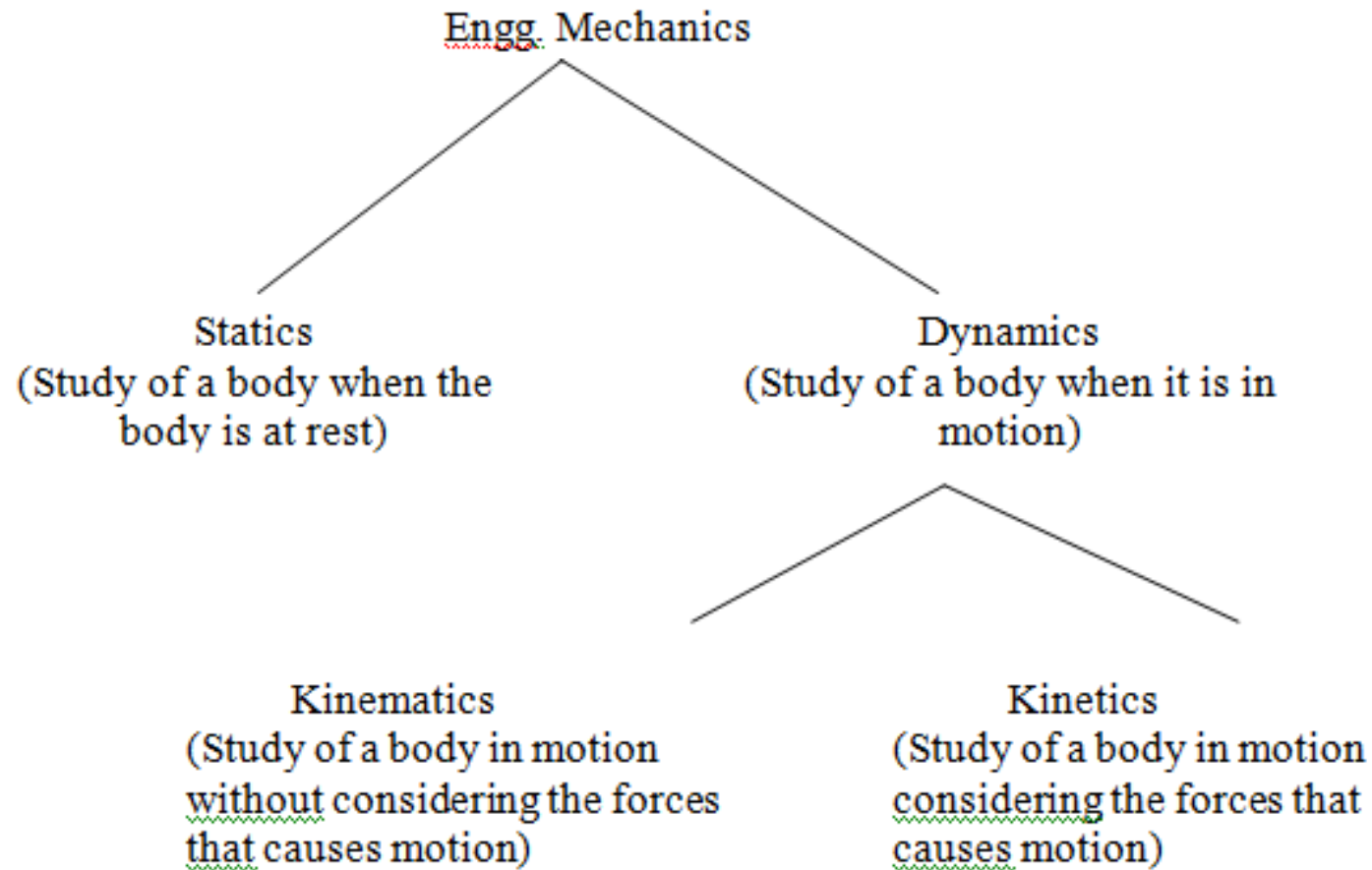# ENGINEERING MECHANICS INTRODUCTION

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Introduction

Engg. Mechanics is a branch of science which deals with the behavior of a body when the body is at rest or motion.

