

StandardRise Revision Notes

**Class 8 | Physics**



# Chapter: Force, Friction and Pressure





# Force, Friction and Pressure

## The Big Idea

**Force:** A push or pull that changes the state of a body.

**Friction:** The invisible force resisting relative motion.

**Pressure:** The impact of force spread over an area.

## Real-Life Relevance

1



**Force:** Sets an object in motion.

2



**Friction:** Allows us to walk without slipping.

3



**Pressure:** Atmospheric pressure difference pulls liquid up.

## Chapter Flow

Force Basics

Types of Forces

Friction

Pressure

Buoyancy

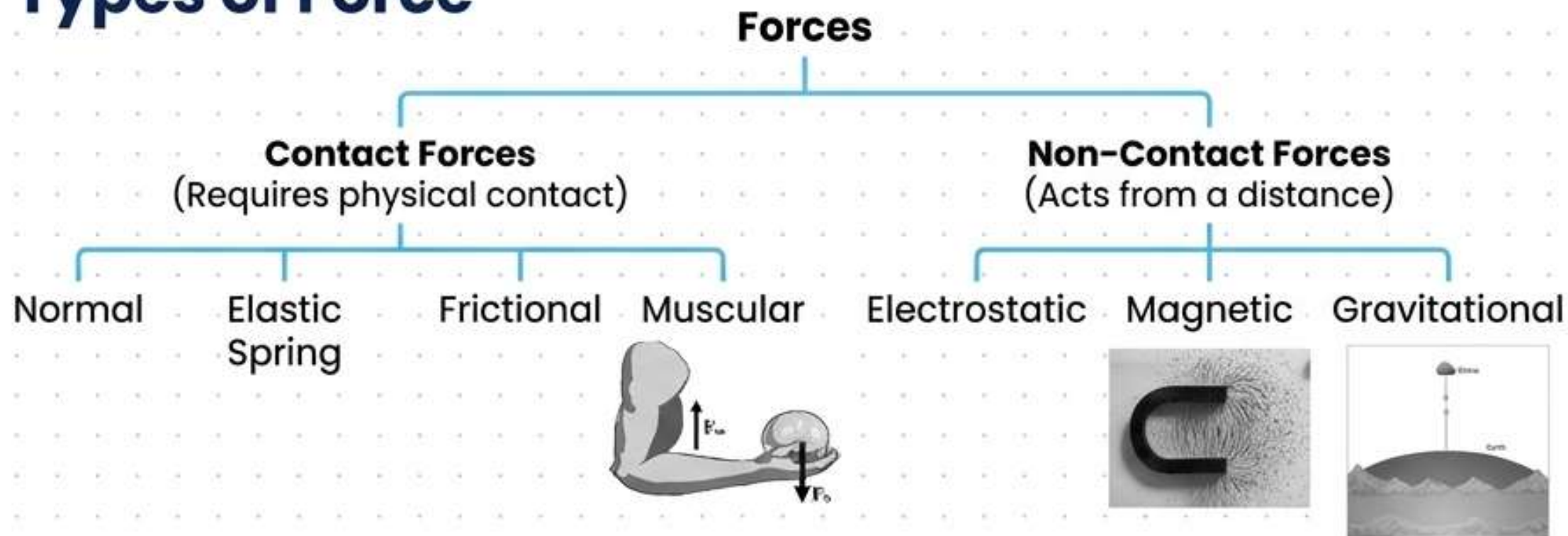
# Core Concepts Breakdown: FORCE

## Effects of Force

- ➔ Start motion
- ➔ Stop motion
- ➔ Change speed
- ➔ Change direction
- ➔ Change shape/size



## Types of Force



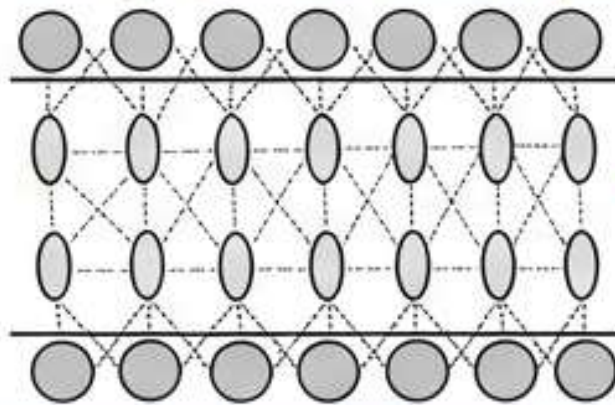
## Comparison Matrix: Mass vs. Weight

Definition	Amount of matter (Mass)	Gravitational pull (Weight)
Dependency	Constant everywhere	Changes with gravity
SI Unit	Kilogram (kg)	Newton (N)
Measurement	Beam balance	Spring balance

