

Physics & Skiing

PHYSICS IN SKIING
IS THE STUDY OF THE
FORCES WE ENCOUNTER

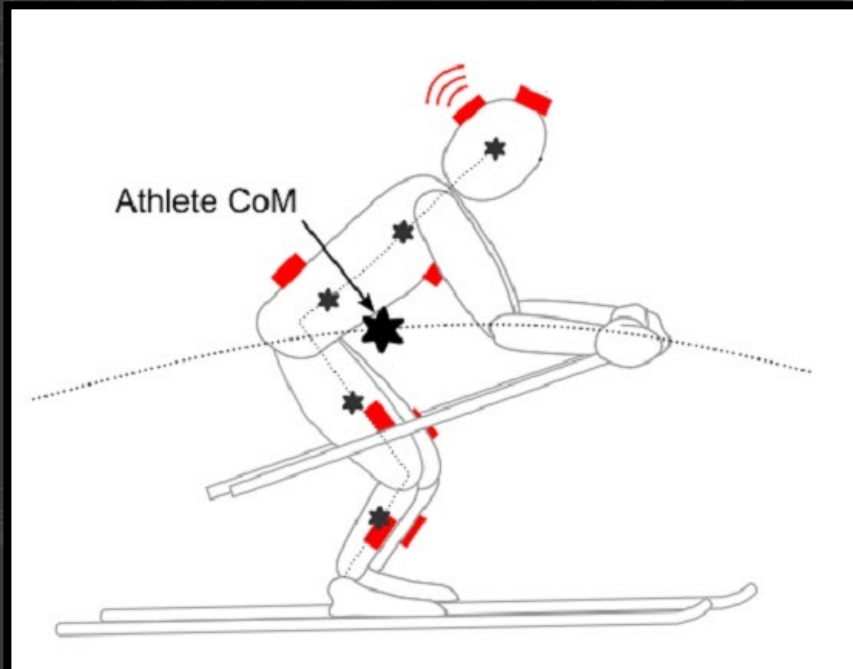


apsi
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CENTRE OF MASS

The centre of mass (CoM) is the point at which all the mass of a body is considered to be focused.



