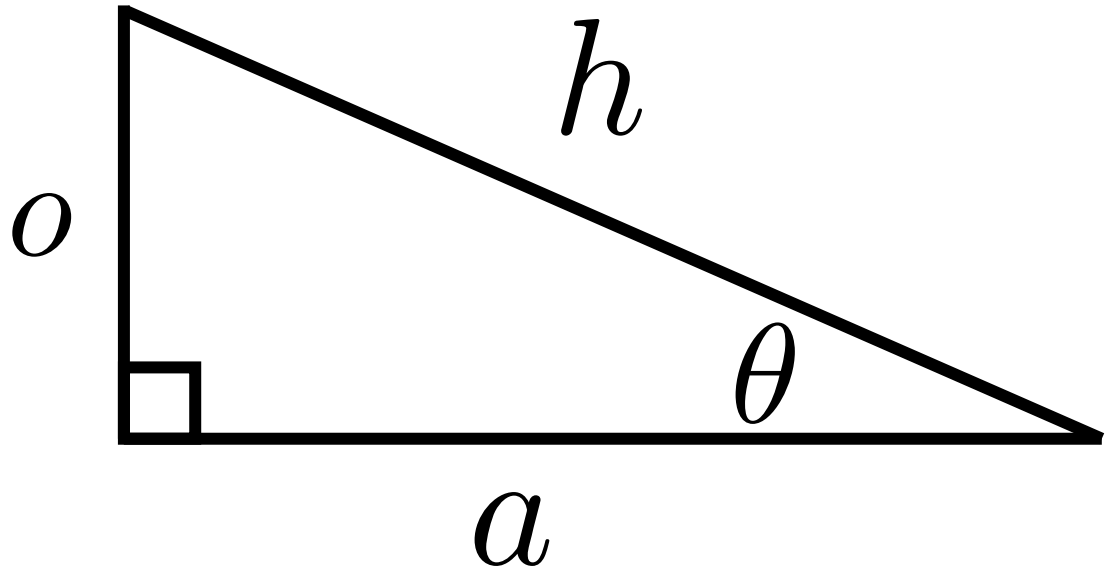
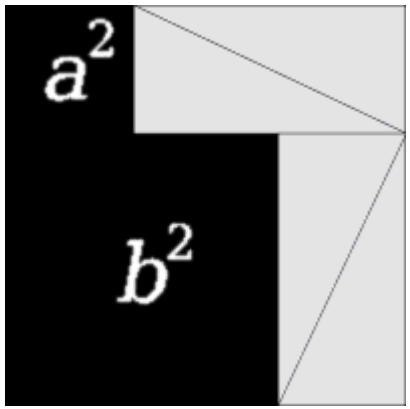
Trigonometry

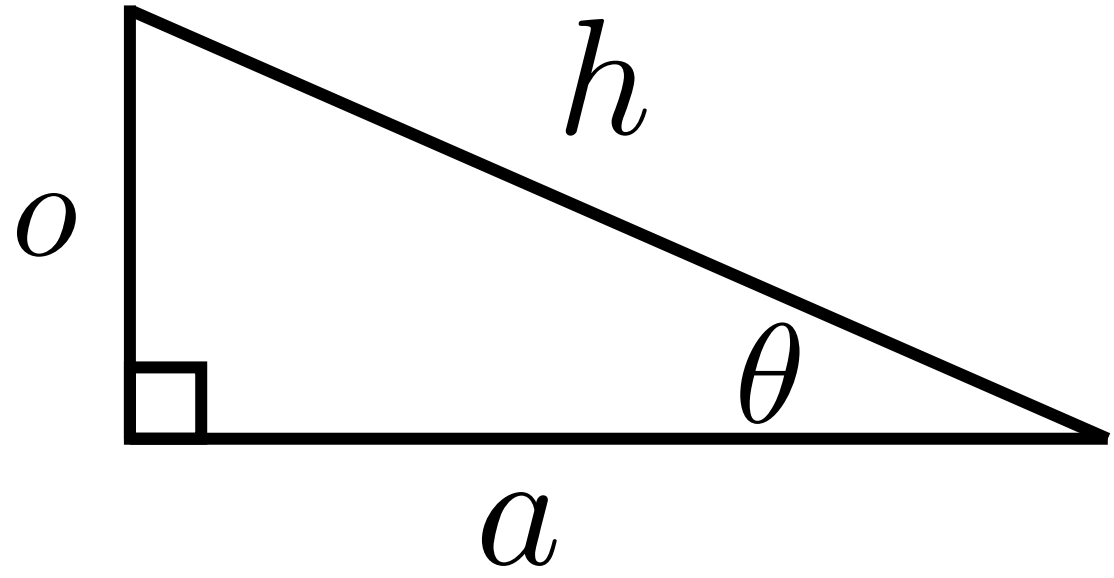




$$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} \qquad \tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} \qquad o^2 + a^2 = h^2$$

