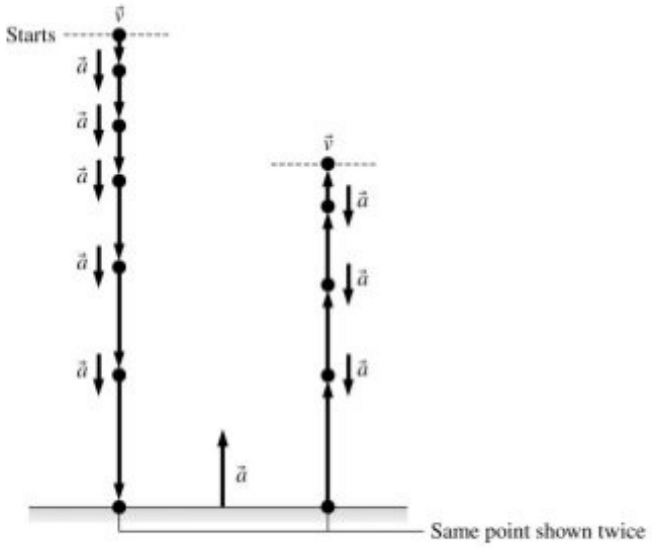
Chap 1

1.16. Model: Represent the tennis ball as a particle.

Visualize: The ball falls freely for three stories. Upon impact, it quickly decelerates to zero velocity while compressing, then accelerates rapidly while re-expanding. As vectors, both the deceleration and acceleration are an upward vector. The downward and upward motions of the ball are shown separately in the figure. The increasing length between the dots during downward motion indicates an increasing average velocity or downward acceleration. On the other hand, the decreasing length between the dots during upward motion indicates acceleration in a direction opposite to the motion, so the average velocity decreases.



Assess: For free-fall motion, acceleration due to gravity is always vertically downward. Notice that the acceleration due to the ground is quite large (although not to scale—that would take too much space) because in a time interval much shorter than the time interval between the points, the velocity of the ball is essentially completely reversed.

1.18. Solve:

(a)

Dot	Time (s)	x (m)
1	0	0
2	2	30
3	4	95
4	6	215
5	8	400
6	10	510
7	12	600
8	14	670
9	16	720

(b)