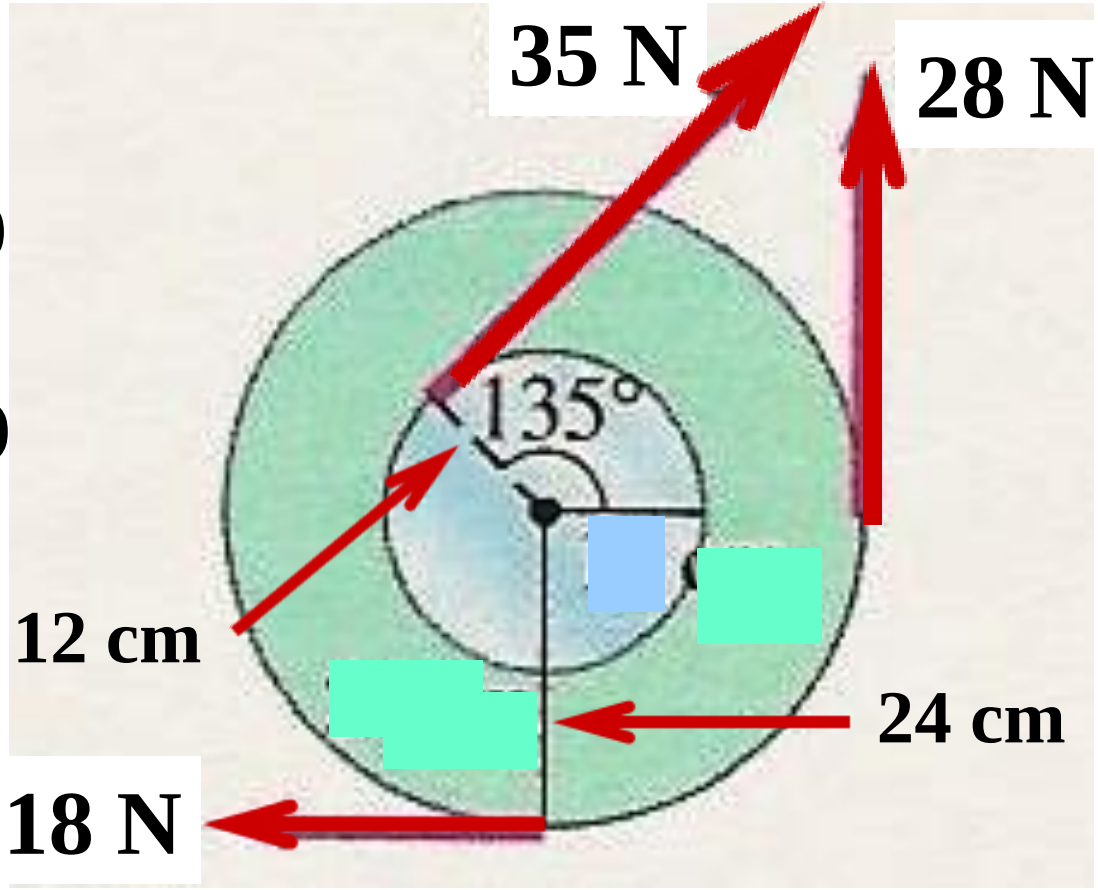
$\tau_B$ = + (0.24 m)(28 N)

= 6.72 m N

$\tau_C$ = - (0.12 m)(35 N)