A trig. identity



$$\sin^2\theta + \cos^2\theta = ?$$

$$o^2 + a^2 = h^2$$

$$h^2\cos^2\theta + h^2\sin^2\theta = h^2$$

$$\sin^2\theta + \cos^2\theta = 1$$

$$o = h\sin\theta$$

$$a = h\cos\theta$$

Clicker question #16

I just barely was able to throw the ball onto the roof.
What is the velocity of the ball when it lands?

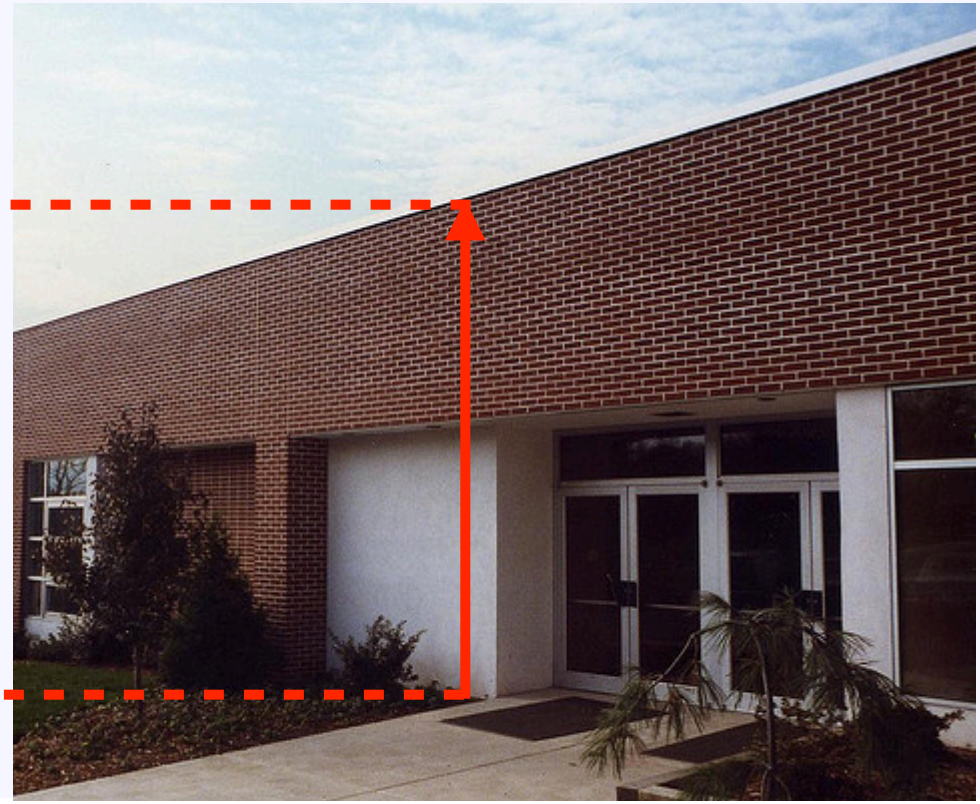
A $v \gg 0$

B $v \approx 0$

C $v \ll 0$

$x \approx 5$ m

v_0



Example: roof the ball

