

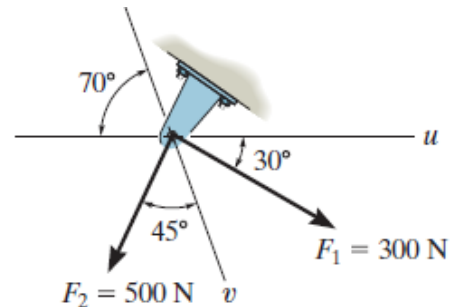
**QUESTION BANK – ENGINEERING STATICS (2023-2024)**

**NOTE: All the solved examples and assignments in the lecture notes must be considered (question bank is not enough).**

**Lecture 1 & 2:**

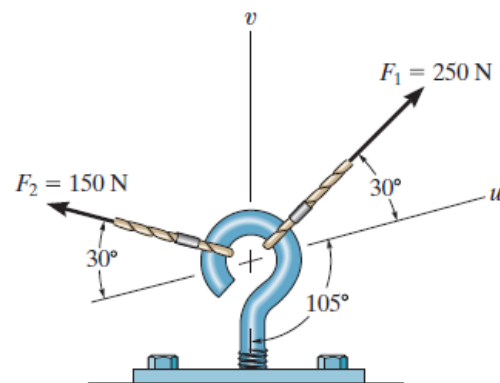
1. Resolve the force  $F_1$  into components acting along the  $u$  and  $v$  axes and determine the magnitudes of the components.

[https://www.youtube.com/watch?v=8cyYqzlvSmg&list=RDCMUCkOINaMzWzxUGrGDE4A4gQw&start\\_radio=1&rv=8cyYqzlvSmg&t=2829&t=2835](https://www.youtube.com/watch?v=8cyYqzlvSmg&list=RDCMUCkOINaMzWzxUGrGDE4A4gQw&start_radio=1&rv=8cyYqzlvSmg&t=2829&t=2835)



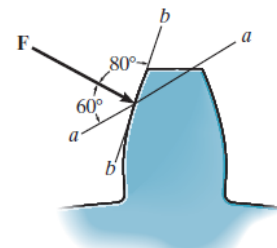
2. Resolve  $F_2$  into components along the  $u$  and  $v$  axes and determine the magnitudes of these components.

<https://www.youtube.com/watch?v=FhG8y7d7fsg>



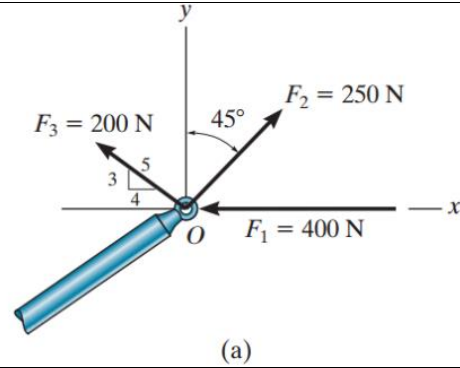
3. The component of force  $F$  acting along line  $aa$  is required to be 30 lb. Determine the magnitude of  $F$  and its component along line  $bb$ .

[https://www.youtube.com/watch?v=pE9\\_S9AYsmI](https://www.youtube.com/watch?v=pE9_S9AYsmI)



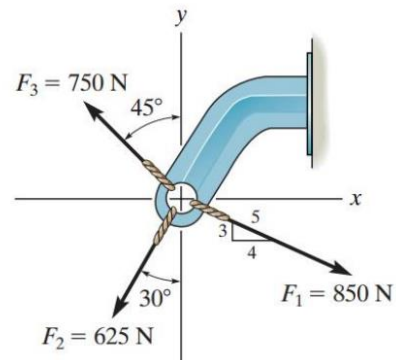
4. The end of the boom O in Figure (a) below is subjected to three concurrent and coplanar forces. Determine the magnitude and direction of the resultant force.

<https://www.youtube.com/watch?v=2q132fdzw0g>



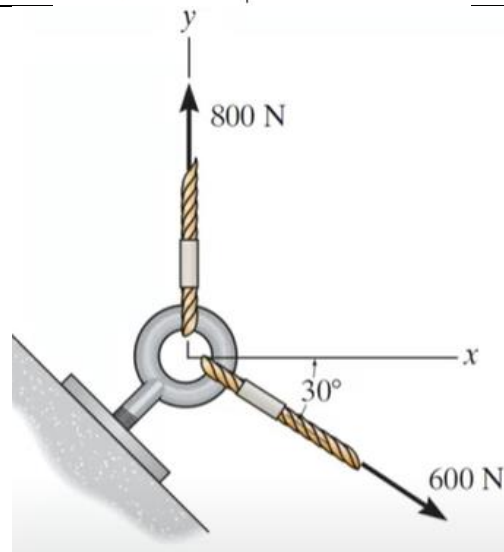
5. Determine the magnitude of the resultant force and its direction measured counterclockwise from the positive x axis.

