

Speaking Physics



ACCELERATION - how fast speed and/or direction changes. One g , the acceleration due to gravity, is 9.8 m/s^2 or 32 ft/s^2 . At an amusement park, acceleration is often measured in g 's rather than m/s^2 or ft/s^2 . So if you hear someone exclaiming that they just pulled 3 g 's while zooming through a loop-the-loop, what they really mean is that they were experiencing an acceleration that is three times the normal affect of gravity, or about 30 m/s^2 .

CENTRIFUGAL FORCE - *centrifugal* is an adjective that means "away from the center". While you might feel pushed away from the center of a scrambler ride such as Triple Play, the centrifugal force is fictitious. In actuality, when the wall of the ride (which is pushing you towards the center in order to whirl you in a circle) exerts a centripetal force on your body, your brain tells you that you are "flying outward" instead. This is also an example of Newton's 3rd Law of Motion where the force you think you feel is a reaction to the initial force from the wall.

CENTRIPETAL FORCE - *centripetal* is an adjective that means "towards the center". This term refers to the push or pull needed to make an object move along a curved path, since inertia makes all objects "want" to travel in straight lines (see Newton's 1st Law of Motion.). A centripetal force is always oriented toward the center of curvature of the object's path.

FORCE - any sort of push or pull is a force. During your experiments at an amusement park, all forces except gravity come from direct contact - the push or pull of one object against another object.

FORCE/MASS - Accelerometers actually measure the "Normal Force per Unit Mass" acting on the accelerometer. The mass of the accelerometer unit itself is very small, while our mass is quite large by comparison. The ratio of force acting on the accelerometer to the force acting on us is the same as the ratio of our masses. We discuss this ratio, force/mass, and often substitute the simple term "force" when we mean the ratio. Force/mass is measured in units of N/kg or g 's, where 1 g is equal to 9.8 N/kg . See document "Accelerometers and Forces."

FRICTION - a contact force that pushes or pulls on objects when you try to move them. Friction causes coaster rides to slow down. Friction usually results from the rubbing of one surface against another. Air resistance, or *drag*, is a special kind of friction.

GRAVITATIONAL POTENTIAL ENERGY - the amount of energy gained from an object's position above the surface of the earth. The higher an object is, the greater the potential energy it has relative to another object at the surface of the earth. Gravitational potential energy is equal to the weight of an object multiplied by its height.

G-FORCE - a fancy way of referring to the weight you feel from gravity or motions. A g -force of 2 g 's means a force acting on an object equal to two times its weight ... if you felt this force you would feel twice as heavy as normal.

INERTIA - the tendency of matter to remain at rest, or move at a constant speed in a straight line.

JERK - the rate of change of acceleration, so named because you notice this phenomenon as a feeling of being "jerked" opposite to the direction of the changing acceleration.

KINETIC ENERGY - the energy of motion. The faster you go, the more kinetic energy you have. An object cannot speed up unless it gets energy from something that pushes or pulls it through some distance. Conservation of energy relates that the sum of the kinetic energy and potential energy of a train on a coaster ride tends to remain constant, excepting some amount of energy that is changed into other forms such as noise and heat during braking.

MASS - a property of any object. The more mass an object has, the greater its inertia, and so the harder it is to accelerate. Big enough masses like the huge mass of the earth create a noticeable gravitational pull, which attracts other nearby masses. When the effect of gravity acts on a mass, it gives it a force downward called *weight*.

MOMENTUM - moving inertia that tends to keep objects moving in the same direction at a constant speed. Momentum is a vector quantity equal to the mass of a moving object multiplied by its velocity. In a simple collision, momentum can be transferred from one object to another. Momentum is conserved; the total momentum after an interaction equals the total momentum before in the absence of any external forces. When all of the interacting objects are included and there are no external forces, the totals will be equal.

PARABOLA - the shape of the curved path of a ball as it is tossed back and forth from one person to another. Roller coaster hills often have this shape.

VELOCITY - the speed of an object, together with information about its direction. It is a vector quantity while speed is a scalar, specifying only how fast the object is moving.