# Core Concepts Breakdown: FRICTION

The 'necessary evil' that opposes relative motion between surfaces in contact. Acts tangentially.

## The Why (Microscopic View)



Friction arises due to adhesive/cohesive forces between microscopic surface irregularities.

**1. Nature of the surface (smooth vs. rough)**

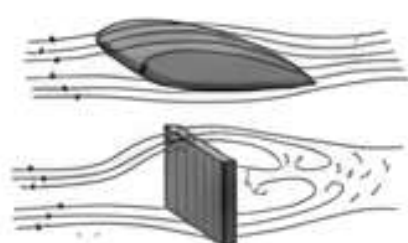
**2. Normal force**  
(greater perpendicular force = greater friction)

**3. Actual area of contact**

## Ways to Reduce Friction

### Streamlining:

Minimizes fluid friction (drag).



*Supersonic plane having streamlined body*

### Lubrication:

Oil/grease smoothes out surface irregularities.



### Ball Bearings:

Converts sliding friction to rolling friction (Rolling < Sliding).



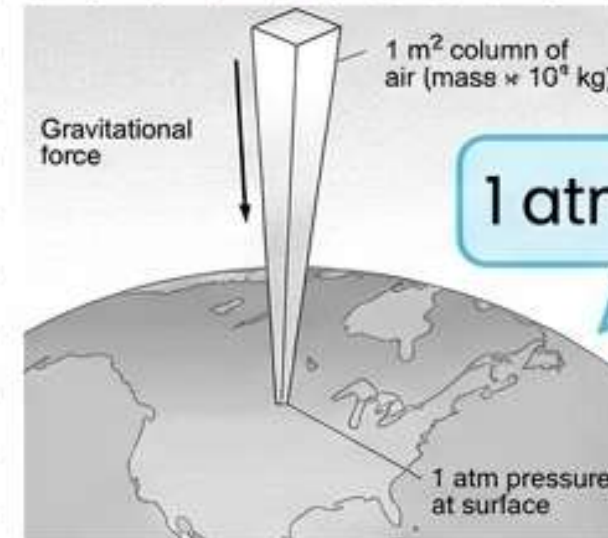
# Core Concepts Breakdown: PRESSURE & BUOYANCY

## Thrust & Pressure

**Thrust:** Total perpendicular force (Unit: **N**).

**Pressure:** Thrust / Area ( $P = F/A$ ). Unit: **Pascal (N/m<sup>2</sup>)**.

## Atmospheric Pressure



1 atm = 1.01 × 10<sup>5</sup> Pa.

## Liquid Pressure Rules

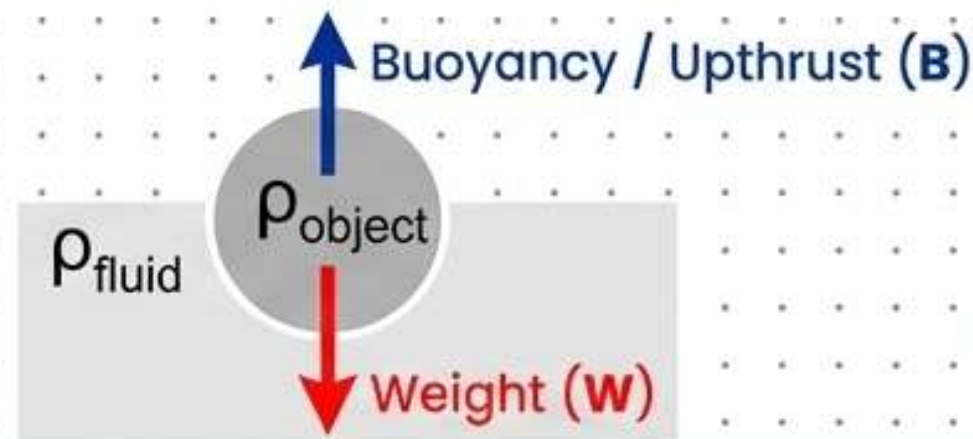
1. Same at horizontal level.