$$x = x_o + \frac{1}{2}(v + v_o)\,t \qquad v^2 = v_o^2 + 2a(x - x_o)$$

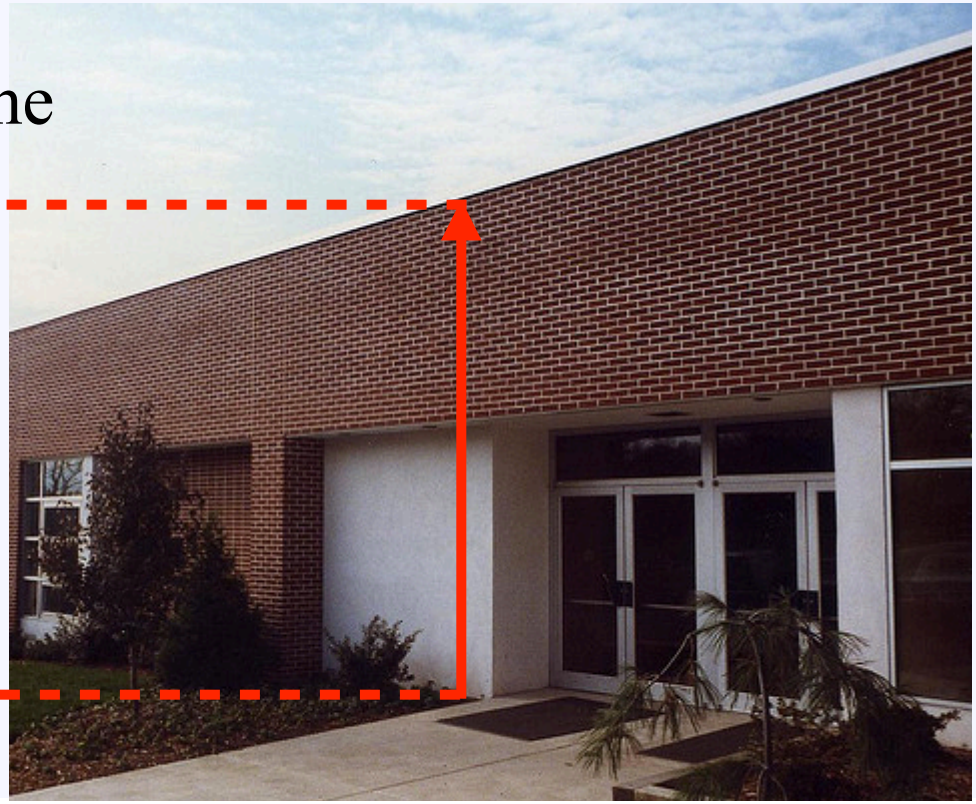
$$x = x_o + v_o t + \frac{1}{2}at^2 \qquad v = v_o + at$$

I just barely threw the ball onto the roof. About how much time did the ball take in flight?

$v \approx 0$

$x \approx 5$ m

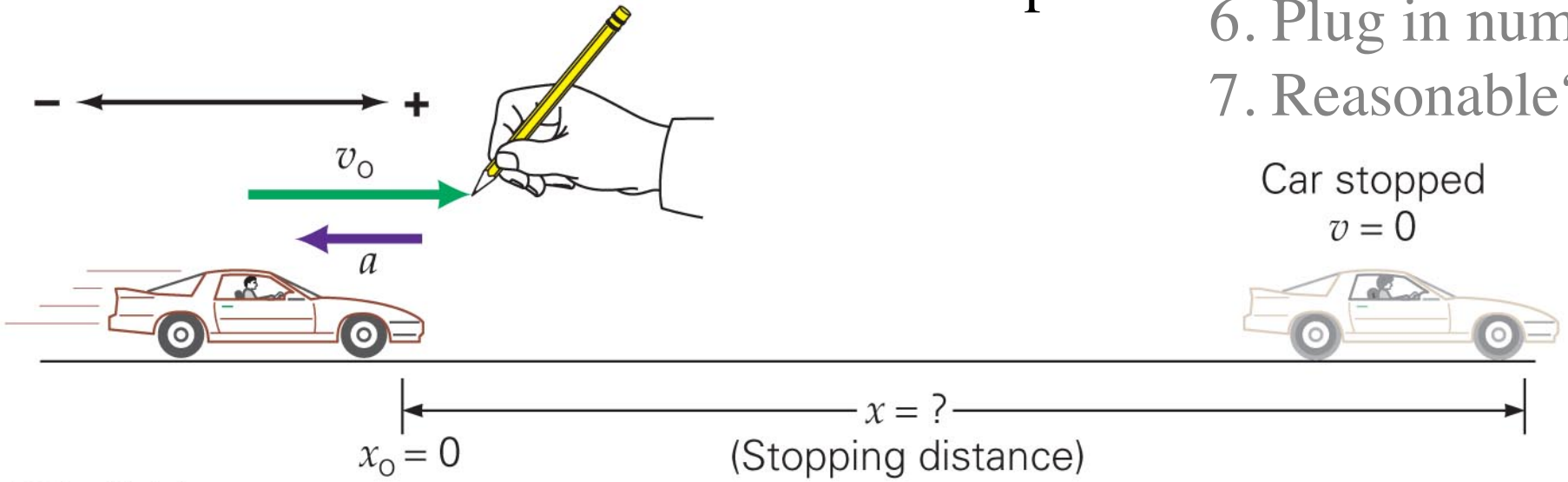
v_0



Stopping distance

1. Read the problem
2. Draw a sketch
3. Given? Goal?
4. Concept(s)/eqn(s)?
5. Solve equations
6. Plug in numbers
7. Reasonable?

