Contents

1 Book

1.1 3.38

$$\begin{aligned}
\Delta x_{\mathrm{B,A}} &= 1500\,\mathrm{m} = 1.5\,\mathrm{km} \\
v_{\frac{b}{w}} &= 4.00\,\mathrm{km\,h^{-1}} \\
v_{\frac{p}{w}} &= 4.00\,\mathrm{km\,h^{-1}} \\
a &= 0 \\
v_w &= 2.80\,\mathrm{km\,h^{-1}}
\end{aligned}$$

$$\begin{aligned}
\Delta x &= v_f t_{b_0} - \frac{1}{2} a t_{b_0}^2 \\
1.5\,\mathrm{km} &= (4.00\,\mathrm{km\,h^{-1}} + 2.80\,\mathrm{km\,h^{-1}})t - \frac{1}{2}(0)t^2 \\
t_{b_0} &= 0.221\,\mathrm{h}
\end{aligned}$$

$$\begin{aligned}
\Delta x &= v_f t_{b_1} - \frac{1}{2} a t_{b_1}^2 \\
1.5\,\mathrm{km} &= (4.00\,\mathrm{km\,h^{-1}} - 2.80\,\mathrm{km\,h^{-1}})t - \frac{1}{2}(0)t^2 \\
t_{b_1} &= 1.25\,\mathrm{h}
\end{aligned}$$

$$\begin{aligned}
t_b &= 0.221\,\mathrm{h} + 1.25\,\mathrm{h} \\
t_b &= 1.471\,\mathrm{h}
\end{aligned}$$

$$\begin{aligned}
2\Delta x &= v_f t_{p_1} - \frac{1}{2} a t_{p_1}^2 \\
2(1.5\,\mathrm{km}) &= (4.00\,\mathrm{km\,h^{-1}})t_{p_1} - \frac{1}{2}(0)t_{p_1}^2 \\
t_p &= 0.75\,\mathrm{h}
\end{aligned}$$

$$\boxed{t_b = 1.471\,\mathrm{h}, t_p = 0.75\,\mathrm{h}}$$

1.2 3.41

$$\begin{aligned}
\Delta x_r &= 500\,\mathrm{m} \\
v_{w/e} &= 0\hat{x} + 2.0\,\mathrm{m\,s^{-1}}\hat{y} \\
v_{b/r} &= 4.2\,\mathrm{m\,s^{-1}}\hat{x} + 0\hat{y} \\
v_{b/e} &= 4.2\,\mathrm{m\,s^{-1}}\hat{x} + 2.0\,\mathrm{m\,s^{-1}}\hat{y}
\end{aligned}$$

(a)

$$\begin{aligned}
v_{b/e} &= \sqrt{(v_{r_x} + v_{b_x})^2 + (v_{r_y} + v_{b_y})^2} \\
&= \sqrt{(0 + 4.2\,\mathrm{m\,s^{-1}})^2 + (2.0\,\mathrm{m\,s^{-1}} + 0)^2} \\
v_{b/e} &= 4.652\,\mathrm{m\,s^{-1}}
\end{aligned}$$

$$\begin{aligned}
\tan(\theta) &= \frac{v_{b/e_y}}{v_{b/e_x}} \\
\theta &= \arctan\left(\frac{v_{b/e_y}}{v_{b/e_x}}\right) \\
\theta &= \arctan\left(\frac{2.0\,\mathrm{m\,s^{-1}}}{4.2\,\mathrm{m\,s^{-1}}}\right) \\
\theta &= 25.46^\circ
\end{aligned}$$

$$\boxed{v_{b/e} = 4.652\,\mathrm{m\,s^{-1}}, \theta = 25.46^\circ\,\mathrm{S\,of\,E}}$$

(b)

$$\begin{aligned}
\Delta x_r &= v_{b/e_x} t - \frac{1}{2} a t^2 \\
500\,\mathrm{m} &= (4.2\,\mathrm{m\,s^{-1}})t - \frac{1}{2}(0)t^2 \\
t &= 119.0\,\mathrm{s}
\end{aligned}$$

$$\boxed{t = 119.0\,\mathrm{s}}$$

(c)

$$y_0 = 0$$

$$\begin{aligned}
\Delta y &= v_{b/e_y} t - \frac{1}{2} a t^2 \\
y_1 - 0 &= (2.0\,\mathrm{m\,s^{-1}})(119.0\,\mathrm{s}) - \frac{1}{2}(0)(119.0\,\mathrm{s}) \\
y_1 &= 238.0\,\mathrm{m}
\end{aligned}$$

$$\boxed{\Delta y = 238.0\,\mathrm{m}}$$

1.3 3.42

(a)

$$\begin{aligned}
\sin(\theta) &= \frac{v_{w/e}}{v_{b/w}} \\
\theta &= \arcsin\left(\frac{v_{w/e}}{v_{b/w}}\right) \\
\theta &= \arcsin\left(\frac{2.0\,\mathrm{m\,s^{-1}}}{4.2\,\mathrm{m\,s^{-1}}}\right) \\
\theta &= 28.44^\circ
\end{aligned}$$

$$\boxed{\theta = 28.44^\circ}$$

(b)

$$\begin{aligned}
v_{b/e} &= \sqrt{(v_{b/w_x} + v_{w/e_x})^2 + (v_{b/w_y} + v_{w/e_y})^2} \\
v_{b/e} &= \sqrt{((4.2\,\mathrm{m\,s^{-1}})\cos(28.44^\circ) + 0)^2 + ((4.2\,\mathrm{m\,s^{-1}})\sin(28.44^\circ) + 2.0\,\mathrm{m\,s^{-1}})^2} \\
v_{b/e} &= 3.693\,\mathrm{m\,s^{-1}}
\end{aligned}$$

$$\boxed{v_{b/e} = 3.693\,\mathrm{m\,s^{-1}}}$$

(c)

$$\begin{aligned}
\Delta x_r &= v_{b/e}t - \frac{1}{2}at^2 \\
500\,\mathrm{m} &= (3.693\,\mathrm{m\,s^{-1}})t - \frac{1}{2}(0)t^2 \\
t &= 135.4\,\mathrm{s}
\end{aligned}$$

$$\boxed{t = 135.4\,\mathrm{s}}$$

1.4 3.43