<https://www.youtube.com/watch?v=fgGleJlekQ>



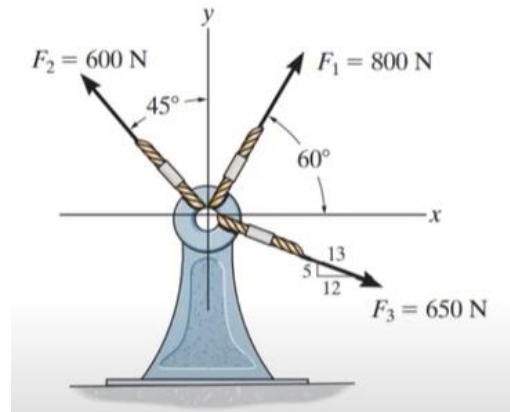
6. Determine the magnitude of the resultant force and its direction measured counterclockwise from the positive x axis.

<https://www.youtube.com/watch?v=hjMOSa7CoaQ>

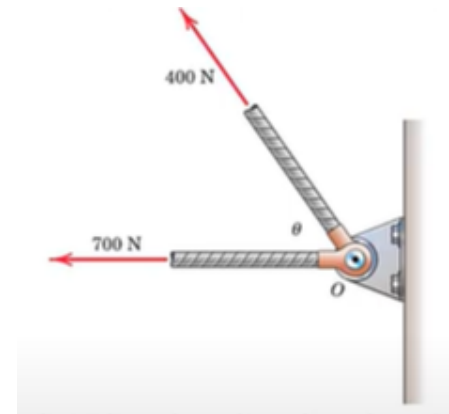


7. Determine the magnitude of the resultant force of the three forces and direction measured counterclockwise from the  $x$  axis

<https://www.youtube.com/watch?v=uLyTE8U1iMI>

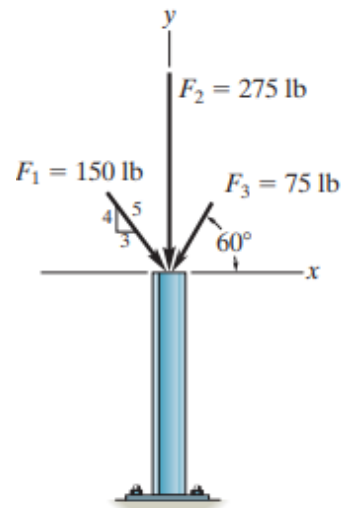


8. At what angle must the 400-N force be applied in order that the resultant  $R$  of the two forces have a magnitude of 1000 N? For this condition what will be the angle between  $R$  and the horizontal?



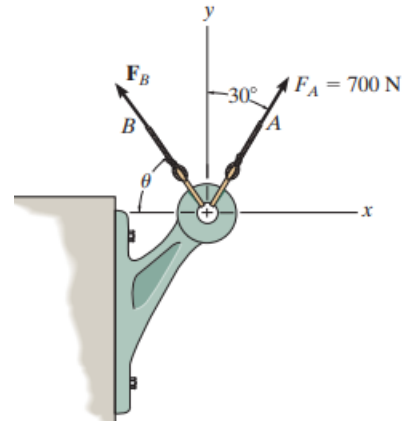
<https://www.youtube.com/watch?v=MYIFs7qswLw>

9. Express each of the three forces acting on the column in Cartesian vector form and compute the magnitude of the resultant force.



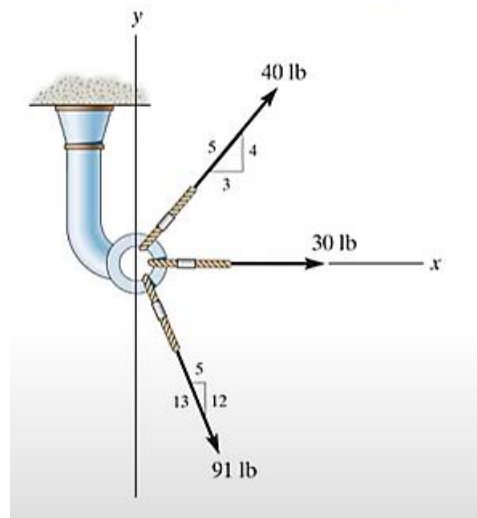
- 10.** Determine the magnitude and orientation, measured counterclockwise from the positive  $y$  axis, of the resultant force acting on the bracket, if  $F_B = 600$  N and  $\theta = 20^\circ$ .

