13. We use the constant-acceleration equations of Table 2-1 (with $+y$ downward and the origin at the release point), Eq. 9-5 for y_{com} and Eq. 9-17 for $\vec{v}_{\text{com}}$.

(a) The location of the first stone (of mass m_1) at $t = 300\times10^{-3}\,\text{s}$ is $y_1 = (1/2)gt^2 = (1/2)(9.8)\left(300 \times 10^{-3}\right)^2 = 0.44\,\text{m}$, and the location of the second stone (of mass $m_2 = 2m_1$) at $t = 300 \times 10^{-3}\,\text{s}$ is $y_2 = (1/2)gt^2 = (1/2)(9.8)(300 \times 10^{-3} - 100 \times 10^{-3})^2 = 0.20\,\text{m}$. Thus, the center of mass is at

$$y_{\text{com}} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2} = \frac{m_1(0.44\,\text{m}) + 2m_1(0.20\,\text{m})}{m_1 + 2m_2} = 0.28 \text{ m} .$$

(b) The speed of the first stone at time t is $v_1 = gt$, while that of the second stone is $v_2 = g(t - 100 \times 10^{-3}\,\text{s})$. Thus, the center-of-mass speed at $t = 300 \times 10^{-3}\,\text{s}$ is

$$\begin{aligned} v_{\text{com}} &= \frac{m_1v_1 + m_2v_2}{m_1 + m_2} \\ &= \frac{m_1(9.8)\left(300 \times 10^{-3}\right) + 2m_1(9.8)\left(300 \times 10^{-3} - 100 \times 10^{-3}\right)}{m_1 + 2m_1} \\ &= 2.3 \text{ m/s} . \end{aligned}$$