1) a. Jarak: $|luas| = \frac{1}{2} \cdot 2 \cdot 30 + \frac{30+40}{2} \cdot 2 + 3 \cdot 40 + \frac{1}{2} \cdot 2 \cdot 40 + \frac{5+6}{2} \cdot 20$

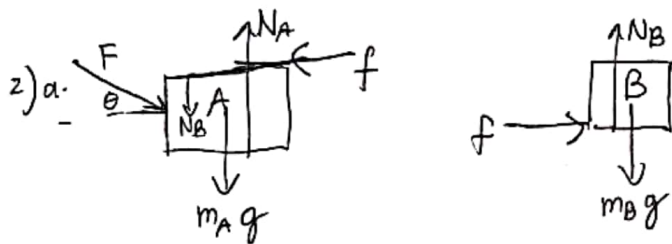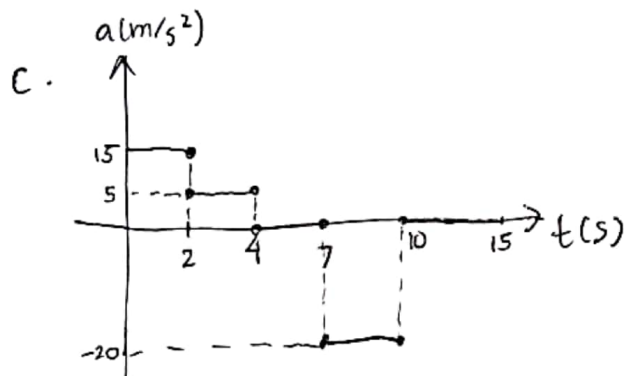$$= 30 + 70 + 120 + 40 + 110$$

$$= 370 \ m$$

Perpindahan : luas $= \frac{1}{2} \cdot 2 \cdot 30 + \frac{30+40}{2} \cdot 2 + 3 \cdot 40 + \frac{1}{2} \cdot 2 \cdot 40 - \frac{5+6}{2} \cdot 20$

$$= 30 + 70 + 120 + 40 - 110$$

$$= 150 \ m$$

b. Kecepatan rata-rata $=$ Jarak/waktu $= 370/15 = 24,67 \ m/s$

Kelajuan rata-rata $=$ perpindahan/waktu $= 150/15 = 10 \ m/s$

c.

2) a.

b. $f_{s,max} = \mu_s \, m_B g = 0,2 \cdot 1 \cdot 10 = 2 \ N$

$\Rightarrow f_{s,max} = m_B \, a$

$2 = 1 \cdot a$

$a = 2 \ m/s^2$

$\Rightarrow F \cos\theta - f_{s,max} = m_A \cdot a$

$F \cdot \frac{4}{5} - 2 = 2 \cdot 2 - 2$

$\frac{4}{5} F = 6$

$F = 7,5 \ Newton$

c. $\Sigma F = m a$

$F \cos\theta - f_{lantai} = (m_A + m_B) a$

$4 \cdot \frac{4}{5} - \mu_k (m_A + m_B) g = (m_A + m_B) a$

$\frac{16}{5} - 0,01 \cdot 3 \cdot 10 = 3a$

$\frac{16}{5} - 0,3 = 3a$

$\frac{14,5}{5} = 3a$

$3a = 2,9$

$a = \frac{29}{30} \ m/s^2$

$\Rightarrow f_{AB} = m_B a = \frac{29}{30} \ N$

3)a* $E_p = \frac{1}{2}kx^2 = \frac{1}{2}mv^2$ * $EK + E_p = EK_A + E_{P_A}$

$v^2 = \frac{k}{m}x^2$ $\frac{1}{2}mv^2 + 0 = EK_A + 2mgR$

$v = x\sqrt{\frac{k}{m}}$ $\frac{1}{2}kx^2 = EK_A + 2mgR$

$EK_A = \frac{1}{2}kx^2 - 2mgR$

b. $\cancel{EK_A = \frac{1}{2}kx^2 - 2mgR}$ $\Sigma F = ma$

$\cancel{\frac{1}{2}mv_A^2 = \frac{1}{2}kx^2 - 2mgR}$ $N + mg = m\frac{v_A^2}{R}$

