

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

5 Newton's laws of motion

Exercise Test yourself, Question 2

Question:

A child, of mass 30 kg, slides down a slide at a constant speed. Assume that there is no air resistance acting on the child. The slide makes an angle of 40° with the horizontal. Find the magnitude of the friction force on the child and the coefficient of friction.

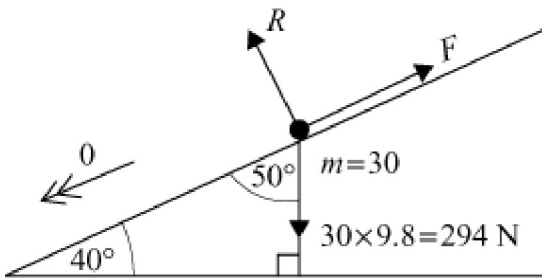
Solution:

Newton's 2nd Law down slope

$$294 \times \cos 50^\circ - F = 30 \times 0$$

$$\therefore F = 294 \cos 50^\circ = 188.979\dots$$

$$F = 189 \text{ N (3 s.f.)}$$



Newton's 2nd Law perpendicular to slope

$$R - 294 \sin 50^\circ = 30 \times 0$$

$$\therefore R = 294 \sin 50^\circ$$

$$R = 225.21\dots \text{ N}$$

and limiting friction

$$F = \mu R$$

gives $\mu = \frac{F}{R}$

$$\mu = \frac{188.979\dots}{225.21\dots} = 0.83909\dots$$

$$\mu = 0.839 \text{ (3 s.f.)}$$