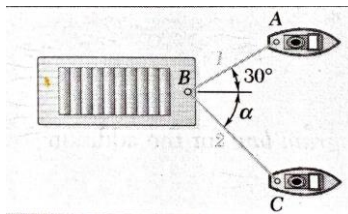


Unit – 4

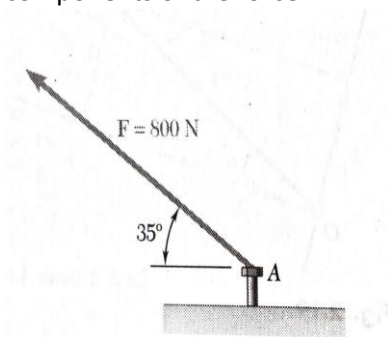
Topics

Mechanics and Analysis of Forces: Introduction, fundamentals of forces and force systems, free body diagrams, coplanar concurrent forces, 2D force components and their resultant, fundamentals of moment of forces with applications, couples, equations of static equilibrium, numerical case studies

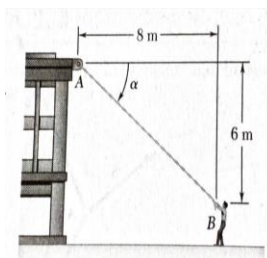
1. A barge is pulled by two tugboats. If the resultant of the forces exerted by tugboat is 25kN force directed along the axis of the barge, a) determine the tension in each rope knowing that $\alpha = 45^\circ$, b) the value of α for which the tension in rope 2 is minimum.



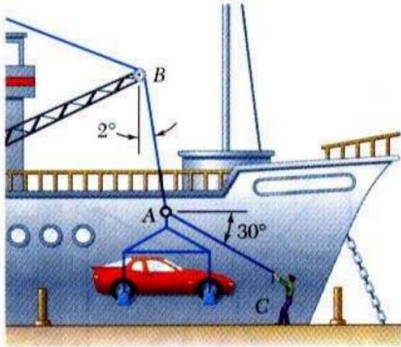
2. A force of 800N is exerted on the bolt A as shown. Determine the horizontal and vertical components of the force.



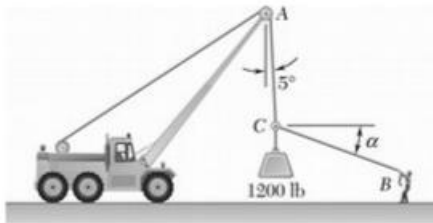
3. A man pulls with a force of 300 N on a rope attached to a building as shown. what are the horizontal and vertical components of the force exerted by the rope at point A.



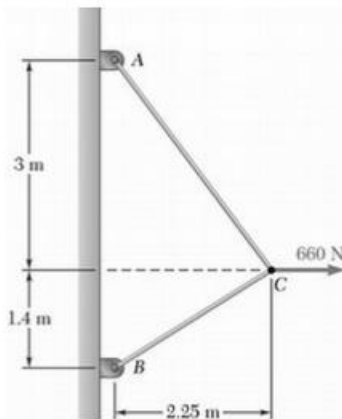
4. In a ship-unloading operation, a 8000-N automobile is supported by a cable. A rope is tied to the cable and pulled to center the automobile over its intended position. What is the tension in the rope?



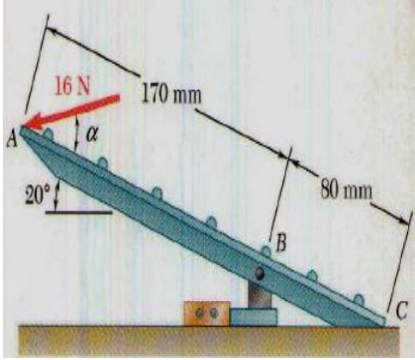
5. For the situation described in Figure P2.45, determine (a) the value of α for which the tension in rope BC is as small as possible, (b) the corresponding value of the tension.



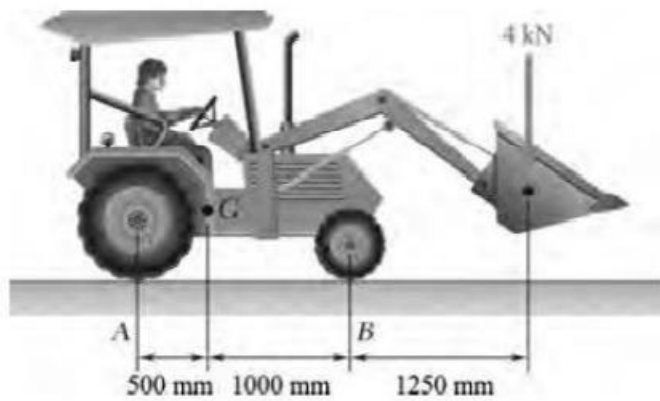
6. Two cables are tied together at C and are loaded as shown. Determine the tension (a) in cable AC, (b) in cable BC.



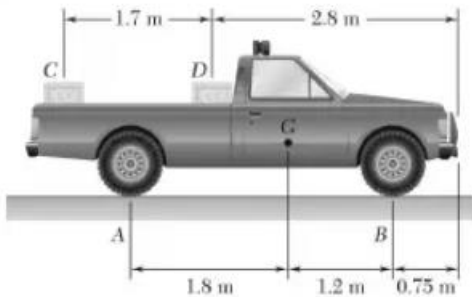
7. A foot valve for a pneumatic system is hinged at B shown in figure 10. Knowing that $\alpha = 28^\circ$, determine the moment of the 16-N force about point B by resolving the force into horizontal and vertical components.



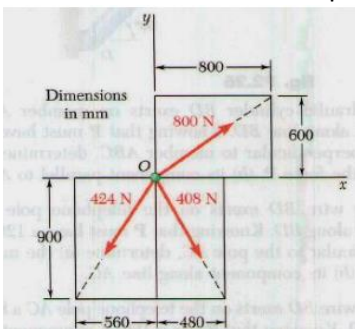
8. A tractor of mass 950 kg is used to lift gravel weighing 4 kN. Determine the reaction at each of the front wheel.



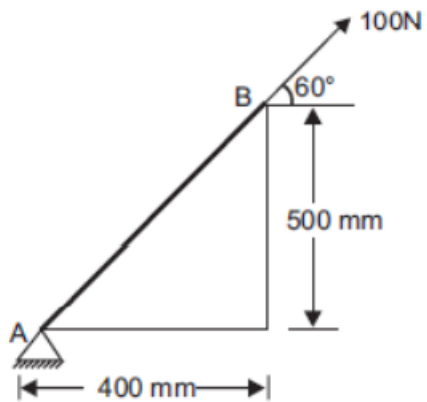
9. Two crates, each of mass 350 kg, are placed as shown in the bed of a 1400-kg pickup truck. Determine the reactions at each of the two (a) rear wheels A, (b) front wheels B



10. Determine the X and Y components of given forces as shown in figure.



11. Find the moment of 100 N force acting at B about point A as shown in Figure



12. A man raises a 10kg joist , of length 4m , by pulling on a rope. Find the tension T in the rope and the reaction at A

