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Rational Mechanics 2025/2026

Series 2

Exercice 1

Determine the required length of cord AC in Fig. 1 so that the 8-kg lamp can be suspended in the position shown. The undeformed length of spring AB is $0,4m$ and the spring has a stiffness of $k_{AB} = 300N.m$.

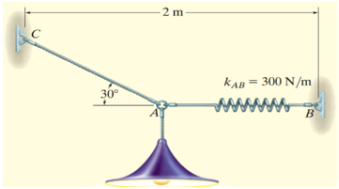

Figure 1: .

Exercice 2

Two forces act on the rod shown in Fig. 2. **Determine** the resultant moment they create about the flange at O. Express the result as a Cartesian vector.

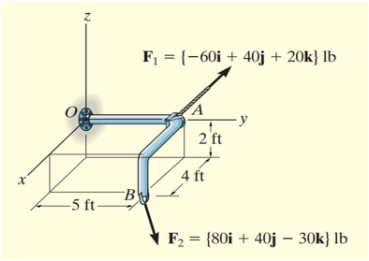

Figure 2: .

Exercice 3

We apply three forces $\vec{F_A} = 20\vec{i}$, $\vec{F_B} = 10\vec{j}$ and $\vec{F_C} = 20\vec{k}$ on a beam of length L, which weighs $P = 15KN$ and is recessed at the point O (Fig. 3). **Determine** the reaction to embedding point O.

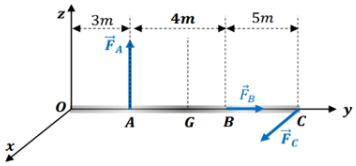

Figure 3: .

Exercice 4

A beam AC hinged at A is held in a horizontal position by a cable attached at end C and passing over a smooth pulley as shown in Fig. 4. The free end of the cable is connected to a weight $2000N$ that rests on the beam. **Determine** the reaction at A and tension in the cable. Neglect the weight of the beam.

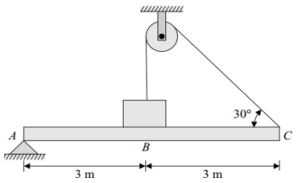

Figure 4: .

Exercice 5

The member shown in Fig. 5. below is pin connected at A and rests against a smooth support at B. **Determine** the horizontal and vertical components of reaction at the pin A.

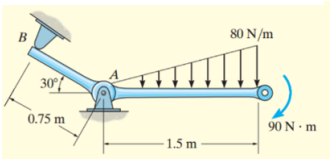

Figure 5: .

Exercice 6

Replace the force system in Fig. 6 by an equivalent resultant force and specify its point of application on the pedestal.

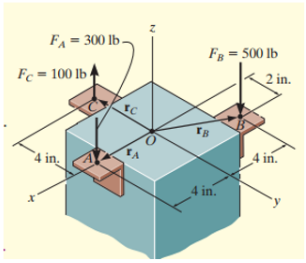

Figure 6: .

Exercice 7

The uniform $10-kg$ ladder in Fig. 7 rests against the smooth wall at B, and the end A rests on the rough horizontal plane for which the coefficient of static friction is $\mu_s = 0.3$. **Determine** the angle of inclination θ of the ladder and the normal reaction at B if the ladder is on the verge of slipping.

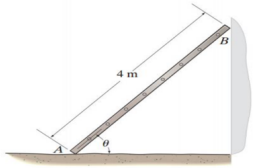

Figure 7: .