Tutorial sheet 1

1. Two forces P and Q are applied as shown in figure 1 at point A of a hook support. Knowing that P = 75 N and Q = 125 N, Determine the magnitude and direction of their resultant. **(R=179 N and α=104.5° in third quadrant from x-axis)**

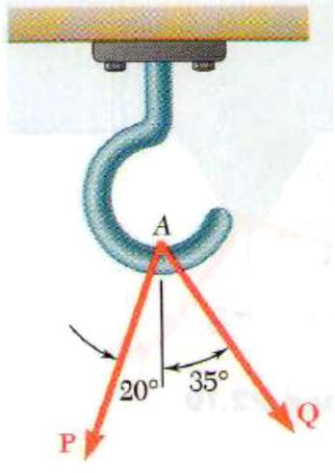


Figure 1

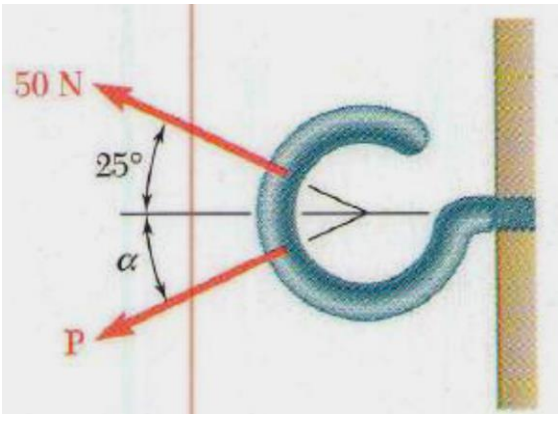


Figure 2

2. Two forces are applied as shown in figure 2 to a hook support. Knowing that the magnitude of P is 35 N, determine (a) the required angle if the resultant R of the two forces applied to the support is to be horizontal (b) the corresponding magnitude of R. **(α=37.1° & R=73.2 N)**

3. Two cables are tied together at C and are loaded as shown in figure 3. Knowing that α= 20°, determine the tension (a) in cable AC, (b) in cable BC. **(AC=2128.9 N and BC=1735.49 N)**

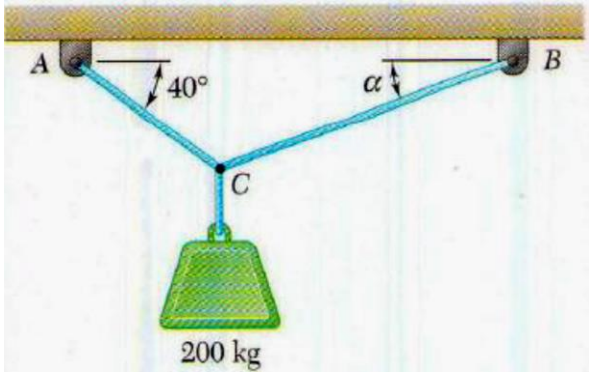


Figure 3

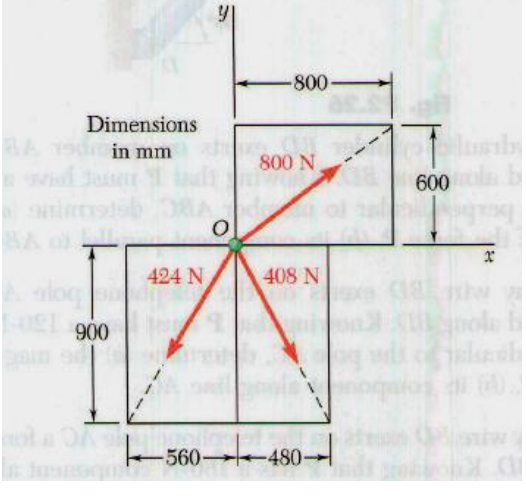


Figure 4

4. Determine the X and Y components of given forces as shown in figure 4. **(X=608N, and Y=-240N)**

5. The guy wire BD in figure 5 exerts on the telephone pole AC a force P directed along BD. Knowing that P must have a 120-N component perpendicular to the pole AC, determine (a) the magnitude of the force P, (b) its component along line AC**. (P=194.9 N & AC=153.6 N)**

