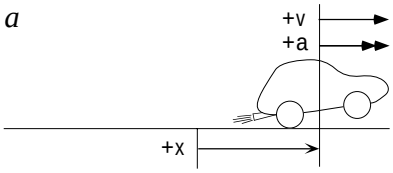
PhyzJob: Acceleration and Velocity are Entirely Different Quantities!

1. POSITION, VELOCITY, AND ACCELERATION: THE POSSIBILITIES ARE ENDLESS

In a one-dimensional linear universe, there are two directions, positive and negative. Consider a car in the two dimensional universe. It can be in "Negland" or "Posiworld." It can be moving in the positive or negative direction. It can be accelerating in the positive or negative direction. Complete the **table of possibilities**, draw the **sketches and vectors**, and give **verbal interpretations** for each motion.

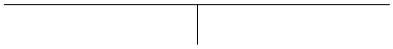
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
Position (**x**)	+	+	+	+	–	–		
Velocity (**v**)	+	+	–	–			–	–
Acceleration (**a**)	+	–	+	–	+		+	

a

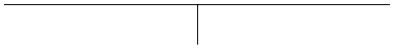


Car is in Posiworld, traveling in the positive direction, and accelerating in the positive direction. Its speed is increasing; the driver is stepping on the gas.

b



c



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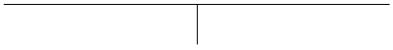
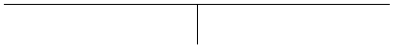
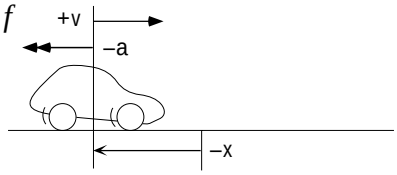


e

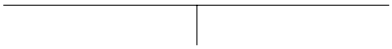


f

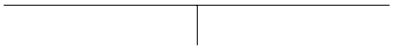


Car is in Negland, traveling in the positive direction, and accelerating in the negative direction. Its speed is decreasing; the driver is stepping on the brakes.

g



h

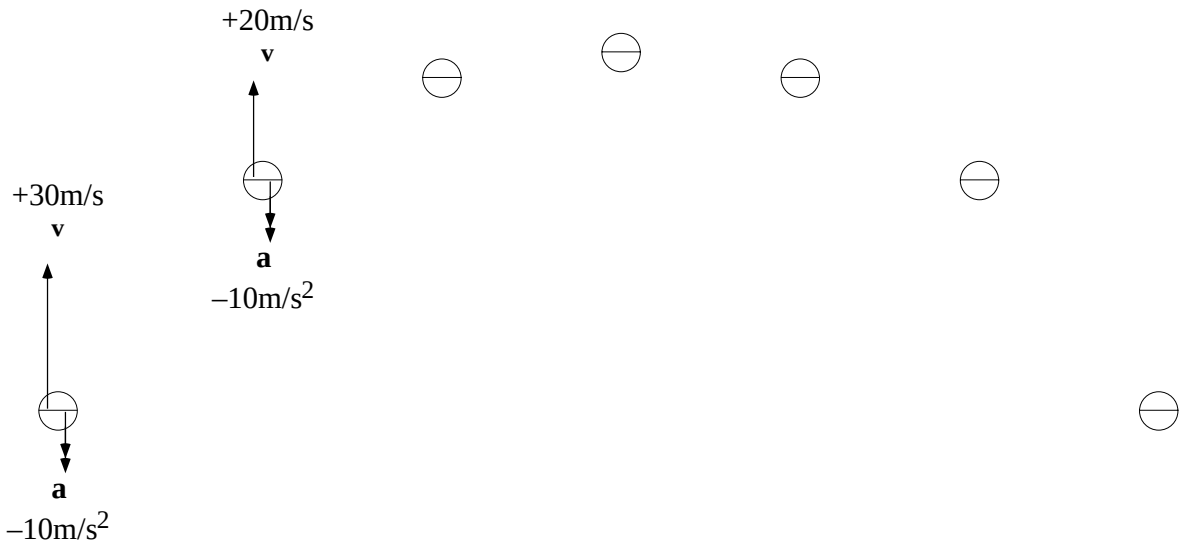


What is ALWAYS true about velocity and acceleration when the car is speeding up?

What is ALWAYS true about velocity and acceleration when the car is slowing down?

2. PROJECTILE PROGRESSION

A ball is thrown upward with an initial velocity of +30m/s. Acceleration due to gravity is $-10 m/s^2$. Draw the velocity and acceleration vectors (and give corresponding values) as the flight progresses. I'll keep track of the position for you. And I've completed the first two for you! You're welcome.

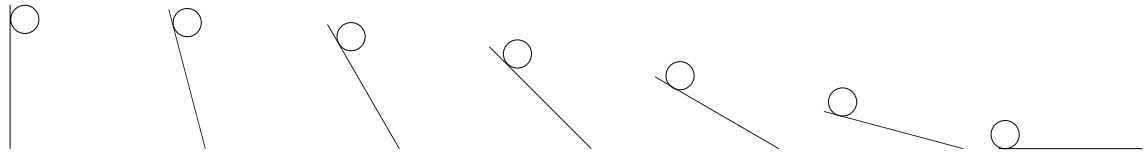


3. WHAT'S *NOT* POSSIBLE?

Consider the results from the previous two exercises. What combination of position, velocity, and acceleration—if any—is NOT possible?

4. VARIOUS INCLINATIONS

a. Balls rolled down each of the ramps below will experience different magnitudes of acceleration. Indicate the magnitude of acceleration by drawing an "a" below each ramp in proportion to the acceleration on that ramp (large "a" for large acceleration; small "a" for small acceleration).



b. Describe what happens to the *acceleration* of the ball as it travels down the ramp shown.