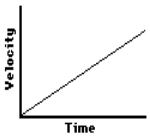
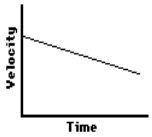
Something New(ton) – UNBALANCED FORCES CAUSE ACCELERATIONS

Newton's First Law states that a body at rest will remain at rest AND a body in motion will remain in motion, with CONSTANT VELOCITY unless acted upon by an unbalanced force.

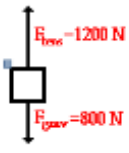
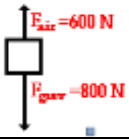
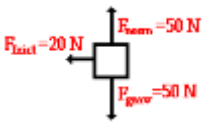
Newton's Second Law answers the obvious (obvious to me, anyway ☺) question: What if there IS an unbalanced force? The unbalanced force will produce acceleration proportional to the net force :

$$\Sigma F = ma$$

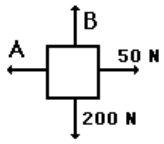
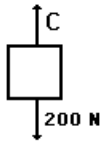
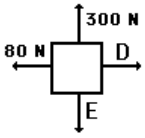
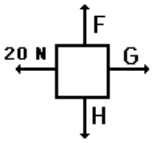
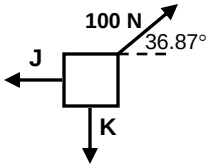
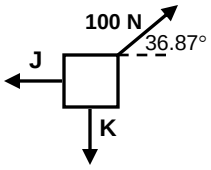
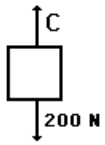
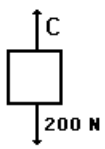
Really Big Ideas Come in Really Small Packages

Scenario	Accelerating?			Evidence (Be Specific)	Net Force?	
	Speeding Up	Slowing Down	Constant Velocity			
					Yes	No
					Yes	No
					Yes	No
This velocity vs. time graph represents the motion of a cyclist. 					Yes	No
This velocity vs. time graph represents the motion of a train entering Austin City Limits (Not ACL). 					Yes	No

Balanced Forces Add Up to Zero. If the forces acting on an object do not add to zero, we say that there is an unbalanced force or a NET force. OMG: REALLY BIG IDEAS ABOUND!! ***If the net force is in the same direction as the motion of an object, the object speeds up, if it is opposite the direction of motion, the object slows down, AND if the net force is perpendicular to the motion of the object, the object turns*** (we'll revisit this last case later).

Scenario	Forces Balanced? (Yes/No)	Net Force (N)	Mass (kg)	Acceleration (m/s^2)	Speeding Up, Slowing Down, or Constant Velocity?
80-kg elevator moving down: 					
80-kg skydiver falling down to Earth: 					
Box (m = 5 kg) sliding to right across floor: 					

In the following table, you are given information about an object, and then must calculate the unknown forces, accelerations, and determine whether the object is speeding up, slowing down, or moving with constant velocity.

Scenario	ΣF Net Force	Forces Balanced? (Yes/No)	Calculate Unknown Forces	Acceleration (m/s^2)	Speeding Up, Slowing Down, Constant Velocity?
20-kg crate moving up. 	**0-N**				
20-kg crate moving upward. 	**900-N, up**				
30-kg crate moving right. 				**2 m/s^2, right**	
10-kg crate moving right. 	**10 N, left**				
6-kg crate moving right. 	**0-N**				
6-kg crate moving right. 	**40 N, left**				
20-kg crate moving up. 				**5 m/s^2, UP**	
20-kg crate moving up. 				**5 m/s^2, DOWN**	