Engg. Mechanics

Statics
(Study of a body when the body is at rest)

Dynamics
(Study of a body when it is in motion)

Kinematics
(Study of a body in motion without considering the forces that causes motion)

Kinetics
(Study of a body in motion considering the forces that causes motion)
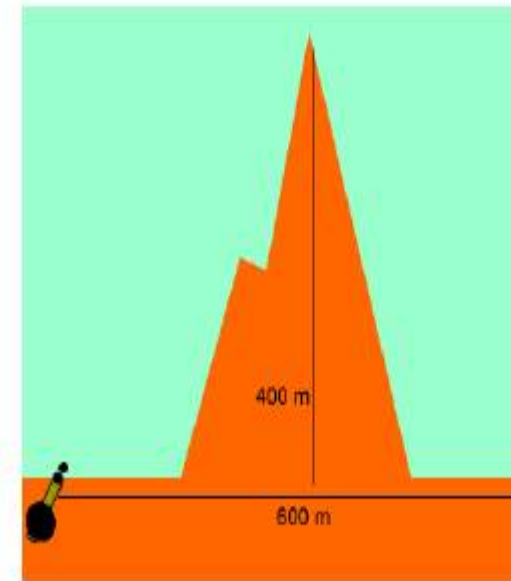
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Introduction

Rigid-body Mechanics

Statics: deals with equilibrium of bodies under action of forces (bodies may be either at rest or move with a constant velocity).
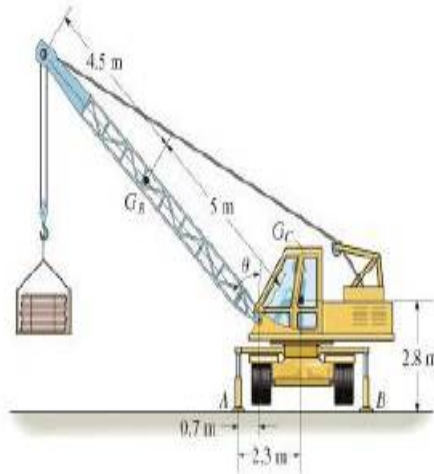
Rigid-body Mechanics

- Dynamics: deals with motion of bodies (accelerated motion)

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FUNDAMENTAL UNITS

Length (Space): needed to locate position of a point in space, & describe size of the physical system → Distances, Geometric Properties

Time: measure of succession of events → basic quantity in Dynamics

Mass: quantity of matter in a body → measure of inertia of a body (its resistance to change in velocity)
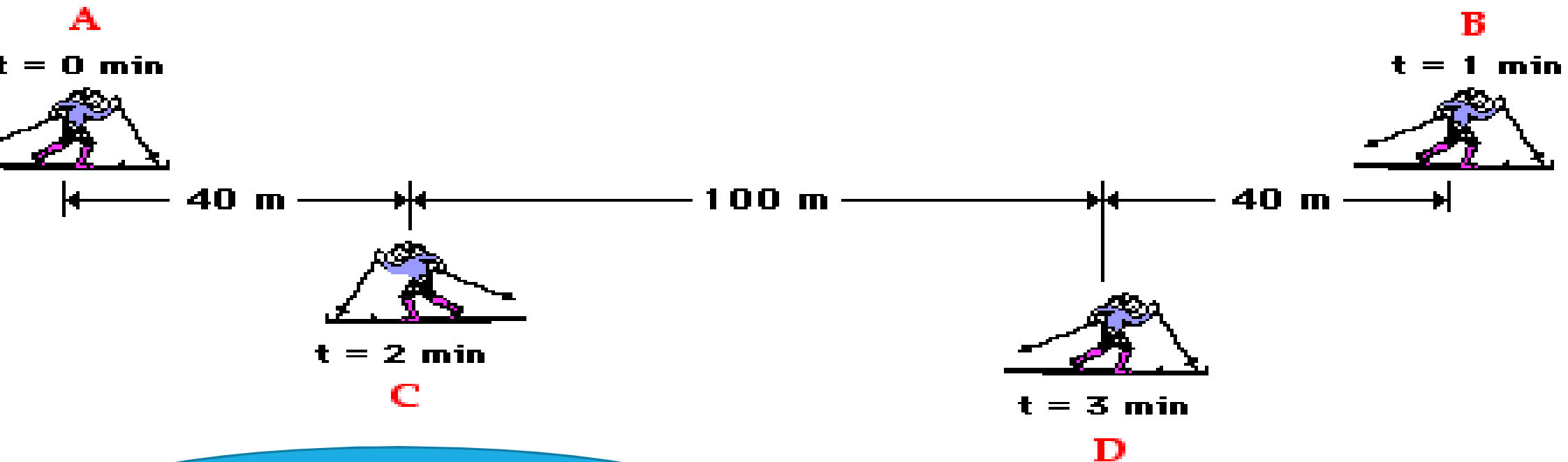
DERIVED UNITS