C.O.M. - Centre of Mass

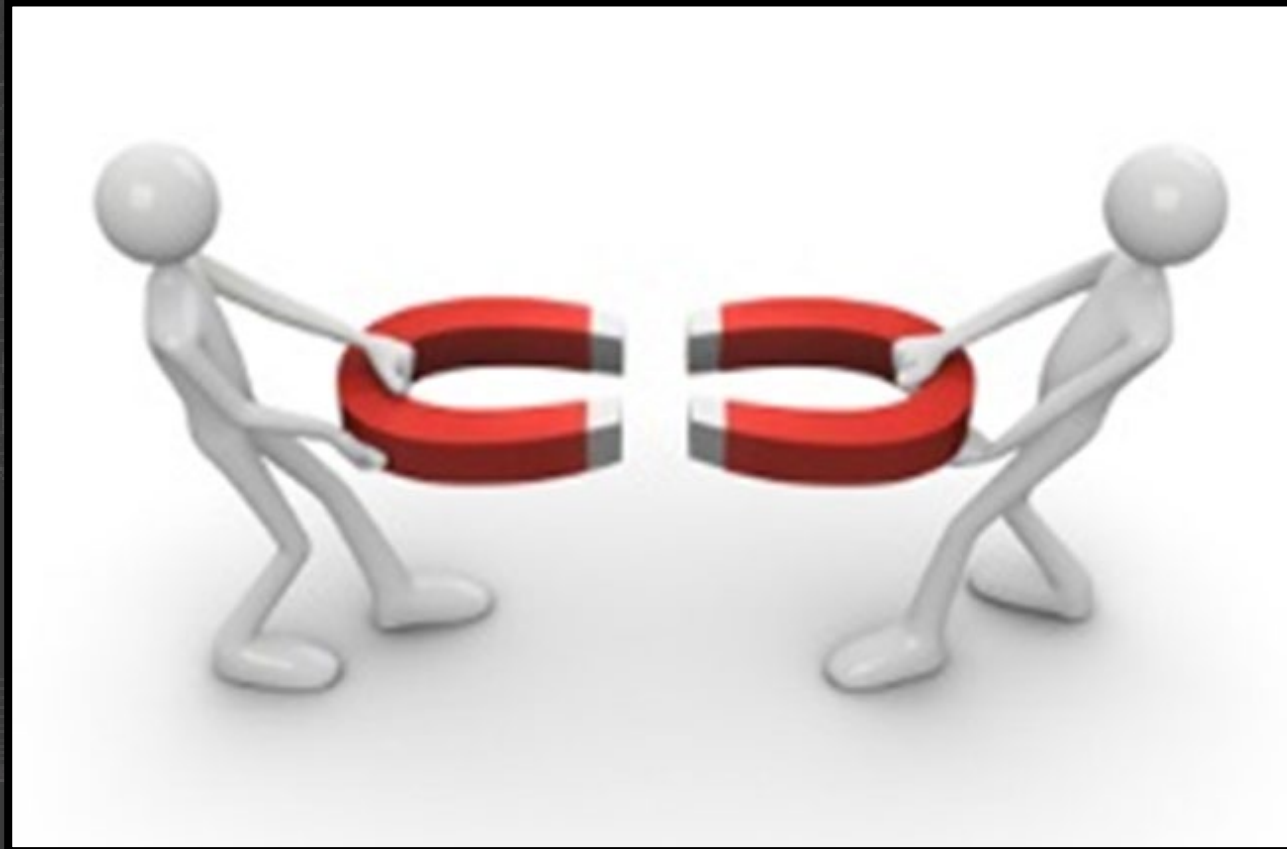
vs

B.O.S. - Base of Support



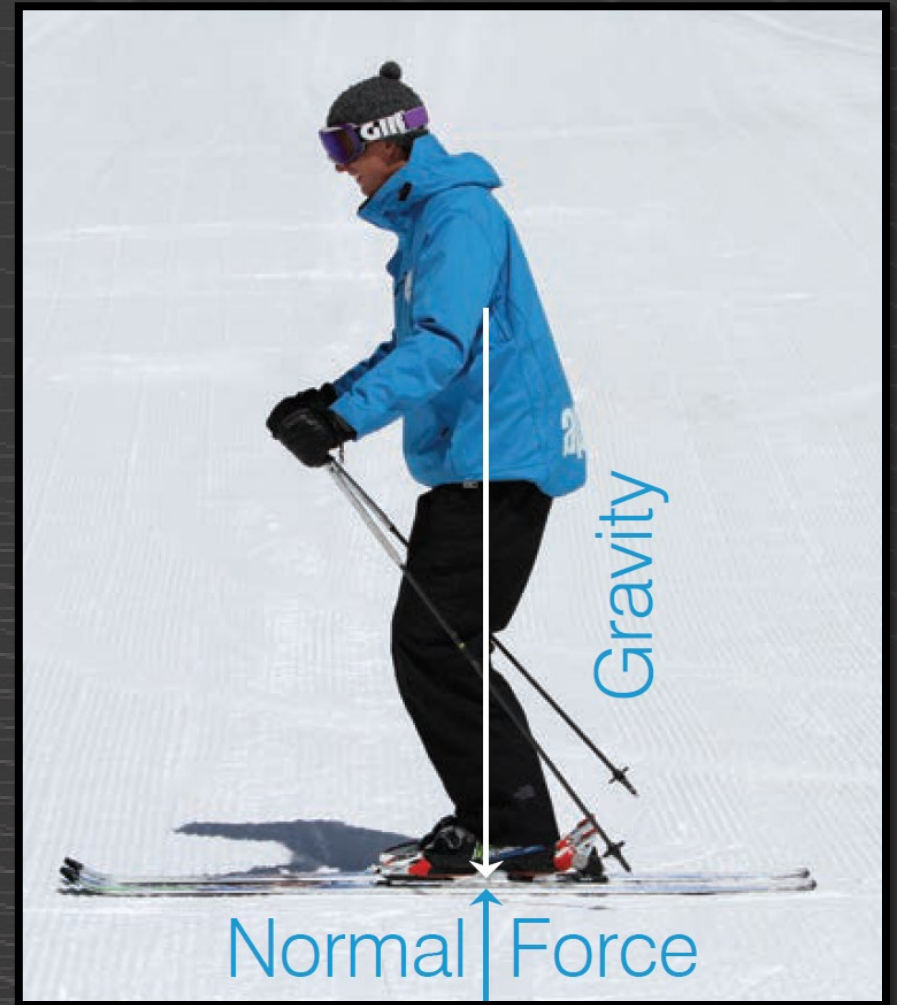
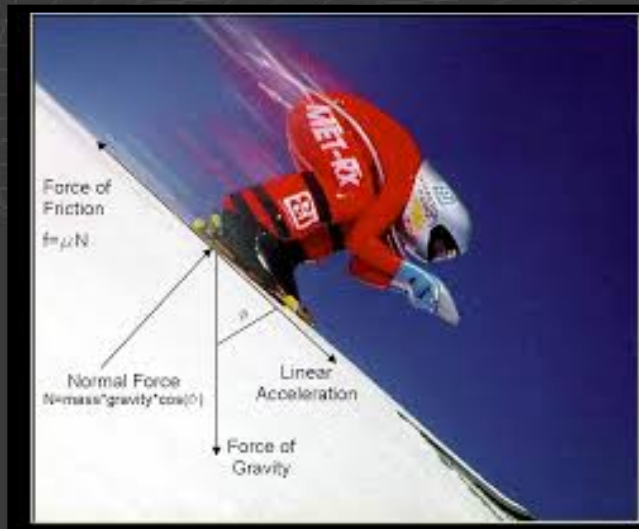
FORCES

A force is something that pushes or pulls on an object.



GRAVITY

Gravity is the force that drives us and makes us move.