A car traveling at 30 m/s (~67 mi/hr) brakes, decelerating by 10 m/s^2.
How far does the car move before it stops?



$$x = x_o + \frac{1}{2}(v + v_o)\,t \qquad v^2 = v_o^2 + 2a(x - x_o) \qquad \bar{v} = \frac{\Delta x}{\Delta t}$$

$$x = x_o + v_o t + \frac{1}{2}at^2 \qquad v = v_o + at \qquad \bar{a} = \frac{\Delta v}{\Delta t}$$

Clicker question #17

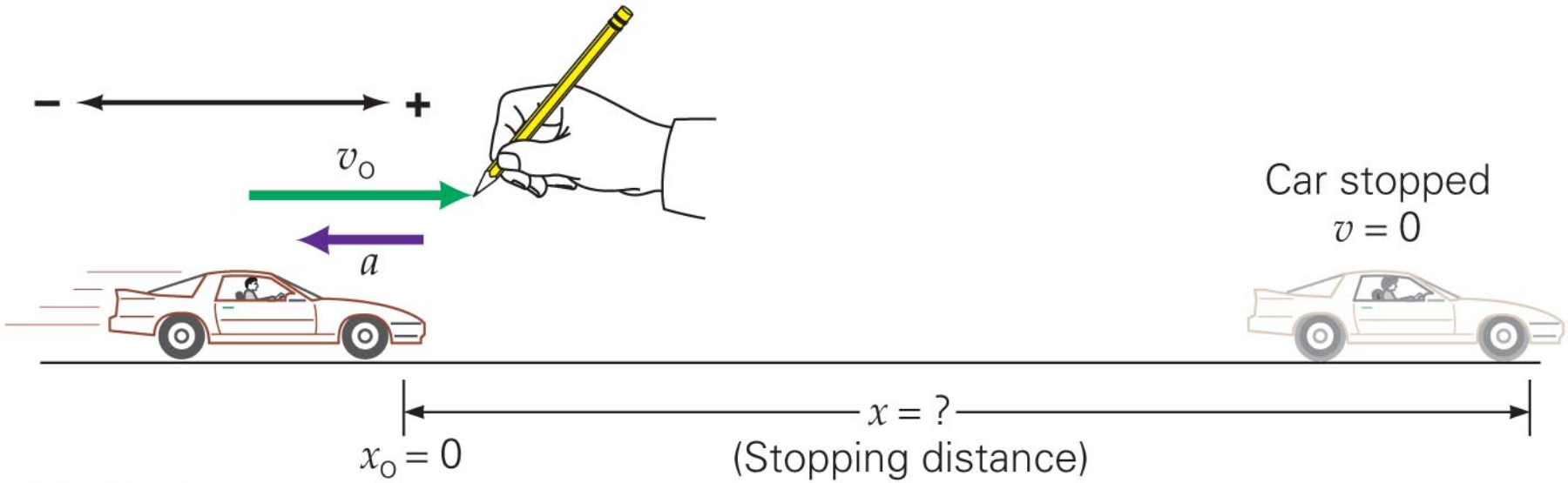
Which equation?

A $\bar{a} = \dfrac{\Delta v}{\Delta t}$

C $v = v_o + at$

B $x = x_o + v_o t + \dfrac{1}{2}at^2$

D $v^2 = v_o^2 + 2a(x - x_o)$



Stopping distance

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7. Reasonable?

