

$$11 \quad |\vec{v}| = \sqrt{12^2 + 9^2} = 15 \text{ m/s}$$

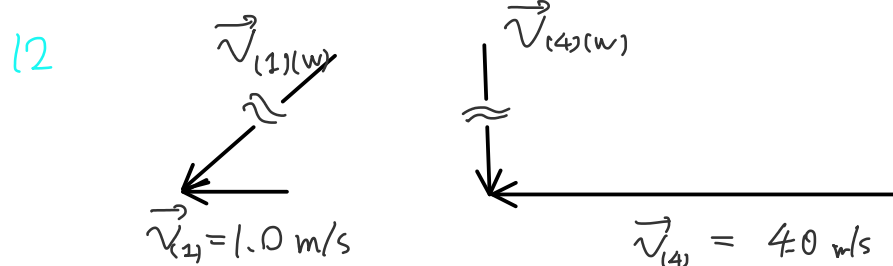
$$\tan \theta = 9/12 = 3/4 = 0.75$$

$$\vec{v} = (30 \cos 30^\circ, 30 \sin 30^\circ)$$

$$= (30 \cdot \frac{\sqrt{3}}{2}, 30 \cdot \frac{1}{2})$$

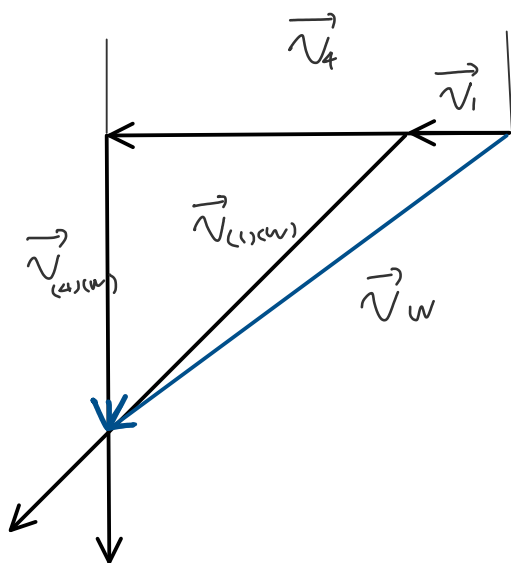
$$= (25.9 \dots, 15)$$

$$\approx (26, 15) \text{ [m/s]}$$



$$\begin{cases} \vec{v}_{(u)(w)} = \vec{v}_w - \vec{v}_{(u)} \\ \vec{v}_{(u)(w)} = \vec{v}_w - \vec{v}_{(u)} \end{cases}$$

$$\begin{cases} \vec{v}_w = \vec{v}_{(u)(w)} + \vec{v}_{(u)} \\ \vec{v}_w = \vec{v}_{(u)(w)} + \vec{v}_{(u)} \end{cases}$$



$$|\vec{v}_w| = \sqrt{4^2 + 3^2} = 5.0 \text{ m/s}$$

$$13 \quad (1) \quad a = \Delta v / \Delta t$$

$$\Delta t = \Delta v / a$$

$$= (v - u) / a \quad s$$

$$(2) \quad x = v_0 t + \frac{1}{2} a t^2$$

$$= u \cdot \frac{v-u}{a} + \frac{1}{2} \cdot \frac{v-u}{a} \cdot \frac{v-u}{a}$$

$$= \frac{1}{2a} \{ 2u(v-u) + (v-u)^2 \}$$

$$= \frac{1}{2a} \{ 2uv - 2u^2 + v^2 - 2uv + u^2 \}$$

$$= \frac{1}{2a} (v^2 - u^2) \text{ m}$$

$$(3) \quad \begin{cases} \frac{1}{2} \left\{ \frac{1}{2a} (v^2 - u^2) \right\} = v_0 t + \frac{1}{2} a t^2 \\ \quad \quad \quad = ut + \frac{1}{2} a t^2 \quad \dots \textcircled{1} \\ v' = v_0 + at = u + at \Leftrightarrow t = \frac{v' - u}{a} \quad \dots \textcircled{2} \end{cases}$$

