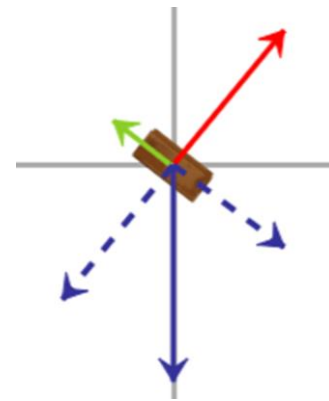


## Vocabulary: Inclined Plane – Simple Machine

### Vocabulary

- Coefficient of friction – the ratio of the force of *friction* between two bodies to the force pressing the bodies together (the *normal force*).
  - The symbol for the coefficient of friction is  $\mu$ .
- Efficiency – the ratio of energy gained by an object to the energy input into the machine.
  - When an object is pushed up an inclined plane, it gains both potential and kinetic energy. Both forms of energy must be considered when calculating the efficiency of the inclined plane.
  - Efficiency can be expressed as a ratio or percentage.
- Force – something that can cause a change in motion; a push or a pull.
  - When you push or pull an object, you exert a force on the object.
  - Other examples include gravity, the electrostatic force, and the strong and weak nuclear forces.
- Free-body diagram – a picture that uses vectors to illustrate the different forces acting on an object.
- Friction – a force that opposes motion.
  - Friction arises because of contact between a moving object and the materials it is moving over or through.
  - The friction between two objects is given by the coefficient of friction.
- Inclined plane – a slanted surface, such as a ramp, along which objects can be moved to a different height.
  - An inclined plane is a type of *simple machine*.
- Mechanical advantage – the factor by which a simple machine reduces the force needed to lift or move an object at constant speed.
  - For example, if a simple machine had a mechanical advantage of 2, it would take just over 50 newtons of force to lift a 100-newton load.
- Mechanical energy – the sum of the kinetic and potential energies of the components in a system.
  - Note that only the *components of a system* are considered. This means, for example, that thermal energy (which is kinetic energy at microscopic scales) would not be considered as mechanical energy when analyzing a macroscopic system, like a brick sliding on an inclined plane.



Free-body diagram

- Normal force – a force exerted on one object by another object in a direction perpendicular to the surface of contact.
- Resultant force – the total force resulting from a combination of external forces on an object.
  - The resultant force is also known as the *net force*.
- Simple machine – a device that requires a single input force to accomplish work.
  - There are six simple machines: the inclined plane, wedge, screw, lever, pulley, and wheel and axle.
- Vector – a representation that specifies the direction and magnitude of a quantity.
  - In physics, vectors are used to represent displacement, velocity, acceleration, force, and other quantities that have a specific direction.
  - Vectors are represented visually by arrows.
    - The symbol for a vector is a bold letter such as **v** for velocity.
    - When describing the magnitude of the vector, an italic letter is used such as *v* for the magnitude of an object's velocity.
- Work – useful energy added to a system by the application of force across a distance.
  - The symbol for work is *W*.
  - To calculate work, multiply the force by the distance traveled in the direction of the force:  $W = Fd_{\parallel}$ .
  - The total work done on a mass by *all* forces in a system can also be calculated by using the work-energy theorem.
  - Using an inclined plane, increasing the length of the plane allows the same amount of work to be done with less force.
- Work-energy theorem – the claim that the kinetic energy gained by an object subject to various forces equals the *net* work done on it by all forces in the system.

