VEHICULAR CHARACTERISTICS

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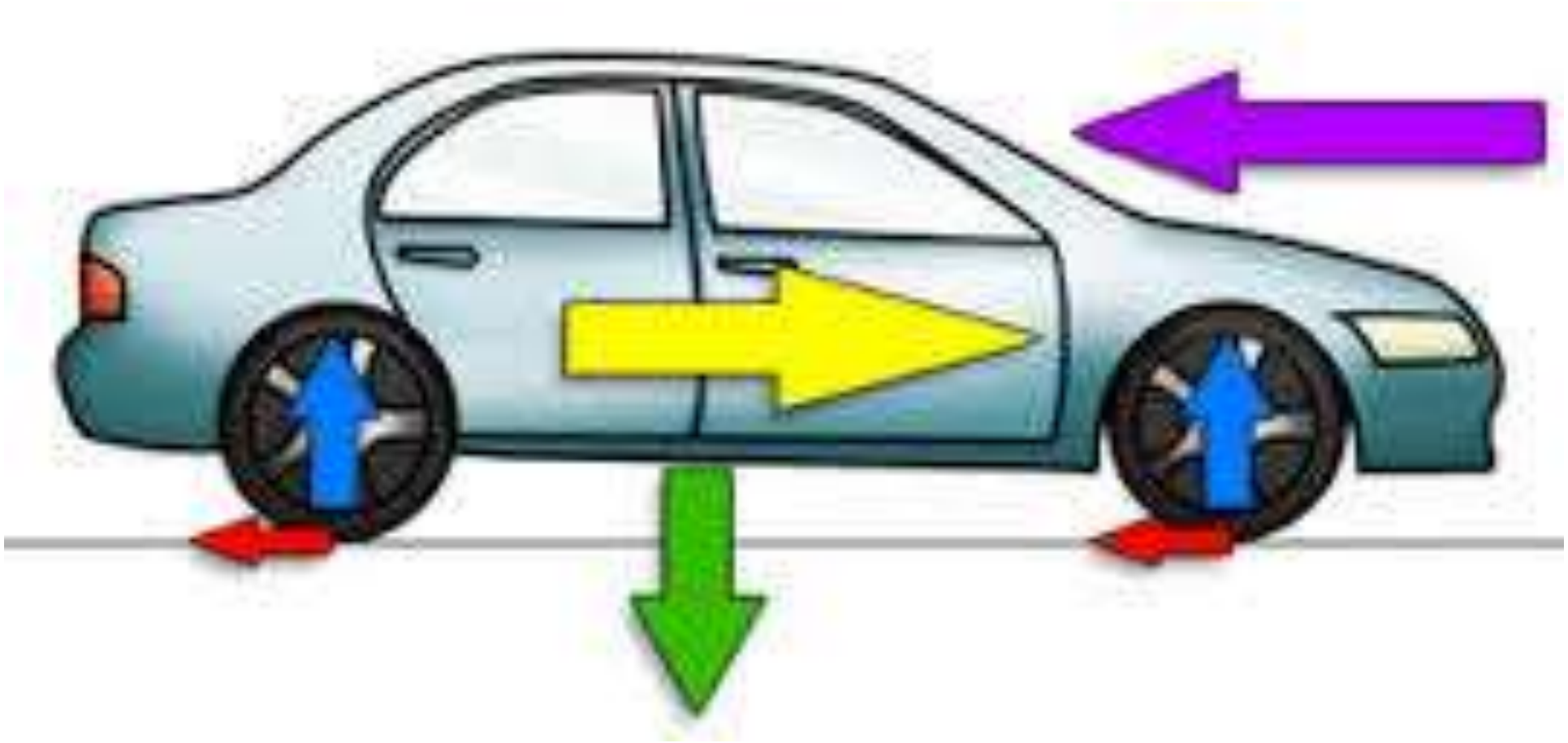
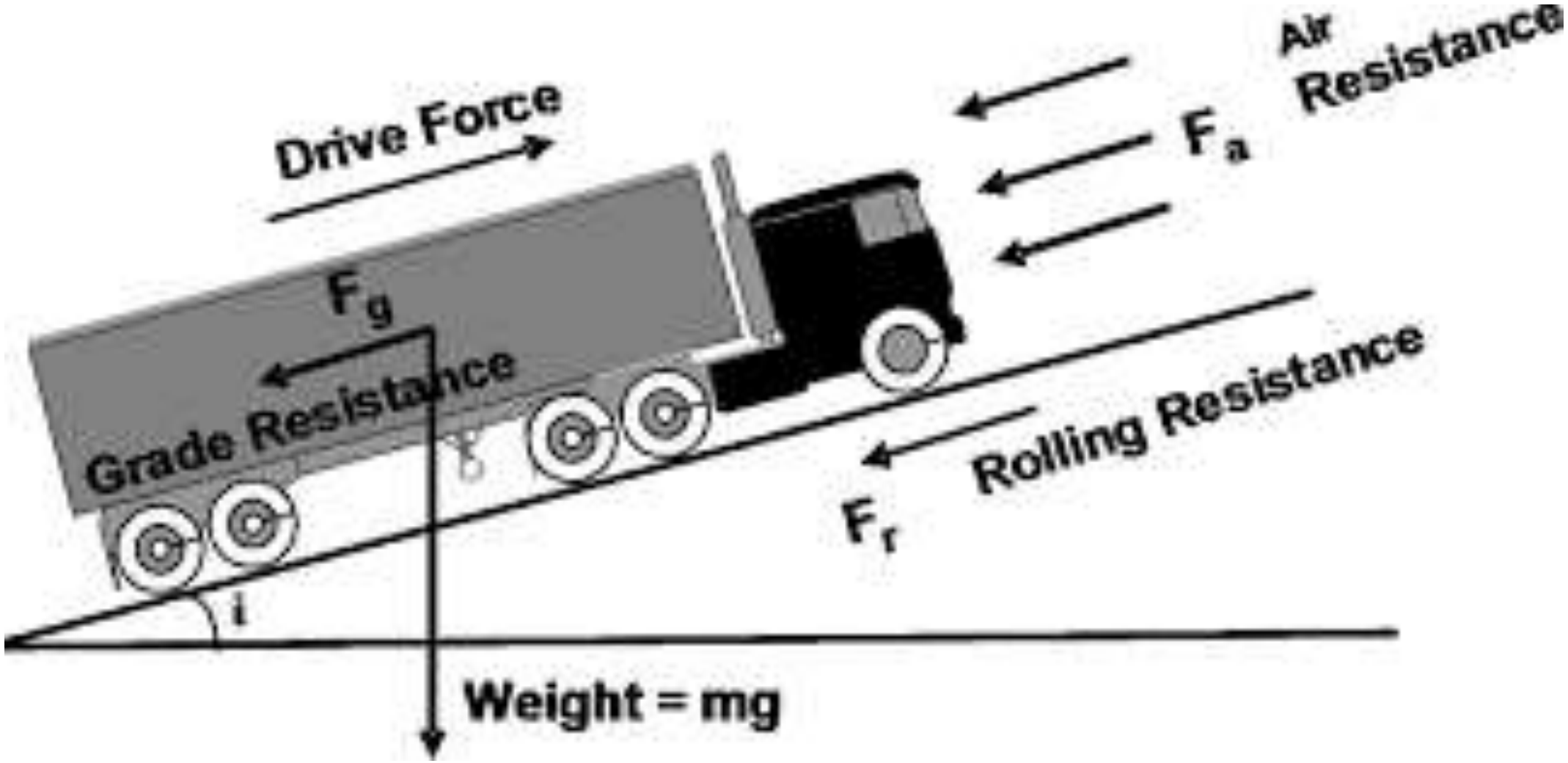
POWER PERFORMANCE OF VEHICLES