$\cancel{v_A^2 = \frac{k}{m}x^2 - 4gR}$ $2mg + mg = \frac{mv_A^2}{R}$

$\cancel{v_A = \sqrt{\frac{k}{m}x^2 - 4gR}}$ $3mg = \frac{mv_A^2}{R}$

$v_A = \sqrt{3gR}$

c. $EK_A = \frac{1}{2}kx^2 - 2mgR$

$\frac{1}{2}mv_A^2 = \frac{1}{2}kx^2 - 2mgR$

$\frac{1}{2}m(3gR) = \frac{1}{2}kx^2 - 2mgR$

$\frac{1}{2}kx^2 = \frac{3}{2}mgR + 2mgR$

$\frac{1}{2}kx^2 = \frac{7}{2}mgR$

$x^2 = \frac{7mgR}{k}$

$x = \sqrt{\frac{7mgR}{k}}$

4) a. $m_1\vec{v_1} + m_2\vec{v_2} = m_1v_1' + m_2v_2'$

$600(13\uparrow) + 750(-20\uparrow) = (600+750)V'$

$7800\uparrow \cancel{\&} - 15000\uparrow = 1350 V'$

$\vec{v'} = \frac{52}{9}\uparrow - \frac{100}{9}\uparrow$ m/s

b. $\tan\theta = \frac{100}{52}$ $\Rightarrow \theta \approx 62,525°$

c. $E = \frac{1}{2}m_1|\vec{v'}|^2 + \frac{1}{2}m_2|\vec{v'}|^2 - \frac{1}{2}m_1|\vec{v_1}|^2 - \frac{1}{2}m_2|\vec{v_2}|^2$

$= \frac{1}{2}(600+750)\left[(\frac{52}{9})^2 + (\frac{100}{9})^2\right] - \frac{1}{2}\cdot600(13)^2 - \frac{1}{2}750\cdot(20)^2 \approx -94833$ Joule

5) a. $EK_1 + EP_1 = EK_2 + EP_1$

$\cancel{\tfrac{1}{2}mx}\,0 + mg(\sin 30°) = \tfrac{1}{2}mv^2 + \tfrac{1}{2}\cancel{m}\,I\omega^2$

$\tfrac{1}{2}mg = \tfrac{1}{2}mv^2 + \tfrac{1}{2}I\dfrac{v^2}{R^2}$

$mg = mv^2 + I\dfrac{v^2}{R^2}$

$8 \cdot 10 = 8v^2 + 0{,}03 \cdot \dfrac{v^2}{(0{,}15)^2}$

$80 = 8v^2 + \tfrac{4}{3}v^2$

$80 = \cancel{16}\,\tfrac{28}{3}v^2$

$v^2 = \dfrac{240}{28}$

$v \approx 2{,}93 \text{ m/s}$

b. $\dfrac{EK_{rot}}{EK_{translasi}} = \dfrac{\tfrac{1}{2}I\omega^2}{\tfrac{1}{2}mv^2} = \dfrac{I\omega^2}{mv^2} = \dfrac{I\,v^2}{mv^2R} = \dfrac{I}{mR} = \dfrac{0{,}03}{8 \cdot 0{,}15} = 0{,}025$

$\therefore 1 : 40$

c. $\cancel{\omega^2 = \dfrac{v^2}{R} = \dfrac{240}{28} = \dfrac{100}{8}}$

$\cancel{\dfrac{v^2}{R^2}}$

$\ast \Sigma F = ma$

$mg \sin 30° = ma$

$a = g \sin 30°$

$a = 10 \cdot \tfrac{1}{2}$

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

$\ast \omega_t^2 = \omega_0^2 + 2\alpha\theta$

$\omega_t^2 = 2\alpha\theta$

$\theta = \dfrac{\omega_t^2}{2\alpha} = \dfrac{v^2}{2R\alpha} = \dfrac{v^2}{\cancel{2R}2a} = \dfrac{240}{28} \cdot \dfrac{1}{10}$

$\theta = \dfrac{24}{28} \text{ radian} = \dfrac{6}{7} \text{ radian}$

$\Rightarrow \dfrac{3}{7\pi} \approx 0{,}14 \text{ putaran}$

turun sejauh $\sin 30° = \tfrac{1}{2}$ meter