2. Increases with depth.

3. Depends on liquid density.

4. Exerts lateral pressure on container walls.

## Buoyancy & Floatation



If  $W > B$  → Object **Sinks**.  
If  $B > W$  → Object **Floats**.

# Key Definitions & Formulas

**Formula: Pressure (P) = F / A**  
(Note: 1 Pascal = 1N over 1m<sup>2</sup>)

**Formula: Pascal's Law Ratio**  
 $F_1 / A_1 = F_2 / A_2$

**Definition: Drag**  
Frictional force exerted by fluids (liquids/gases).



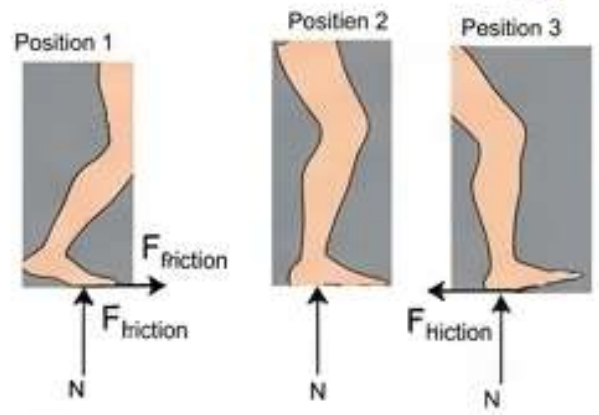
**Formula: Weight (W) = m x g**  
(Note: Earth's gravity  $g = 9.8 \text{ m/s}^2$ )

**Formula: Relative Density =**  
**Density of substance /**  
**Density of water**  
**(NO UNITS!)**

**Definition: Apparent Weight**  
True Weight - Buoyant Force.

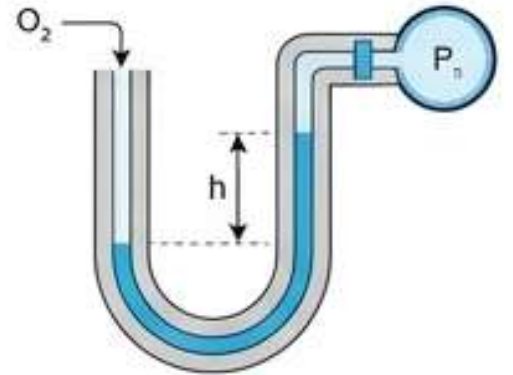
# Visual Concepts & Processes

## Friction Enables Walking



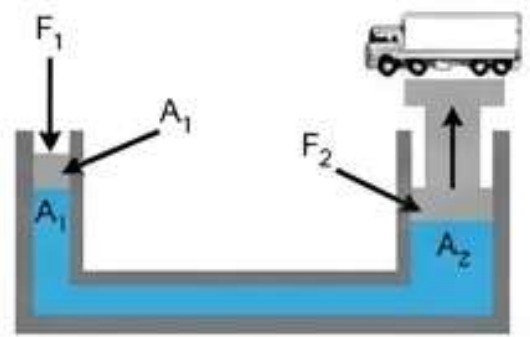
Pushing backward on the ground creates a forward frictional reaction force. Friction is the driving force for walking!

## Liquid Pressure / The Manometer



Pressure difference in the liquid levels represents the pressure exerted on the membrane. Deeper liquid = greater pressure.

## Application of Pascal's Law (Hydraulic Lift)



A small force on a small area ( $A_1$ ) translates into a massive lifting force on a large area ( $A_2$ ).