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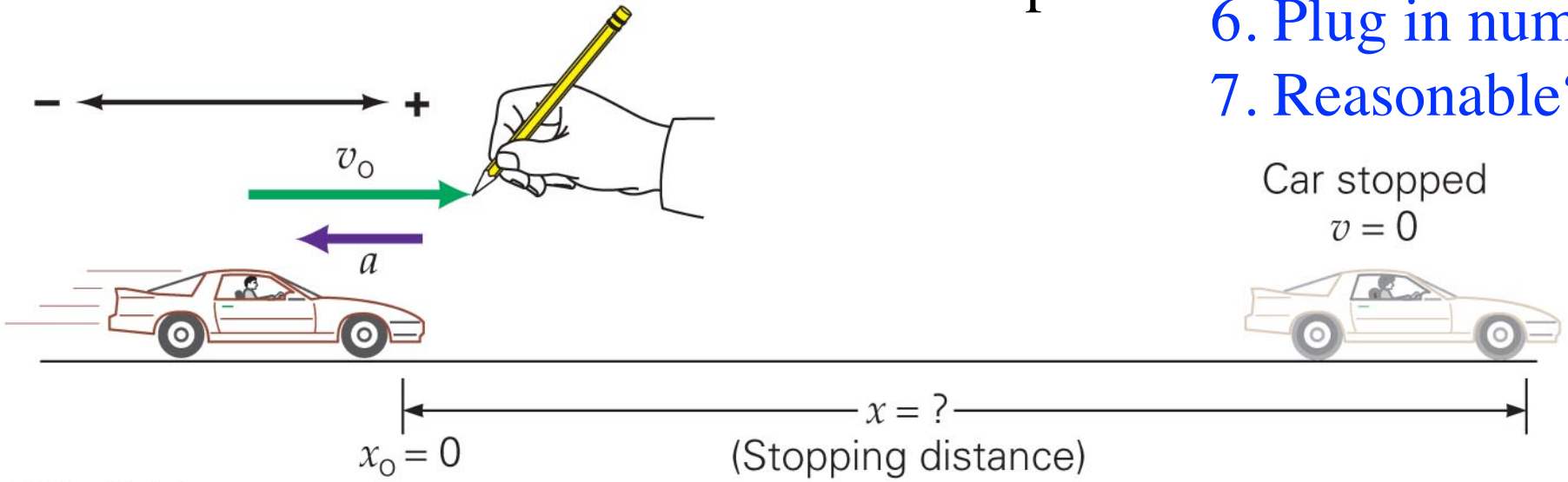


$$v^2 = v_o^2 + 2a(x - x_o)$$

Clicker question #18

A car traveling at 30 m/s (~65 mi/hr)
hits the brakes, decelerating by 10 m/s^2.
How far does the car move before it stops?