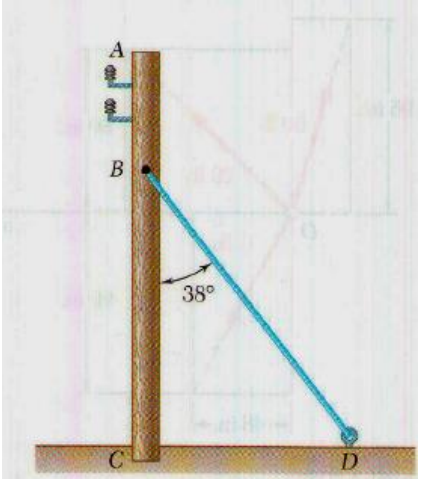


Figure 5

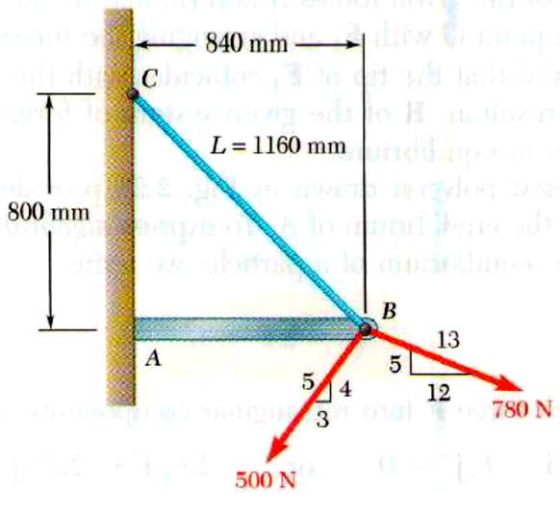


Figure 6

6. For the figure 6, determine the required tension in cable BC, if the resultant of three forces exerted at point B is to be vertical (b) the corresponding magnitude of the resultant force **(BC=580 N and R=300 N)**

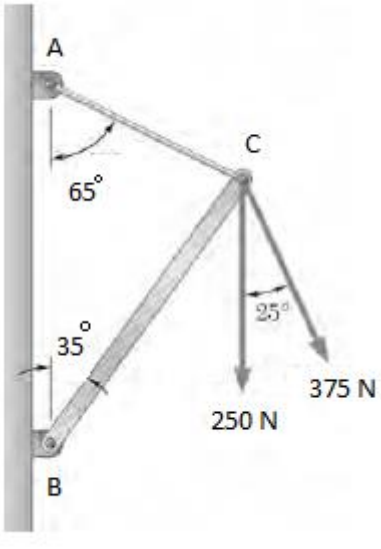


Figure 7

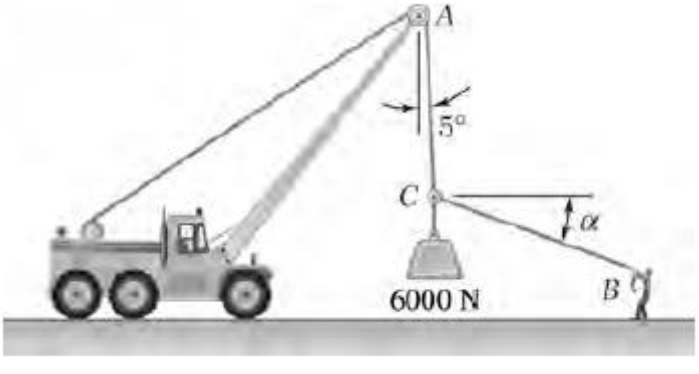


Figure 8

7. Determine (a) the required tension in cable AC, knowing that the resultant of the three forces exerted at point C of boom BC must be directed along BC, (b) the corresponding magnitude of the resultant as shown in Figure 7 **(Tension=475 N and R=475 N).**

8. Knowing that α= 20°, determine the tension (a) in cable AC, (b) in rope BC as shown in figure 8**. (AC=6220 N and BC=577 N)**

9. A Steel Tank is to be positioned in an excavation as given in figure 9. Knowing that the angle α=20°, determine (a) the required magnitude of force P if the resultant R of the two forces applied at A is to be vertical, (b) the corresponding magnitude of R **(P=1958 N and R=1732 N)**

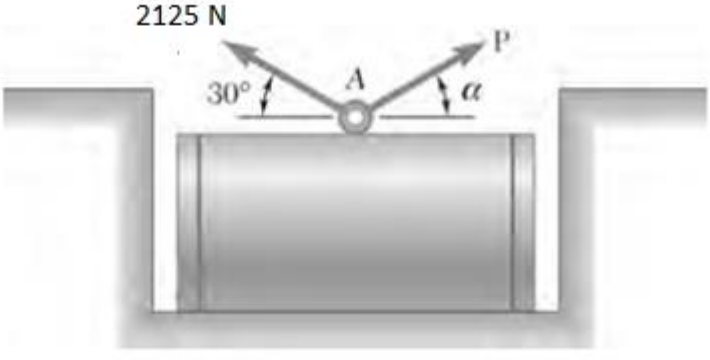


Figure 9

10. A foot valve for a pneumatic system is hinged at B shown in figure 10. Knowing that α= 28°, determine the moment of the 16-N force about point B by resolving the force into components along ABC and in a direction perpendicular to ABC. **(M=1277 N-mm Anticlockwise)**

