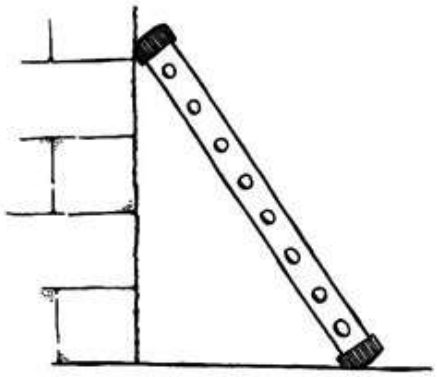
NAME _____ DATE _____

Scenario

A ladder is set against a wall so that the ladder makes a 30° angle from the floor. The wall is very smooth, but the floor is not. The ladder only remains motionless as long as a person holds it in place. When the person lets go, the ladder accelerates down and to the right.



Blake analyzes this scenario and identifies that the four forces acting on the ladder are its weight F_g, the normal force from the wall N_w, the normal force from the floor N_f, and the friction between the ladder and the floor F_F. He then correctly ranks the magnitudes of these forces as $F_g > N_F > N_w > F_F$.

Using Representations

PART A: On the diagram above, draw and label the forces that are exerted on the ladder. To clearly indicate at which point on the ladder each force is exerted, draw each force as a distinct arrow starting on, and pointing away from, the point at which the force is exerted. The lengths of the arrows should indicate the relative magnitudes of the forces.

Argumentation

PART B: Explain why $F_g > N_f$. Equations may be a part of your answer, but equations alone are insufficient.

PART C: Explain why $N_f > F_f$. Equations may be a part of your answer, but equations alone are insufficient.

PART D: Explain why $N_w > F_f$. Equations may be a part of your answer, but equations alone are insufficient.

Use an Equation

PART E: Blake states that the ranking could not be completely determined until it was demonstrated that $N_f > N_w + F_f$. Explain how this expression is demonstrated by the scenario described.