derived from fundamental units

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SCALAR & VECTOR

The velocity of this cyclist is an example of a vector quantity.

Use the diagram to determine the resulting displacement and the distance traveled by the skier during these three minutes.

A
t = 0 min

B
t = 1 min

|← 40 m →|← 100 m →|← 40 m →|

t = 2 min
C

t = 3 min
D

The skier covers a distance of
(180 m + 140 m + 100 m) = 420 m
and has a displacement of 140 m,
rightward.

EFFECTS OF A FORCE

Formula of Force
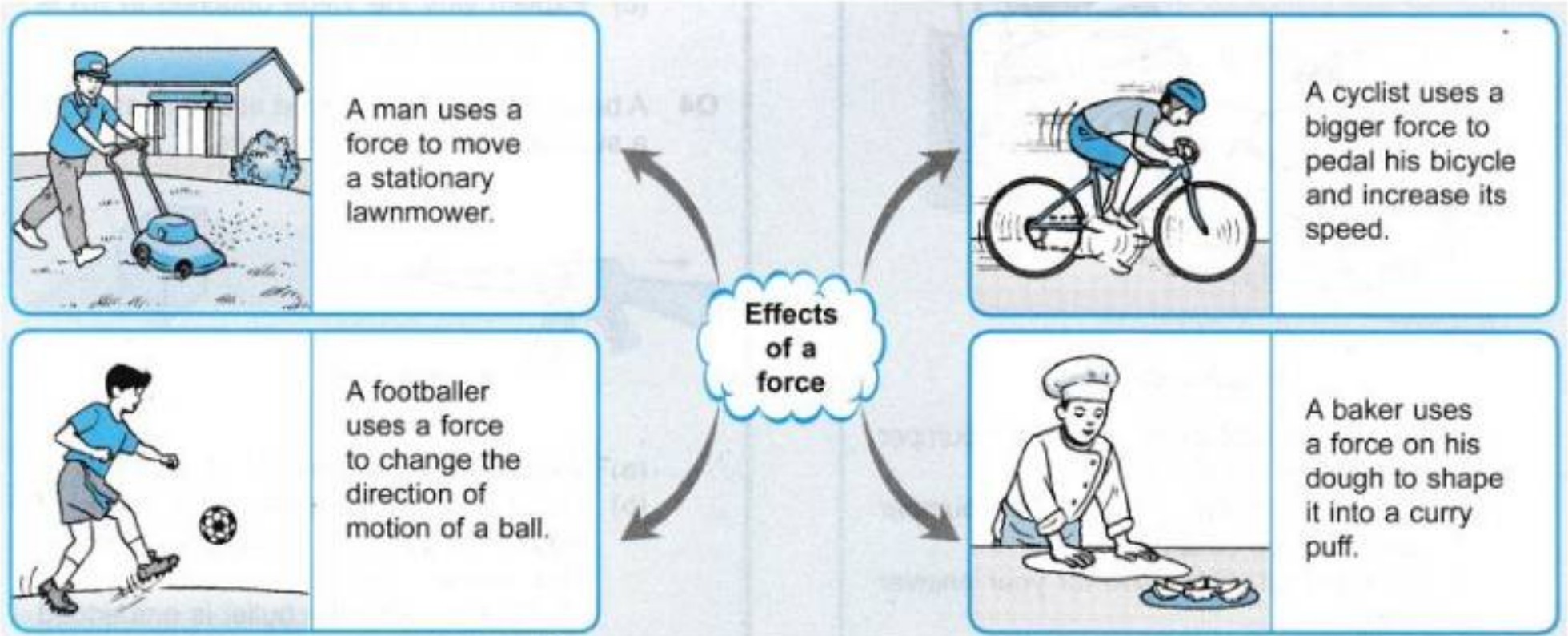
▸ Force is measured in newtons (N).