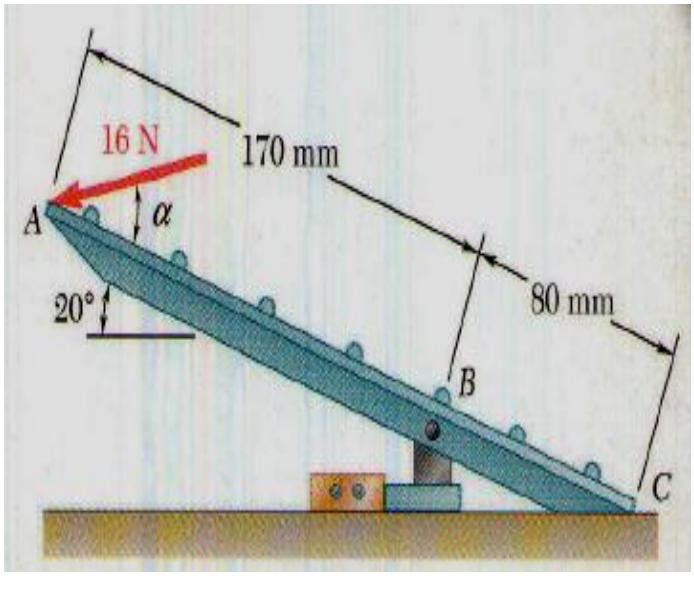


Figure 10

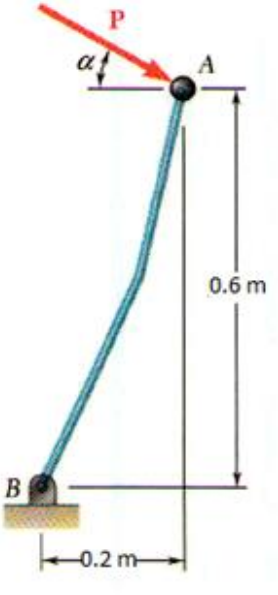


Figure 11

11. A 20N force P is applied to a shift lever. Determine the moment of P about B when α is equal to 25 degree as shown in figure 11.**(M=12.57 N-m Clockwise)**

12. For the shift lever shown as shown in figure 11, determine the magnitude and the direction of the smallest force P that has a 25N-m clockwise moment about B. **(P=39.6 N and α=18.43° in fourth quadrant from x-axis)**

13. A 300-N force is applied at A as shown. Determine (a) the moment of the 300-N force about D, (b) the magnitude and sense of the horizontal force applied at C that creates the same moment about D, (c) the smallest force applied at C that creates the same moment about D**. (M=41.77 N-m anticlockwise, F_H=334 N and F_S=177 N)**

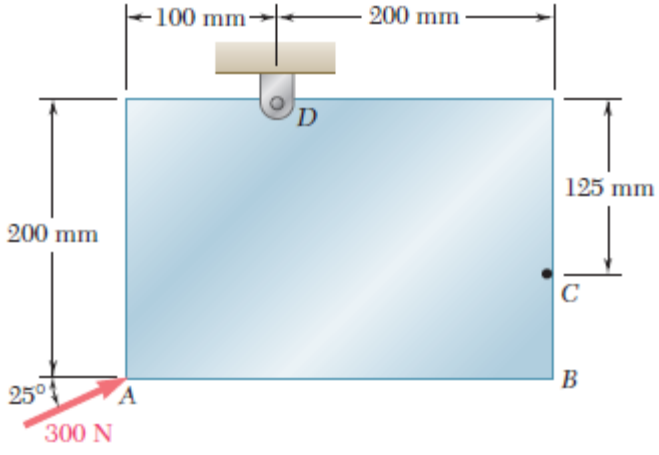


Figure 12

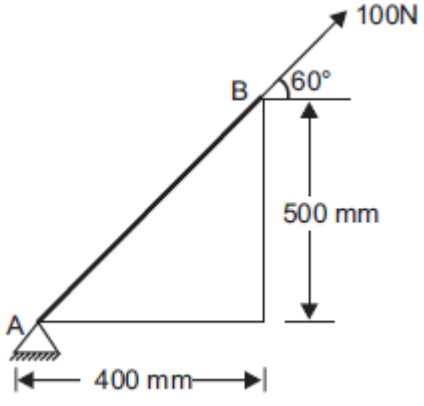
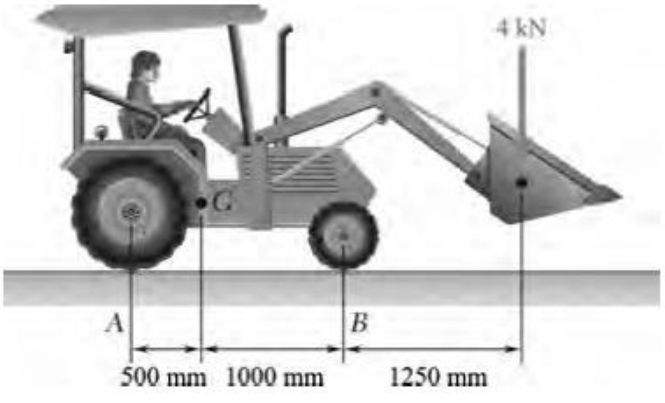


Figure 13

14. Find the moment of 100 N force acting at B about point A as shown in Figure 13. **(M=9641 N-mm Anti-Clockwise)**

15. A tractor of mass 950 kg is used to lift gravel weighing 4 KN. Determine the reaction at each of the front wheel. **($2R_A$=2880 N, $2R_B$=10440 N)**



16. Two crates, each of mass 350 Kg, are placed as shown in the bed of 1400 –kg pickup truck. Determine the reactions at each of the two (a) rear wheels A, (b) front wheels B **(R_A=6.07 KN and R_B=4.23 KN)**