71. Using Eq. 2-15 for both object j (the jelly jar) and object p (the peanut butter), with $y = 0$ designating the base of the building in both cases, we have

$$\begin{aligned} y_j &= 40t - \frac{1}{2}gt^2 \\ y_p - 50 &= 0 - \frac{1}{2}gt^2 \end{aligned}$$

with SI units understood. Thus, using Eq. 9-5, the center of mass of this system is at

$$y_{\text{com}} = \frac{1}{3.0 \text{ kg}}\left((1.0 \text{ kg})y_j + (2.0 \text{ kg})y_p\right) = \frac{100}{3} + \frac{40}{3}t - \frac{1}{2}gt^2 \ .$$

(a) With $t = 3.0$ s, the above equation gives $y_{\text{com}} = 29$ m.

(b) We maximize y_{com} by working through the condition

$$\frac{dy_{\text{com}}}{dt} = 0 = \frac{40}{3} - gt \ .$$

Thus, we find $t = 1.4$ s, which produces $y_{\text{com}} = 42$ m as its highest value.