CORRESPONDENCE

To the Editor of the *Mathematical Gazette*

Dear Sir,

Readers of the *Gazette* may be interested in a new technique for solving trigonometrical equations, invented by a candidate for an A level examination.

The problem was to show that, if a ladder rests with one end on the ground and the other end against a wall, and the friction is limiting at each end, then $\alpha = \frac{1}{2}\pi - 2\lambda$, where α is the inclination of the ladder and λ the angle of friction. The candidate obtained the incorrect equation :

$$2 \tan \alpha = \cot \lambda - 3 \tan \lambda,$$

and then proceeded thus : taking tangents (he presumably meant inverse tangents) of both sides,

$$2\alpha = 180 - \lambda - 3\lambda,$$

so

$$\alpha = 90 - 2\lambda.$$

Yours etc,

E. J. F. Primrose

To the Editor of the *Mathematical Gazette*

Dear Sir,

In Note 2510 (*Mathematical Gazette*, May, 1955) Dr. T. A. S. Jackson asserts that two generally accepted laws of static friction are sometimes inconsistent. These laws are (1) that the reaction must lie within the cone of friction and (2) that friction opposes the tendency to relative motion. He supports his argument by considering the problem of a bar resting obliquely against a rough wall and rejects as erroneous a solution given by Loney. However, the forces assumed by Loney are in equilibrium and moreover the reaction at the wall satisfies both laws (1) and (2). I fail to detect any inconsistency. What Dr. Jackson's analysis does establish is that, if we are prepared to waive condition (2), then more oblique positions of the rod are possible than if we require that both conditions shall be satisfied. But, whether we are entitled to abandon the second law and solve all such problems under the condition imposed by the first law alone, as Dr. Jackson does, is a question which can only be decided by experiment. Dr. Jackson admits that the second law is accepted by most authorities and it would appear to be highly plausible. However, a factual statement from a physicist would be helpful in deciding the matter.

In problems where a rigid body is in contact with a rough plane at a number of points and is acted upon by a steadily increasing force R (see Note 2606, *Mathematical Gazette*, May, 1956), it may be objected that before limiting conditions are attained the direction of the relative motion tendency at a point of contact is indeterminate, so that law (2) cannot be applied. However, when conditions are limiting this is not the case and law (2) may be employed to determine these conditions and R uniquely. Since the body cannot be ideally rigid, it seems reasonable to suppose that when R has increased to this critical value, slipping will take place. This is not the point of view taken by Dr. Jackson in Note 2606, but only experiment can decide whether or not it is justified. No logical inconsistency appears to be involved.

Yours etc,

Derek F. Lawden