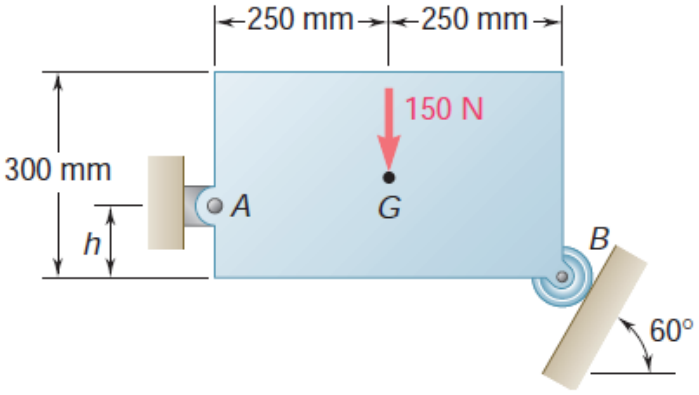
Assignment 1
ME 141

1. Determine the reactions at *A* and *B* when (a) h = 0, (b) h = 200 mm.



Ans.: (a)

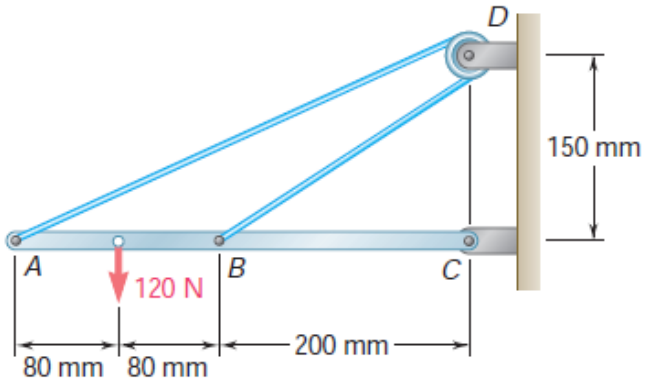
$\mathbf{B} = 150.0\ \text{N} \angle 30.0°$

$\mathbf{A}_x = 129.9\ \text{N} \rightarrow$

$\mathbf{A}_y = 75\ \text{N} \uparrow$

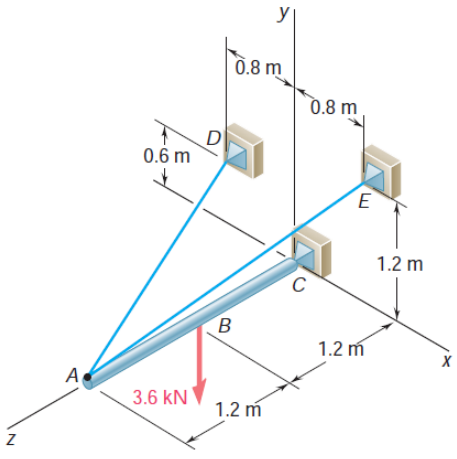
$\mathbf{A} = 150.0\ \text{N} \angle 30.0°$

2. Neglecting friction and the radius of the pulley, determine (a) the tension in cable *ADB*, (b) the reaction at *C*. [Ans.: (a) T =130.0 N, (b) $\mathbf{C} = 224\ \text{N} \angle 2.05°$]

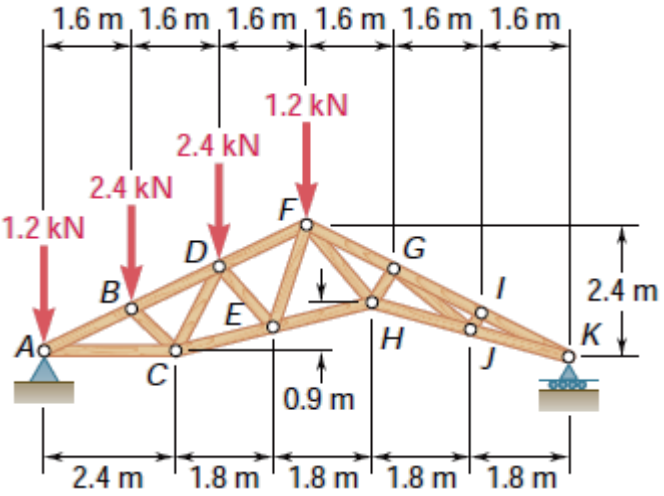


3. A 2.4-m boom is held by a ball-and-socket joint at *C* and by two cables *AD* and *AE*. Determine the tension in each cable and the reactions at *C*.

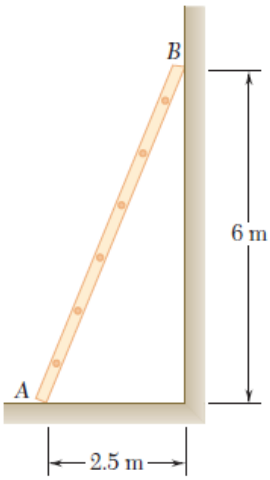
[Ans.: T_{AE} = 2.8 kN, T_{AD} = 2.6 kN,
$\boldsymbol{C}$ = 1.8 kN **j** + 4.8 kN **k**]



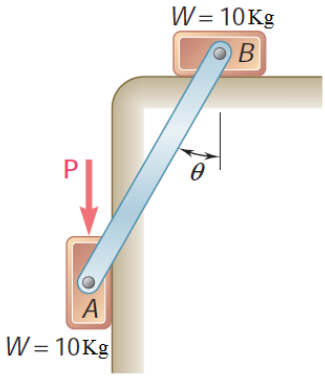
4. (a) Determine the force in members *EF*, *FH*, *EH* and *GH* of the vaulted roof truss shown using joint method. State whether each member is in tension or compression.
(b) Validate the results of (a) using section method.



