

ME203 Mechanics of Machines

Assignment I

-) Identification of links and pairs
-) Construction of Kinematic diagrams and
-) Identification of degree of freedom



Important Instructions

- Students should follow the guidelines discussed in the class to construct the kinematic diagram.
- Suitable assumptions can be made to consider the given mechanism as a planar mechanism.
- Avoid free sketch diagram to represent the kinematic diagram.
- Should solve the problem in a A3 sheet
- Group details (Section, Group number Roll numbers of group members) should be specified clearly along with the problem number.
- The calculated degrees freedom of the given mechanism should be justified

with the number of actuators needed to actuate the mechanism.

- It is a group assignment but the students need to submit the hard copy of the assignment individually. Refer the separate page attached for group and problem details.
- Issued on: 22 August 2017
- To be submitted on

**When: 1ST September 2017
(before 12 noon)**

Where: To my office

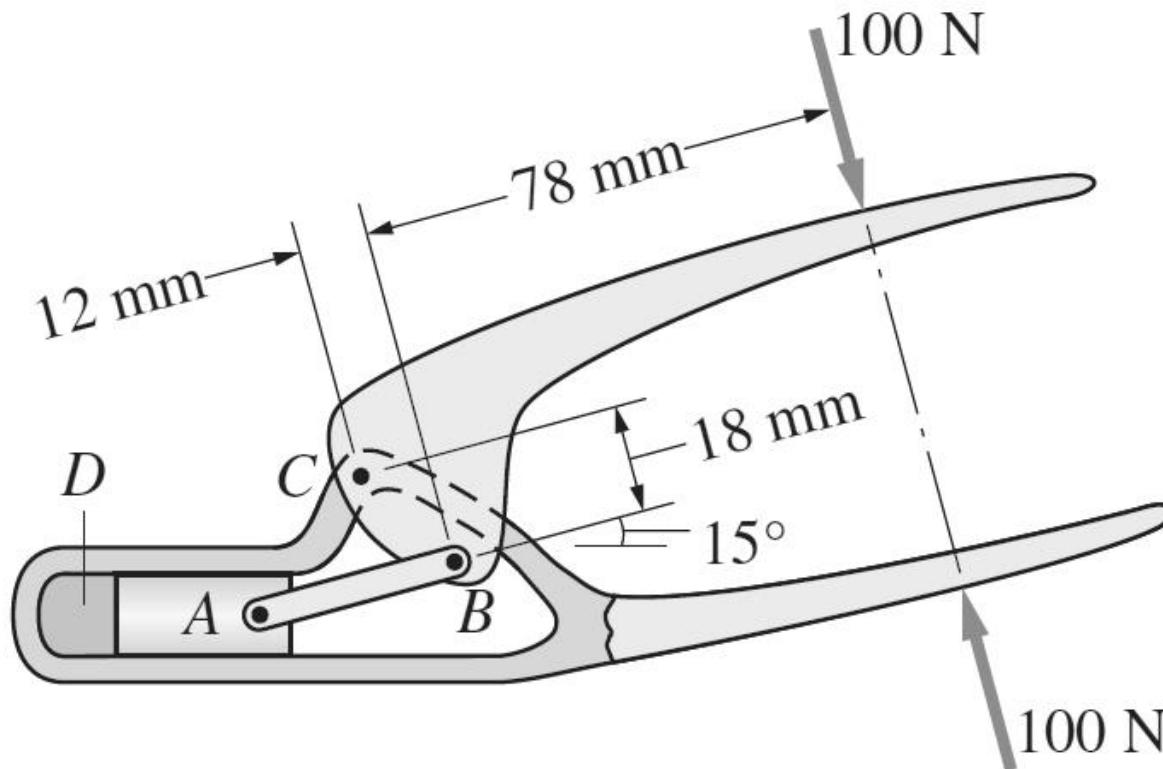
M103, Department of Mechanical

Engineering, NITK Surathkal

ME 203 MECHANICS OF MACHINES
ASSIGNMENT I AND II

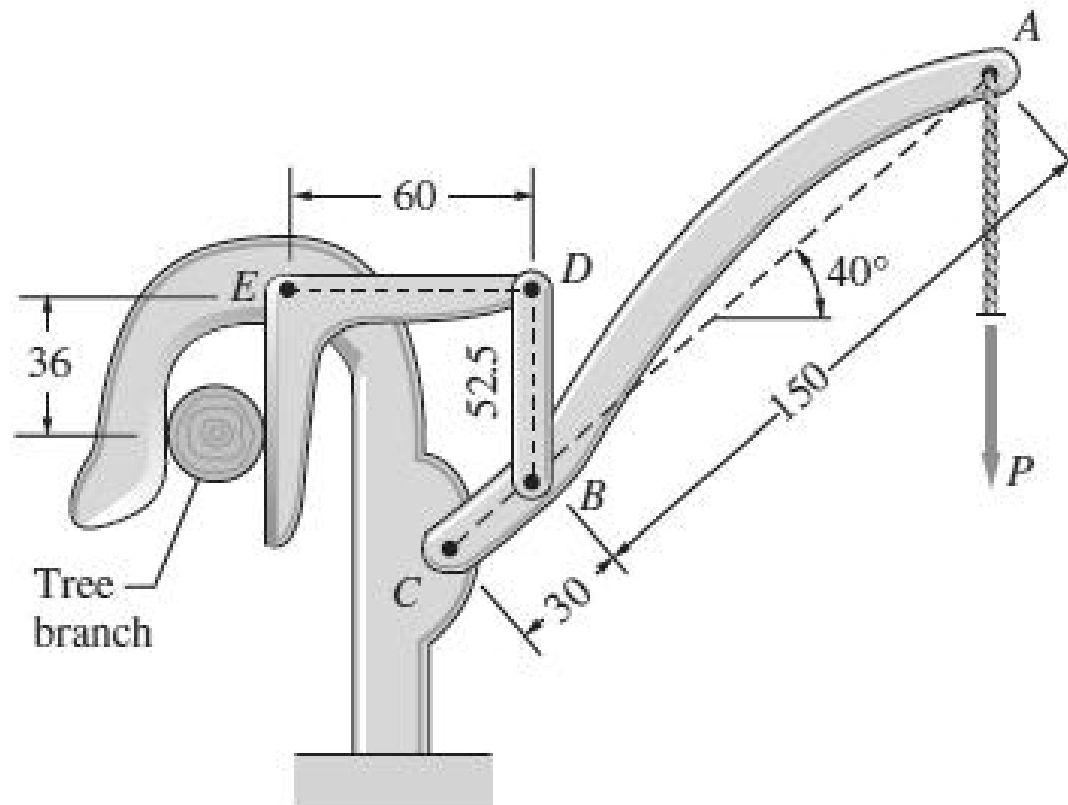
Problem statement

The tool shown is used to crimp terminals onto electrical wires. The wire and terminal are inserted into space D and are squeezed together by the motion of slider A. Construct the kinematic diagram to find the magnitude of the crimping force.