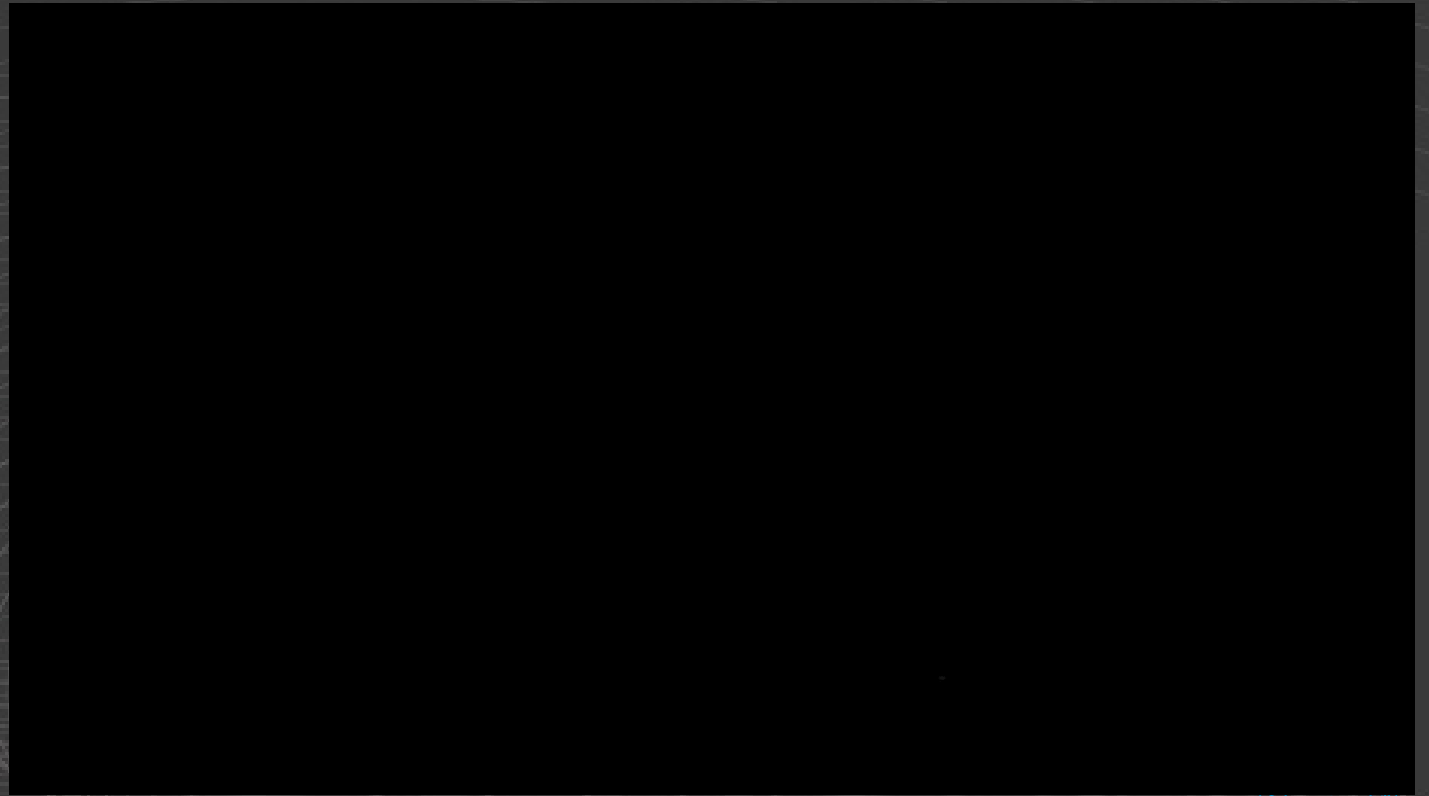


Can you think of some other factors in skiing that may change how gravity effects our movement?



FACTORS THAT EFFECT THE IMPACT GRAVITY HAS ON OUR MOVEMENT

- Snow conditions
- Wind
- Clothing
- Steepness of the hill
- Our weight
- Edge angle



CENTRIPETAL FORCE AND CENTRIFUGAL FORCES

The **Centripetal** force is always trying to move inwards and moves around a center access.

The **Centrifugal** force is trying to move to the outside of the mass and break away from the center.



