



Chapter Six: Newton's Laws of Motion

- **6.1 Newton's First Law**
- **6.2 Newton's Second Law**
- **6.3 Newton's Third Law and**

Momentum



Chapter 6.1 Learning Goals

- Describe how forces cause changes in motion.
- Demonstrate and describe Newton's first law.
- Explain the meaning of net force.



6.1 Force changes motion

- A force is a push or pull, or any action that is able to change motion.



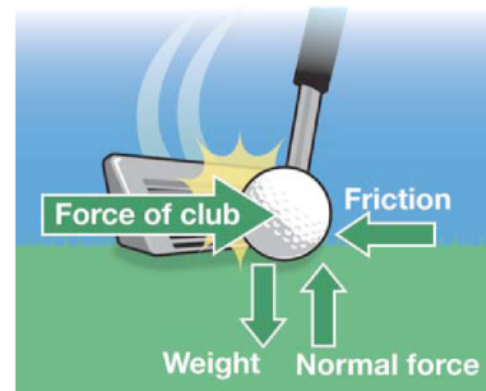


6.1 Law of inertia

- **Newton's first law** says that objects continue the motion they already have unless they are acted on by a net force.
- If the net force is zero, an object at rest will stay at rest.
- If an object is acted upon by unbalanced forces, its motion will change.

6.1 Net force

- Newton's first law is often written in terms of the net force:
- "An object at rest will stay at rest and an object in motion will continue in motion at constant velocity **UNLESS** there is a net force."

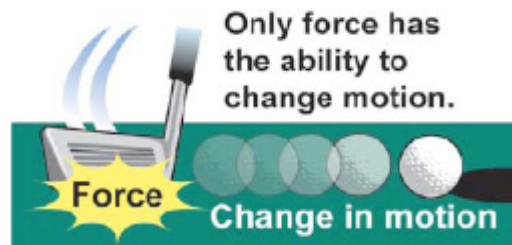


According to these vectors, in what direction is the net force?



6.1 Force changes motion

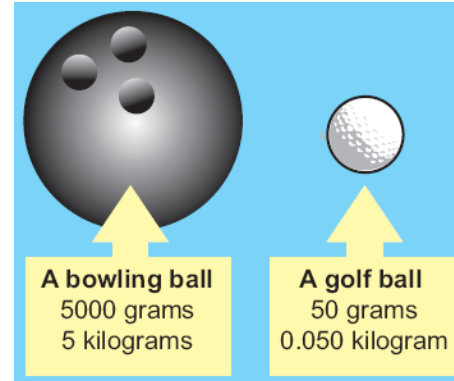
- Forces can be used to increase or decrease the speed of an object, or to change the direction an object is moving.





6.1 Law of inertia

- **Inertia is the property of an object that resists changes in motion.**
- **Objects with more mass have more inertia and are more resistant to changes in their motion.**



Which ball has more inertia?

Newton's First Law of Motion

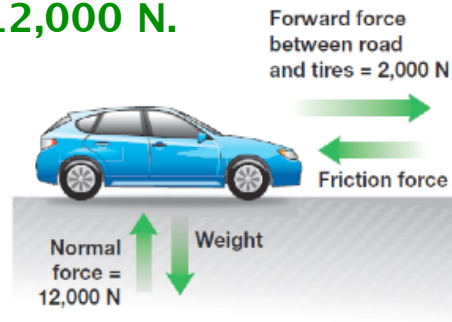


An object at rest will stay at rest and an object in motion will continue in motion with the same speed and direction UNLESS acted on by a force.



Solving Problems

A car drives along the highway at constant velocity. Find the car's weight and the friction force if the engine produces a force of 2,000 newtons between the tires and the road and the normal force on the car is 12,000 N.





Solving Problems

1. Looking for:

- ...weight of car in newtons, force due to friction

2. Given:

- ...Force_N = 12,000N (up);
- ...Force_E = 2,000N (forward)

3. Relationships:

- Newton's 1st Law:
 - net force = zero at constant velocity; so Force_N = Force_W and Force_E = Force_F