# Most Asked Board Questions

**Q: Why do porters place a round piece of cloth on their heads?**

**Examiner Keywords**

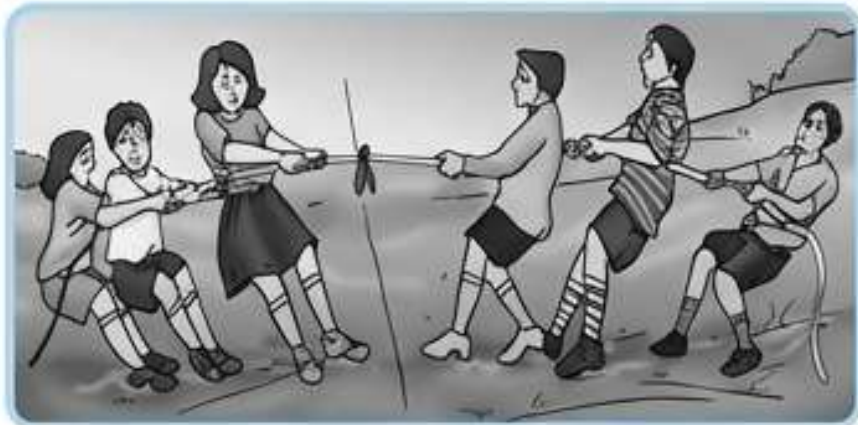
Increases actual area of contact, decreases pressure ( $P=F/A$ ).

**Q: Explain why it is easier to cut with a sharp knife.**

**Examiner Keywords**

Smaller area of edge, greater pressure exerted for the same force.

**Q: What happens in a tug of war when both pull equally?**



**Examiner Keywords**

Balanced forces, net force is zero.

**Q: Why do objects weigh less in water?**

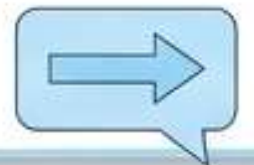
**Examiner Keywords**

Upthrust / Buoyant force opposes downward gravity.

**Q: Why are ball bearings used in machines?**

**Examiner Keywords**

Converts sliding friction to rolling friction, which is significantly weaker.

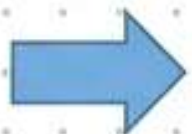


# Common Mistakes & Exam Traps



## Trap 1:

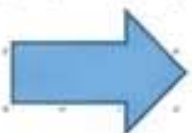
Writing the unit of mass as Newtons.



## Truth:

Mass is strictly kg. Weight is Newtons ( $W=mg$ ).

Trap 2: Assuming friction only slows things down.



Truth: Friction is a "necessary evil." It acts as the driving force that allows us to walk and vehicles to roll.

Trap 3: Giving "Relative Density" a unit like  $\text{kg/m}^3$ .



Truth: It is a ratio of two identical units (densities), so it has NO unit.

Trap 4: Using Thrust and Pressure interchangeably.



Truth: Thrust is the physical force (N); Pressure is the effect of that force over an area (Pa).

# Rapid Revision Sheet

## FORCE

- Push/Pull → Changes state/shape.
- 1 kgf = 9.8N.
- Contact vs. Non-Contact.

## FRICTION

- Opposes relative motion → Depends on Normal Force + Surface Nature.
- Static > Sliding > Rolling.

## PRESSURE

- $P = F/A$
- $A \uparrow$  means  $P \downarrow$ .
- 1 atm =  $1.01 \times 10^5$  Pa.

## LIQUIDS

- Pressure increases with depth → Lateral pressure on walls.
- Pascal's Law ( $F_1/A_1 = F_2/A_2$ ).

## BUOYANCY

- Upthrust opposes gravity.
- Floatation: Object floats if  $B > W$  (or density of object < fluid).

# Answer Writing Framework

## The Physics 3-Mark Formula

### 1. Define:

State the core physical principle clearly.

### 2. Formula:

Write the mathematical relationship (Draw a box around it!).

### 3. Apply:

Relate the formula to the specific real-world scenario in the prompt.

## Example Walkthrough

**Question:** Why are caterpillar tracks used in heavy battle tanks?

### Step 1 (Define):

Pressure is the force exerted per unit area.

