Direction, Force, and Acceleration

Way to go!!

Review the Facts: Forces

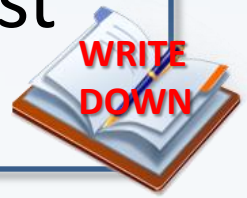
- Recall that the net force is the combination of all the forces acting on an object.
- The net force has a direction:
  - The net force for forces acting in the same direction is the sum of the forces.
  - The net force for forces acting in opposite directions is the difference between the forces.

Review the Facts: Acceleration

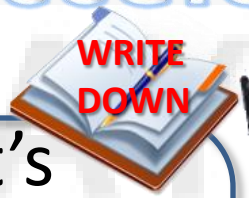
- According to Newton's Second Law, the acceleration of an object is equal to the net force divided by the mass.

$$\textbf{acceleration} = \frac{\textbf{net force}}{\textbf{mass}}$$

- Mass has no direction.
- Since force has direction, acceleration must also have direction.



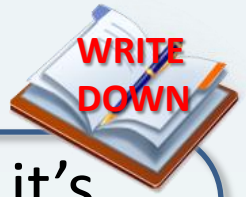
The Direction of Acceleration



- A net force opposite an object's motion is negative and produces a negative acceleration, slowing the object down.
- A net force in the same direction as an object's motion is positive and produces a positive acceleration, speeding the object up.
- A net force at an angle to an object's motion will cause the object to change direction.

Pushing the swing at the wrong time slows it down instead of speeding it up.

Turning



- If a force is maintained on an object at an angle to it's motion, it will cause it to turn and follow a curved path.
- Circular motion
  - When an unbalanced force is applied to an object at right angles to the object's motion the object travels in a circle.
  - Such a force is called a centripetal force.
  - The centripetal force is toward the center of the object's circular path
    - Example: Earth moving around the sun