A 10 m

C 1.7 m

B 45 m

D Not enough information given to know

Clicker question #19

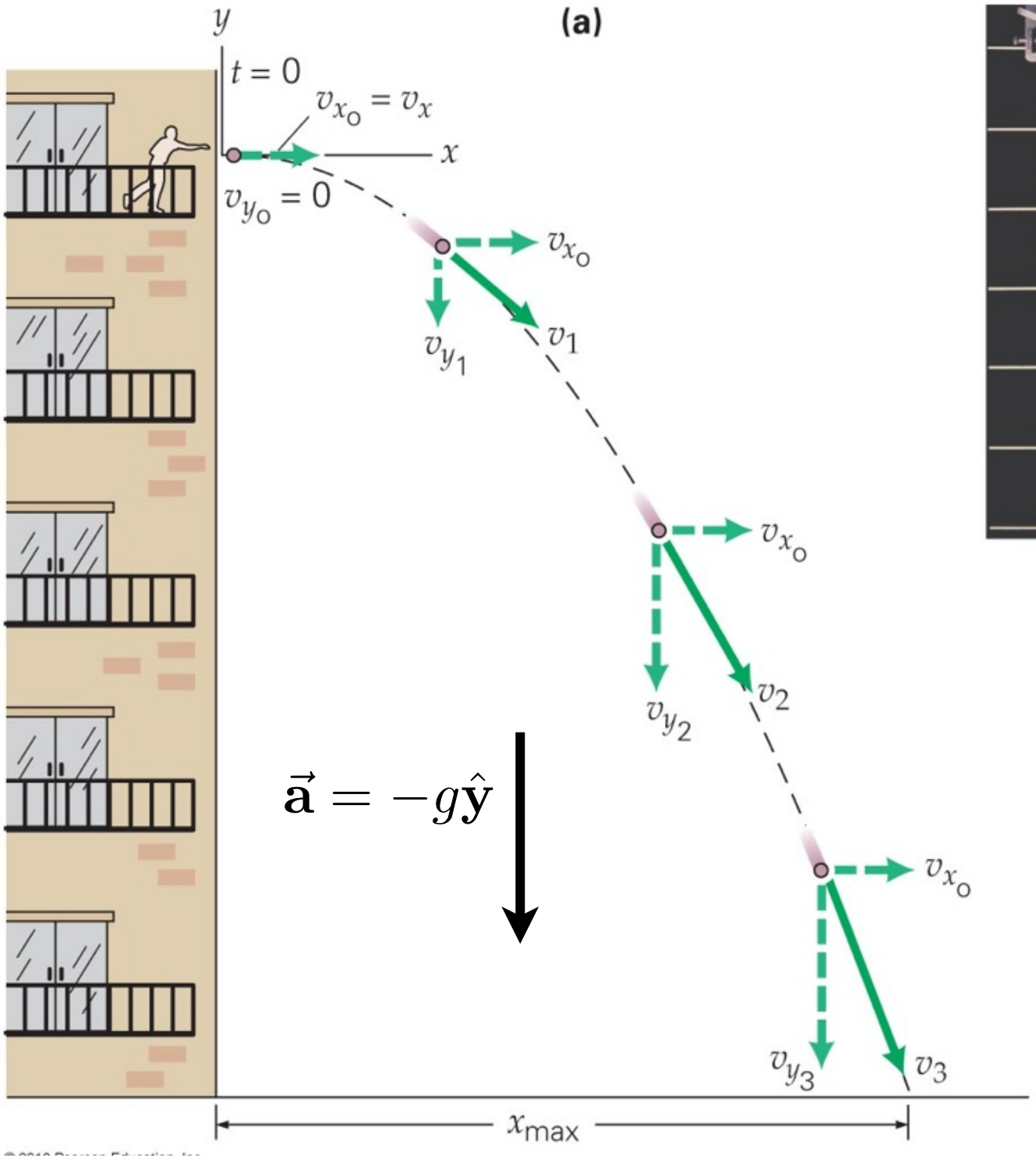
If a car needs 150 ft to stop when driving ~70 mi/hr, how much distance is needed to stop at ~140 mi/hr?

