

# Newton's Toy Box

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# Glossary

A page number in boldface type indicates the page on which the word is defined in the text.

**acceleration** rate at which an object's velocity changes (5, 8, 12, 13)

**air resistance** fluid friction acting on an object moving through air; also called drag (7, 8)

**average speed** total distance traveled divided by the time it takes to travel that distance (3)

**balanced forces** forces that cancel each other because they are equal in strength and opposite in direction (4, 11)

**compound machine** combination of two or more simple machines that work together (15, 21)

**displacement** how far an object moved from its original position and in what direction the object moved (3)

**distance** how far it is from one point to another (2–5, 8, 14–20, 23)

**efficiency** in a machine, percentage of the work input that is changed to useful work output (16)

**energy** ability to do work or cause change (14, 16)

**first-class lever** lever with its fulcrum located between the input force and the output force (18, 19, 21)

**force** push or pull that acts on an object, causing it to move, change speed or direction, or stop moving (4–6, 8–23)

**free fall** when gravity alone is acting on an object (23)

**friction** force that opposes motion, or resistance caused when two surfaces touch or rub together (6, 7, 11, 13, 16)

**fulcrum** fixed point around which a lever rotates (18–21)

**gear** wheel with “teeth” around its edge (21)

**gravity** force that exists between any two objects that have mass, attracting or pulling them together (4, 8, 10, 11, 14, 22, 23)

**inclined plane** simple machine that is a slope, a surface with one end raised higher than the other end; also called a ramp (16, 17, 18)

**inertia** tendency of a still or moving object to resist a change in its motion (11)

**input force** force put into a machine (15–21)

**joule** unit of work or energy (14, 16, 17)

**kinetic energy** energy an object has due to its motion (14)

**law of conservation of momentum** the total momentum of a group of interacting objects does not change unless an outside force acts on the objects (9)

**law of universal gravitation** force of attraction that exists between any two objects with mass (22)

**lever** simple machine made up of a rigid bar that turns about a fixed point, or fulcrum (16, 18–21)

**machine** device that changes a force to make work easier (7, 15–18, 20, 21)

**mass** amount of matter in an object (8–13, 22)

**mechanical advantage** ratio of the input force to the output force for a given machine (15, 18–21)

**momentum** property of matter due to its mass and velocity (9, 16)

**motion** change in position or place (2–4, 6, 10–14, 18, 22, 23)

**net force** force that results from the combination of all the forces that act on an object (4, 5, 11–13, 23)

**newton** unit of force, equal to the force that causes a 1-kilogram mass to accelerate at a rate of  $1 \text{ m/s}^2$  (4, 8, 12, 14)

**Newton's first law of motion** an object at rest will remain at rest and an object in motion will continue to move at the same speed in a straight line unless a net force acts on it (11)

**Newton's second law of motion** an object acted on by a net force will accelerate in the direction of the force. The object's acceleration equals the net force on the object divided by the object's mass. (12)

**Newton's third law of motion** for every action force exerted on an object, the object will exert an equal and opposite reaction force (13)

**output force** force produced by a machine (15–21)

**position** object's place or location (2–4, 14)

**potential energy** energy that is stored, available as a result of an object's position or condition (14)

**power** rate at which work is done; measured in watts (14)

**pulley** simple machine made up of a wheel with a groove in the rim for a rope or cable (15, 16, 21)

**reference point** stationary object used to determine the motion of another nearby object (2, 23)

**satellite** object that travels around, or orbits, another object (23)

**screw** simple machine that is an inclined plane wrapped around a cylinder (16, 18, 21)

**second-class lever** lever with the output force located between the input force and fulcrum (19, 20)

**simple machine** tool with few or no moving parts that changes the direction or size of a force in order to do work (15–18, 20, 21)

**speed** rate at which the position of an object changes (2, 3–5, 10, 11, 15, 20, 23)

**terminal velocity** constant velocity reached by a falling object when the force of air resistance equals the force of gravity (8)

**third-class lever** lever with the input force located between the fulcrum and the output force (19, 20, 21)

**unbalanced forces** forces that do not cancel each other out and result in a net force on an object (5)

**velocity** rate at which an object moves in a certain direction (3, 5, 8, 9, 11, 23)

**wedge** simple machine with one or two sloping sides that meet at a sharp edge or point (16, 17, 21)

**weight** measure of the force of gravity acting on an object (8, 14, 21)

**wheel and axle** simple machine made up of a wheel fixed to a smaller shaft; both rotate together (16, 20, 21)

**work** result of a force moving an object over a distance (14–17)

**work input** work done on a machine (16)

**work output** work done by a machine (16)