[https://www.youtube.com/watch?v=Mvm\\_7V-K\\_EE](https://www.youtube.com/watch?v=Mvm_7V-K_EE)



- 11.** Determine the magnitude of the resultant force of the three forces and direction measured counterclockwise from the  $x$  axis.

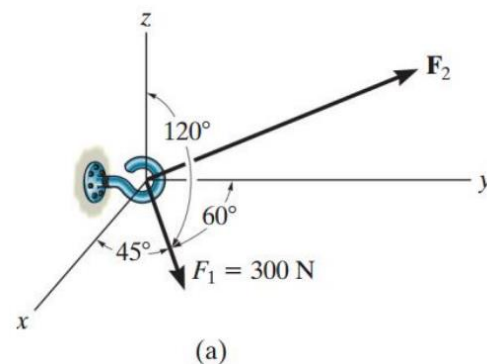
[https://www.youtube.com/watch?v=UKtySuHn06A&list=PLPLlcVV9fXj\\_jUWnOcr8TSsq-Hi1VL9Ry&index=33](https://www.youtube.com/watch?v=UKtySuHn06A&list=PLPLlcVV9fXj_jUWnOcr8TSsq-Hi1VL9Ry&index=33)



## Lecture 3 & 4:

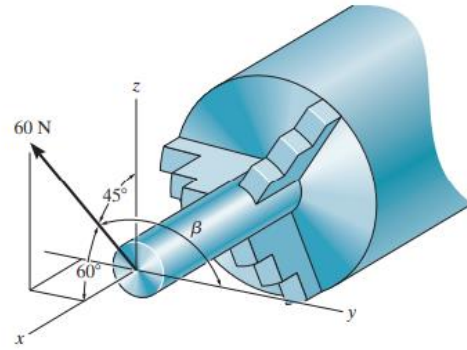
- 12.** Two forces act on the hook shown in Fig. below. Specify the magnitude of  $F_2$  and its coordinate direction angles so that the resultant force  $F_R$  acts along the positive  $y$ -axis and has a magnitude of 800 N.

<https://www.youtube.com/watch?v=oENumDfKx3k&t=65s>



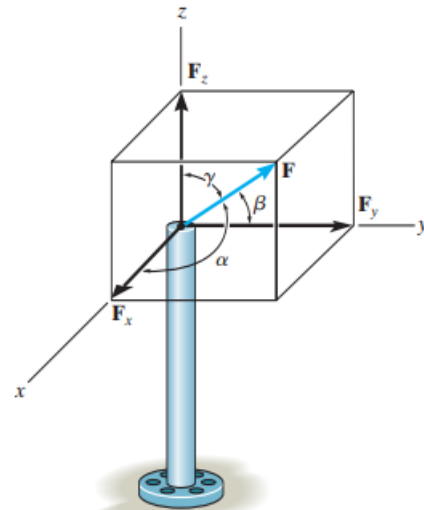
- 13.** The stock mounted on the lathe is subjected to a force of 60 N. Determine the coordinate direction angle and express the force as a Cartesian vector.

<https://www.youtube.com/watch?v=d0MytieRNS0>



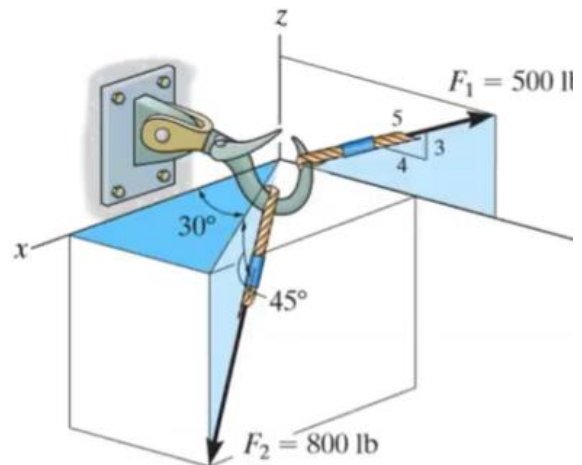
- 14.** The pole is subjected to the force  $F$ , which has components acting along the  $x$ ,  $y$ ,  $z$  axes as shown. If the magnitude of  $F$  is 3 kN,  $\beta = 30^\circ$ ,  $\gamma = 75^\circ$  determine the magnitudes of its three components.

