2nd Law of Motion

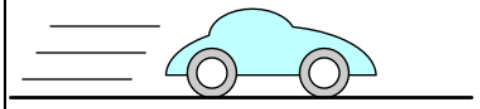
When the net force is not zero, the rate of speed change is given by the ratio of net force to mass.

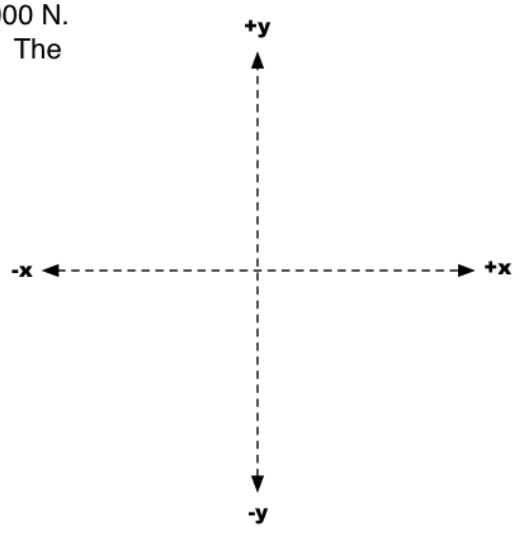
$$\text{speed change factor} = \frac{\text{NET FORCE (N)}}{\text{mass (kg)}}$$

Speed Change with Net Force 1

The 2,500 kg car's engine pushes forward with a force of 7,000 N. Drag from the air opposes its motion with a force of 2,000 N. The car was moving at 8 m/s to start.

a) Put the forces on the diagram & find the net force.
b) Calculate the speed change factor.
c) Fill in the table below.





Speed at t = 0	Speed at t = 1 s	Speed at t = 2 s	Speed at t = 3 s	Speed at t = 4 s
8 m/s				

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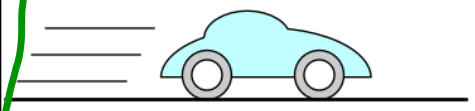
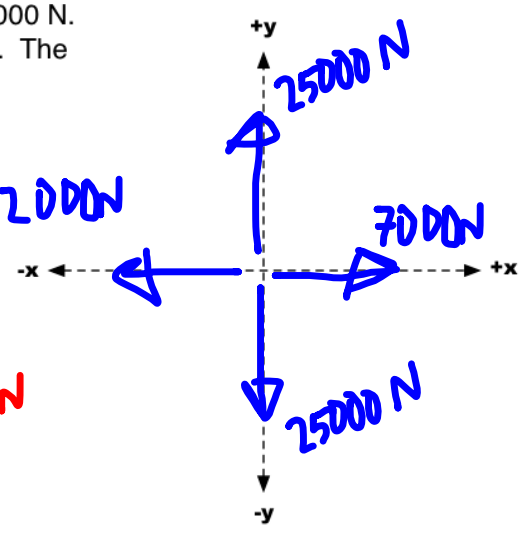




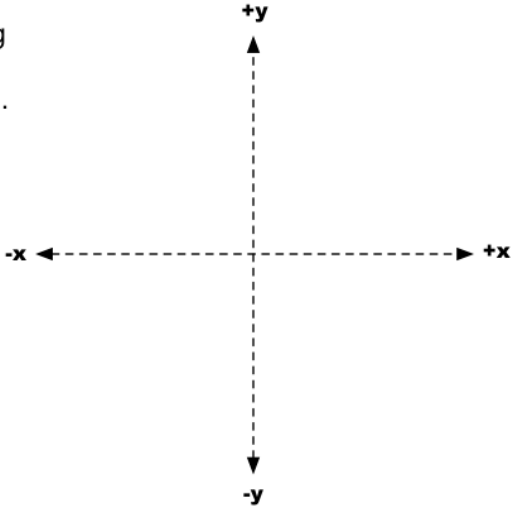
$F_{net}(x) = 7000N - 2000N = 5000N$

$a = \frac{F_{net}}{m} = \frac{5000N}{2500kg} = 2\frac{m}{s}$ every sec

Speed at t = 0	Speed at t = 1 s	Speed at t = 2 s	Speed at t = 3 s	Speed at t = 4 s
8 m/s	$10\frac{m}{s}$	$12\frac{m}{s}$	$14\frac{m}{s}$	$16\frac{m}{s}$

The 0.4 kg ball is thrown downward with an initial speed of 2 m/s downward. It experiences 1 N of drag opposing its motion.

a) Put the forces on the diagram & find the net force.
b) Calculate the speed change factor.
c) Fill in the table below.



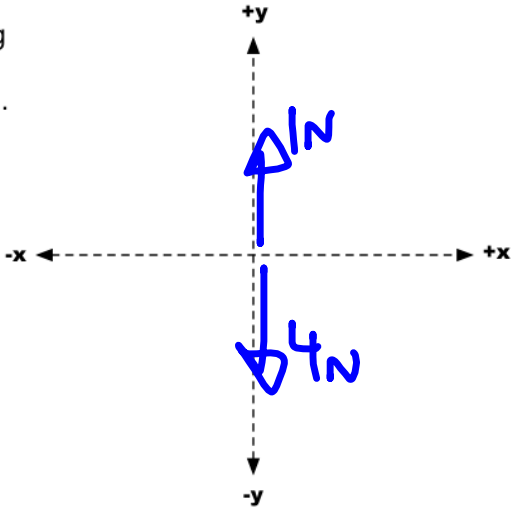
Speed at t = 0	Speed at t = 1 s	Speed at t = 2 s	Speed at t = 3 s	Speed at t = 4 s
-2 m/s				

The 0.4 kg ball is thrown downward with an initial speed of 2 m/s downward. It experiences 1 N of drag opposing its motion.

a) Put the forces on the diagram & find the net force.

b) Calculate the speed change factor.

c) Fill in the table below.



0.4kg → 4N

$F_{net}(y) = -4N + 1N = -3N$

$a = \frac{F_{net}}{m} = \frac{-3N}{0.4kg} = -7.5 \frac{m}{s}$ every sec

Speed at t = 0	Speed at t = 1 s	Speed at t = 2 s	Speed at t = 3 s	Speed at t = 4 s
-2 m/s	$-9.5 \frac{m}{s}$	$-17 \frac{m}{s}$	$-24.5 \frac{m}{s}$	$-32 \frac{m}{s}$