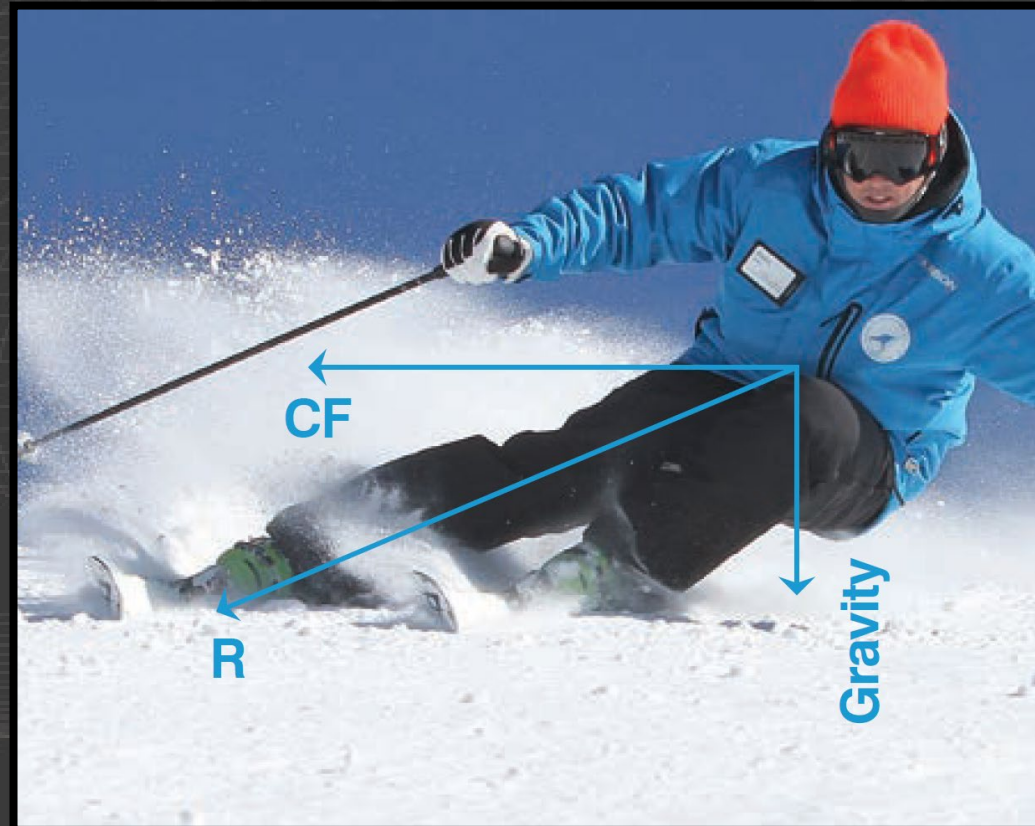
CENTRIPETAL FORCE AND CENTRIFUGAL FORCES

Watch the video and think of skiing moments that have led to falls resulting from getting the relationship of the centripetal and centrifugal forces imbalanced.



