

Solutionbank M1

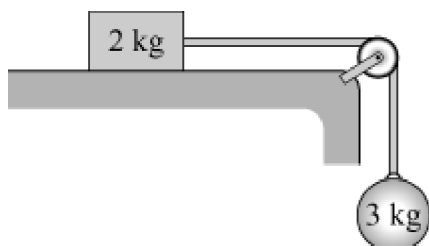
Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 5

Question:

The diagram shows a block of mass 2 kg, that slides on a rough horizontal table. It is attached by a light, inextensible string to a 3 kg mass. If the block accelerates at 4.9 m s^{-2} , find the coefficient of friction between the block and the table.



Solution:

Using $F = ma$,

for 3 kg mass; $3g - T = 3a$ [1]

for 2 kg mass (horizontally, as motion takes place horizontally) $T - F = 2a$ [2]

Resolving vertically for 2 kg mass; $R = 2g$ [3]

In limiting equilibrium, $F = \mu R$ [4]

It is given that $a = 4.9$,

$$[1] \Rightarrow 3g - T = 3 \times 4.9$$

$$\begin{aligned} \therefore T &= 3 \times 4.9 \\ &= 14.7 \end{aligned}$$

$$[2] \Rightarrow 14.7 - F = 2 \times 4.9$$

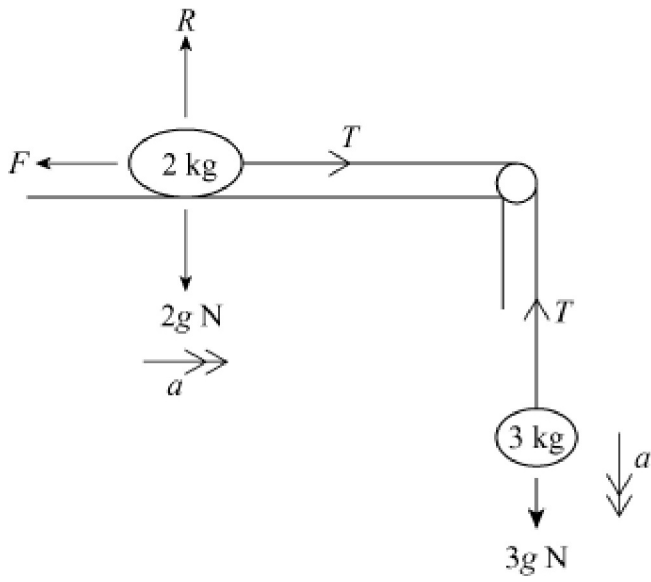
$$\therefore F = 4.9$$

$$[3] \text{ and } [4] \Rightarrow F = \mu R$$

$$= \mu \times 2g$$

$$\therefore 4.9 = \mu \times 2g$$

$$\therefore \mu = \frac{1}{4} \text{ or } 0.25$$



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