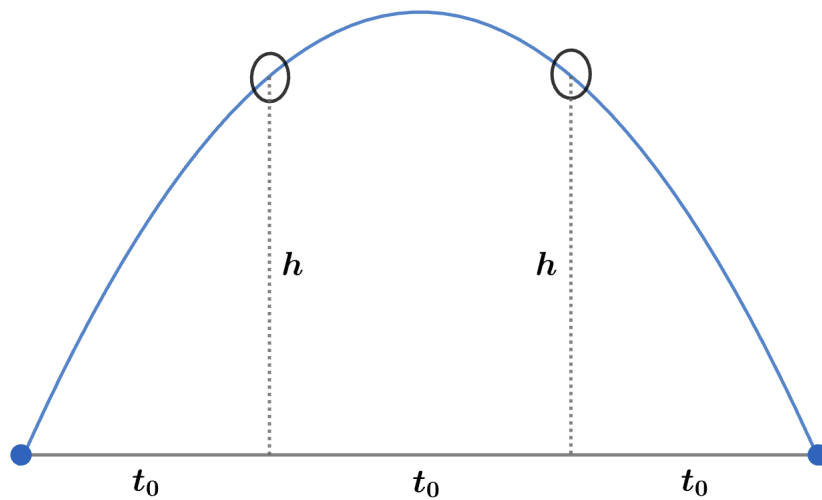


# 2024 F=ma Exam: Problem 1

Kevin S. Huang

Recall the total time of flight for a projectile is given by

$$T = \frac{2v_{0y}}{g}$$



Since the two hoops are at the same height  $h$ , it takes the same time  $t_0$  for the arrow to travel from the second hoop to the ground as it takes for the arrow to travel from the ground to the first hoop. Thus we have

$$T = 3t_0$$

so the particle has initial vertical velocity

$$v_{0y} = \frac{3gt_0}{2}$$

Using a kinematics equation,

$$h = v_{0y}t_0 - \frac{1}{2}gt_0^2 = gt_0^2 = (10 \text{ m/s}^2)(1 \text{ s})^2 = 10 \text{ m}$$

so the answer is B.