

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 1

Question:

Two particles, of mass 3 kg and 5 kg, respectively, are attached to the ends of a light, inextensible string that passes over a smooth pulley. Both strings are vertical. Find the acceleration of the particles and the tension in the string.

Solution:

Using $F = ma$,

$$\text{For 5 kg particle; } 5g - T = 5a \quad [1]$$

$$\text{For 3 kg particle; } T - 3g = 3a$$

$$\text{Adding; } 2g = 8a$$

$$a = \frac{1}{4}g$$

\therefore Acceleration is 2.45 m s^{-2}

Substituting into equation [1]

$$5g - T = 5 \times \frac{1}{4}g$$

$$\frac{15}{4}g = T$$

\therefore Tension is 36.75 N