Problem statement

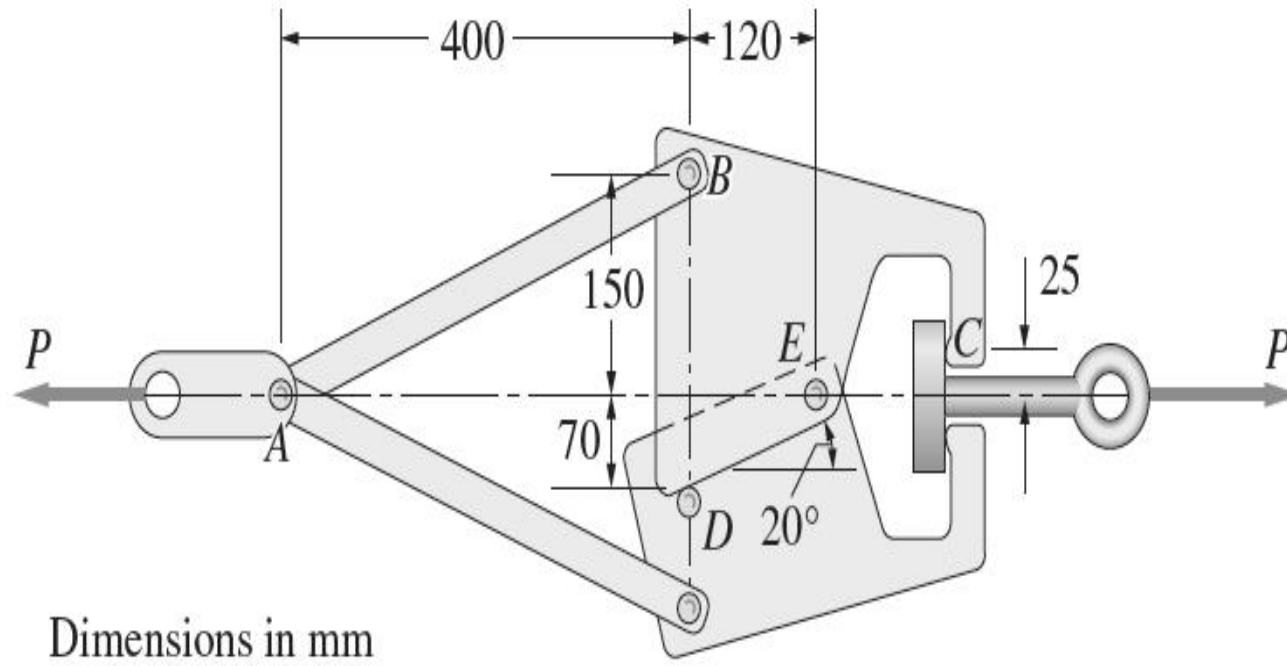
The figure represents the head of a pole-mounted tree pruner. Construct a kinematic diagram to calculate the force applied by the cutting blade ED on the tree branch when the vertical rope attached at A is pulled with the force P.



Dimensions in mm

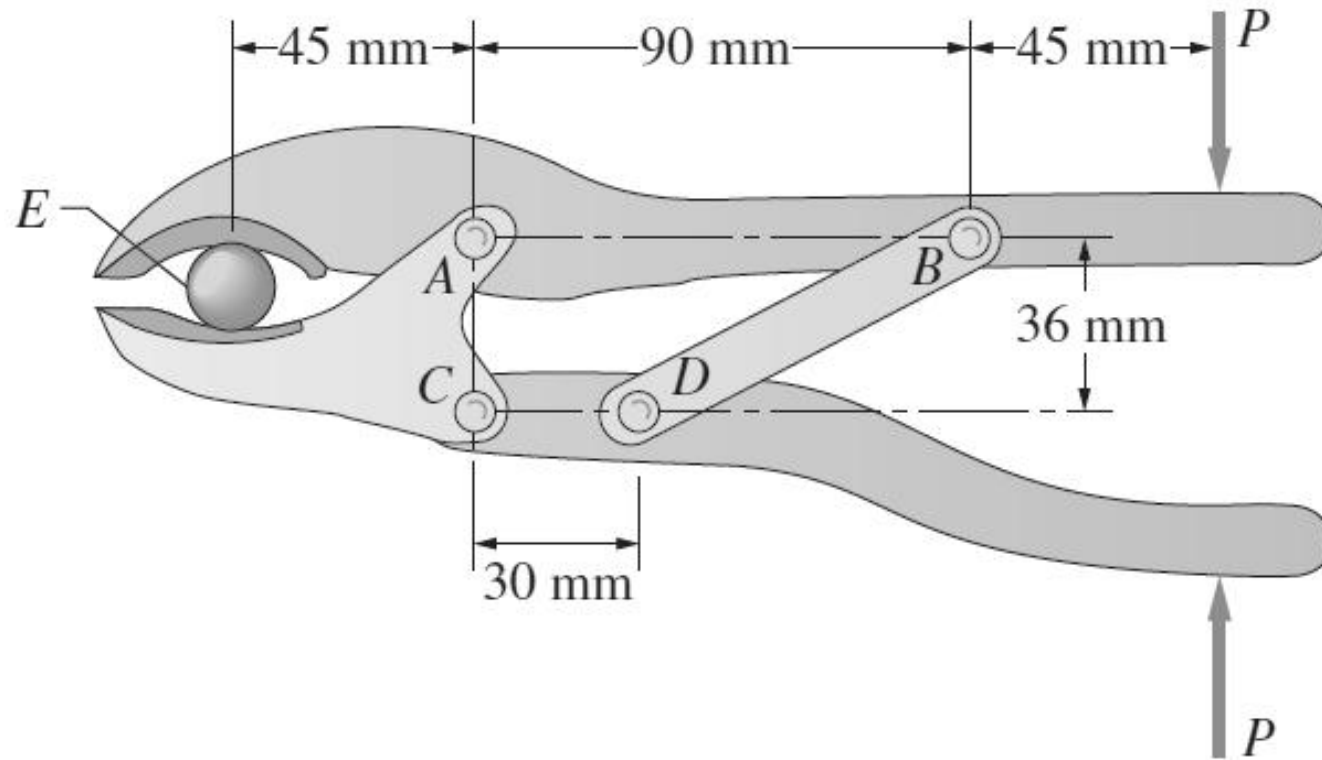
Problem statement

The device shown is an overload prevention mechanism. When the force acting on the smooth peg at D reaches 1 kN, the peg will be sheared, allowing the jaws at C to open and thereby releasing the eye-bolt. Construct a kinematic diagram to determine the maximum value of the tension P that can be applied without causing the eyebolt to be released. Neglect friction between the links.