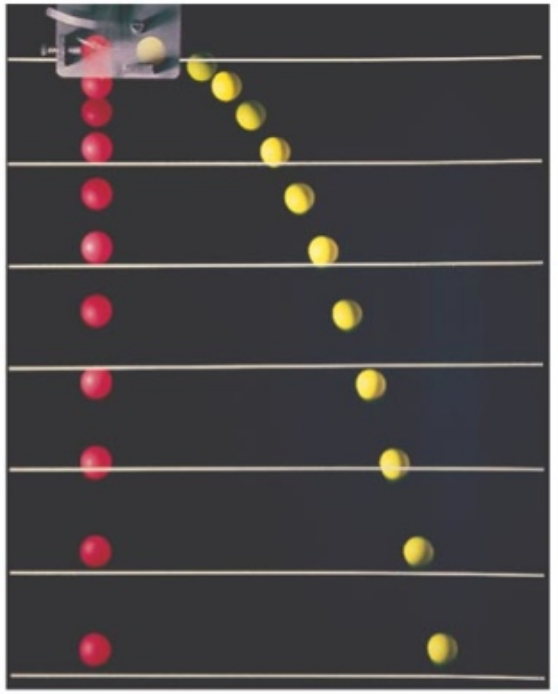
A 75 ft

C 150 ft

B 300 ft

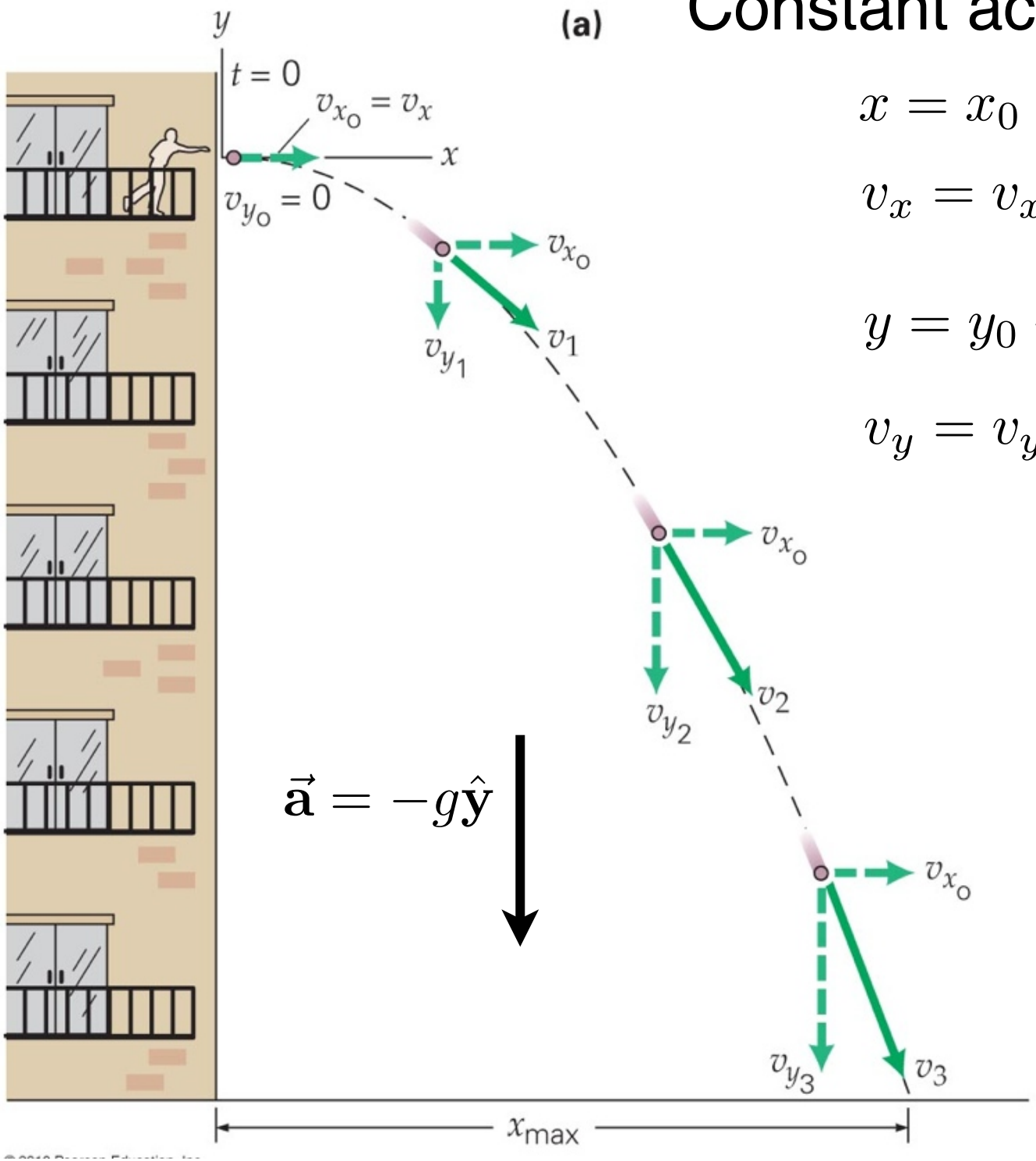
D 600 ft





(b)

Constant acceleration in 2D:



