1. (b) acceleration is nonzero, but its velocity is zero.
2. (e) A and B reach the ground at the same time; and they have the same velocity in the vertical direction.
3. (d) 70 m
4. (b) B
5. (e) $4h$, $2t$
6. (a) $\vec{\mathbf{B}}$ and $\vec{\mathbf{C}}$ have equal magnitudes and point in the same direction.
7. (e) 0.8 m/s^2
8. (e) 0.2 m/s^2
9. (d) 60 m
10. Vector equation:

$$\vec{v}_{bs} = \vec{v}_{bw} + \vec{v}_{ws}$$

Components: Say the river flows east

	x(E)	y(N)
$\vec{v}_{bw}$	0.0 m/s	+5.0 m/s
$\vec{v}_{ws}$	+3.0 m/s	0 m/s
$\vec{v}_{bs}$	+3.0 m/s	+5.0 m/s

(a)
Magnitude:

$$v_{bs} = \sqrt{(3.0\ m/s)^2 + (5.0\ m/s)^2} = 5.83\ m/s$$

Angle:

$$\theta = \tan^{-1}(\frac{5.0}{3.0}) = 59^\circ \text{ North of East}$$

(b)
distance:

$$y = v_{bw}t$$
$$540\ m = (5.0\ m/s)t$$
$$t = \frac{540\ m}{5.0\ m/s} = 108\ s$$
$$d = vt = (5.83\ m/s)(108\ s) = 630\ m$$

11. (a) At $t = 2.5\ s$, we know $y = -10.0\ m$, and so we can find v_{0y}

$$y = v_{0y}t - \frac{1}{2}gt^2$$
$$v_{0y} = \frac{y + \frac{1}{2}gt^2}{t} = \frac{-10.0\ m + 4.9\ m/s^2(2.5\ s)^2}{2.5\ s} = +8.25\ m/s$$

The speed is given by

$$v_0 = \frac{v_{0y}}{\sin 35^\circ} = \frac{+8.25\ m/s}{\sin 35^\circ} = 14.4\ m/s$$

(b) At maximum height, $v_y = 0$

$$v_y^2 = v_{0y}^2 - 2gy$$

$$y = \frac{v_y^2 - v_{0y}^2}{2g} = \frac{v_{0y}^2}{2g} = \frac{(8.25\ m/s)^2}{2(9.8\ m/s^2)} = 3.5\ m$$

It rises 3.5 m above the launch point, which is 13.5 m above the level plain.

(c)

$$x = v_{0x}t = (v_0 \cos 35^\circ)t$$

$$x = (14.4\ m/s \cos 35^\circ)(2.5\ s) = 29.5\ m$$