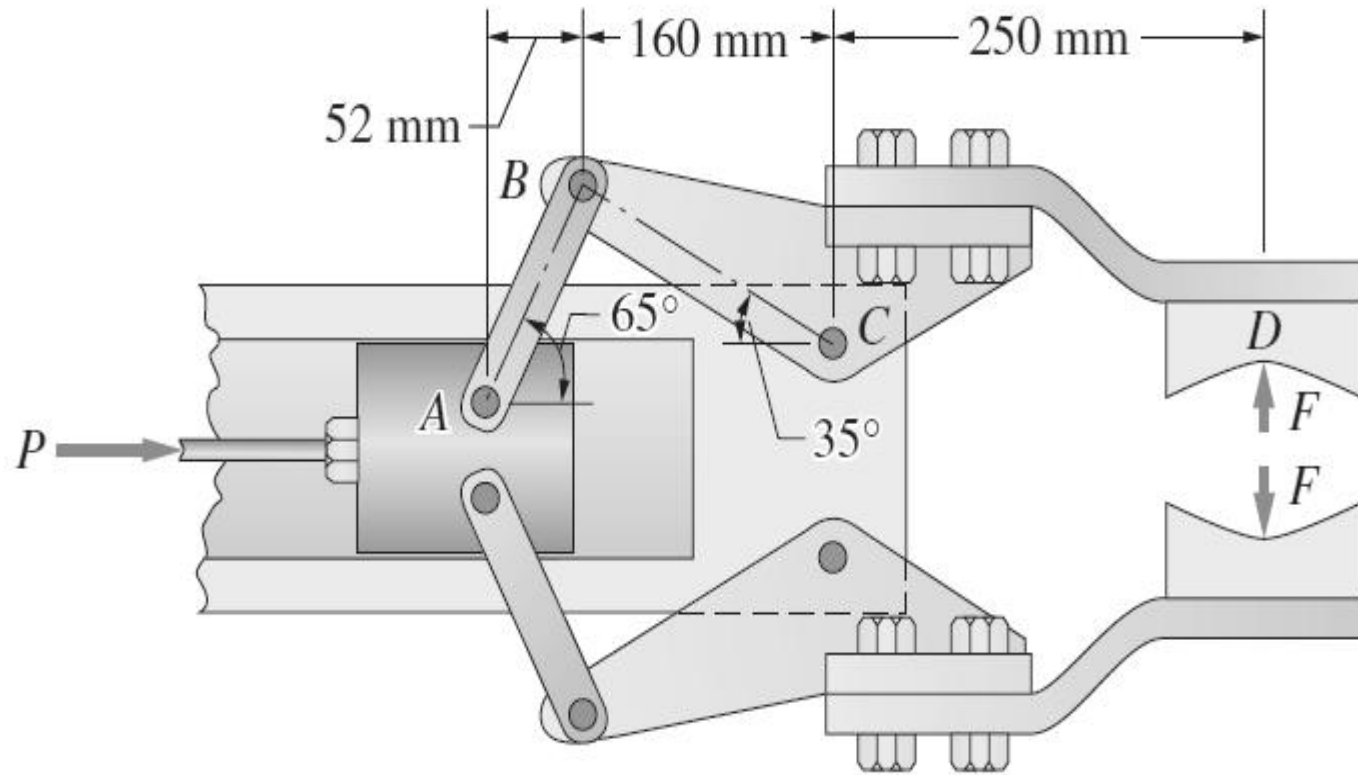
GROUP III

For the pliers shown, construct the kinematic diagram to determine the relationship between the magnitudes of the applied forces P and the gripping forces at E .



Problem statement

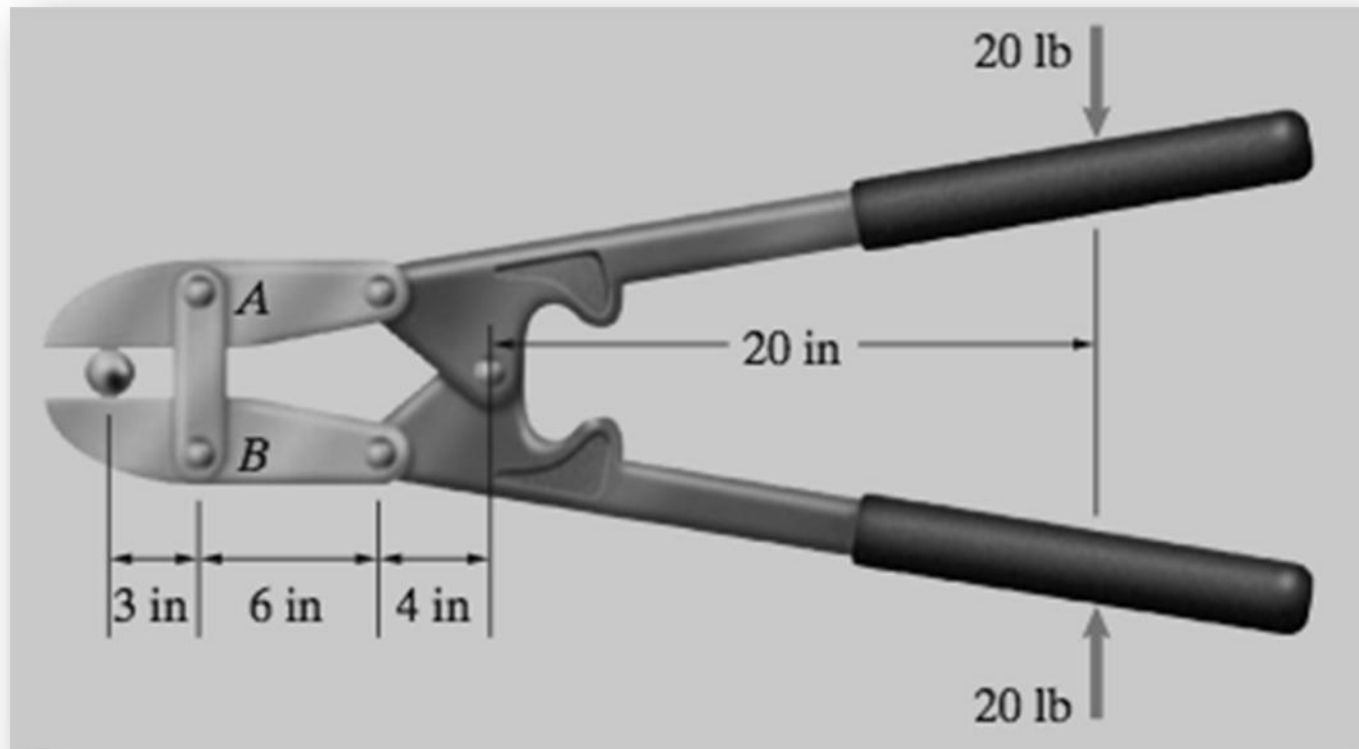
When activated by the force P , the gripper on a robotic arm is able to pick up objects by applying the gripping force F . Given that $P = 120\text{ N}$, construct the kinematic diagram to calculate the gripping force for the position shown.



