

C:(20 pts) Daredevil Stunt

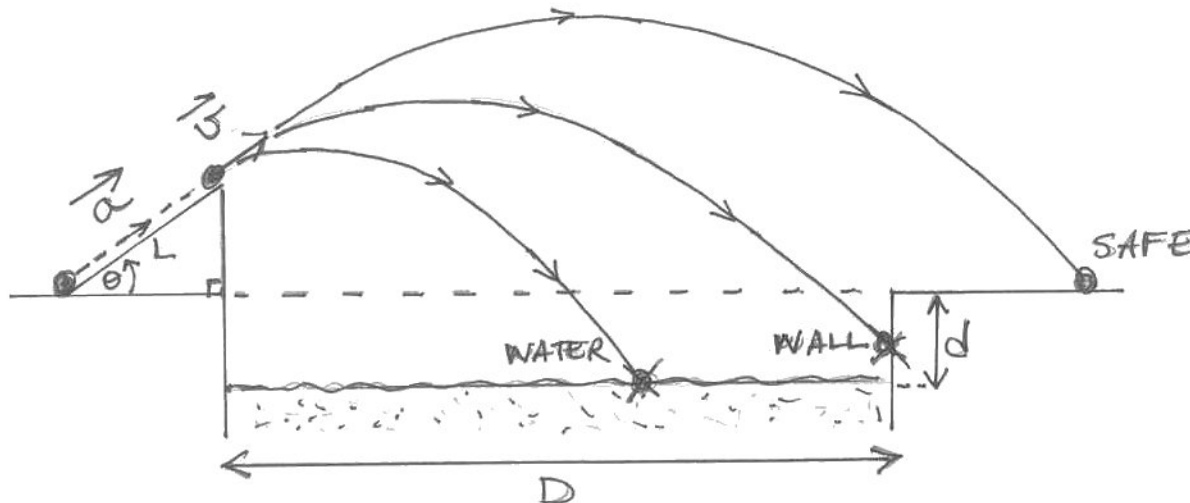
EK is preparing the following stunt. EK plans to fly in a rocket across a large water channel and safely land on the other side. The rocket will start from rest and accelerate up a ramp with length $L = 40m$, inclined at an angle $\theta = 30^\circ$ from the horizontal, with acceleration $a = 50m/s^2$. After leaving the ramp, the rocket will follow a free fall trajectory and land safely on the far side of the channel. That's the plan anyway... The channel has width $D = 400m$; the far side is level with the launch side; and the water is at a level of $d = 15m$ below the banks. What is the initial speed v of the rocket as it leaves the ramp? **Does EK make it safely to the other side?** I.e., does EK land safely on the far side, or crash directly into the water, or hit the wall below the far side. **Support your statement by appropriate calculations.** In the process, find the rocket's flight time T , i.e. the time elapsed from leaving the ramp to and hitting something.

•(6pts) $v =$ _____

•(10ts) Please circle one:

•(4pts) $T =$ _____

SAFE LANDING or HITS WATER or HITS WALL.



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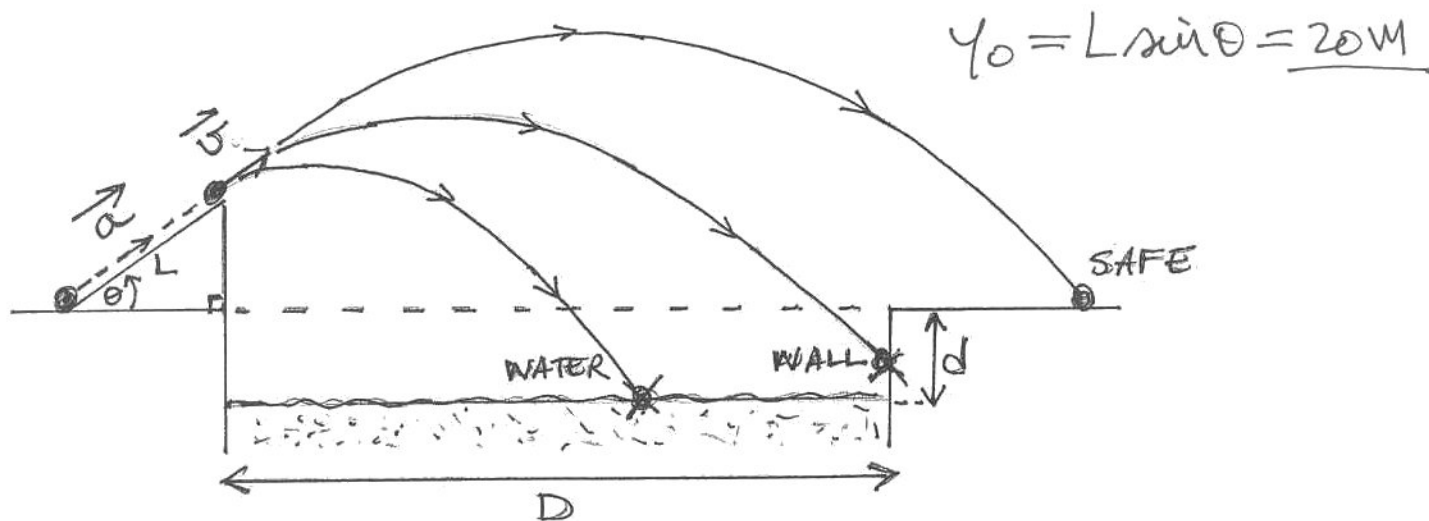
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•(6pts) $v = \underline{63.2 \frac{m}{s}}$

•(10ts) Please circle one:

•(4pts) $T = \underline{7.30 s}$

SAFE LANDING or HITS WATER or HITS WALL.



$$v^2 = 2aL \implies v = \sqrt{2aL} = \underline{63.2456 \frac{m}{s}} \approx \boxed{63.2 \frac{m}{s}}$$

◦ Flight time to reach $x=D$:

$$x = v_x t, \quad D = v \cos \theta \cdot T$$

$$T = \frac{D}{v \cos \theta} = \underline{7.30297 s} \approx \boxed{7.30 s}$$

◦ Where (vertical y) is rocket at this time?

$$y = y_0 + v \sin \theta \cdot T - \frac{1}{2} g T^2 = \underline{-10.3930 m}$$

$0 < y < d \implies$ Hits wall