$$F = ma$$
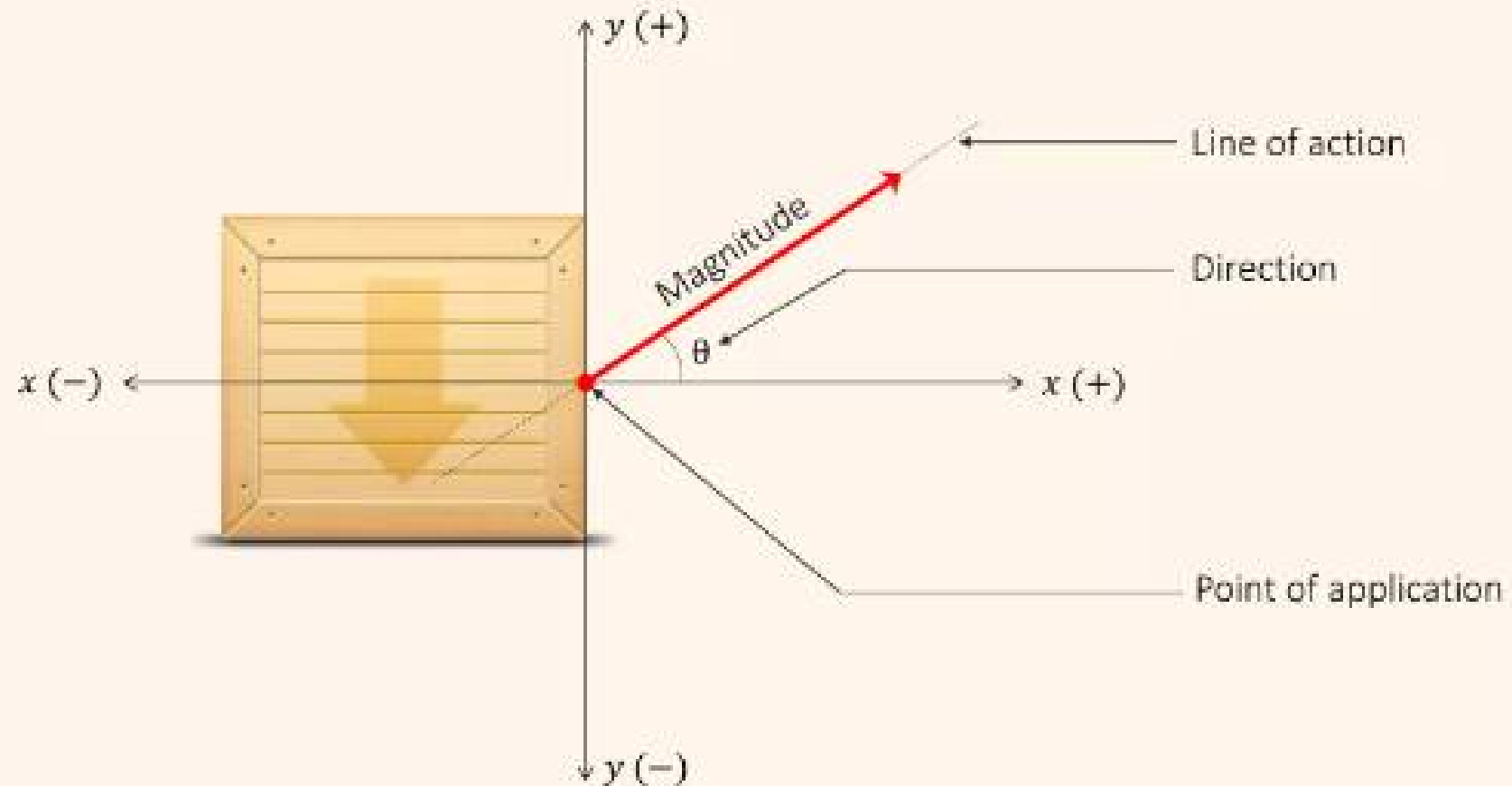
Where F - force
m - mass of the object
a - acceleration

