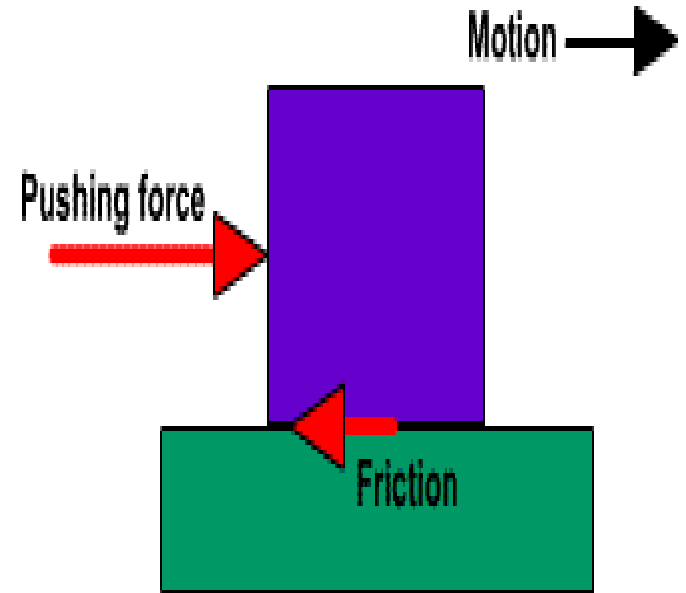


FRICITION IN SPORTS

**A force that
opposes motion.**

What is friction?

- **Is a force that opposes motion between two surfaces that are in contact.**
- Friction is an important force in every sport and human movement.
- **Friction occurs when two surfaces are in contact.**



- Friction is a force between two surfaces that are sliding, or trying to slide across one another, for example when you try to push a toy car along the floor.
- Friction always works in the direction opposite from the direction the object is moving, or trying to move. It always slows a moving object down.

FRICITION

Fluid

Dynamic

Static

Rolling

Sliding

Pivot

Fluid Friction

- **For a solid object moving through a liquid or gas, the amount of friction depends on the shape and surface area of the object and the viscosity (thickness or thinness) of the liquid.**

LAWS OF FLUID FRICTION

- i. The friction force is different for different lubricants.
- ii. The friction force is independent on the load as well as substances of the bearing surfaces.
- iii. The friction force reduce with increasing in the temperature of the lubricant.

- **When a liquid or gas is pushed out of the way of a moving object.**



The force that tries to slow objects down when they move through a liquid or a gas, known as "drag", or "air resistance".



All gases and liquids are fluids.

An airplane and a swimmer both experience fluid friction.



What is Dynamic friction?

- **It is the friction between two moving surfaces.**

when the body is in moving condition then the friction force exerted by the body is called is called "Dynamic friction".

- Dynamic friction is also classified into three categories - (i) sliding friction
 - (ii) Rolling friction
 - (iii) Pivot friction

(i) sliding friction : -

when a body slide over another body then the friction force exerted by the body is called "Sliding friction".

(ii) Rolling friction:-

A body which has balls or rollers roles on the another body then the friction force exerted by the second body on the first body is called "Rolling friction".

(iii) Pivot friction:-

The friction force experienced by a body , due to the motion of rotation as in case of foot step bearings.

LAWS OF DYNAMIC FRICTION

- i. The direction of the friction force will be opposite to the direction of motion of the body.
- ii. The ratio of the dynamic friction to the normal reaction is a constant.
- iii. As we increase the speed of the moving body then the friction force decrease.

Sliding and Rolling





Sliding Friction

Sliding friction is friction that occurs when solid surfaces slide over one another.

Examples:

Writing – pencil point and paper

Combing your hair – surface of comb and strands of hair



Rolling friction is friction that occurs between surfaces in motion in which one of the surfaces is a wheel, roller, or ball.

Examples:

Riding a bike – tires and ground

Bowling – ball and lane





Pivot Friction

- The friction force experienced by a body , due to the motion of rotation as in case of foot step bearings.

Static friction

- **It occurs when a force is applied to an object but this object doesn't move.**
- when the body is in rest condition then the friction force exerted by the body is called "static friction".
- Static friction is also referred to as **Limiting Friction** when describing the maximum amount of friction that develops just before two surfaces begin to slide.

LAWS OF STATIC FRICTION

- i. The applied force will be equal in magnitude with friction force.
- ii. The ratio of the limiting friction force to the normal reaction force is called coefficient of static friction.
- iii. The force of friction is dependent on the roughness of the surface but independent on the area of contact.

