

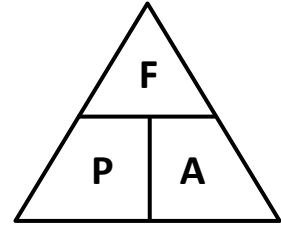
Mechanics (Pressure)

Pressure depends on two things

- the Force (in newtons, N) and
- the Area it's pressing on – the contact area (in square metres, m²)

Pressure is force per unit area or $P = F/A$

Its unit is newtons per square metre (Nm⁻²) or pascal (Pa)

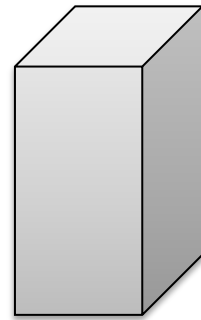


Example

An 8 kg block of area 4 m² is sitting on the floor. What pressure does it exert?

- the force on the floor is the weight of the block: 80 N
- the area it's pressing on is the base area of the : 4 m²

So the pressure on the floor is $80 \div 4 = 20 \text{ Nm}^{-2}$ (or 20 Pa)



When the area is small, even quite a small force can create a very large pressure. This is why this sharp knife is good at cutting the tomato: it creates a large pressure when you push the very small area of the sharp blade against something. But when you want to spread butter you lay the knife blade flat (or you'd end up cutting the bread).

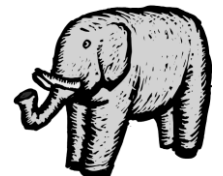


Ice skates have sharp edges. They have a small area in contact with the ice. Your weight creates a very large pressure on the ice.



A woman can damage floors by walking on them in high-heeled shoes because the area of the heel is small. It easily creates enough pressure to cause a dent in the floor.

The pressure from the heel can be greater than if an elephant was standing there. The force from the elephant is spread over a much



larger area and so the pressure is less.

KEY PHRASE: **Pressure is inversely related to area of contact.**

What does this mean? Well... "if the area decreases↓ the pressure increases↑..... for the same force" AND "if the area increases↑ the pressure decreases↓.... for the same force".

So camels have big feet so they don't sink in the sand.



Some things to remember...

Skiing is usually done by people with two legs and therefore two skis. Calculate the area of one ski & multiply by two!



It's the same for the area of bicycle tyres in contact with the ground.

Common sense suggests this truck has FOUR tyres in contact with the ground (even if we can only see two).



So why do Eskimos wear snowshoes?



And what about comparing a heavier boy (Nick) on skis with a lighter boy (Tim) wearing boots, both standing on snow?

Even though Nick is heavier than Tim, his weight is applied over a larger area. Tim's lighter weight is applied over a smaller area. So Tim puts more pressure on the ground and so sinks more.

You should also be able to show who exerts the most pressure by calculation. Remember – TWO feet!

And finally back to the 8 kg block of weight 80N ...

Turning it on its side has NOT changed the force (still 80N) but since the contact area has increased \uparrow the pressure has decreased \downarrow since (...use that key phrases here...) **pressure is inversely related to area of contact.**

