7. If the object is not accelerating, all forces are balanced. All horizontal forces directed to the right are balanced by an equal amount of force directed to the left. All vertical forces directed upward are balanced by downward forces. So,

\[ F_1 \cos 50 = F_2 \cos 50 \]
\[ F_1 \sin 50 + F_2 \sin 50 = 100 \]

\[ F_1 = F_2 \]
\[ 2 \sin 50 F_1 = 100 \]
\[ F_1 = 65.2 \text{ lbs} \]

22. Force = 5.0 lbs. line of action (moment arm) = 18 inch = 1.5 ft. Torque = R x F

30. A Truck, weighing 20 tons = 20 * 2000 lbs, is 30 ft from one of a 100 ft bridge supported at the ends. Take the torques about one of the ends.
Balancing the torques calculated about the left end:
\[ F_2 \times (100 \text{ ft}) = 10000 \times (50 \text{ ft}) + 40000 \times (30 \text{ ft}) \]
\[ F_2 = \frac{(500000 \text{ ft-lb}) + 120000 \text{ ft-lb}}{100 \text{ ft}} = 12500 \text{ lb} \]

Now, balancing the forces acting vertically:
\[ F_1 + F_2 = 40000 \text{ lb} + 10000 \text{ lb} \]
\[ F_1 + 12500 \text{ lb} = 40000 + 10000 \]
\[ F_1 = 37500 \text{ lb} \]

39. As seen in the diagram, the plumb bob line must fall inside the wheel base for the truck to be stable.