Forces and Motion

How Do you describe motion?

Motion — The action of something being moved.

It can be described as:
- position
- direction
- speed

① Position — An object's location relative to another object (the reference point).

Examples:
"above, below, beside, behind, ahead of" plus the distance from the other object.

① position — The distance (length) from the reference point changes when the object moves.

② Direction — The course or path that an object is moving

It can be determined by reading a compass using the terms "north," "south", "east", or "west."

② Direction — Can also be described using the terms right, left, forward, or towards →

Direction relative to another object, or "up/down" relative to Earth.

Example: Take a right at the stop sign.

Speed A measure of how fast an object is moving.

Types of Forces

Force A push or pull.

Forces can make things move faster, slower, stop, or change direction.

Force

Forces can be affected by:
- Magnetism
- Gravity
- Friction

Magnetism A non-contact force.

A force that acts at a distance and cannot be seen.

Materials that create this force are said to be magnetic and are called magnets.

The needle of a compass moves because of Earth's

Magnetism magnetism.

When like poles (S-S or N-N) are near each other the magnetic force causes the poles to repel, or push away from each other.

When opposite poles (N-S or S-N) of magnets are near each other, the magnetic force causes the poles to attract, or pull toward each other.

Magnetism The closer the objects, the greater the magnetic force.

The magnetic force is greatest at the poles of magnets.

Gravity A non-contact force.

A pull that attracts objects to each other.

The force of gravity between Earth and anything on it is extremely noticeable because the mass of →

Gravity Earth is so large.

The pull of Earth's gravity makes any object fall to the ground.

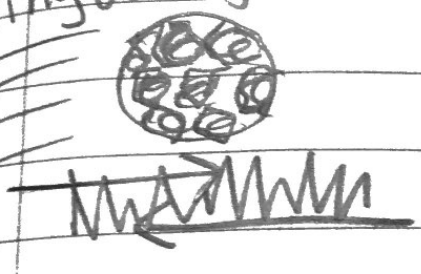
As the Moon goes around Earth, its gravity pulls on Earth causing water in the oceans to move toward the Moon.

Earth's gravity pulls on the Moon and keeps the Moon moving around Earth.

Friction A contact force.

The force that opposes motion between two surfaces that are touching.

soccer ball moving on grass



The rougher the surface area, and the harder the surfaces press together, the more friction there will be.

Friction can be reduced by using lubricants, for example: motor oil, wax, or grease.

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Friction

Friction occurs in liquids and gases, as well as between solids.

Without friction, it would be very hard to slow or stop the motion of objects.

Balanced Forces

Balanced forces produce <u>NO CHANGE</u> in the motion of an object.

If an object is NOT moving, it will stay motionless.

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Balanced Forces

If an object is moving, it will maintain its rate of motion (speed) and direction.

Balanced forces are equal in strength and opposite in direction.

Unbalanced forces

Unbalanced forces produce a change in the motion of an object.

An object that is already moving will change its speed and/or direction.

Unbalanced forces

It does not have another equal force or force in the opposite direction off-setting it.

Rate of Motion

The speed of the object or how fast or slow the object is moving.

Object at rest

If an unbalanced force acts on an object at rest, the object will move in the direction of the force.

A stronger force will make it move faster.

Object in motion

The unbalanced force may speed the object up, slow it down, or make it change direction.

If the force is in the same direction as the object is moving, it will speed up.

If the force is in the opposite direction as the object is moving, it will slow down or stop.

If the force is to the side of the object, it will turn.

How changes in an object affect change in motion:

change in force

If there are 2 objects with the same mass, and one is acted on by a greater force than the object acted on by the greater force will have the greatest change in speed.

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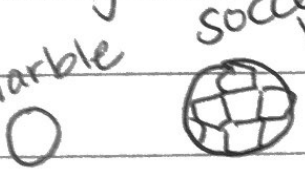
change in mass

If there are two objects, one with a greater mass than the other, and the same force is applied, the object with the lesser mass



Both pushed with the same force, the marble will travel further.

Change in Mass

Will have the greatest change in speed.

It is more difficult to change the speed of the object with the greater mass than the object with the lesser mass.

Effects of Friction

Friction acts against motion.

The following variables influence the effect of friction:

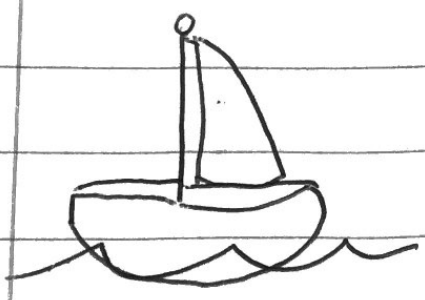
Effects of Friction

Texture of the surface:
- Rough surfaces tend to create more friction.
- Smooth surfaces tend to create less friction.

Weight:
- the weight of an object and size of the surface affects friction.

① Air resistance (such as the size of a parachute)

② the resistance of an object as it glides through water.



(such as a boat)

Effects of Friction

Without lubrication, moving parts of machines would slow down or stop very quickly.