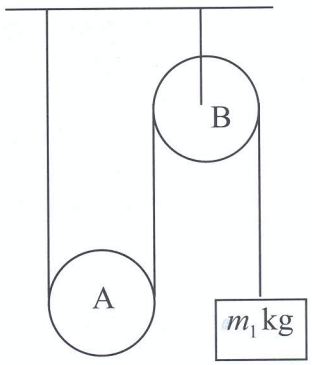
2008 **4.** **(a)** The diagram shows a light inextensible string having one end fixed, passing under a smooth movable pulley A of mass $m$ kg and then over a fixed smooth light pulley B.
The other end of the string is attached to a particle of mass $m_1$ kg.




The system is released from rest.

Show that the upward acceleration of A is $\dfrac{(2m_1 - m)g}{4m_1 + m}$.

| | |
|---|---|
| Upward acceleration of A $= f$ | 5 |
| Downward acceleration of $m_1 = 2f$ | 5 |
| $m_1 g - T = m_1(2f)$ | 5 |
| $2T - mg = m(f)$ | 5 |
| $2m_1 g - 2T = 4m_1 f$<br>$2T - mg = mf$ | |
| $2m_1 g - mg = (4m_1 + m)f$ | 5 |
| $f = \dfrac{(2m_1 - m)g}{4m_1 + m}$ | 5 |
| | 30 |