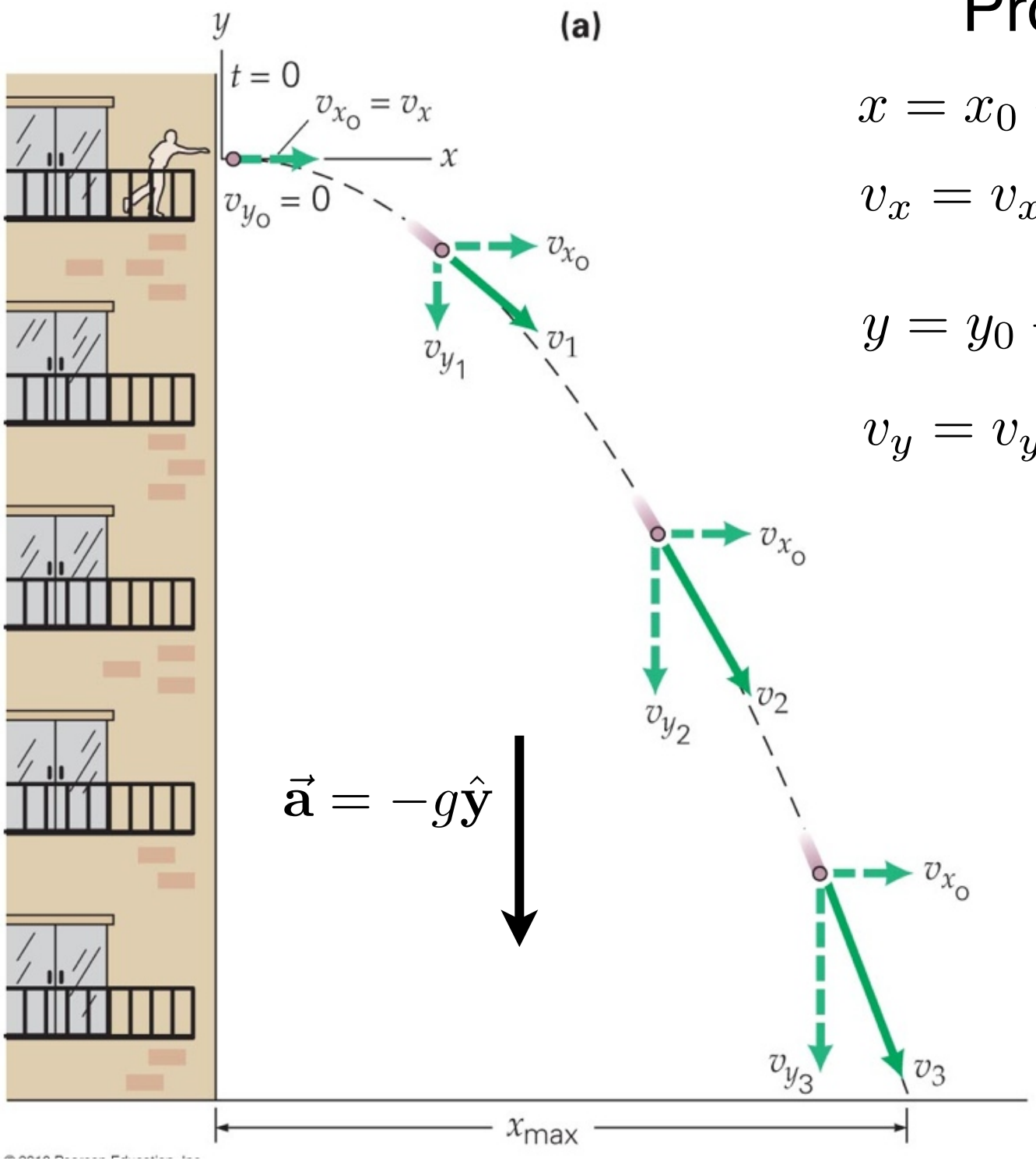
$$x = x_0 + v_{x0}t + \frac{1}{2}a_x t^2$$

$$v_x = v_{x0} + a_x t$$

$$y = y_0 + v_{y0}t + \frac{1}{2}a_y t^2$$

$$v_y = v_{y0} + a_y t$$

Projectile



$$x = x_0 + v_{x0}t$$

$$v_x = v_{x0}$$

$$y = y_0 + v_{y0}t - \frac{1}{2}gt^2$$

$$v_y = v_{y0} - gt$$

Clicker question #22

Question 3.4a Firing Balls I

A small cart is rolling at constant velocity on a flat track. It fires a ball straight up into the air as it moves. After it is fired, what happens to the ball?

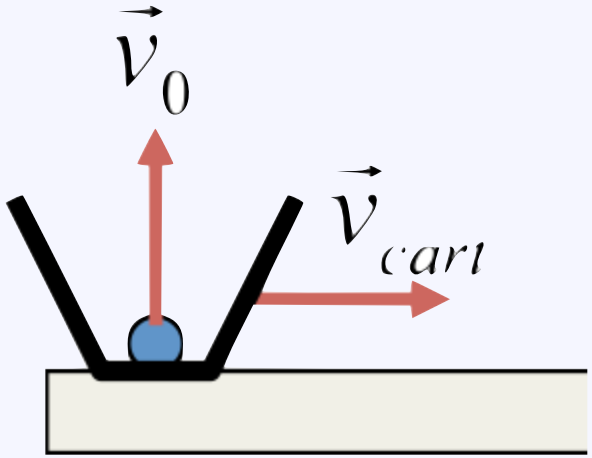
A. it depends on how fast the cart is moving

B. it falls behind the cart

C. it falls in front of the cart

D. it falls right back into the cart

E. it remains at rest



Class participation

0. Your name

1. Order from *largest* to *smallest* **magnitude**:

Arrange in a row: largest on left; for ties, stack vertically

$\vec{a}+\vec{d}$	$\vec{d}$	$\vec{a}+\vec{c}$	$\vec{f}+\vec{c}$	$\vec{a}+\vec{b}$	$\vec{a}+\vec{e}$