EFFECTS OF A FORCE

A man uses a force to move a stationary lawnmower.

A footballer uses a force to change the direction of motion of a ball.

Effects of a force

A cyclist uses a bigger force to pedal his bicycle and increase its speed.

A baker uses a force on his dough to shape it into a curry puff.

CHARACTERISTICS OF FORCE

CONTACT FORCE

Drag Force

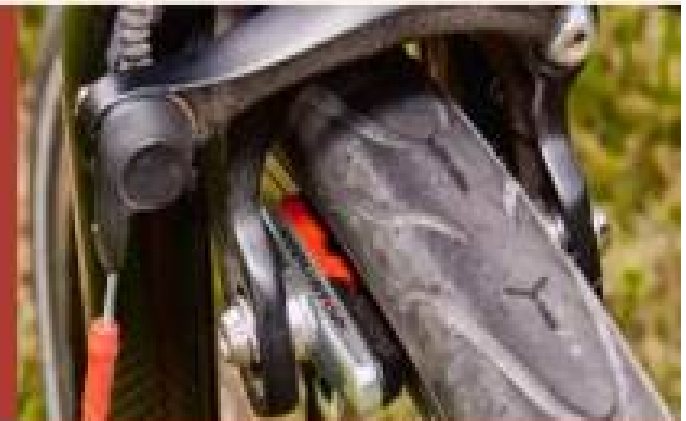It is a force that is experienced by an object when it is moving through a fluid