<https://www.youtube.com/watch?v=UJUy30IPGv0>



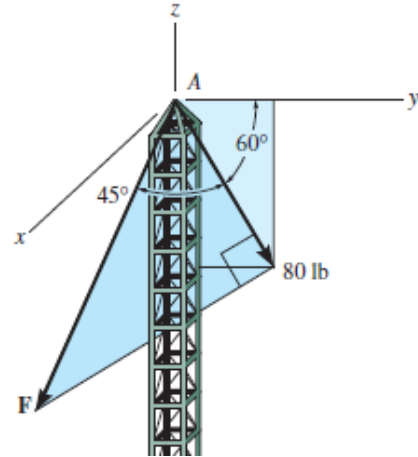
- 15.** Determine the magnitude of the resultant force acting on a hook.

<https://www.youtube.com/watch?v=Gyp2BI-Xqnk>



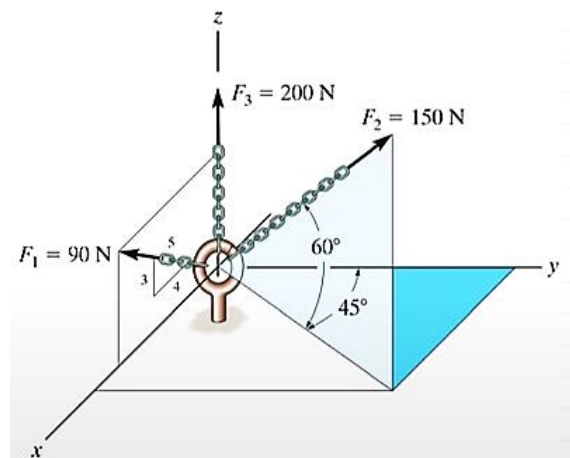
- 16.** A force  $F$  is applied at the top of the tower at  $A$ . If it acts in the direction shown such that one of its components lying in the shaded  $y$ - $z$  plane has a magnitude of 80 lb, determine its magnitude  $F$  and coordinate direction angles  $\alpha, \beta, \gamma$ .

<https://www.youtube.com/watch?v=OiQsmVZu2BQ>



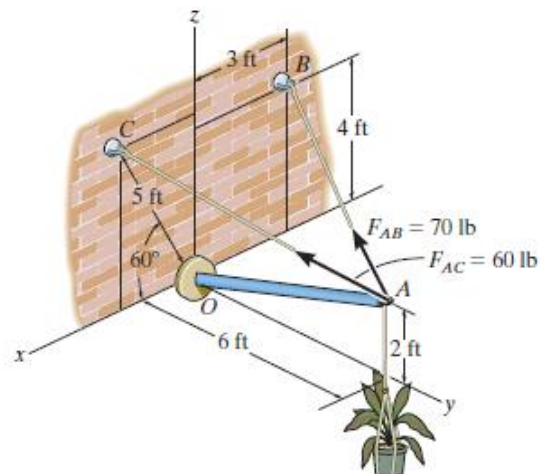
- 17.** Determine the coordinate direction angles of  $F_1$  and  $F_R$ .

[https://www.youtube.com/watch?v=esOjYf8dX-w&list=PLPLlcVV9fXj\\_jUWnOcR8TSsq-Hi1VL9Ry&index=54](https://www.youtube.com/watch?v=esOjYf8dX-w&list=PLPLlcVV9fXj_jUWnOcR8TSsq-Hi1VL9Ry&index=54)



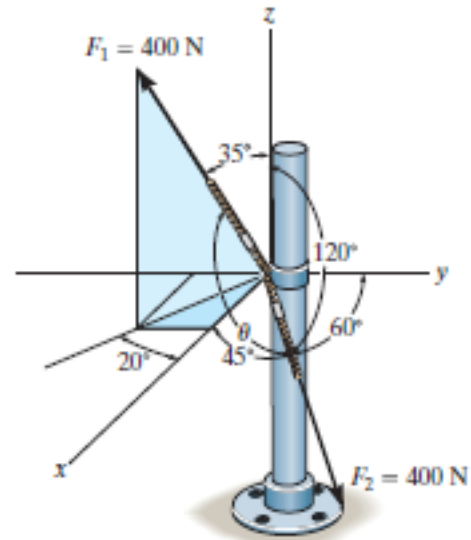
- 18.** Determine the projected component of force  $F_{AC}$  along the axis of strut  $AO$ . Express the result as a Cartesian vector.

