First Serie
## Generalities and basic definitions (Force vectors)

Exercise N°1: Determine the magnitude and direction of the resultant of two forces of 100 N and 150 N acting at an angle of 45°.

Exercise N°2: Two unequal forces act at an angle of 120°. If the bigger force is 80 N and their resultant is perpendicular to the smaller one, find the smaller force.

Exercise N°3: A hook is subjected to three forces (T_1 = 180N, T_2 = 50N and T_3 = 30N) as shown in Fig. I.1. Determine the magnitude and direction of the resultant.
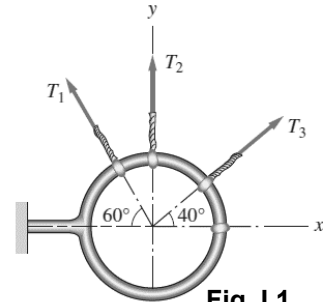

Fig. I.1.

Exercise N°4: It is required that the resultant force acting on the eyebolt in Fig. I.2 be directed along the positive x axis and that F_2 have a minimum magnitude. Determine this magnitude, the angle θ, and the corresponding resultant force.
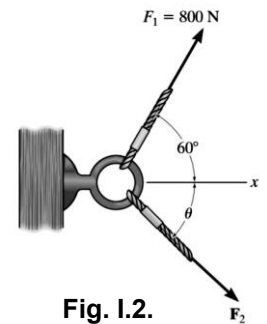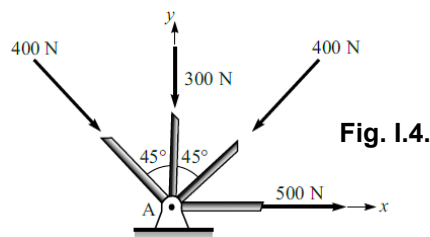

Fig. I.2.

Exercise N°5: Three forces shown in Fig. I.3 produce a resultant of 20 N acting upward along the y-axis. Determine the magnitude of P and Q.
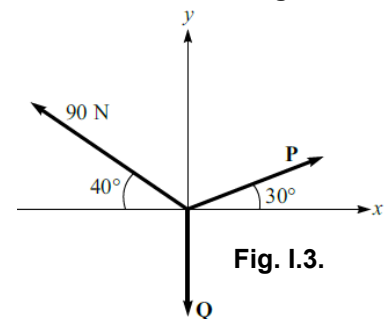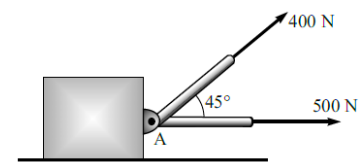

Fig. I.3.

Exercise N°6: Four members are meeting at pinned-support A in a roof truss as shown in Fig. I.4. Determine the total force components in x- and y-directions of the force transmitted to A by the member forces given.

Fig. I.4.

Exercise N°7: Determine the resultant of the forces transmitted by the rods to the joint A in Fig. I.5.

Fig. I.5.

Exercise N°8: A bar AB is supported at its end A, as shown in Fig. I.6. Determine the moment about the point A of the 1000 N force acting at the point B.
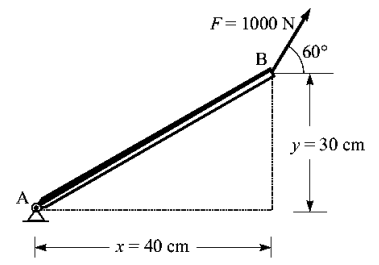

Fig. I.6.

Exercise N°9: Determine the magnitude and sense of the moment of the 800-N force about point A, see Fig. 1.7.
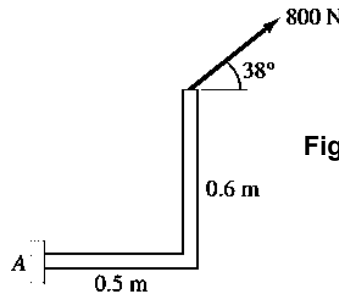

Fig. I.7.

Exercise N°10: Two like parallel forces of 500 N and 1000 N act at the two ends of 3.6-m long rod, as shown in Fig. 1.8. Determine the magnitude of their resultant and the point of its application along the rod.
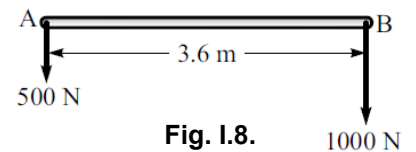

Fig. I.8.

Exercise N°11: Four forces act on the machine part (Fig. I.9). What is the sum of the moments of the forces about the origin O?
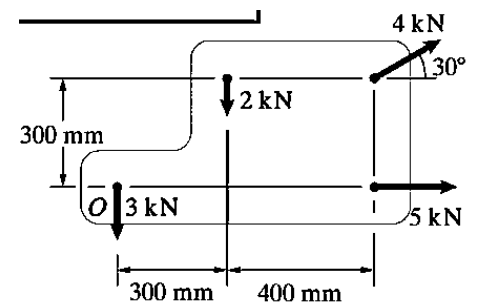
Exercise N°12: For the machine part shown in Fig. I.10, replace the applied load of 150 kN acting at point A by:

1. an equivalent force-couple system with the force acting at point B;
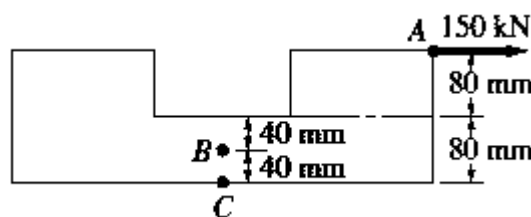2. two horizontal forces, one acting at point B and the other acting at point C.

Fig. I.9.

Fig. I.10.