Applied Force

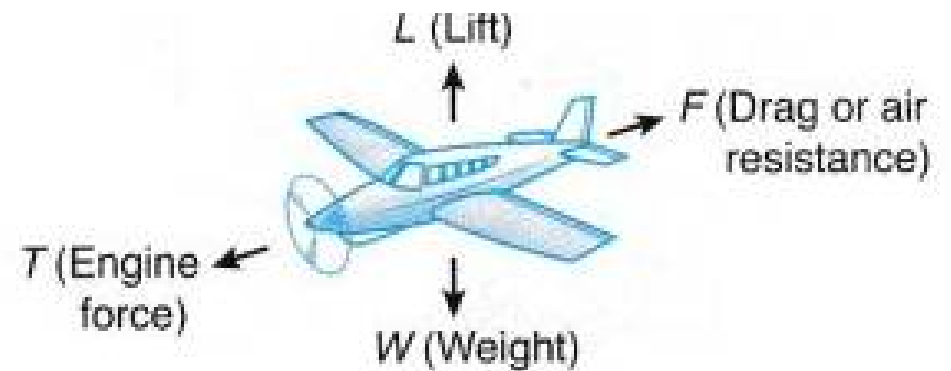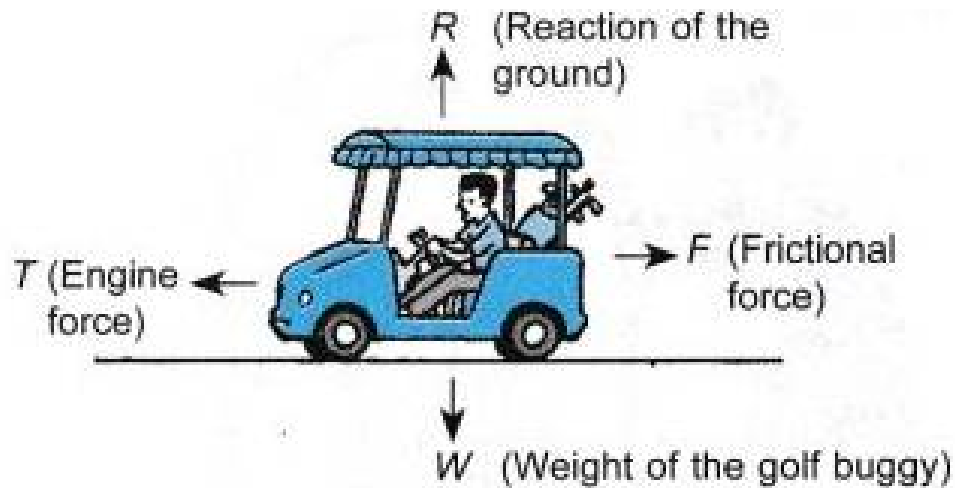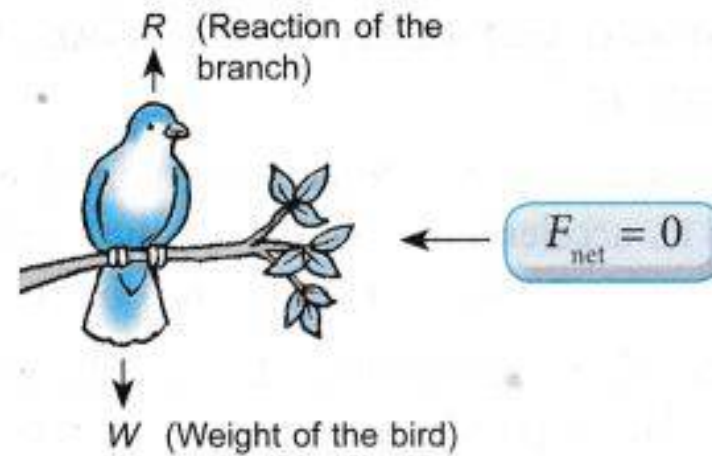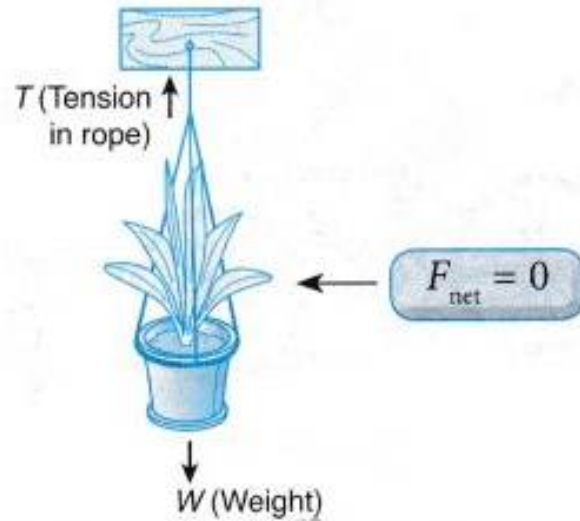It is a force that is applied to an object by a person or another object

Frictional Force

It is a force that is resisting the relative motion of objects sliding against each other

Balanced Forces

T (Tension in rope)

$F_{net} = 0$

W (Weight)

R (Reaction of the branch)

$F_{net} = 0$

W (Weight of the bird)

R (Reaction of the ground)

T (Engine force)

F (Frictional force)

W (Weight of the golf buggy)

L (Lift)

F (Drag or air resistance)

T (Engine force)

W (Weight)

Unbalanced Forces

Resultant force, F

Resultant force, $F \rightarrow$

Resultant force, F