<https://www.youtube.com/watch?v=NtJDPUFkcPo>



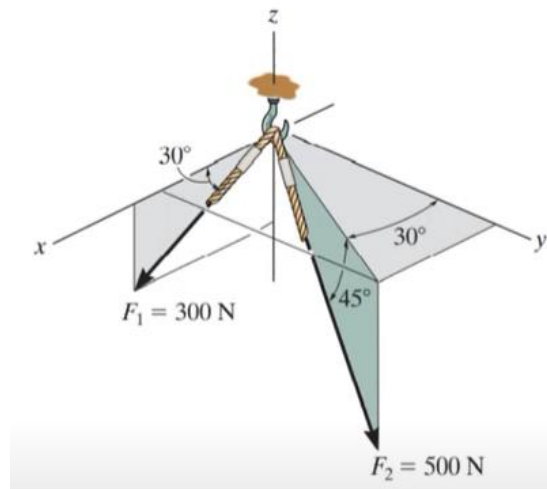
- 19.** The cables each exert a force of 400 N on the post. Determine the magnitude of the projected component of  $F_1$  along the line of action of  $F_2$ .

[https://www.youtube.com/watch?v=DGU\\_JUKCF2o](https://www.youtube.com/watch?v=DGU_JUKCF2o)



- 20.** Express each force as a cartesian vector.

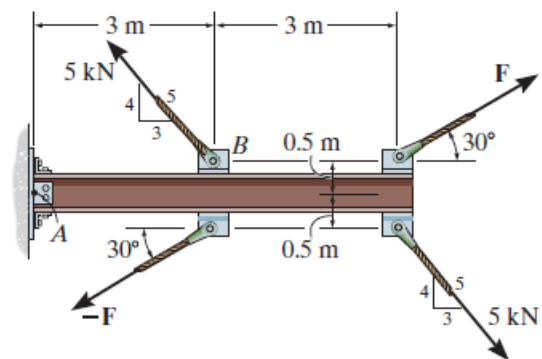
<https://www.youtube.com/watch?v=PiOV8QJXW4I>



## Lecture 5 & 6:

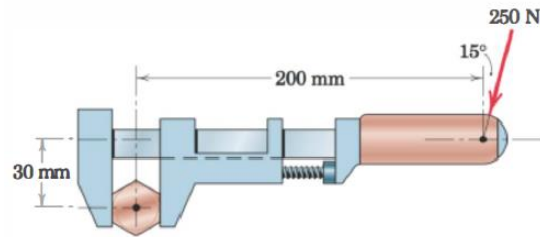
- 21.** Determine the required magnitude of force  $F$ , if the resultant couple moment on the beam is to be zero.

[https://www.youtube.com/watch?v=nsTzXW4\\_KW8](https://www.youtube.com/watch?v=nsTzXW4_KW8)



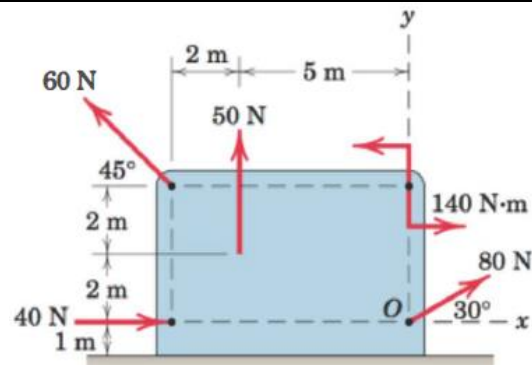
- 22.** Calculate the moment of the 250-N force on the handle of the monkey wrench about the center of the bolt.

<https://www.youtube.com/watch?v=lnOtSzKGnDY>



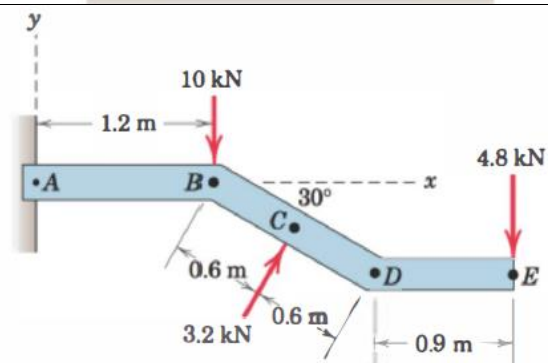
- 23.** Determine the resultant of the four forces and one couple which act on the plate shown.

<https://www.youtube.com/watch?v=Uv8FXIAGzkQ>



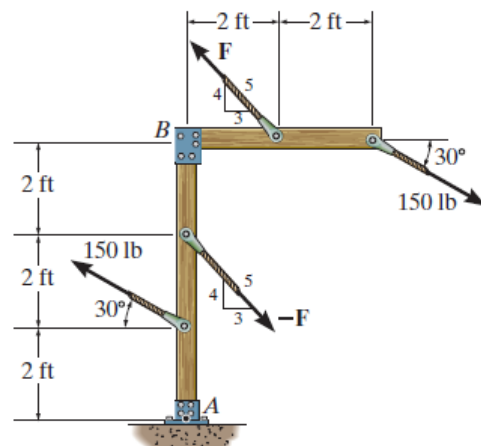
- 24.** Replace the three forces which act on the bent bar by a force-couple system at the support point A. Then determine the x-intercept of the line of action of the stand-alone resultant force R.