= - 4.2 m N

$\tau_{fr}$ = + 0.4 m N




**Net torque:** $\sum\tau = \tau_A + \tau_B + \tau_C + \tau_{fr} = -1.4$ m N

# Section 9-3: Application to Muscles & Joints

$$\sum F_x = 0, \quad \sum F_y = 0, \quad \sum \tau = 0$$

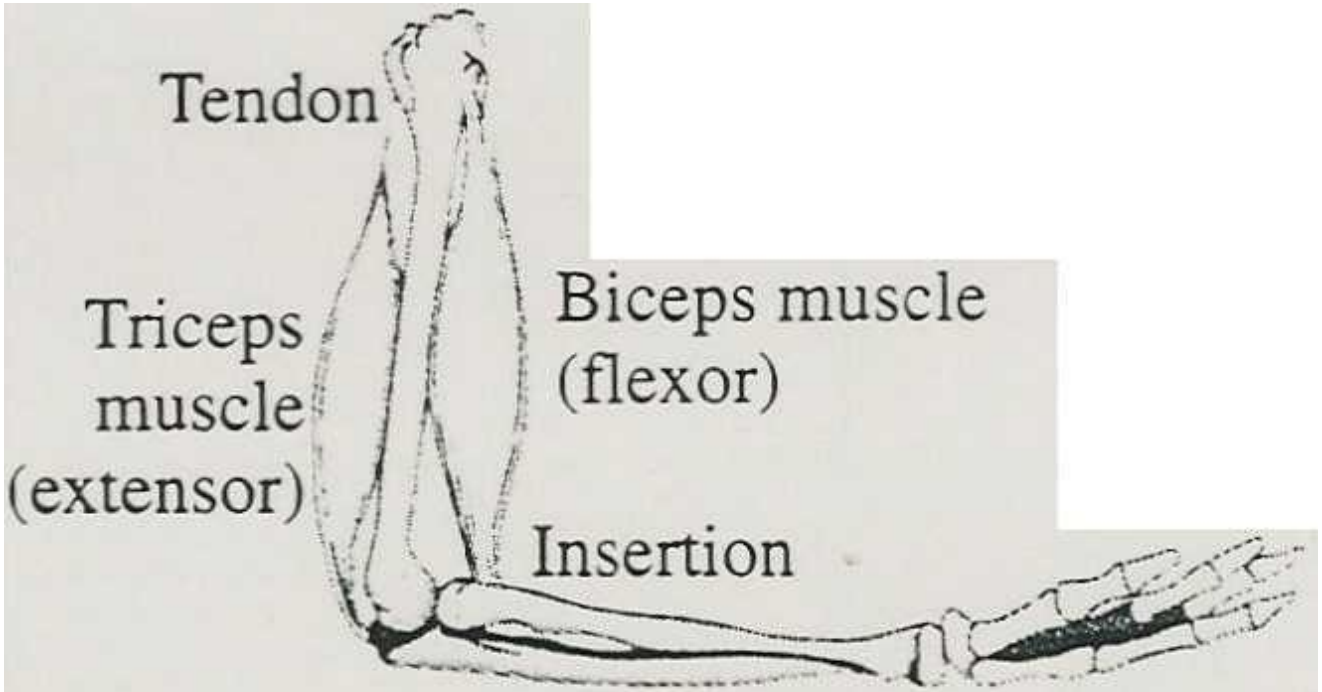
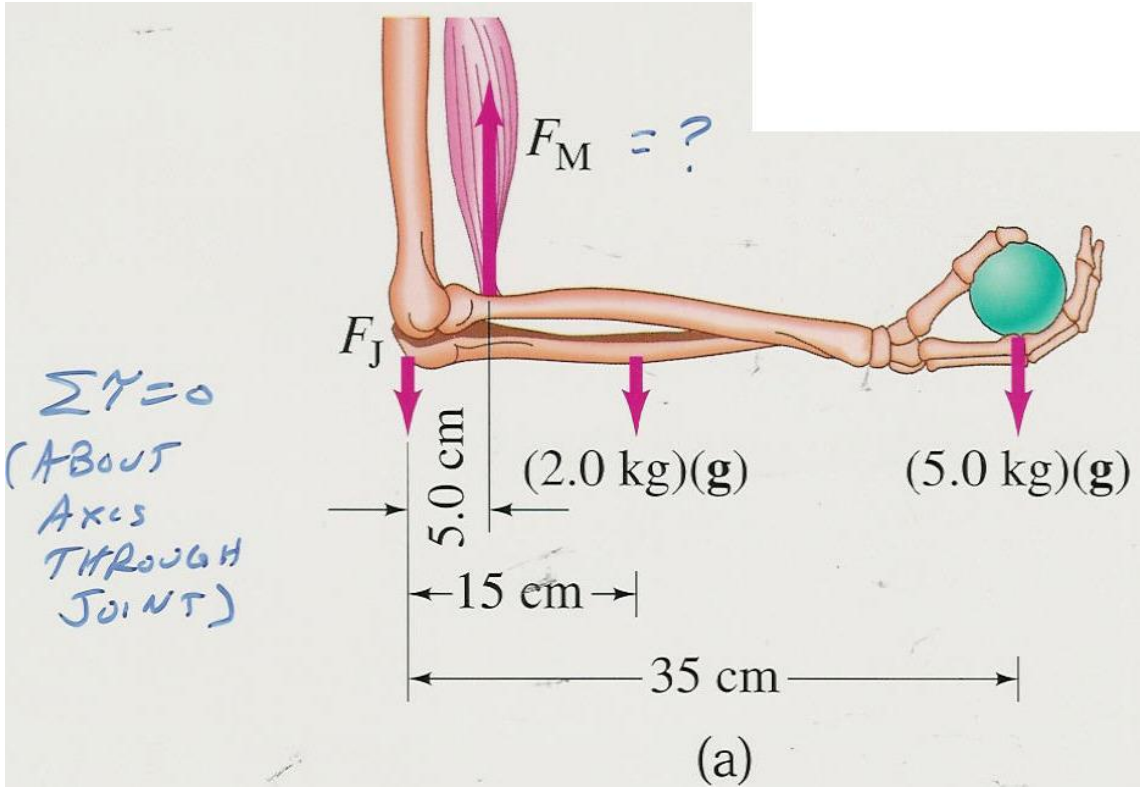
