

Mathematics Questions by Topic

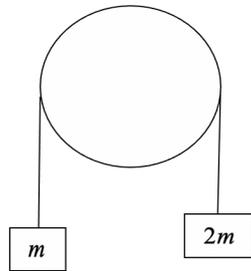
Motion and Force

Answer 1

Source: K22SM2Q14

Question 1

Two masses of mass m and $2m$ kg are hanging vertically and connected by a light string which passes over a smooth pulley. In this situation the mass $2m$ moves downwards with an acceleration of $a \text{ ms}^{-2}$ and the tension in the string is T_1 newtons. When an extra mass of $3m$ is added to the mass m , it now moves down with the same acceleration of $a \text{ ms}^{-2}$ and the tension in the string is T_2 newtons. The ratio $\frac{T_2}{T_1}$ is equal to.



- A. $\frac{1}{3}$
- B. 1
- C. 2
- D. 3
- E. 4

ANSWER C

with masses m_1 and m_2 , assume $m_2 > m_1$ (1) $m_2g - T = m_2a$ (2) $T - m_1g = m_1a$,

then solving for the tension in the string $T = \frac{2m_1m_2g}{m_1 + m_2}$

$$\text{Case (1) } m_1 = m, m_2 = 2m, T_1 = \frac{2m^2g}{3m} = \frac{2mg}{3}$$

$$\text{Case (2) } m_1 = 4m, m_2 = 2m, T_2 = \frac{8m^2g}{6m} = \frac{4mg}{3}$$

$$\frac{T_2}{T_1} = 2$$