<https://www.youtube.com/watch?v=BUIuVE180F4>



- 25.** Determine the required magnitude of force F, if the resultant couple moment on the beam is equal to 200 lb.ft clockwise.

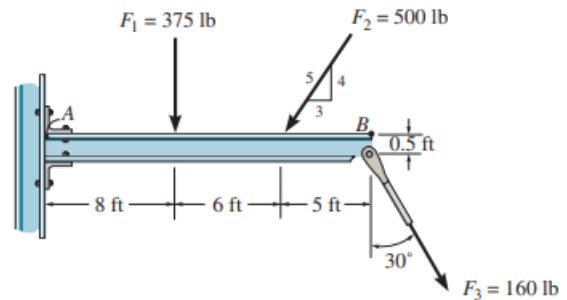
<https://www.youtube.com/watch?v=NRB9eNFWG9s&t=54s>





- 26.** Determine the moment about point A of each of the three forces acting on the beam.

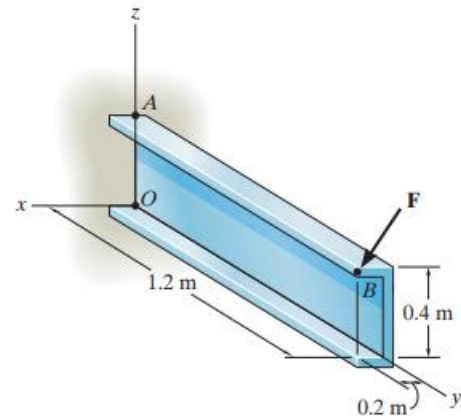
<https://www.youtube.com/watch?v=nY0j-cyQJXQ>



- 27.** The force  $F = (600i + 300j - 600k)$  acts at the end of the beam. Determine the moment of the force about point A.

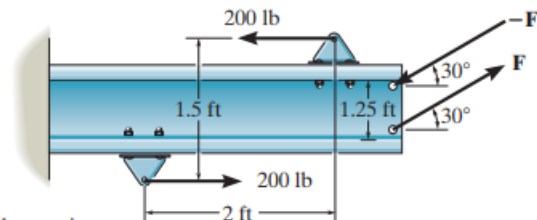
<https://www.youtube.com/watch?v=a27edfMJN38>

note: The same idea just in US unit system



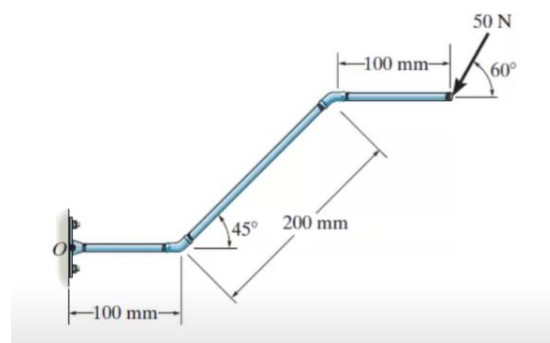
- 28.** Two couples act on the beam. If resultant couple moment = 450 lb.ft , determine the magnitude of F.

<https://www.youtube.com/watch?v=O-6qljLYYIE>



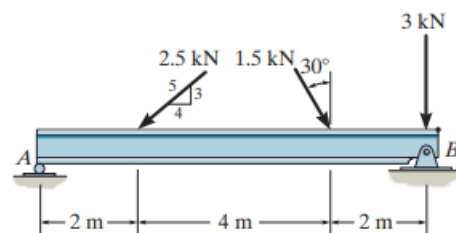
- 29.** Determine the moment about point O.

<https://www.youtube.com/watch?v=SL3pe2yUOsQ>



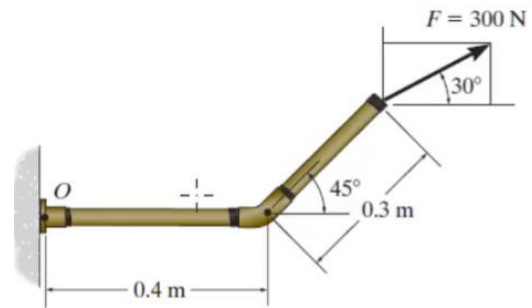
- 30.** Replace the force system acting on the beam by an equivalent force and couple moment at point B.