GROUP V

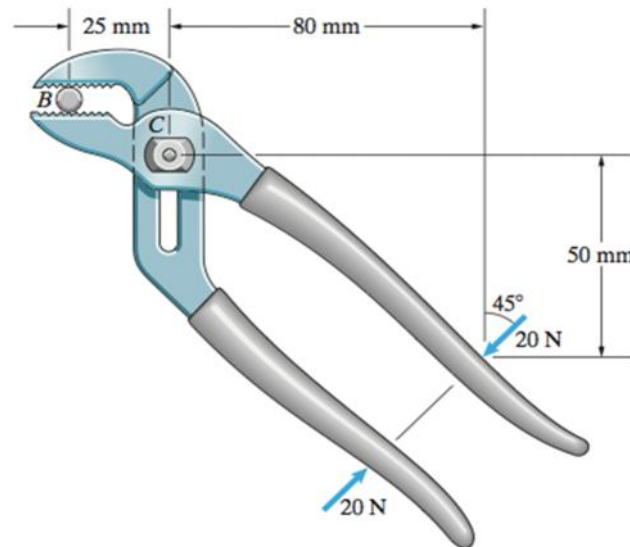
Problem statement

Construct a kinematic diagram to determine the force exerted on the ball by the bolt cutters and the magnitude of axial force in the member AB. Also calculate mobility of the mechanism.



Problem statement

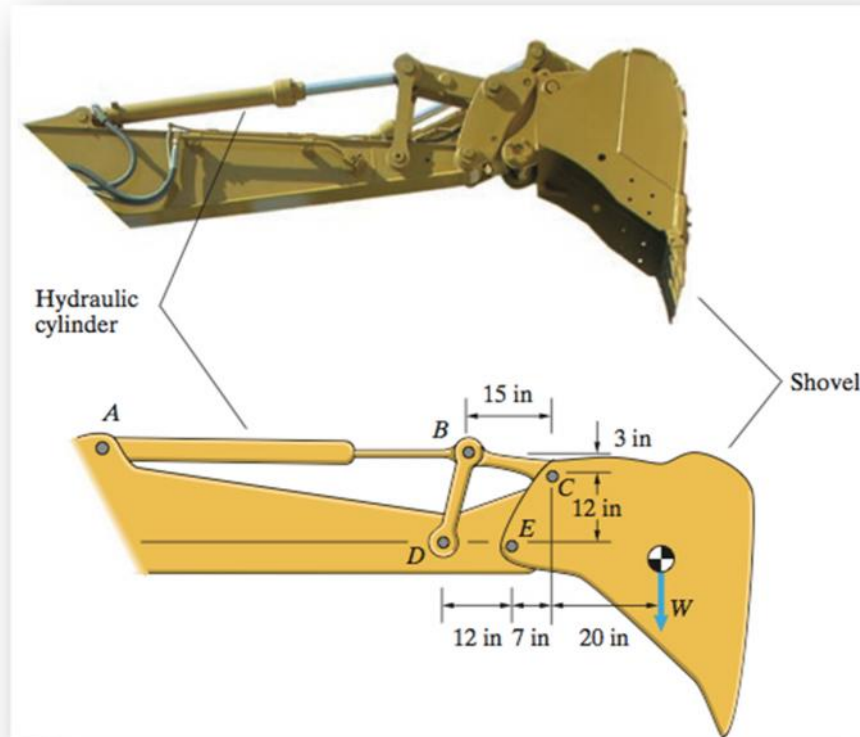
The woman exerts 20 N forces to the pliers as shown. Construct a kinematic diagram to (i) determine the magnitude of the forces the pliers exert on the bolt at B? (II) determine the magnitude of the force the members of the pliers exert on each other at the pinned connection C. Also calculate the mobility of the mechanism.



GROUP VII

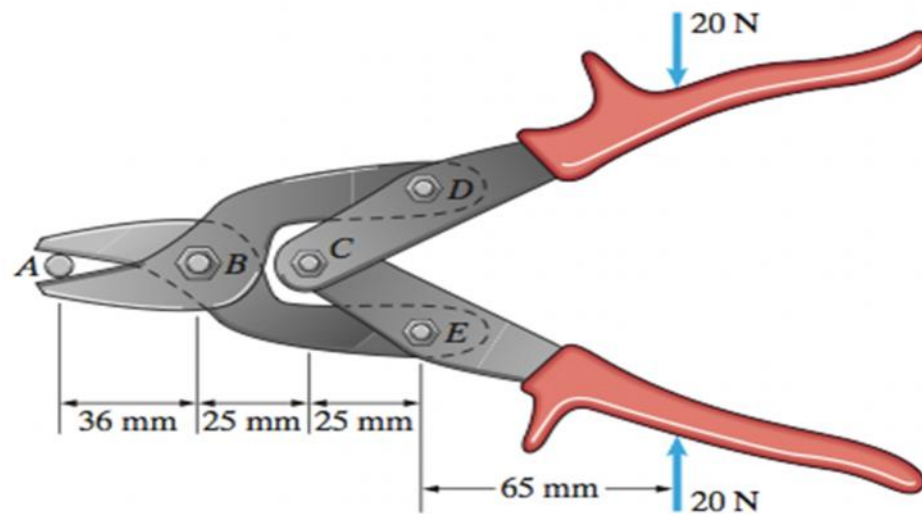
Problem statement

The shovel of the excavator is supported by a pin support at E and the two-force member BC. The 300-kb weight W of the shovel acts at the point shown. Determine the reaction on the shovel at E and the magnitude of the axial force in the two-force member BC.



