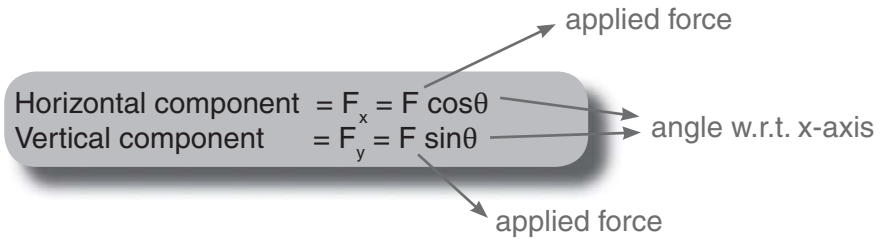
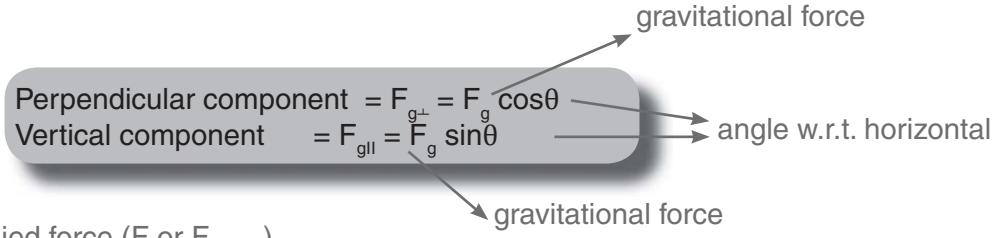
Summary

- Vectors that are two-dimensional can be divided into two components. Components of a vector F are known as F_x (the x-component) and F_y (the y-component).



- Objects on an inclined plane: The gravitational force is no longer perpendicular to the plane. It can be divided into components with respect to the plane.

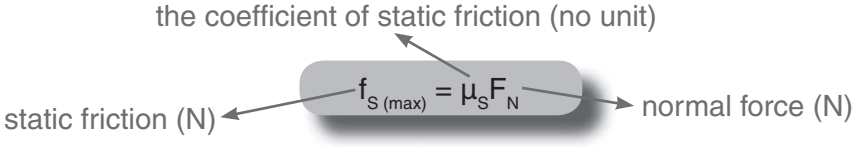


- Applied force (F or $F_{applied}$)
  A person or object exerts a force on another object/person.
  The applied force is:
  - in the same line – forwards or backwards – as the direction of movement or
  - at an angle to the direction of the movement.
  - The components of the force can then be calculated in the direction of movement and perpendicular to it.

- Friction (F_f or f)
  When an object moves or tries to move on a certain surface, the contact surface exerts a frictional force on the object.
  Friction always tries to minimise motion, therefore acts:
  - in the opposite direction to the movement or attempted movement;
  - parallel to the surface on which the object makes contact.

- Factors that influence frictional forces:
  - Normal force: the greater the normal force, the greater the frictional force.
    Surface type: the rougher the contact surface, the greater the frictional force.
    This means the type of contact surface determines the coefficient of friction (μ).

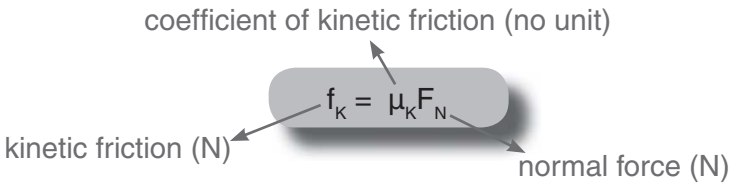
- Static friction is the frictional force of one contact surface on another when there is no relative motion between the objects.



- $\mu_S = \tan\theta$ where θ is the angle of the gradient of an incline.

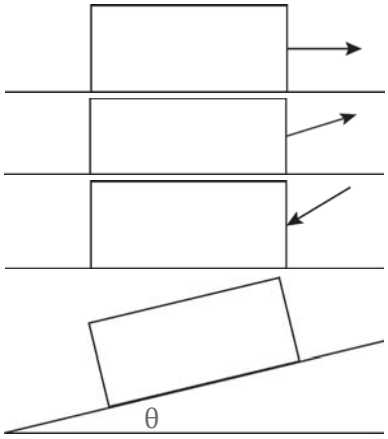
Summary

- Kinetic friction is the frictional force of one contact surface on another when one or both objects move.



- Normal force (F_N or N)
  A normal force is the force exerted by a surface on an object resting on that surface.
  The normal is always perpendicular to the surface, even if the surface is at an angle.
  Acts on the object that rests on or against the contact surface.
  The normal force is a supporting force

- Normal force: always perpendicular to the contact surface



$F_N = F_g$

$F_N = F_g - F_y$ $(F_y = F \sin\theta)$

$F_N = F_g + F_y$ $(F_y = F \sin\theta)$

$F_N = F_{g\perp}$ $(F_{g\perp} = F_g \cos\theta)$

- Tension (F_T or T)
  When a cable or rope is pulled, it exerts a tension force.

- The tension in a rope is constant throughout the rope being pulled, but the direction can be different.

- Air resistance (F_{air} or F_f)
  Air particles offer resistance to objects moving through the air.
  Air friction always acts in the opposite direction to movement.

- An object is in equilibrium if it:
  - is at rest; (also known as static equilibrium); or
  - moves at a constant velocity, and therefore has no acceleration. This is known as dynamic equilibrium.

Summary

- Determining the resultant vector.
  There are various methods of calculating the resultant of a number of vectors.
  - Using a scale diagram with the head to tail method.
  - Using a scale diagram with the tail to tail method.
  - Using trigonometry to find the components, and using these with Pythagoras.

- Forces in equilibrium:
  When a number of forces are in equilibrium, the resultant force is zero. This means that when you use the head to tail method, the head of the last vector will end at the tail of the first vector.

- Closed vector diagram: Any closed vector diagram, when using the head to tail method, means that there is a zero resultant.

Notes