<https://www.youtube.com/watch?v=z0psGhLtN6Q>



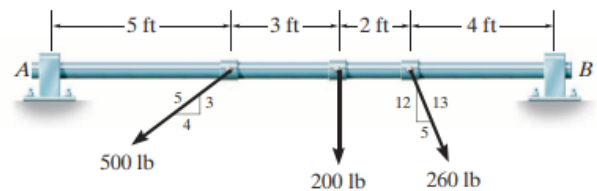
**31.** Determine the moment about point O.

<https://www.youtube.com/watch?v=FW3MLMYOROM>



**32.** Replace the three forces acting on the shaft by a single resultant force. Specify where the force acts, measured from end B.

<https://www.youtube.com/watch?v=1MSOBdDAPrs>

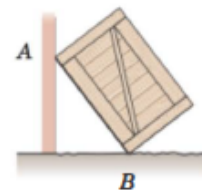


## Lecture 7:

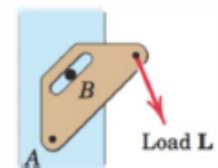
**33.** Draw the FBD for these following bodies:

	Body
1. Bell crank supporting mass $m$ with pin support at A.	
2. Control lever applying torque to shaft at O.	
3. Boom OA, of negligible mass compared with mass $m$ . Boom hinged at O and supported by hoisting cable at B.	

4. Uniform crate of mass  $m$  leaning against smooth vertical wall and supported on a rough horizontal surface.

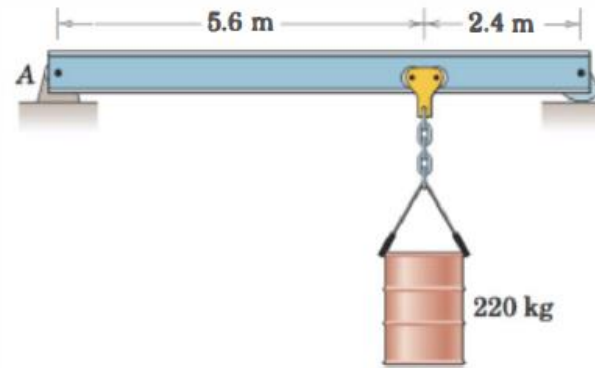


5. Loaded bracket supported by pin connection at A and fixed pin in smooth slot at B.



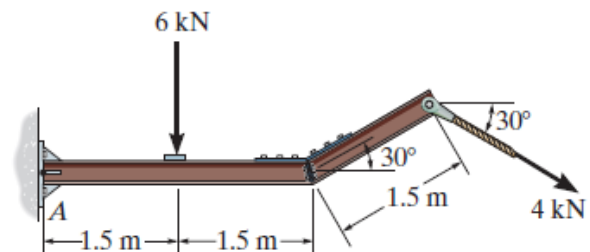
- 34.** The 450-kg uniform 1-beam supports the load shown. Determine the reactions at the supports.

<https://www.youtube.com/watch?v=VFjPkDQBQ4E>



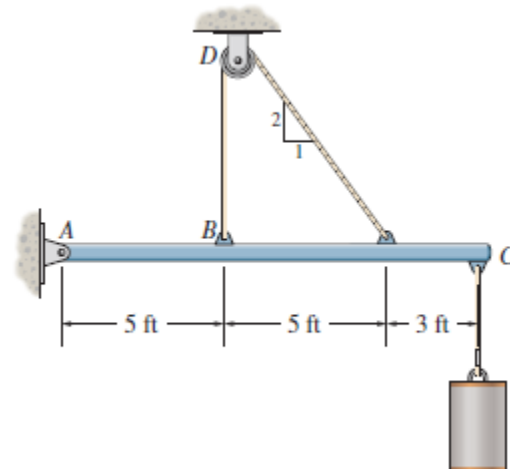
- 35.** Determine the components of the support reactions at the fixed support A on the cantilevered beam.