Static friction is friction that occurs when the surfaces in contact are at rest (not in motion).

Examples:

A book resting on a desk.

A potted plant sitting on a sidewalk.





Static friction



Factors Affecting Friction

a) The Force pressing the two surfaces together.

- Friction is caused by the interlocking of irregularities of the two surfaces when one object is placed over another object . If the two surfaces of objects are pressed together harder by a great force, then the friction will increase.

- Example

Block Sled: The force pressing the base of the sled to the turf is equal to the weight of the sled pushing down and the reaction of the earth pushing up.

These two forces press the contacting surfaces of sled and turf together.

If a coach gets on the sled , both the weight of the sled pressing downward and the reaction force of the earth pressing upward increase as well.

The frictional force opposing an athlete attempting to push the sled will therefore be greater.

b) The actual contact area between the two surfaces.

- Actual is the important word here, since friction can occur only where there is contact between two surfaces.

- Example

- Lifted Sled: If the athlete lifts sled by pushing forward and upward then no friction occurs where the sled loses contact with ground.
- Soccer Studs: If soccer studs are the only part of the boot contacting the ground, then only the surface of the studs contributes to the contacting area; the rest of sole makes no contact and generates no friction.

c) The nature and type of materials that are in contact.

- When the two surfaces are in contact are smooth, then the friction between them will be small because the interlocking of smooth surfaces is less. As the degree of roughness of the two surfaces in contact increases, the friction also increases.
- When the two surfaces in contact are very rough, then the friction between them will be very large because the interlocking of very rough surface is too much.

- Example

Skiing: The long steel blades gliding on the ice where a thin layer of water produced by the blade pressing on the ice .

The thin film of the water produced by the blade pressing on the ice produces a lubricant that reduces friction to an extremely low level.

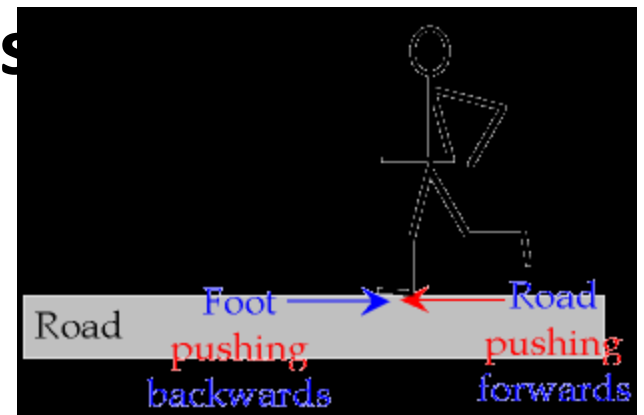
Shoes: The court shoes with gum rubber soles pressing against a rubberised surface, create a tremendously high level of friction.

d) The relative motion between the two surfaces.

- Static friction produces a higher level of resistance than sliding friction. We all have experienced the fact that it's easier to keep an object sliding than to start it sliding.

Is friction good or bad?

- Friction can be good.
- When we walk we push backwards against the ground , the opposing force pushes us forwards.
- Without friction our feet would slip and walking would be impossible.



It is also good

- To stop your bicycle (brake system).



But sometimes is bad...

- **Soil erosion caused by wind (friction of a fluid).**
- **Holes in your shoes, jeans. (friction of a solid) high friction**
- **Lack of friction is dangerous too, you may fall if the floor is very slippery.**

Friction in Sports

- It is important in every sport and human movement.
- Locomotion requires frictional force, so we wear shoes which provide frictional force.
- In most athletic shoes we want large frictional force thus soles provide large friction.
- In activities like dancing and bowling, sliding is desirable, so soles of these activities have less friction.

- In snow skiing we want small friction, so we wax the bottoms of our skis.
- In racquet sports the grips are made of leather or rubber to increase friction.
- In Gymnastics using chalk on hands.

- Rolling friction is common in bowling, billiards, hockey, football, cycling etc. the resistive force is less in rolling conditions.
 - Rolling friction varies according to the nature of the surfaces in contact, the pressure pushing the surfaces together, and the diameter of the rolling object.

- Cycling:
 - Sprint cycle races use narrow tubular tyres, inflating them to pressure that average 120 psi(pounds per square inch).
 - Mountain bikes tires are underinflates, wide, knobbly to provide stability and traction on rough surfaces.

