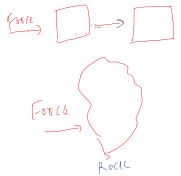
Work and Energy

- Work is done when produces motion.



$W = F \times S$

Force, displacement.

- Work done by a force on a body depends upon two factors
  - → Magnitude of force.
  - → Displacement through which the body moves.

$W = F \times S$

→ Work done in moving a body is equal to the product of force exerted on the body and the distance moved by the body in the direction of force.

→ $W = F \times S$

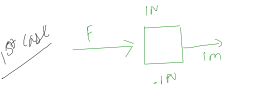
$= N \times m$

$W =$ Joule

$1\ Joule = 1\ N \times 1\ M$

Ans 1 J is the amount of work done on an object when a force of 1 N displaces it by 1 m along the line of action of the force.

→ Work is a scalar quantity.



$W = F \times S$

$= 1N \times 1m$

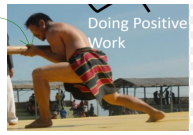
$= 1Nm = 1J$

$W = F \times S$

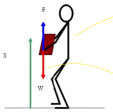
$= -1N \times -1m.$

$= 1Nm = 1J$

Positive and Negative work



When displacement of an object is in the same direction as that of force applied it is called positive work done.

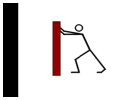


Work done by man → +ve.

Work done by gravitational force → -ve.

Negative work - when displacement of an object is in the opposite direction of applied force then it is negative work done.

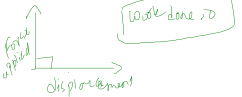
Zero work done



$W = F \times S$

$= 0$

$W = 0$



Example 11.1 A force of 5 N is acting on an object. The object is displaced through 2 m in the direction of the force (Fig.

2) Calculate the work done in lifting 200kg of water through a vertical height of 6 metres. (Assume $g = 10\ ms^{-2}$)

$W = F \times S$

$W = m \times a \times S$

$= m \times g \times h$

$= 200 \times 10 \times 6$

$W = 12000\ J$

3) A car weighing 1000kg & travelling at $30\ ms^{-1}$ stops at a distance of 50m decelerating uniformly. What is the force exerted on it by the brakes? What is the work done by the breaks.

$W = F \times S$

$= 9000 \times 50$

$= 450000\ J$

$F = ma$

$F = -9000\ N$

$v^2 - u^2 = 2as$

$0 = 900 + 2 \times a \times 50$

$a = -9\ ms^{-2}$