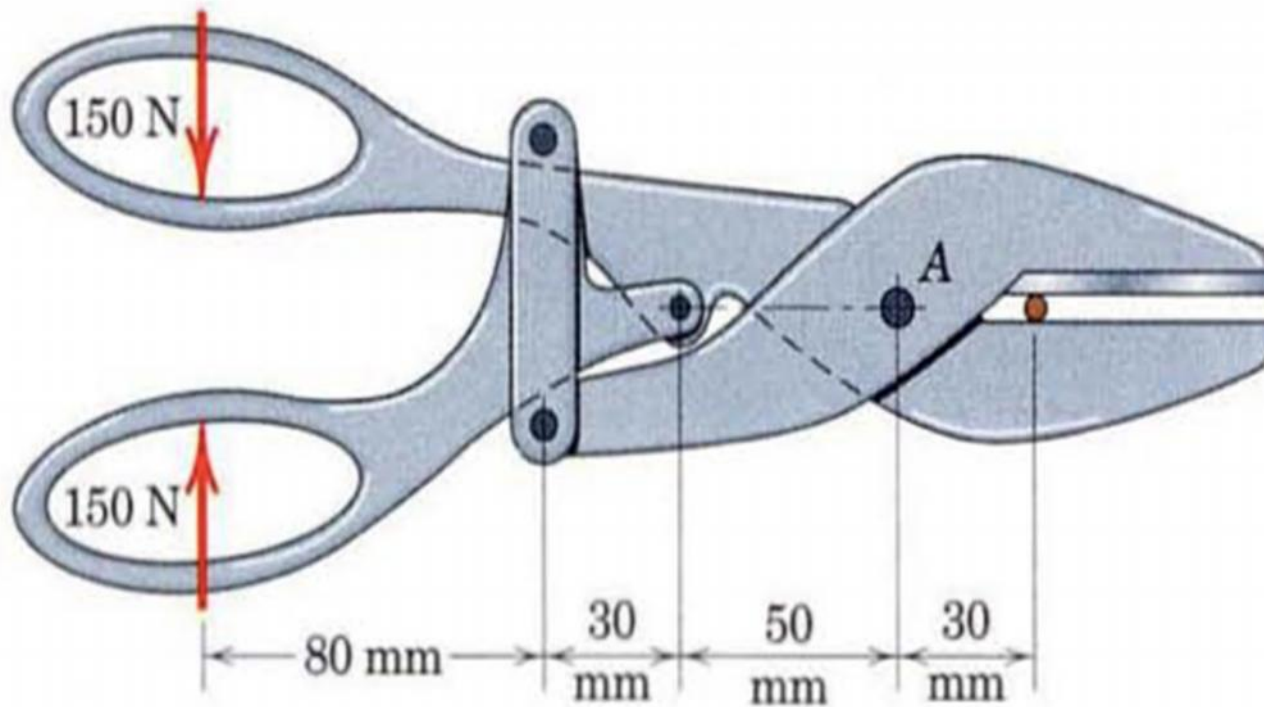
Problem statement

The woman exerts 20 N forces on the handles of the shears. Determine the magnitude of the forces exerted on the branch at A.



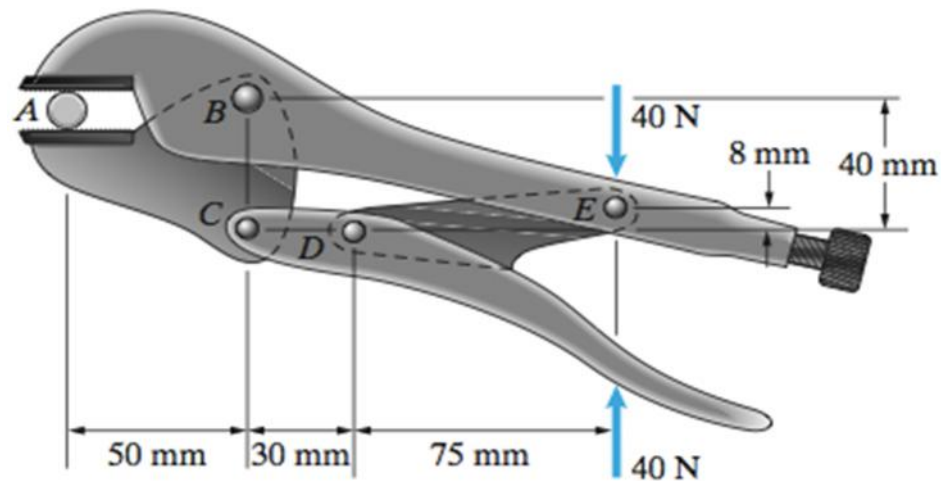
Problem statement

Compound-lever snips, shown in the figure, are designed to replace regular tinner's snips when large cutting forces are required. For the gripping force of 150 N. Construct a kinematic diagram to determine the cutting force P at a distance of 30 mm along the blade from the pin at A?



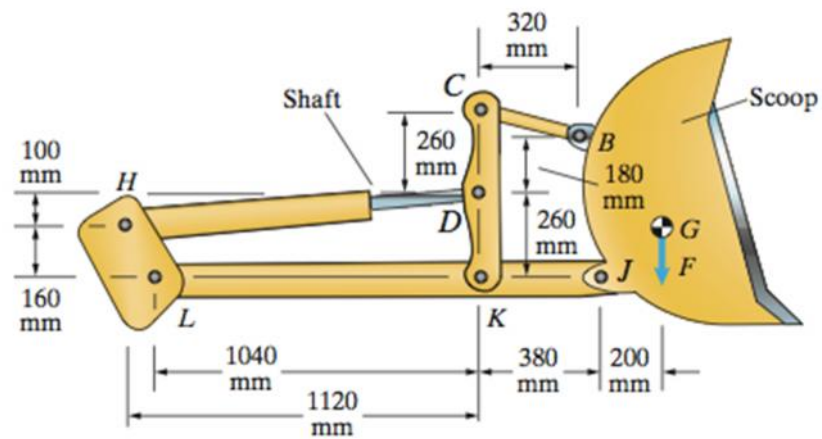
Problem statement

The person exerts 40- N forces on the handles of the locking wrench. Determine the magnitude of the forces the wrench exerts on the bolt at A



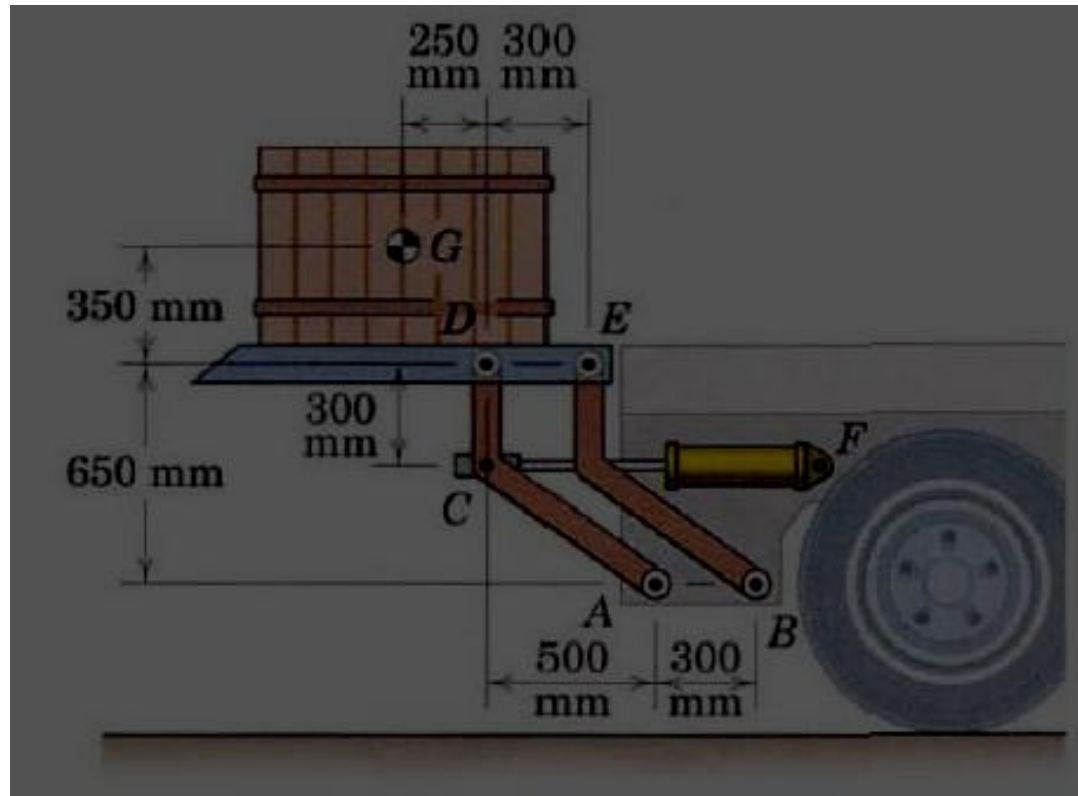
Problem statement

The mechanism shown in the diagram (one of the two identical mechanism that support the scoop of the excavator) supports a downward force $F = 1800 \text{ N}$ at G . Members BC and DH can be treated as two-force members. Determine the reactions on member CDK at K .



