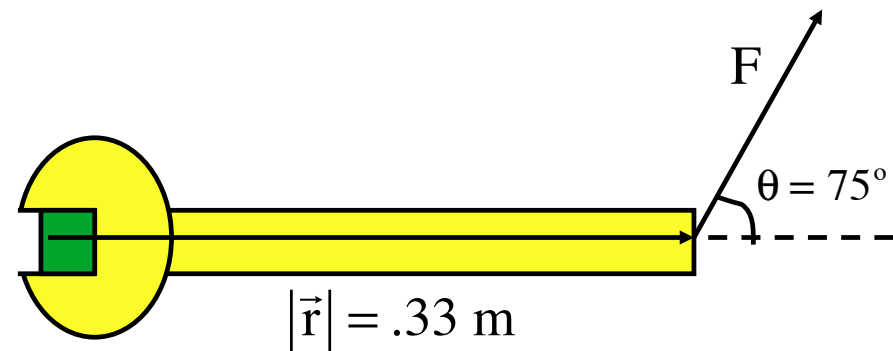


#8.2

Lugnuts on a car can handle 65 newton•meters of torque. For the situation shown, what is the maximum force that can be applied without damaging the lugnut?



We know that:
$$|\Gamma_{\text{about axis}}| = |\vec{r} \times \vec{F}|$$
$$= |\vec{r}| |\vec{F}| \sin \phi$$

So:
$$|\vec{F}| = \frac{\Gamma_{\text{about axis}}}{|\vec{r}| \sin \phi}$$
$$= \frac{(65 \text{ N} \cdot \text{m})}{(.33 \text{ m}) \sin 75^\circ}$$
$$= 204 \text{ newtons}$$

Note that the angle ϕ is the angle between the LINE OF THE TWO VECTORS.