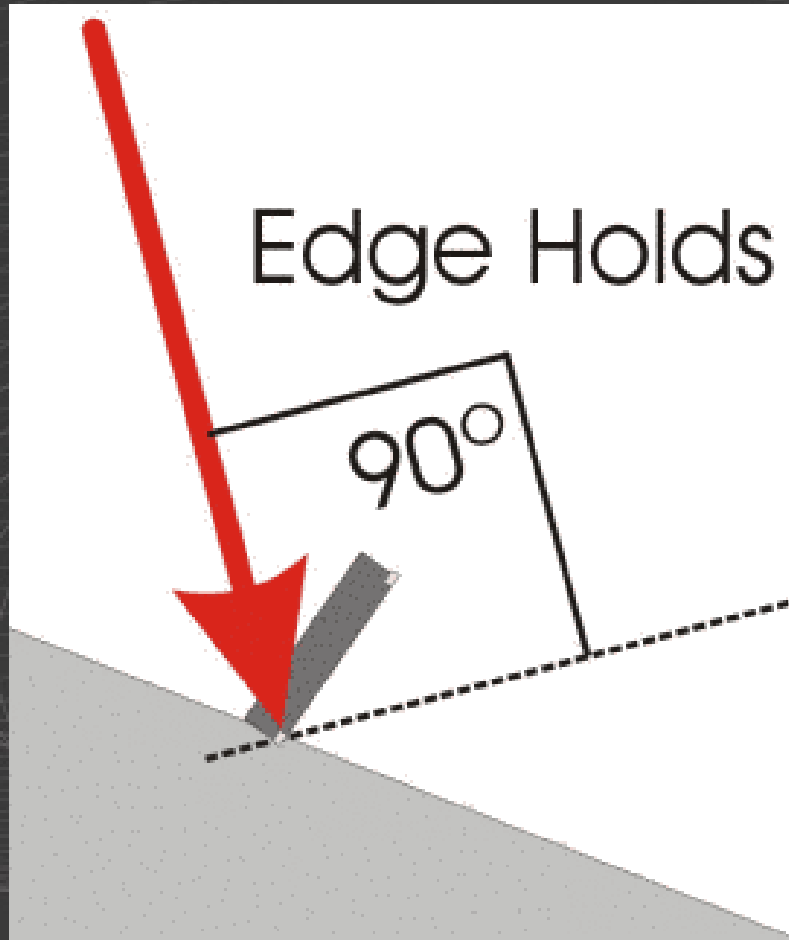
COMBINING FORCES

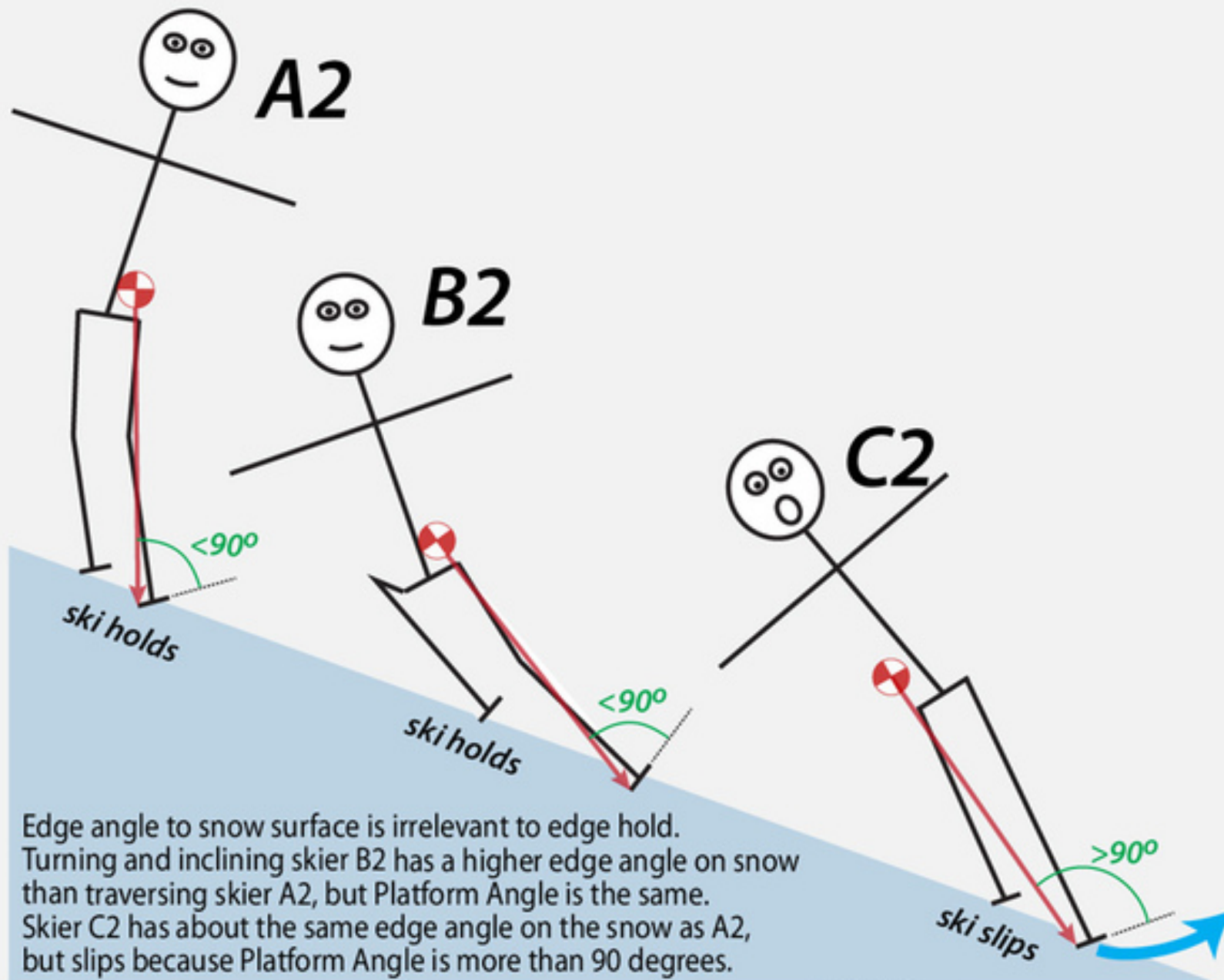
When two or more forces act on a person's centre of mass, we can combine the two forces to result in one force which makes it easier to understand and draw. It is called the 'resultant force'.



