

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 6 Connected particles

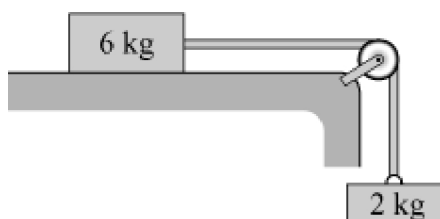
### Exercise A, Question 6

#### Question:

A block, of mass 6 kg, rests on a rough, horizontal surface. The coefficient of friction between the block and the surface is 0.2. A light, inextensible string attached to the block passes over a smooth pulley. A weight, of mass 2 kg, hangs from the other end of the string, as shown in the diagram below.

Find the tension in the string and the acceleration of the block.

[A]



#### Solution:

Using  $F = ma$

for 2 kg mass;  $2g - T = 2a$  [1]

for 6 kg mass (horizontally, as motion takes place horizontally)  $T - F = 6a$  [2]

Resolving vertically for 6 kg mass;  $R = 6g$  [3]

In limiting equilibrium  $F = \mu R$   
 $= 0.2R$  ( since  $\mu = 0.2$  ) [4]

[3] & [4]  $\Rightarrow F = 0.2R = 0.2 \times 6g$   
 $= 1.2g$

[2]  $\Rightarrow T - 1.2g = 6a$  [5]

$3 \times [1] \Rightarrow 6g - 3T = 6a$

$\therefore T - 1.2g = 6g - 3T$

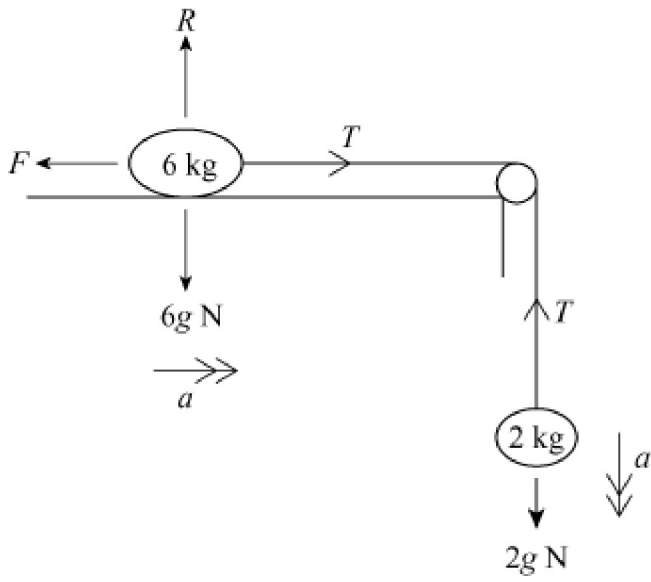
$4T = 7.2g$

$T = 17.6 \text{ N}$

Adding [1] and [5]  $0.8g = 8a$

$\therefore a = 0.1g$

i.e.: Acceleration is  $0.98 \text{ m s}^{-2}$



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