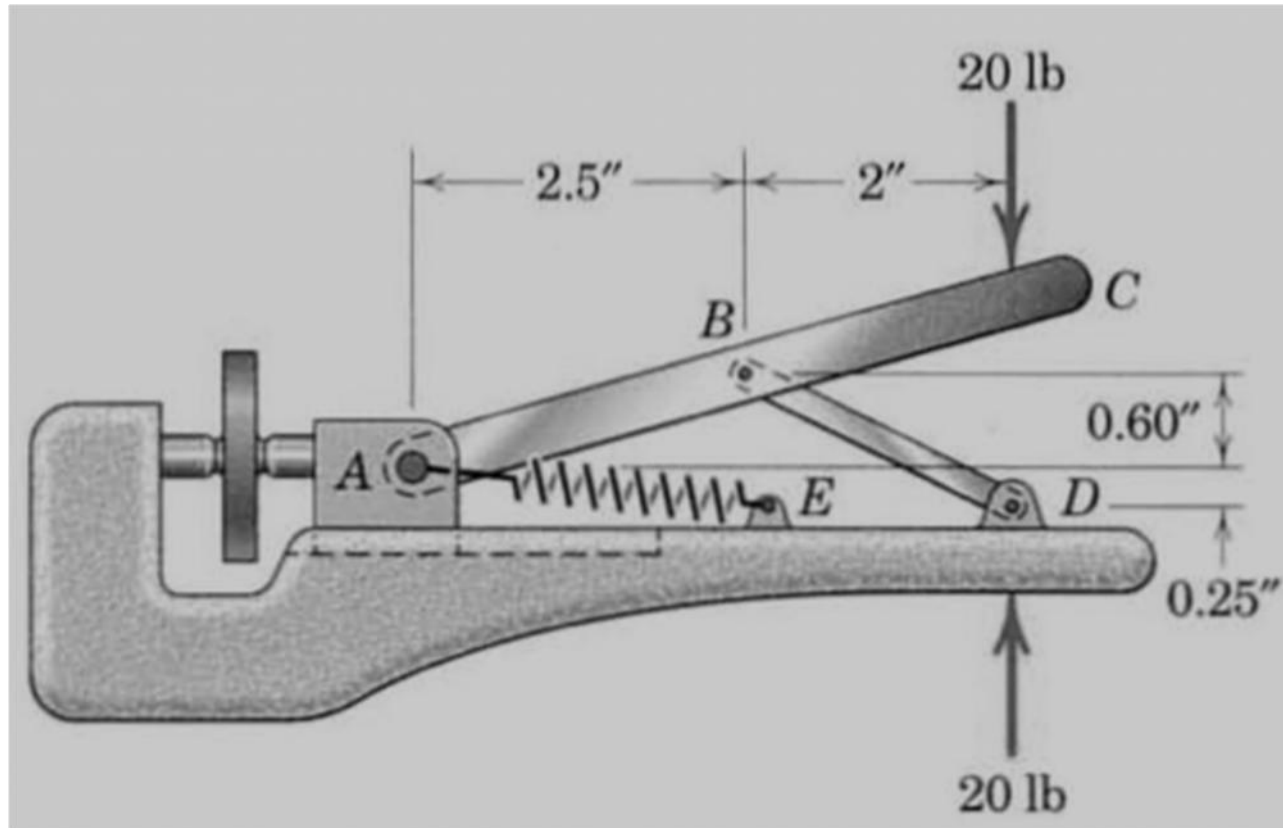
Problem statement

A power-operated loading platform designed for the back of a truck is shown in the figure. The position of the platform is controlled by the hydraulic cylinder, which applies force at C. The links are pivoted to the truck frame at A, B and F. Construct a kinematic diagram to determine the force P supplied by the cylinder in order to support the platform in the position shown. The mass of the platform and links may be neglected compared with that of the 250-kg crate with center of mass at G.



