# Single Body Analysis #3

$$m_1 g - T_{1,2} = m_1 a$$

Question 3

$$T_{1,2} - T_{2,3} = m_2 a$$

$$T_{2,3} = m_3 a$$

$$\boxed{m_1 g = m_1 a + m_2 a + m_3 a}$$

$$m_1 g = (m_1 + m_2 + m_3) a$$

$$\frac{m_1 g}{m_1 + m_2 + m_3} = a$$

$$a = \frac{m_1 g}{m_1 + m_2 + m_3}$$

$$= \frac{(15\,\text{kg}) \left(10\,\frac{\text{m}}{\text{s}^2}\right)}{(15\,\text{kg}) + (20\,\text{kg}) + (30\,\text{kg})}$$

$$= \boxed{2.307692308\,\frac{\text{m}}{\text{s}^2}} \quad \checkmark$$

## Single Body Analysis #3 (continued)

$$T_{2,3} = m_3\, a$$

$$= (30\,\text{kg})\left(2.307692308\,\tfrac{\text{m}}{\text{s}^2}\right)$$

$$= \boxed{69.23076924\,\text{N}} \quad \checkmark$$

$$T_{1,2} - T_{2,3} = m_2\, a$$

$$T_{1,2} = m_2\, a + T_{2,3}$$

$$= (20\,\text{kg})\left(2.307692308\,\tfrac{\text{m}}{\text{s}^2}\right) + (69.23076924\,\text{N})$$

$$= \boxed{115.3846154\,\text{N}} \quad \checkmark$$

| Var | Given value | Units | Description |
|-----|-------------|-------|-------------|
| $g$ | 10 | $\frac{\text{m}}{\text{s}^2}$ | Acceleration due to gravity |
| $m_1$ | 15 | kg | Mass 1 |
| $m_2$ | 20 | kg | Mass 2 |
| $m_3$ | 30 | kg | Masss 3 |
| $a$ | | $\frac{\text{m}}{\text{s}^2}$ | Acceleration |

# Single Body Analysis #3 (continued)

| | | | |
|---|---|---|---|
| $T_{1,2}$ | | N | Tension 1 |
| $T_{2,3}$ | | N | Tension 2 |