Solution Problem 1

\[ \Sigma F_x = 0 = -F_{\text{dynamometer}} \cos 30° + F_{x\text{knee}} \]
\[ F_{x\text{knee}} = 86.6 \text{N} \]

\[ \Sigma F_y = 0 = -F_{\text{dynamometer}} \sin 30° - W + F_{y\text{knee}} \]
\[ F_{y\text{knee}} = 50.0 + 45.0 = 95.0 \text{N} \]
\[ F_{\text{knee}}^2 = 86.6^2 + 95.0^2, \text{ therefore} \]
\[ F_{\text{knee}} = 128.5 \text{N} \quad \theta = \tan^{-1}(95.0/86.6) = 47.6° \text{ above horizontal} \]

\[ \Sigma T = 0 = -(F_{\text{dynamometer}} \times 0.3) - (W \times 0.24 \cos 30°) + T_{\text{knee}} \]
\[ T_{\text{knee}} = (100 \times 0.3) + (45.0 \times 0.24 \times 0.866) = 39.4 \text{Nm (extensor)} \]

The dynamometer reading is affected by the position. All things being equal, moving it closer to the knee will increase the reading while moving it further away will increase the reading. But it wouldn’t affect the torque at the knee joint.