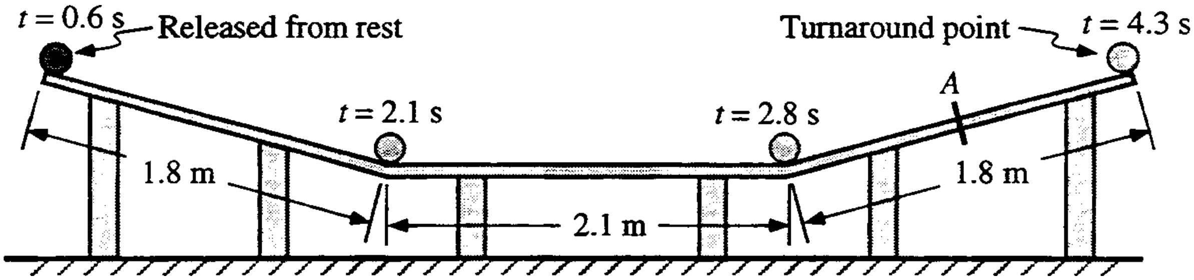
Test 1 Solution: Problem 4 (16 points)



A. Determine the speed of the ball at t = 2.1 s. Show your work.

$s = \frac{2.1\,m}{2.8s - 2.1s} = \boxed{3\,m/s}$

I used the time interval t = 2.1 s to t = 2.8 s because velocity & speed is constant.

Determine the magnitude of the acceleration of the ball at point A (halfway up the second incline). Show your work.

$|\vec{v}|$ at t = 4.3s is 0

$|\vec{a}| = \frac{0 - 3m/s}{4.3s - 2.8s} = |-2m/s^2| = \boxed{2m/s^2}$

On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at point A. Explain why you drew the arrow the way you did.

I drew the acceleration vector pointing down the ramp because the ball is slowing down.

If object slows down, velocity and acceleration vectors must point in opposite directions.

On the diagram above, draw an arrow indicating the direction of the acceleration of the ball at t = 4.3 s (the turnaround point). If the acceleration at the turnaround point is zero, state that explicitly. Explain why you drew the arrow the way you did.

I drew the acceleration vector pointing down the ramp be cause just before t = 4.3s the ball is slowing down and just after t = 4.3s the ball is speeding up indicating that the acceleration vector must be pointing down the ramp.

Instructor's note: This is a pretty good solution. There were only two things that kept it from receiving full credit. One was lack of symbolic solutions in parts A and B. The other was the reasoning in part D. A complete solution to part D would describe how the ball slows down going up the ramp, comes to a stop, and then speeds up down the ramp back the way it came. Thus the ball has an acceleration down the ramp right before turn around and right after. If the ball had zero acceleration at the turn around point, it would stop and just stay there.