Platform Angle

R





Edge angle to snow surface is irrelevant to edge hold.
Turning and inclining skier B2 has a higher edge angle on snow than traversing skier A2, but Platform Angle is the same.
Skier C2 has about the same edge angle on the snow as A2, but slips because Platform Angle is more than 90 degrees.

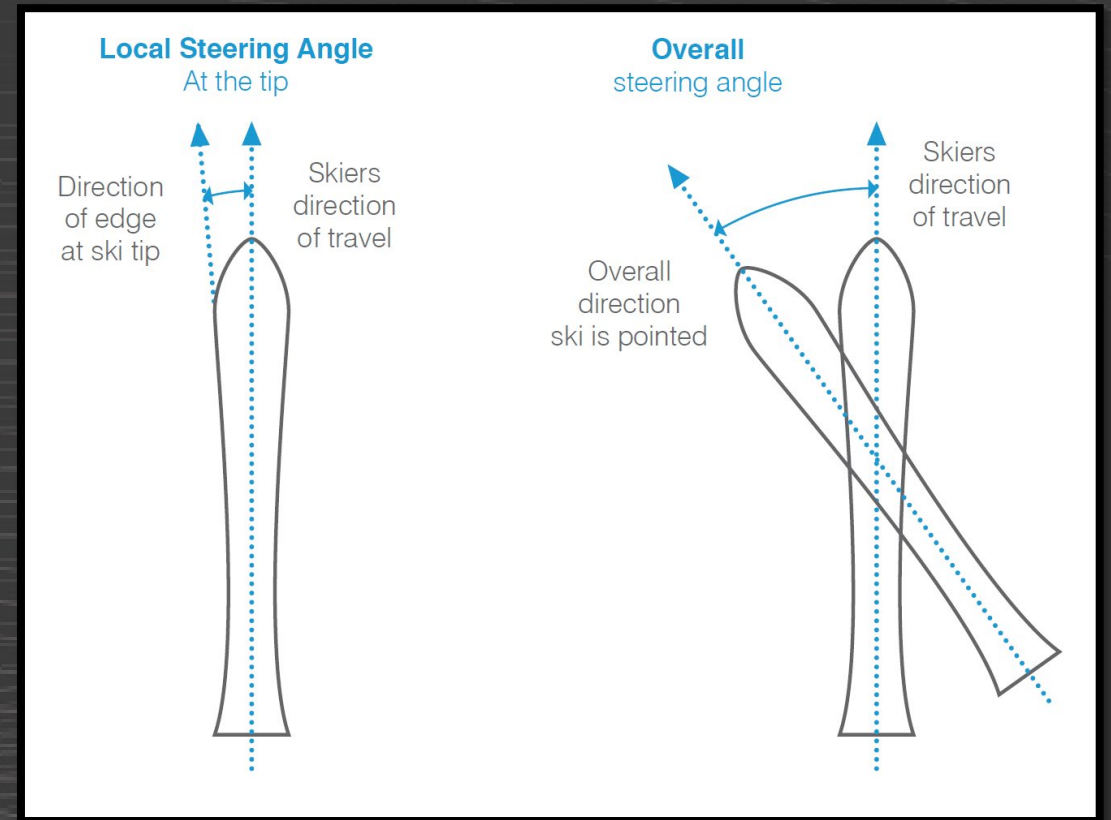
PLATFORM ANGLE

- Practice drawing the critical edge angle. Use the picture a picture like this to assist.



