

# 1. Mind Map: Kinetic Energy & Work Done

## KE & Work Done

### Kinetic Energy

Energy possessed by an object because it is moving

Formula:  $KE = \frac{1}{2} (m v^2)$

Why speed matters more than mass:

1 kg at 2 m/s → KE = 2 J

1 kg at 4 m/s → KE = 8 J

1 kg at 2 m/s → KE = 2 J

2 kg at 2 m/s → KE = 4 J

1. *Velocity is squared! This means doubling speed quadruples KE.*

2. *Doubling mass, just doubles the KE*

*Fast Vs. Massive*

*Small fast bullet > slow big boulder*

### Work Done by a Force

Work is transfer of energy when a force moves an object  
(If there's no displacement, there's no work—no matter how strong the force!)

Work = Force × Distance × cos(θ)  
– θ is the angle between force and displacement

#### Types of Work

Positive Work → Force aids motion → KE increases

Negative Work → Force opposes motion → KE decreases

Zero Work → Force is perpendicular (like centripetal force) → No KE change

1. *Force must be constant*
2. *Only the component of force in the direction of motion does work.*
3. *If multiple forces act, either: (a) calculate work done by each and add them, or (b) use the net (resultant) force in the work formula.*