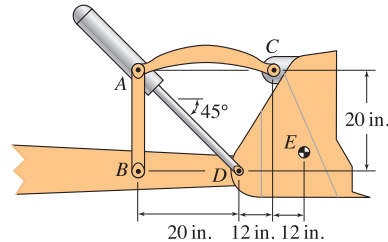


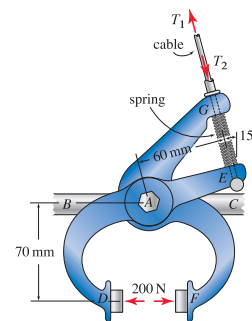
The shovel of an end loader has pins at points A , B , C , and D . The scoop supports a downward vertical load of 2000 lb, which is not shown in the figure, at point E .

- Draw four FBDs, one each for parts AB and AC , hydraulic cylinder AD , shovel CDE , and member BD , labeling all forces.
- Determine the force the hydraulic cylinder AD must generate to keep the shovel in equilibrium.

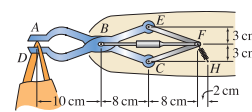


The hand brake for a bicycle is shown. Portions DE and FG are free to rotate on bolt A which is screwed into the frame BC of the bicycle. The brake is actuated by a shielded cable where T_1 is applied to point E and T_2 is applied to point G . A spring having 50 N compressive force is placed between points E and G so that the brake stays open when it is not being used. Assume the change in the spring's force is negligible when the brake is actuated to produce the 200 N forces at points D and F .

- Draw three FBDs, one each for DE and FG and bolt A , labeling all forces.
- Determine the necessary cable forces T_1 and T_2 .
- Determine the forces exerted by DE and FG on bolt A .



A prosthetic arm and hand assembly is shown. Points B and H are fixed to the arm. The hand is actuated by a pneumatic cylinder BF that opens and closes the hand. The spring FH helps keep the hand in alignment with the arm. If the person holds a bag of groceries that weighs 30 N and grips the bag at A and D with a 10 N force, determine the forces supported by the pneumatic cylinder and the spring. Assume that while holding the bag of groceries, the arm and hand have the geometry shown where the pneumatic cylinder is horizontal.



A small trailer-mounted dumper is shown. All connections are pinned and member EF is horizontal. The hydraulic cylinder simultaneously tilts the dump and opens the gate.

- Draw five FBDs, one each for hydraulic cylinder AE , members BDE and EF , gate FG , and the dump, labeling all forces.
- Determine the force supported by hydraulic cylinder AE .

