EXPERIMENT PROCEDURE

- **Measure the component F_1 of the weight of an object which acts down an inclined plane as a function of the angle of inclination α.**
- **Plot the ratio of the component F_1 to the weight G as a function of sin α.**
- **Calculate the component of force normal to the plane F_2.**

OBJECTIVE

Determine the forces acting on an inclined plane.

SUMMARY

If a body needs to be propelled up an inclined plane, it is not the body's full weight G which needs to be overcome, but only the component which acts parallel to the plane F_1. The fact that this component is less than the weight is more pronounced the smaller the inclination α of the plane becomes.

REQUIRED APPARATUS

Quantity	Description	Number
1	Inclined Plane	**1003213**
1	Precision Dynamometer 5 N	**1003106**
1	Set of Weights 1 g to 500 g	**1010189**

BASIC PRINCIPLES

If a body needs to be propelled up an inclined plane, it is not the body's full weight G which needs to be overcome, but only the component which acts parallel to the plane F_1. The vector differential between the weight and the component down the plane is represented by the component normal to the plane F_2, see Fig. 1.

The magnitudes of the forces are given by the following relationships:

(1) $$F_1 = G \cdot \sin\alpha$$

(2) $$F_2 = G \cdot \cos\alpha \ .$$

In this experiment, the body is suspended from a cord which runs over a pulley. The force along the plane is then compensated for by weights on a weight holder suspended from the other end of the cord. Since the friction between the body and the inclined plane is of importance, the value used for the measurements is an average of the lowest and highest values, where the component of the force down the plane is just enough to stop the body sliding down the slope and when it is just enough not to drag it up the slope.
The weight of the body G is determined in advance using a dynamometer. The weight of the weight holder is also taken into account. The angle of inclination α can simply be read from a protractor scale.

EVALUATION

In order to evaluate the data, the ratio of the parallel component of the force F_1, as measured for various inclination angles α, and the weight of the body G is plotted on a graph against sin α. To within the measurement tolerances, the values all lie on a straight line passing through the origin.

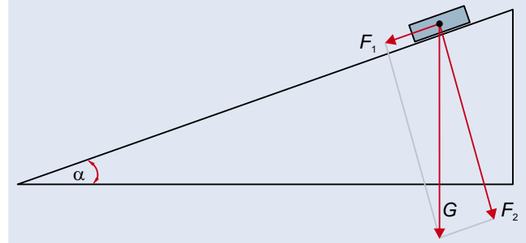

Fig. 1: Resolution of the weight G into vector components parallel to the plane, F_1, and normal to the plane, F_2

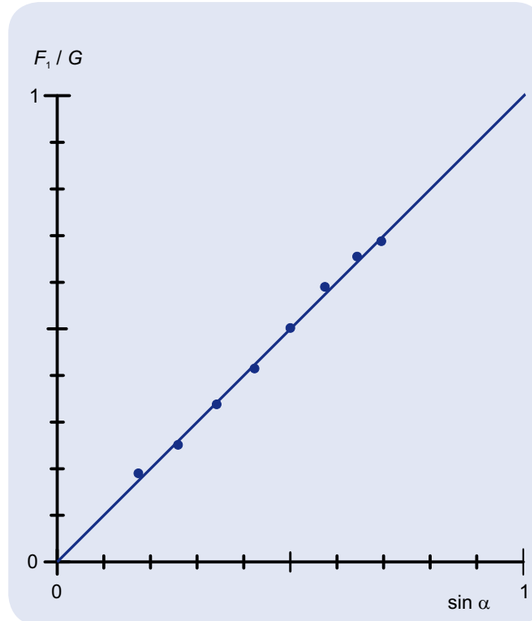

Fig. 2: The ratio between the parallel component F_1 and the weight G as a function of sin α.