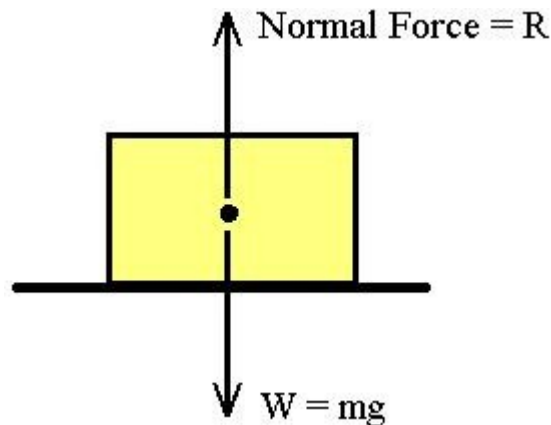


Physics 12

Weight, Gravity, and Free Body Diagrams

1. Weight is a measure of the force due to gravity and mass is a measure of the amount of inertia. The standard international unit of measure for weight is Newtons (N) and mass is measured in kg.
2. The force due to gravity can be calculated using $F_g = mg$.
3. When an object rests on a surface, the object applies a force on the surface equal to the weight of the object and the surface pushes back with an equal and opposite force according to Newton's third law.

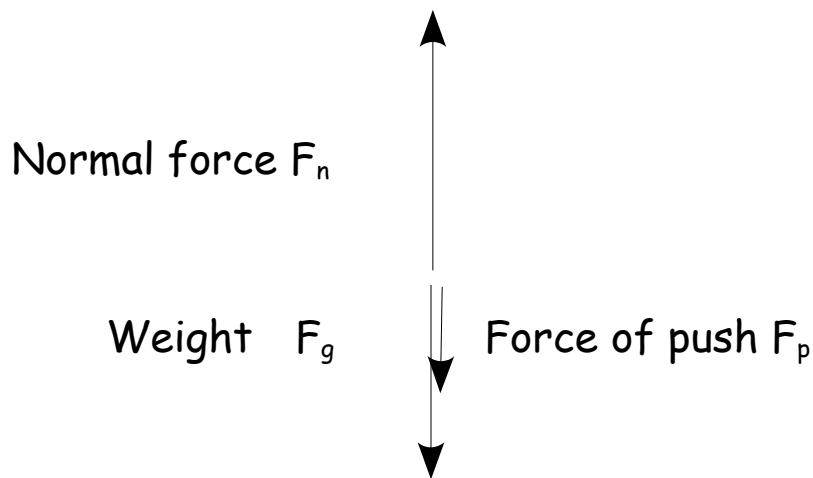


4. The force that the supporting structure provides is called the normal force. The normal force is always perpendicular to the supporting structure.
5. Free body diagrams can be very useful in determining all the forces acting on an object. Once the forces are identified they are drawn without the object only the vectors are drawn. A free body diagram is drawn for the above box.



Example:

A friend gives you a box of mass 10.0kg. The friend pushed down on the box with a force of 40.0N. Draw a free body diagram for this scenario and determine the normal force exerted on the box.



$$\Sigma F = ma$$

$\Sigma F = 0$ since the box is not accelerating

$$F_n + -F_g + -F_p = 0$$

$$F_n = F_g + F_p$$

$$F_n = mg + 40.0N$$

$$F_n = 10.0 \text{ kg} \times 9.80N/kg + 40.0N = 138N$$