Multiple choice questions

M1 Which of the following is necessary for the center of gravity of an object to coincide with its center of mass?
   A. The object is flat.
   B. The object has axial symmetry.
   C. The gravitational acceleration $g$ is uniform over the object.

M2 A ladder stands on the ground, leaning against the wall. Would you feel safer climbing up the ladder if you were told that the ground is frictionless but the wall is rough or if you were told that the wall is frictionless but the ground is rough?
   A. Rough wall is better.
   B. Rough ground is better.
   C. Depends on the angle between the ladder and the wall.
Problems

P1 Locate the centers of gravity of objects shown below.

![Diagram of objects](image1)

P2 The construction below is in static equilibrium. If mass $m_4 = 12$ g, find masses $m_1, m_2, m_3$.

![Diagram of construction](image2)

P3 A uniform beam is inclined at an angle $\theta$ to the horizontal. Its upper end is connected to a wall by a rope, and its lower end rests on a rough, horizontal surface. The coefficient of static friction between the beam and the surface is $\mu_s$. Assume that the angle $\theta$ is such that the static friction force is at its maximum value. Find $\mu_s$ as a function of $\theta$.

![Diagram of beam](image3)

P4 A 10 kg monkey climbs a uniform ladder with weight 120 N and length 3 m. The ladder rests against the wall and makes an angle of $\theta = 60^\circ$ with the ground. The upper and lower ends of the ladder rest on frictionless surfaces. The lower end is connected to the wall by a horizontal rope that is can support a maximum tension of 80 N. Find the maximum distance $d$ that the monkey can climb up the ladder before the rope breaks.

![Diagram of monkey climbing ladder](image4)