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$$\frac{1}{4a} (v^2 - u^2) = u \cdot \frac{v' - u}{a} + \frac{1}{2} \cdot \frac{v' - u}{a} \cdot \frac{v' - u}{a}$$

$$= \frac{1}{2a} \{ 2u(v' - u) + (v' - u)^2 \}$$

$$= \frac{1}{2a} \{ 2uv' - 2u^2 + v'^2 - 2uv' + u^2 \}$$

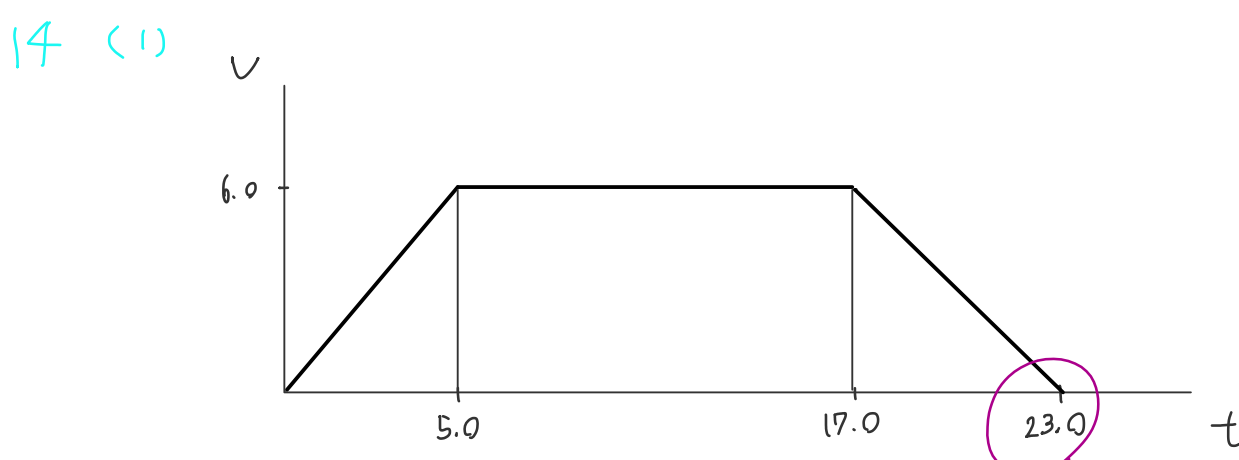
$$= \frac{1}{2a} (v'^2 - u^2)$$

$$v^2 - u^2 = 2(v'^2 - u^2)$$

$$2v'^2 = v^2 - u^2 + 2u^2 = v^2 + u^2$$

$$v'^2 = \frac{u^2 + v^2}{2}$$

$$v' = \sqrt{\frac{u^2 + v^2}{2}} \text{ m/s}$$



$$(2) \quad a = 6.0 / 5.0 = 1.2 \text{ m/s}^2$$

$$b = -6.0 / 6.0 = -1.0 \text{ m/s}^2 \quad (|b| = 1.0 \text{ m/s}^2)$$

$$(3) \quad x = \frac{1}{2} \cdot 5 \cdot 6^3 + 12 \cdot 6 + \frac{1}{2} \cdot 6 \cdot 6$$

$$= 15 + 72 + 18 = 105$$

$$\approx 1.1 \cdot 10^2 \text{ m}$$

$$15 \quad (1) \quad A \text{ の速度} = B \text{ の速度} =: v$$

$$A: v = v_0 + at = at$$

$$100 = v_0 t + \frac{1}{2} a t^2 = \frac{1}{2} a t^2$$

$$\Leftrightarrow \frac{200}{a} = t^2 \Leftrightarrow t = \sqrt{\frac{200}{a}} = 10 \sqrt{\frac{2}{a}}$$

$$B: v = 10$$

$$\Rightarrow 10 = a \cdot 10 \sqrt{\frac{2}{a}}$$

$$1 = \sqrt{2a}$$

$$1 = 2a$$

$$a = \frac{1}{2} = 0.50 \text{ m/s}^2$$

$$(2) \quad x < x'.$$

$$A: x = v_0 t + \frac{1}{2} a t^2 = 0 + \frac{1}{2} \cdot \frac{1}{2} t^2 = \frac{1}{4} t^2$$

$$B: x = v_0 t + \frac{1}{2} a t^2 = 10t + 0 = 10t$$

$$\Leftrightarrow t = \frac{x}{10}$$

$$\Rightarrow \frac{1}{4} = \frac{1}{4} \cdot \frac{x}{10} \cdot \frac{x}{10}$$

$$400 = x$$

$$x = 40 \cdot 10^3 \text{ m}$$

$$(3) \quad (2) \text{ より } t = 400 / 10 = 40 \text{ s}$$

$$A: v = v_0 + at = 0 + \frac{1}{2} \cdot 40 = 20 \text{ m/s}$$

$$B: v = v_0 + at = 10 + 0 = 10 \text{ m/s}$$

$$v_{AB} = v_B - v_A = 10 - 20 = -10 \text{ m/s}$$

$$= 10 \text{ m/s} \quad (\text{進行方向と反対向き})$$