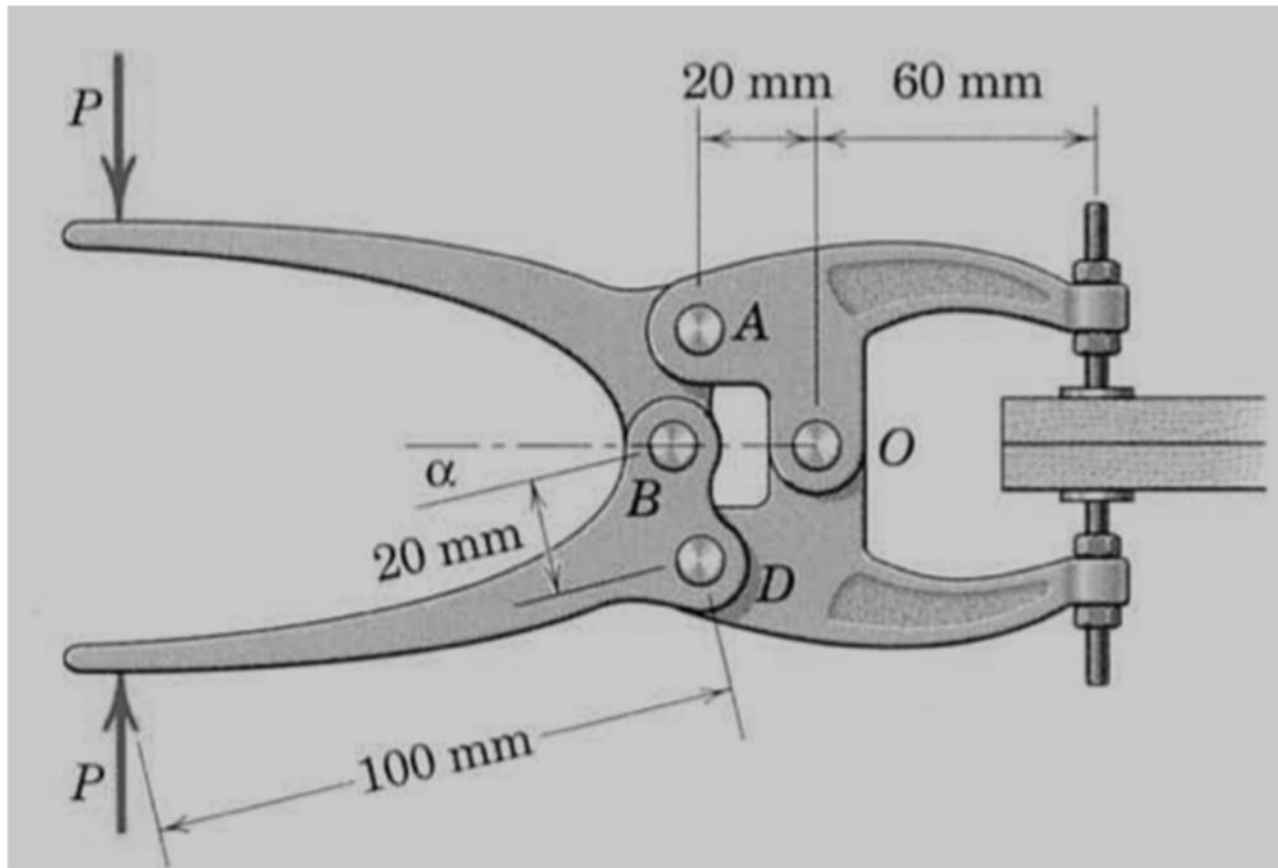
Problem statement

A pair of 20-lb forces is applied to the handles of the small eyelet squeezer. The block at A slides with negligible friction in a slot machined in the lower part of the tool. Neglect the small force of the light return spring AE and construct a kinematic diagram to determine the compressive force P applied to the eyelet.



Problem statement

The toggle pliers are used for a variety of clamping purposes. For the handle position given by $\alpha = 10^\circ$ and for a handle grip $P = 150 \text{ N}$, construct a kinematic diagram to calculate the clamping force C produced. Note that pins A and D are symmetric about the horizontal centreline of the tool.



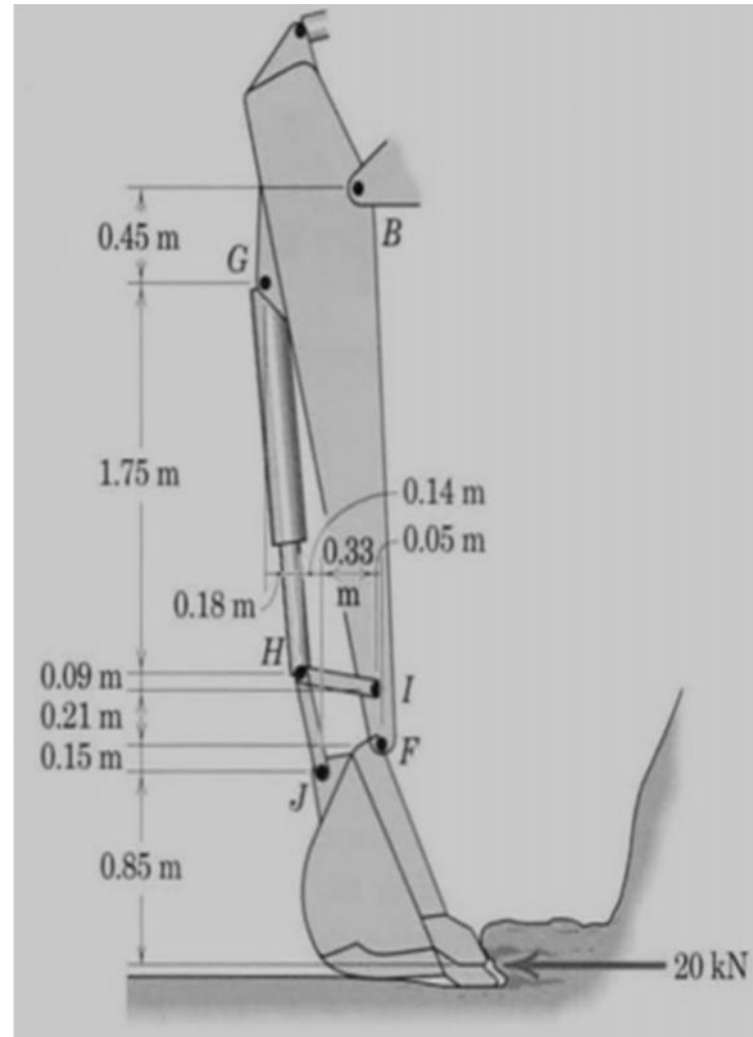
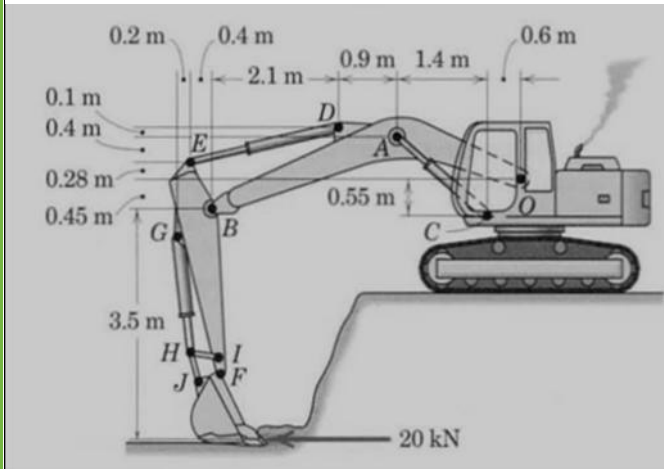
GROUP XVI

GROUP XVI



Problem statement

In a particular position shown, the excavator supplies a 20-kN force parallel to the ground. Determine the force in hydraulic cylinder GH of the excavator. Also determine the pressure p against the 95-mm-diameter piston of the single cylinder. Neglect the weight of the members compared with the 20 kN force.



