Mechanical Aptitude — Quick Reference

BMCT · Wiesen · Ramsay · All Major Mechanical Aptitude Tests

Newton's Laws of Motion

Law	Statement	Everyday Example
1st — Inertia	An object at rest stays at rest until a force acts on it.	Passenger thrown forward when car stops
2nd — F = m × a	Force equals mass times acceleration.	Heavier object needs more force to accelerate
3rd — Action/Reaction	Every action has an equal and opposite reaction.	Rocket thrust, walking forward

Work, Energy, Power

Formula	Equation	Notes
Work	W = F × d	Force × distance in direction of motion
Power	P = W / t	1 hp = 746 W = 550 ft·lb/s
Kinetic Energy	KE = ½mv²	Energy of motion
Potential Energy	PE = mgh	Energy from height
Momentum	p = m × v	Conserved in collisions

Gears, Pulleys & Levers

Device	Key Rule	Relationship
Gear ratio	Ratio = T_driven / T_driver	Larger driven = slower, more torque
Meshed gears	Opposite rotation direction	Idler keeps ratio, reverses direction
Fixed pulley	MA = 1	Changes direction of force only
Movable pulley	MA = 2	Halves effort force required
Block & tackle	MA = # supporting ropes	More MA, more rope pulled
1st-class lever	E–F–L order	Seesaw, crowbar
2nd-class lever	F–L–E order	Wheelbarrow
3rd-class lever	F–E–L order	Tweezers, forearm
Lever law	F_e × d_e = F_l × d_l	Balance condition

Fluids — Pascal & Bernoulli

Principle	Formula	Meaning
Pressure	P = F / A	Force per unit area
Pascal's law	F1/A1 = F2/A2	Hydraulic jack: small force × big stroke = big force × small stroke
Bernoulli	Faster flow → lower pressure	Why an airplane wing lifts
Buoyancy	F_buoyancy = ρ × V × g	Weight of displaced fluid

Electricity & Heat

Concept	Rule / Formula	Key Takeaway
Ohm's law	V = IR	Power P = VI
Series circuit	Currents equal, voltages add	Break = whole circuit stops
Parallel circuit	Voltages equal, currents add	One branch can fail without the rest
Conduction	Heat flow through solids	Metals conduct well
Convection	Heat flow in fluids	Hot air/water rises
Radiation	Heat via EM waves	No medium required (sun to earth)
Magnetism	Like poles repel, unlike attract	Right-hand rule: thumb = current, fingers = field

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