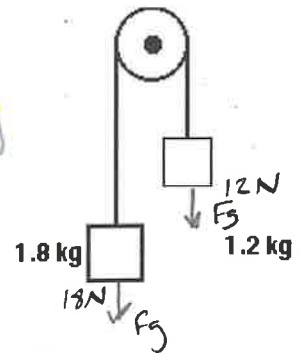Name: **Key**

Tension Practice Problems – Hanging Masses

1. Two masses are connected to each other through a pulley. The larger mass is 1.8 kg and the smaller mass is 1.2 kg.

    a. What is the acceleration of the masses?

$$\Sigma F = Ma \rightarrow a = \frac{\Sigma F}{M} \rightarrow \frac{(18N - 12N)}{(1.8\,Kg + 1.2kg)} = \boxed{2\,m/s^2}$$
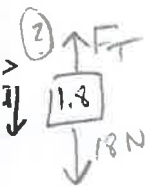
    b. What is the tension in the string?

Tunnel Vision

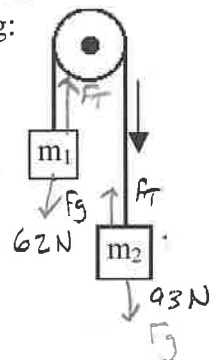$$\Sigma F = Ma \rightarrow a = \frac{\Sigma F}{M} \rightarrow \frac{18N - F_T}{1.8\,kg} = 2\,m/s^2 \qquad \boxed{F_T = 14N}$$

2. Two masses are connected to each other through a pulley If $m_1 = 6.2$ kg and $m_2 = 9.3$ kg:

    a. What is the acceleration?

$$\Sigma F = Ma \rightarrow \frac{\Sigma F}{M} = a \quad \frac{(93N - 62N)}{(9.3\,kg + 6.2\,kg)} = 2\,m/s^2$$

    b. What is the tension in the rope?

Tunnel Vision

$$\frac{\Sigma F}{M} = a \qquad \frac{93N - F_T}{9.3\,kg} = 2\,m/s^2 \qquad \boxed{F_T = 73N}$$
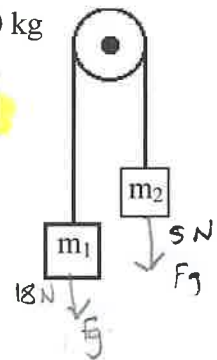
3. Two masses are connected to each other through a pulley If $m_1 = 1.8$ kg and $m_2 = 0.50$ kg

    a. What is the acceleration?

$$\Sigma F = Ma \rightarrow \frac{\Sigma F}{M} = a \quad \frac{(18N - 5N)}{(1.8\,kg + 0.5\,kg)} = \boxed{5.7\,m/s^2}$$

    b. What is the tension in the rope?

Tunnel Vision

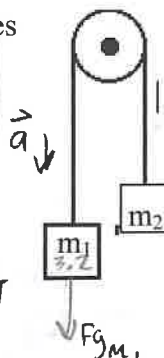$$\frac{\Sigma F}{M} = a \qquad \frac{18N - F_T}{1.8\,kg} = 5.7\,m/s^2 \qquad \boxed{F_T = 7.7N}$$

4. Two masses are connected to each other through a pulley If $m_1 = 3.2$ kg and accelerates at 1.5 m/s² downward:

    a. What is the tension in the rope?
$$\Sigma F = Ma$$
$$\Sigma F = (3.2\,kg)(1.5\,m/s^2) \rightarrow 4.8N$$

Tunnel Vision

$$Fg_{M_1} = (3.2\,kg)(10\,m/s^2) = 32N$$

$$If... \quad \Sigma F = Ma \rightarrow \Sigma F = (3.2\,kg)(1.5\,m/s^2)$$

    b. What is the mass, m_2?
$$Fg_{M_1} - F_T = 4.8N \qquad 32N - 4.8N = F_T$$
$$\boxed{F_T = 27.2N}$$

$$M_2 = 2.36\,kg$$
$$kg\,m/s^2 = N$$
$$Ma = F$$

$$\Sigma F = (M_2 + 3.2\,kg)(1.5\,m/s^2)$$

$$\Sigma F = Fg_{M_1} - Fg_{M_2} = 32N - (M_2 \cdot 10\,m/s^2) \qquad 1.5\,m/s^2\,M_2 + 4.8\,kg\,m/s^2 = 32N - M_2(10\,m/s^2)$$

SET Both ΣF EQUAL

$$(11.5\,m/s^2)M_2 = 27.2N$$