

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

Exercise Test yourself, Question 5

Question:

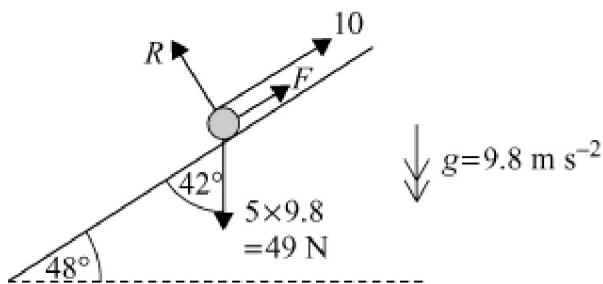
A particle, of mass 5 kg, is at rest on a slope inclined at an angle of 48° to the horizontal. A force, of magnitude 10 N, that is directed up the slope acts on the particle.

- (a) Find the magnitude of the friction force acting on the particle.
- (b) Find an inequality that the coefficient of friction between the particle and the slope must satisfy.

Solution:

$$\text{Along plane } F + 10 = 49 \times \cos 42^\circ$$

$$\begin{aligned} \therefore F &= 49 \cos 42^\circ - 10 \\ \text{i.e. } F &= 26.414\dots \\ \text{i.e. } F &= 26.4 \text{ N (3 s.f.)} \end{aligned}$$



- (b) Perpendicular to plane

$$\begin{aligned} R &= 49 \times \sin 42^\circ \\ \therefore R &= 32.787\dots \end{aligned}$$

$$\begin{aligned} \text{Limiting equilibrium } F &\leq \mu \times R \\ 26.414\dots &\leq \mu \times 32.787\dots \\ \frac{26.414}{32.787} &\leq \mu \\ \mu &\geq 0.80561\dots \\ \mu &\geq 0.806 \text{ (3 s.f.)} \end{aligned}$$