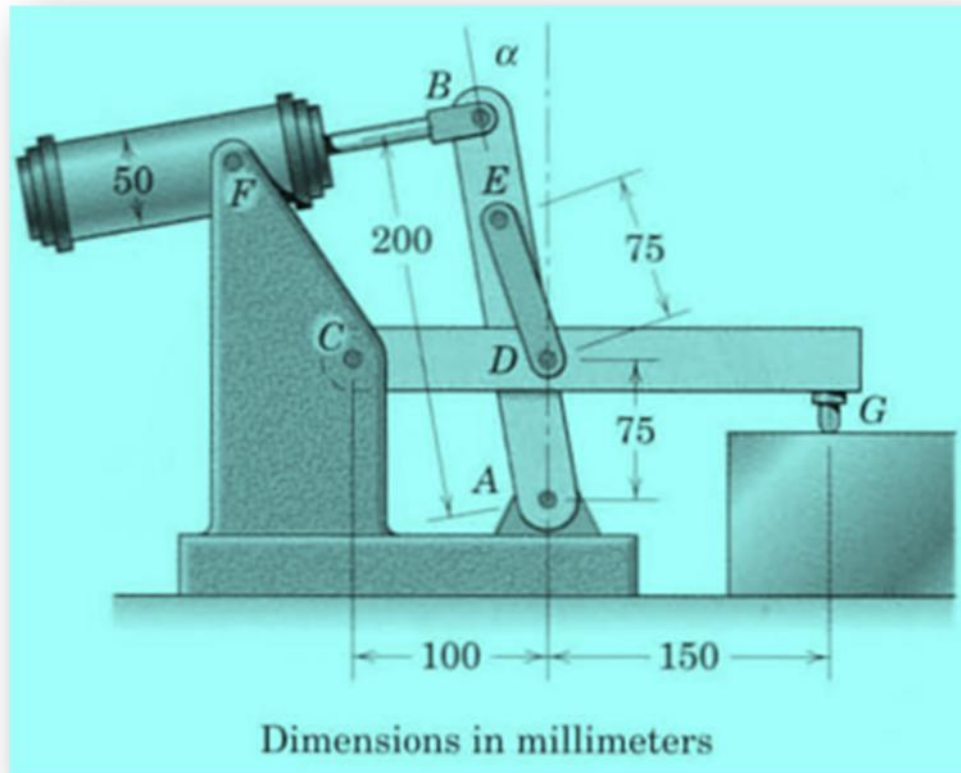
GROUP XVII

GROUP XVIII

The top diagram shows a side view of a truck with a dump body tilted at 24.5° . The body has a width of 48" and a height of 36". A hoisting mechanism is shown with points A, B, C, D, and E. A cable is attached to the body at point G. The bottom diagram is a detailed view of the hoisting mechanism. It shows a triangular linkage with vertices A, B, and C. A cable is attached to the body at point D. The body is tilted at 24.5° . The distance from the pivot point A to the cable attachment point D is 29.9". The distance from the pivot point A to the cable attachment point B is 8.91". The distance from the pivot point A to the cable attachment point C is 12". The distance from the pivot point A to the cable attachment point E is 48". The distance from the pivot point A to the cable attachment point D is 20". The angle between the cable and the body is 69.5° . The angle between the cable and the body is 12° . The angle between the cable and the body is 12° .

Problem statement

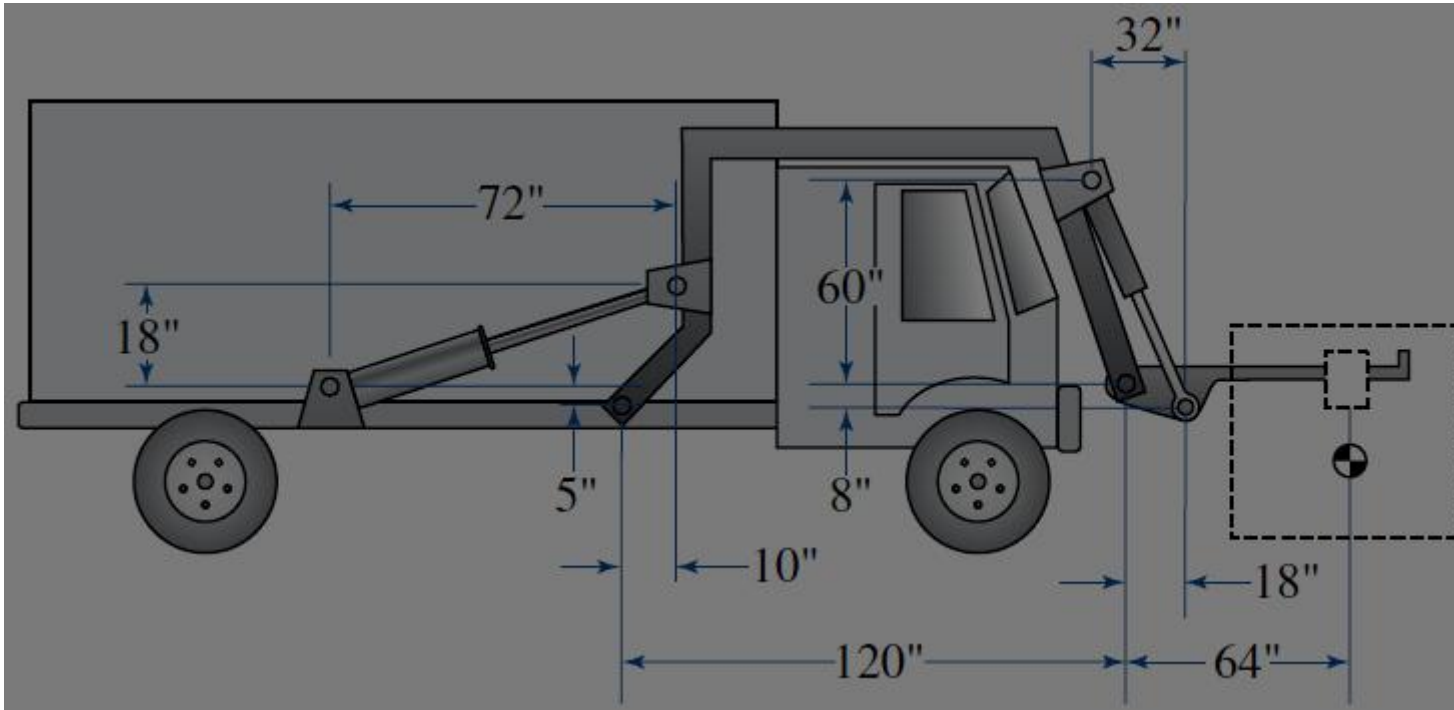
A pneumatic cylinder pivoted at F operates the lever AB of the quick-acting toggle clamp, which holds the work in position while it is machined. For an air pressure of 400 kPa above atmospheric pressure against the 50-mm-diameter piston, construct a kinematic diagram to determine the clamping force at G for the position $\alpha = 10^\circ$. For this position, the piston rod is perpendicularly to AB.



Problem statement

Figure illustrates a refuse truck capable of moving dumpster from a lowered position, as shown, to a raised and rotated position. Gravity removes the contents into the truck box. The dumpster weighs 2400 lb and is shared equally by the two front forks. Construct a kinematic diagram to determine the force in the two hydraulic cylinders.

GROUP XX



NIT Karnataka Surathkal
Department of Mechanical Engineering
ME 203 MECHANICS OF MACHINES
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ME 203 MECHANICS OF MACHINES
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	16601316ME246	NIRAJ IYER
12	16615216ME247	NISHANT KUMAR
	16619216ME248	OMKAR MAHADEV VARADAI
	16627016ME250	SONAL SANJAY PARAB
	16635216ME251	ANAND NANDKISHOR PATHAK
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	16610516ME259	R TANUJ
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15	16620016ME262	RAMAVATH TEEKYA
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	16636916ME264	ROHIT KUMAR
	16657116ME265	SACHIN K M
16	16616016ME266	JESH RAKESH SANGHVI
	16622716ME267	SANKET KULKARNI
	16604816ME268	SATHYANANDA P
	16612216ME269	SHASHANK R
17	16603216ME270	SHREYAS S
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	16708016ME273	SREEHARI
18	16700216ME274	SRIJIT SEN
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