1. The uniform 5-m bar with a mass of 100 kg is hinged at $O$ and prevented from rotating in the vertical plane beyond the $30^\circ$ position by the fixed roller at $A$. Calculate the magnitude of the total force supported by the pin at $O$. 

![Diagram of a 5-m bar with a mass of 100 kg hinged at O and prevented from rotating in the vertical plane beyond the 30° position by a fixed roller at A. The bar is 1 m wide and 0.5 m high.]
2. Calculate the forces induced in members GH, HF, ED and AC for the crane truss when it lifts an 1800-kg car. The radius of each pulley is 750 mm. Indicate whether the members are in tension or compression.
3. Calculate the $x$ and $y$ coordinates of the centroid for the area shown. Use the coordinate system given.
4. The uniform horizontal boom $OD$ is fastened by a ball-and-socket at point $O$ and by ropes $AC$ and $AB$. If the boom weighs 3.6 kN and is subjected to the 8 kN force shown, determine the tension in each rope and the reaction at point $O$. 

---

**Diagram Description:**
- The boom is horizontal with point $O$ at the bottom.
- Ropes $AC$ and $AB$ are connected to points $O$ and $D$.
- Point $B$ is 3.6 m from $O$.
- Point $C$ is 2.7 m from point $O$.
- A force of 8 kN is applied at point $D$.

---

**Mathematical Analysis:**
To determine the tension in each rope, we can use the principles of equilibrium. The forces must balance out in both the $x$, $y$, and $z$ directions. 

**Reaction at $O$:**
- The reaction components in the $x$, $y$, and $z$ directions can be calculated using the forces acting on $O$.
- The horizontal reaction $R_x$ can be found by balancing forces in the $x$ and $y$ directions.
- The vertical reaction $R_y$ is determined by balancing the forces in the $z$ direction.

---

**Solution Steps:**
1. **Equilibrium Equations:**
   - $\sum F_x = 0$: $R_x - 8 = 0 \\
   - \sum F_y = 0$: $R_y - 3.6 = 0 \\
   - \sum F_z = 0$: $T_{AC} + T_{AB} - 3.6 = 0$
2. **Solve for $R_x$ and $R_y$:**
   - $R_x = 8$ kN
   - $R_y = 3.6$ kN
3. **Solve for the tensions $T_{AC}$ and $T_{AB}$:**
   - $T_{AC} + T_{AB} = 3.6$ kN

---

**Final Solution:**
- The tension in rope $AC$ and $AB$ can be found by further analysis or using trigonometric methods based on the angles and forces involved.