

## Tutorial Week 1

1.  $\Sigma F = m \cdot a$

$$\vec{F} = (m_1 + m_2) a$$

$$a = \frac{\vec{F}}{m_1 + m_2} \quad \text{--- ①}$$

$$\Sigma F = m \cdot a$$

$$\vec{F} - F_{21} = m \cdot a$$

$$-F_{21} = m_1 a - \vec{F}$$

$$= \frac{m_1 \vec{F}}{m_1 + m_2} - \vec{F} \quad (\text{From ①})$$

$$F_{21} = \vec{F} - \frac{m_1 \vec{F}}{m_1 + m_2}$$

2.  $\Sigma F = 10 - 2 = 8 \text{ N}$

$$m = 5 \text{ kg}$$

$$F = ma$$

$$a = \frac{F}{m} = \frac{8}{5} \text{ m/s}^2$$

3. c) less than 2 N

$$\Sigma F = (m_1 + m_2) a$$

$$2 = 4a$$

$$a = 0.5 \text{ m/s}^2$$

$$F_{21} = m_1 a$$

$$= 3 \times 0.5$$

$$= \underline{1.5 \text{ N}} < 2 \text{ N}$$

4.

$$a) \Sigma F = 30 - 8 - 6 = \underline{16 \text{ N}}$$

$$\Sigma m = 2 + 4 = \underline{6 \text{ kg}}$$

$$b) a = \frac{F}{m} = \frac{16}{6} = \underline{\frac{8}{3} \text{ m/s}^2}$$

$$c) \Sigma F_2 = m_2 a + 6 \text{ N}$$

$$= 2 \times \frac{8}{3} + 6 \text{ N}$$

$$= 5.3 + 6 \text{ N}$$

$$= \underline{11.3 \text{ N}}$$

$$d) \Sigma F_1 = m_1 a$$

$$= \frac{4 \times 8}{3}$$

$$= \frac{32}{3} \text{ N}$$

$$= \underline{10.6 \text{ N}}$$

5.

$$a) k = 3400 \text{ N/m}$$

$$F_s = kx$$

$$F_s = 3400 x$$

$$35 \times 9.81 = 3400 x$$

$$x = \frac{35 \times 9.81}{3400}$$

$$= 0.101 \text{ m}$$

Spring compresses by 0.101 m

b)

$$F_s = kx$$

$$a = 9.81 + 1.9 = 11.71 \text{ m/s}^2$$

$$F_s = m \cdot g = 35 \times 11.71$$

$$x = \frac{35 \times 11.71}{3400} = \frac{409.85}{3400} = 0.121 \text{ m}$$

Spring compresses by 0.121 m

$$6. \quad 15 = (2+3) a$$

$$a = 3 \text{ m/s}^2$$

$$F_{21} = m_2 a$$

$$= 2 \times 3$$

$$= 6 \text{ N}$$

$$F_s = 6 \text{ N}$$

$$F_s = kx$$

$$x = \frac{6}{140}$$

$$= 0.043 \text{ m}$$

$\therefore$  Spring stretches by 0.043 m