STEERING ANGLE - LOCAL AND OVERALL

- The Local steering angle is the natural side cut of the ski.
- The overall steering angle is when the ski is twisted or moved to have an angle greater than the one set by its design. The greater the angle the tighter the turn and greater forces will need to be managed by the skier.

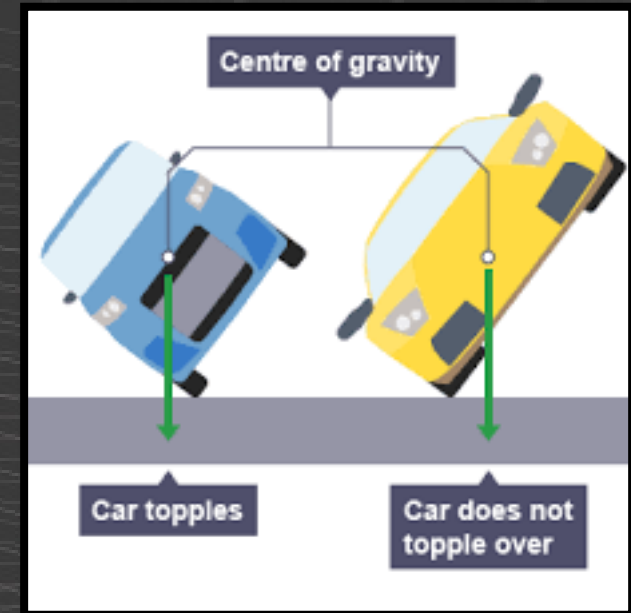
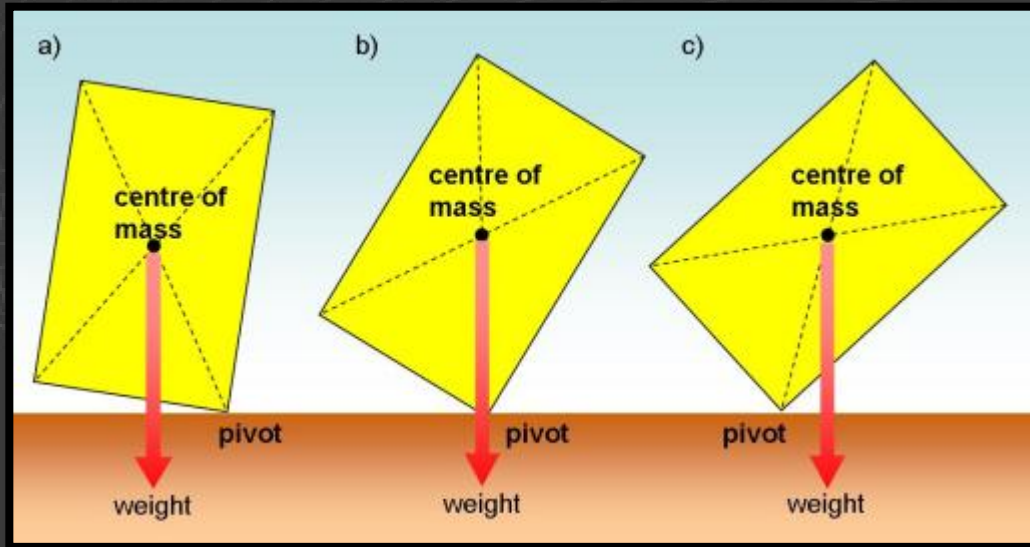


STEERING ANGLE

Watch the video of this racer twisting the ski at the top to create a tighter turn around the gate.



Toppling



Toppling

Halve the radius = Double the Force
Go twice as fast = Quadruple the force

$$F \propto \frac{mv^2}{r}$$

To topple across our skis in turns we must unbalance this equation.

- Make Centripetal Force Greater

Or

- Let Centrifugal force win

Toppling



Stemming



Slowing the skis down

Pressing on the uphill ski



Absorbing