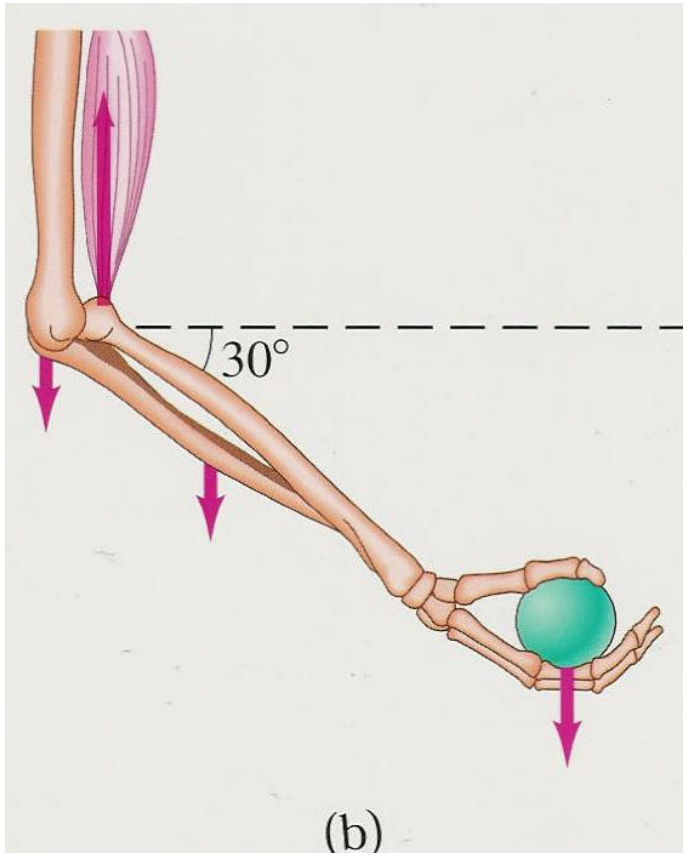



**FIGURE 9–14** Diagram showing the biceps (flexor) and triceps (extensor) muscles in the human arm.

# Example 9-8: Elbow




$\Sigma\tau = 0$ (ABOUT AXIS THROUGH JOINT)



# Example 9-9: Forces on Your Back

$\sum F_x = 0, \quad \sum F_y = 0, \sum \tau = 0$ (axis at spine base)