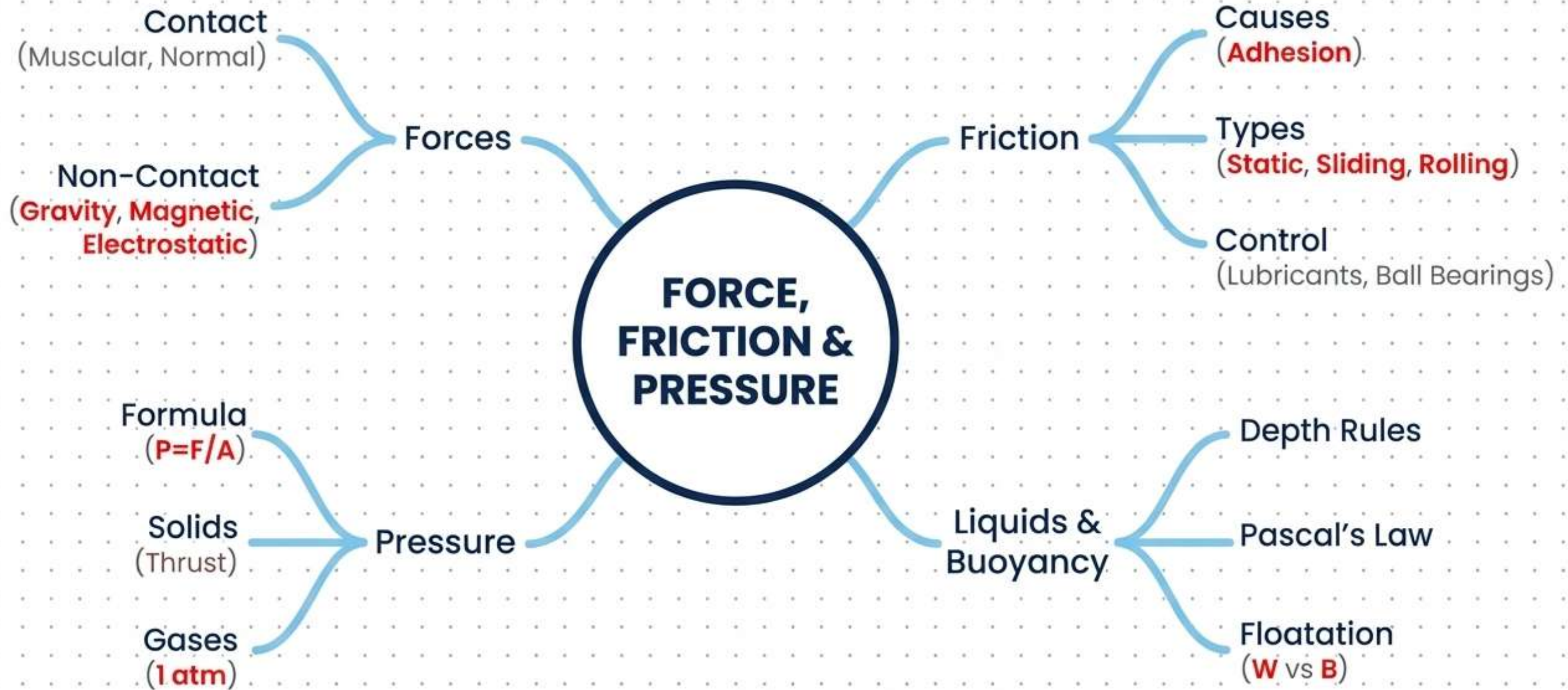
### Step 2 (Formula):

$$P = F/A$$

### Step 3 (Apply):

Caterpillar tracks have a very large surface area ( $A \uparrow$ ). This significantly reduces the pressure ( $P \downarrow$ ) exerted on the ground, preventing the heavy tank from sinking into the mud.

# Visual Mind Map



# Memory Tricks & Mnemonics

## Trick 1: Non-Contact Forces 'MEN can't touch!'

**M**agnetic, **E**lectrostatic, **N**uclear/**G**ravitational are the Non-Contact forces.

## Trick 2: Pressure Rule "High Heels Hurt!"

Small Area = High Pressure.



## Trick 3: Friction Strength

**"Static is Stubborn, Rolling is Rapid."**

Reminds you the order of strength: Static > Sliding > Rolling.



# Final Exam Checklist

## Concepts Mastered:

- I can list the 5 physical effects of force.
- I can classify contact vs. non-contact forces.
- I understand why friction is called a 'necessary evil'.
- I can list the 4 rules of liquid pressure.
- I know the conditions for an object to float or sink ( $W$  vs  $B$ ).

## Math & Application Ready:

- I can calculate Pressure ( $P = F/A$ ).
- I can calculate Weight from mass ( $W = mg$ ).
- I know that Relative Density has no units.

