

(2005)

MC1. (B)

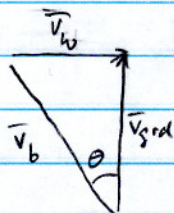
MC2. (C)

MC3. (A)

MC4. (D)

MC5. (D)

II. a)



$$v_b \sin \theta = v_w$$

$$\theta = \text{ArcSin} \frac{v_w}{v_b} = \text{ArcSin} \frac{4 \text{ km/h}}{5 \text{ km/h}} = 53.1^\circ$$

$$b) \quad t = \frac{x}{v_{\text{gnd}}} = \frac{0.76 \text{ km}}{5 \text{ km/h} \cdot \cos 53.1^\circ} = 0.75 \text{ hr} = 15.2 \text{ min.}$$

$$c) \quad t = \frac{x}{v_b} = \frac{0.76 \text{ km}}{5 \text{ km/h}} = 0.152 \text{ hr} = 9.12 \text{ min.}$$

$$d) \quad x = v_w \cdot t = 4 \text{ km/h} \cdot 0.152 \text{ hrs} = 608 \text{ m}$$

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III: a) $y = y_0 + v_{0y}t - \frac{1}{2}gt^2$

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$$\frac{1}{2}gt^2 - v_{0y}t + (y - y_0) = 0$$

$$t = \frac{v_{0y} \pm \sqrt{v_{0y}^2 - 4 \cdot \frac{1}{2}g(y - y_0)}}{g} = \frac{60 \text{ m/s} \cdot \sin 60^\circ \pm \sqrt{(60 \text{ m/s} \cdot \sin 60^\circ)^2 + 2 \cdot 9.81 \text{ m/s}^2 \cdot 200 \text{ m}}}{9.81 \text{ m/s}^2}$$

$$t = \underline{13.6 \text{ s}} \quad (6)$$

(4)

b) $R = v_{0x} \cdot t = 60 \text{ m/s} \cdot \cos 60^\circ \cdot 13.6 \text{ s} = \underline{408 \text{ m}}$

IV: a) $a = \frac{m_2 - m_1}{m_1 + m_2} g$ $T = \frac{2m_1 m_2}{m_1 + m_2} g$

$$a = \frac{6 \text{ m} - 4 \text{ m}}{10 \text{ m}} g = \frac{2}{10} g = 1.96 \text{ m/s}^2$$

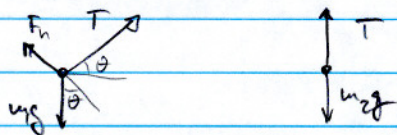
b) $T = \frac{2 \cdot 4 \text{ m} \cdot 6 \text{ m}}{10 \text{ m}} g = \frac{48}{10} \text{ mg} = 0.471 \text{ m/s}^2$

c) $m_1 = 0$: $T = 0$; $a = g$

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a)



$$b) c) \quad T - m_1 g \sin \theta = m_1 a$$

$$m_2 g - T = m_2 a$$

$$T = m_2 (g - a)$$

$$m_2 (g - a) - m_1 g \sin \theta = m_1 a$$

$$a(m_1 + m_2) = (m_2 - m_1 \sin \theta)g$$

$$a = \frac{m_2 - m_1 \sin \theta}{m_1 + m_2} g = \underline{-1.71 \text{ m/s}^2} \quad (\text{down the ramp})$$

$$T = m_2 (g - a) = \underline{0.864 \text{ N}}$$

$$d) \quad x = \frac{1}{2} a t^2$$

$$t = \sqrt{\frac{2x}{a}} = \sqrt{\frac{2 \cdot 1.0 \text{ m}}{1.71 \text{ m/s}^2}} = \underline{1.083 \text{ s}}$$