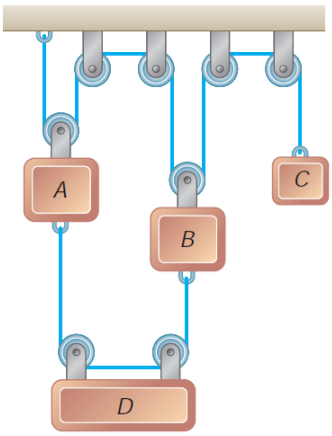
5. A 6.5 m ladder *AB* leans against a wall as shown. Assuming that the coefficient of static friction μ_s is the same at *A* and *B*, determine the smallest value of μ_s for which equilibrium is maintained.
[Hint: Smallest value of μ_s for which equilibrium is maintained can be found considering the motion of point *A* and *B* is impending.]
[Ans.: $\mu_s = 0.2$]



6. Two 10 Kg blocks *A* and *B* are connected by a slender rod of negligible weight. The coefficient of static friction is 0.30 between all surfaces of contact, and the rod forms an angle $\theta = 30°$ with the vertical.
(*a*) Show that the system is in equilibrium when $P = 0$.
(*b*) Determine the largest value of *P* for which equilibrium is maintained.



7. Block C starts from rest at $t = 0$ and moves downward with a constant acceleration of 4 cm/s^2. Knowing that block B has a constant velocity of 3 cm/s upward, determine
(a) the time when the velocity of block A is zero,
(b) the time when the velocity of block A is equal to the velocity of block D,
(c) the change in position of block A after 5 s.



8. Beer and Johnston, Problem 11.57 and 11.58.

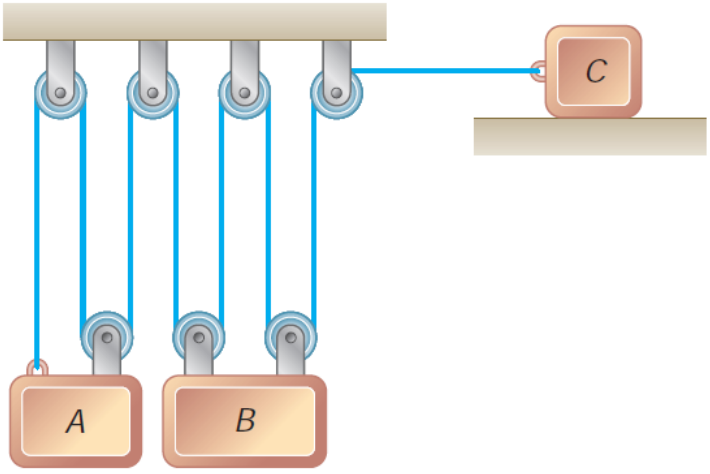
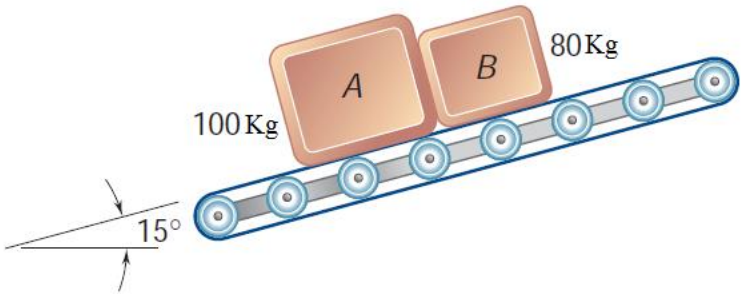
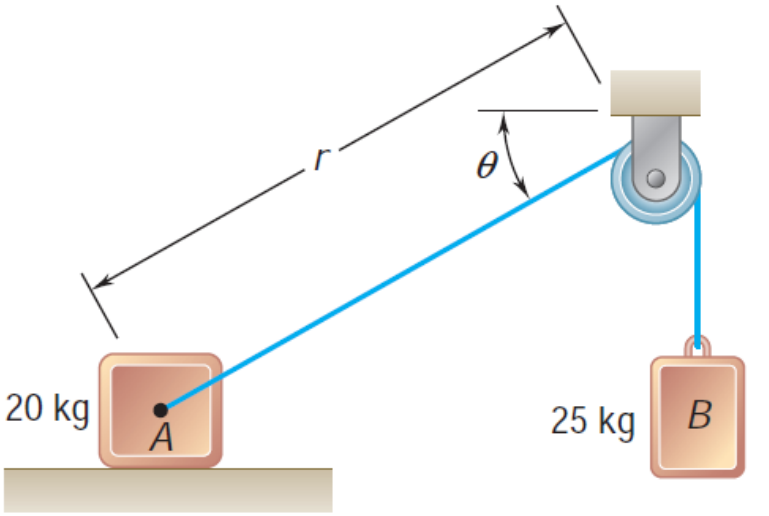


Fig. P11.57 and P11.58

9. Boxes A and B are at rest on a conveyor belt that is initially at rest. The belt is suddenly started in an upward direction so that slipping occurs between the belt and the boxes. Knowing that the coefficients of kinetic friction between the belt and the boxes are $\mu_s = 0.30$ and $\mu_k = 0.32$, determine the initial acceleration of each box. Will the boxes remain in contact during the motion?



10. Beer and Johnston, Problem 12.71 and 12.72.



Submission Date: 23 June 2018 (class time)