Solutionbank M1

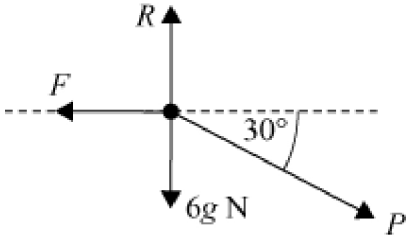
Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

Exercise F, Question 4

Question:

The diagram shows a particle of mass of 6 kg at rest on a rough horizontal plane, subject to an external force of magnitude P N. What is the greatest value of P, if $\mu = \frac{2}{3}$?



Solution:

Resolving horizontally
$F = P \cos 30°$
Resolving vertically
$R = 58.8 + P \sin 30°$

$$\text{for equilibrium } F \leq \frac{2}{3} \times R$$

$$P \cos 30° \leq \frac{2}{3}[\,58.8 + P \sin 30°\,]$$

$$\therefore P \cos 30° \leq 39.2 + P \times \frac{2}{3} \sin 30°$$

$$\therefore P[\,\cos 30° - \frac{2}{3} \times \sin 30°\,] \leq 39.2$$

$$\therefore P \leq \frac{39.2}{[\,\cos 30° - \frac{2}{3} \times \sin 30°\,]}$$

$$P \leq 73.588...$$

$\therefore$ greatest value of P is 73.6 N (3 s.f.)