

### Formulas of Gravitational Acceleration

$$v_f = v_i + gt$$

$$d_f = d_i + v_i t + \frac{1}{2} g t^2$$

$$v_f^2 = v_i^2 + 2g(d_f - d_i)$$

*g is negative when an object is thrown up, and positive when it falls down*

### Formulas of Constant Acceleration

$$v_f = v_i + at$$

$$d_f = d_i + v_i t + \frac{1}{2} a t^2$$

$$v_f^2 = v_i^2 + 2a(d_f - d_i)$$

### Newton's Laws of Motion

**First Law** an object at rest stays at rest, and an object in motion stays in motion unless an unbalanced force is applied

**Second Law**  $F = ma$

**Third Law** The law of action and reaction

### Friction Force

normal force a contact force in which a surface vertically affects an object

friction force a force that prevents an object's motion

types of friction static and kinetic

formula of friction force (static)  $f = \mu_s \times mg$

formula of friction force (kinetic)  $f = \mu_k \times mg$

formula of Normal Force  $F = mg$  (vertical) or the object's weight (horizontal)

$\mu_s > \mu_k$

*friction depends on mass, not surface area*

*weight is measured in N, mass is measured in Kg*



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