[https://www.youtube.com/watch?v=sD9\\_NryfKts](https://www.youtube.com/watch?v=sD9_NryfKts)



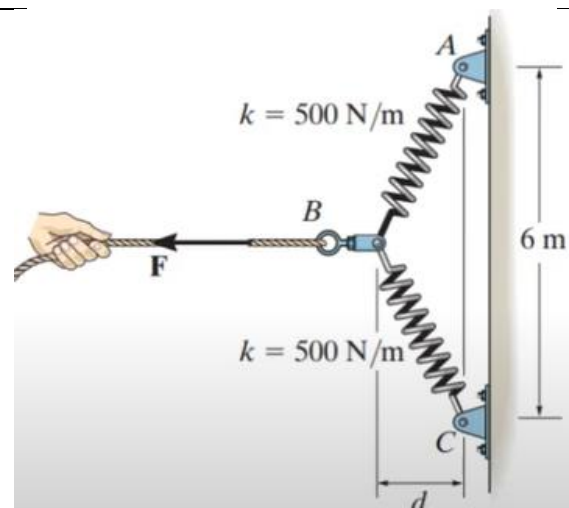
- 36.** Determine the tension in the cable and the horizontal and vertical components of reaction of the pin A. The pulley at D is frictionless and the cylinder weighs 80 lb.

<https://www.youtube.com/watch?v=jEDR4QlbCWI>



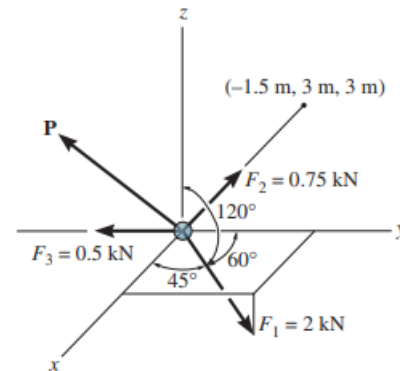
- 37.** The springs BA and BC each have a stiffness of 500 N/m and an unstretched length of 3 m. Determine the horizontal force F applied to the cord which is attached to the small ring B so that the displacement of the ring from the wall is  $d = 1.5$  m.

<https://www.youtube.com/watch?v=WBU1eDw7iC4>

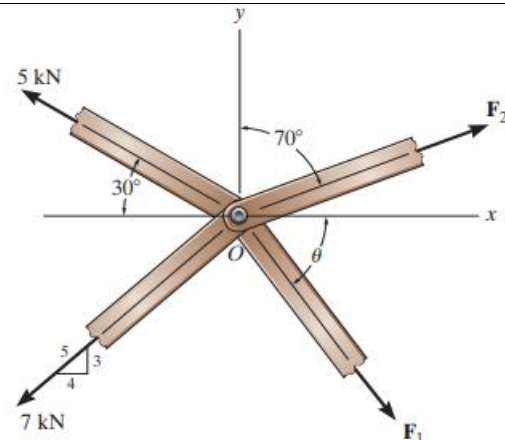


- 38.** Determine the magnitude and direction of the force  $P$  required to keep the concurrent force system in equilibrium.

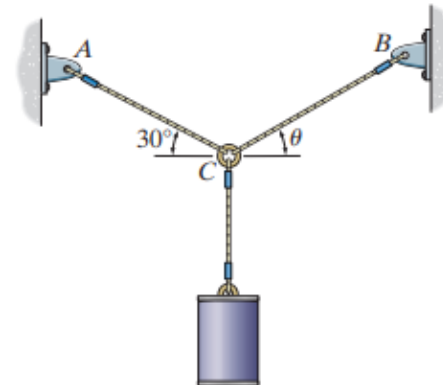
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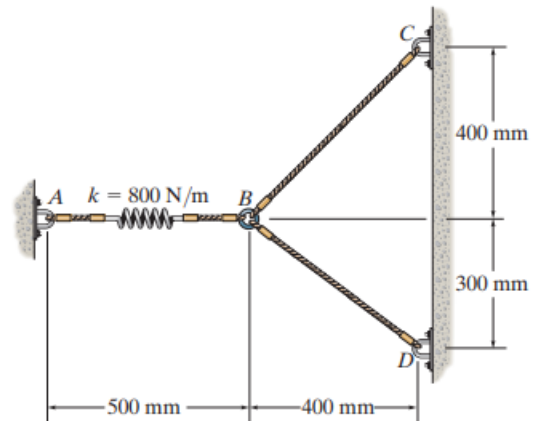
- 39.** The members of a truss are pin connected at joint  $O$ . Determine the magnitudes of and for equilibrium. Set  $\theta = 60^\circ$ .



- 40.** Determine the tension developed in wires  $CA$  and  $CB$  required for equilibrium of the 10-kg cylinder. Take  $\theta = 40^\circ$ .



- 41.** The spring has a stiffness of  $k = 800 \text{ N/m}$  and an unstretched length of  $200 \text{ mm}$ . Determine the force in cables  $BC$  and  $BD$  when the spring is held in the position shown.



## Lecture 8:

- 42.** Determine the force in members  $BC$ ,  $CF$ , and  $FE$ . State if the members are in tension or compression.

<https://www.youtube.com/watch?v=6xfM Mx8vYrE>

