Kinematics is the study of motion. It is the branch of classical mechanics that describes the motion of objects without regard to the forces that cause the motion. Kinematics is often used in physics to describe the motion of large objects such as planets and stars.

In kinematics, there are three main types of motion: translational, rotational, and periodic. Translational motion is motion in a straight line. Rotational motion is motion around a center of rotation. Periodic motion is motion that repeats itself over time.

The most important quantity in kinematics is displacement. Displacement is the distance that an object has moved from its starting point. It is a vector quantity, which means it has both a magnitude and a direction.

The speed of an object is its displacement divided by the time it takes to move that distance. Speed is a scalar quantity, which means it has only a magnitude and no direction.

The velocity of an object is its speed in a particular direction. Velocity is a vector quantity, which means it has both a magnitude and a direction.

The acceleration of an object is the change in its velocity divided by the time it takes to change that velocity. Acceleration is a vector quantity, which means it has both a magnitude and a direction.

The following equations are useful for solving problems in kinematics:

Displacement = initial velocity $\times$ time $+ \frac{1}{2} \times$ acceleration $\times$ time2

Final velocity2 = initial velocity2 $+ 2 \times$ acceleration $\times$ displacement

Speed = distance traveled / time taken

Average speed = total distance traveled / total time taken

Velocity = speed in a particular direction

Average velocity = total displacement / total time taken

Acceleration = change in velocity / time taken

Average acceleration = change in velocity / time taken