- The power developed by the engine should be sufficient to overcome all resistance to motion at the desired speed and to accelerate at any desired rate to the desired speed. The following forces have to be overcome for this purpose..
  1. Rolling resistance
  2. Air resistance
  3. Grade resistance
  4. Inertia forces during acceleration and deceleration
  5. Transmission forces

RESISTANCES




Drive Force
Air Resistance
F_a
F_g
Grade Resistance
Rolling Resistance
F_r
i
Weight = mg

LINK

- https://www.youtube.com/watch?v=PwdG9bFsJyA

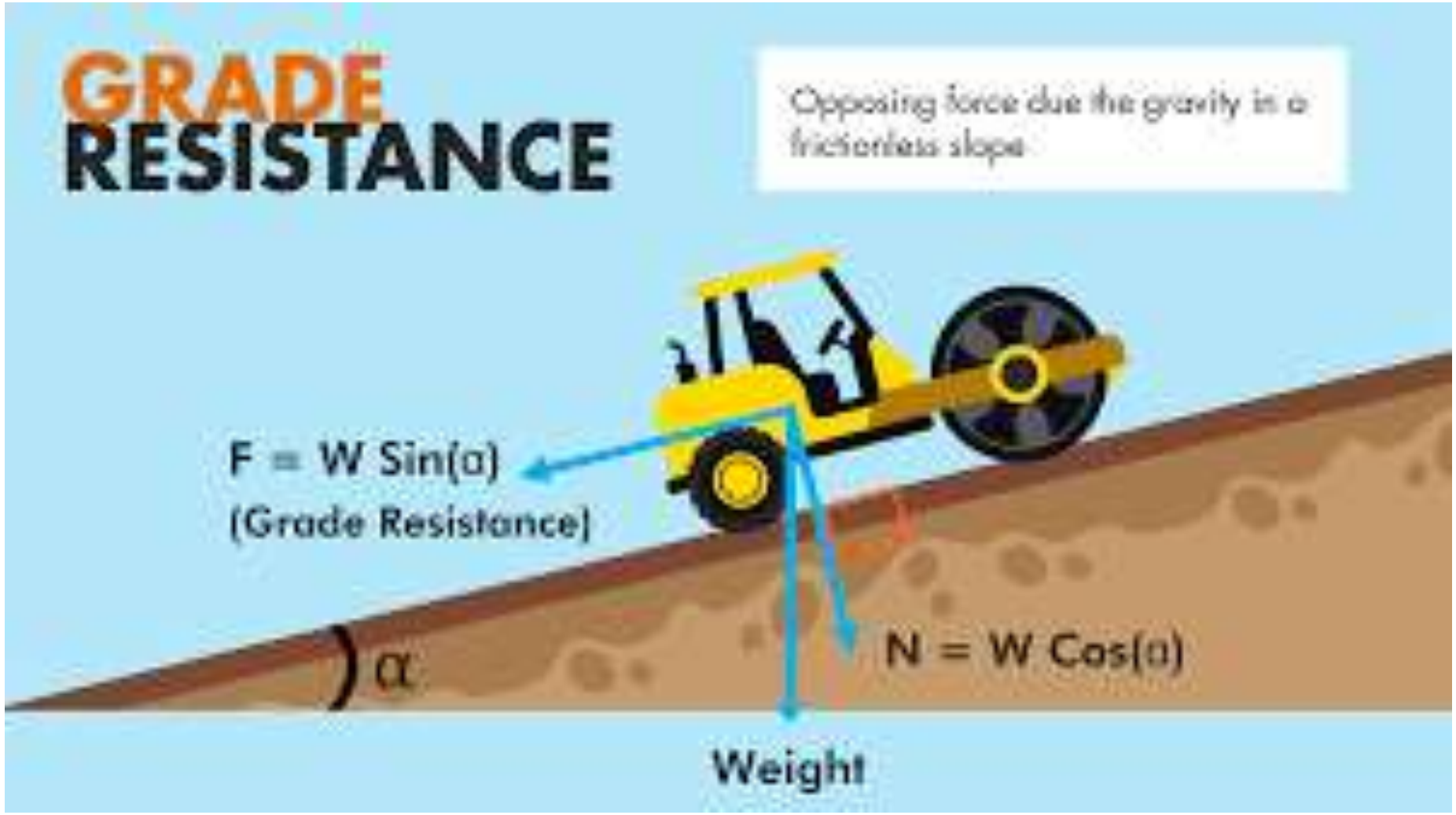
ROLLING RESISTANCE

- When the vehicle wheel rolls over the road surface, the irregularities and the roughness of the surface cause of deformation of the tyres.
- The road surface itself any undergo deformations. Shocks and impacts are caused by such a motion and these hinder rolling motion of the wheels.
- The rolling resistance varies with the type of surfacing.

AIR RESISTANCE

- Air density.
- Friction of air against the sides of vehicle body.
- Eddying of the air stream behind the vehicle, under the body and around the wheels causes power loss.
- The flow of air through the vehicle for ventilating and cooling causes resistance to motion.

GRADE RESISTANCE



INERTIA FORCES DURING ACCELERATION AND DECELERATION

- Force= Mass* acceleration
- When the speed of a moving vehicle needs to be increased some additional power is needed to accelerate. Similarly if the vehicle has to gather a desired speed from a stopped position, additional force is needed to accelerate.

TRANSMISSION LOSSES

- Losses in power occur to the mode of power transmission from the engine to the gear system and in the gear system itself.
- Start of vehicle- high power at slow speed
- High engine power- to climb uphill
- Highest forward gear- 1:1 represents direct drive
- Total losses- 10-15% of the engine power
- Upto 25% in case of trucks in lower gears