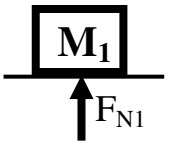
Name: _____

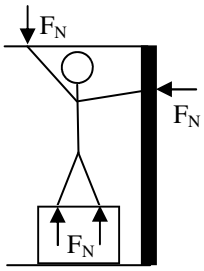
Period: _____

Normal Force (F_N)

The normal force is the supporting force of a surface on an object. Without a normal force an object would break thru a surface.



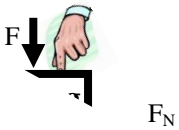
"Normal" means perpendicular. F_N is always perpendicular to a surface, even if the surface is tilted.



There are 4 normal forces acting on this person, because there are 4 surfaces pushing on him.

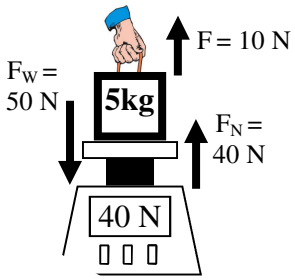
Simple, As a supporting force the normal force is exactly what a scale would read. The scale would have to give more support (more F_N) for heavier objects, for example.

Downward forces increase the normal force.



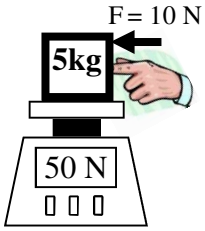
$F_N = F_W = 50$ N

Upward forces decrease the normal force.



$F_N = 40$ N

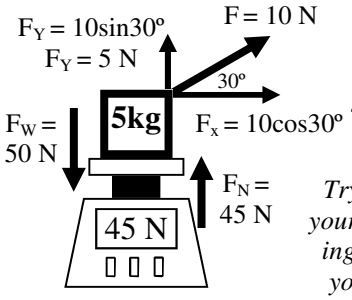
Sideways forces don't affect the normal force and $F_N = F_W$, again.



$F_N = F_W = 50$ N

Simple Normal F_N

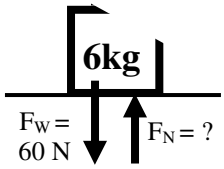
If a force pulls at an angle, only the vertical component af-



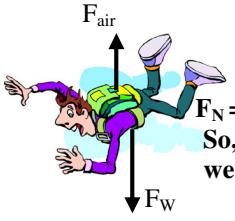
The horizontal component is irrelevant

$F_N = 50 - 5 = 45$ N

Try it! Put an object in your left hand while pushing or pulling on it with your right hand. Only vertical forces will matter.

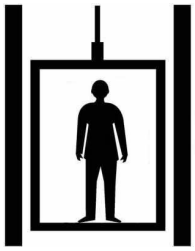


Perceived Weight When a person is skydiving they feel weightless. Gravity is pulling them down, so they still have weight, but their perceived weight is zero. On a roller coaster you feel like your weight changes, too. At the top you feel lighter, at the bottom you feel heavier, but, again, your weight hasn't changed. What has changed is the normal force on your body! **Normal Force = Perceived weight! If $F_N = 0$ N you feel weightless!**



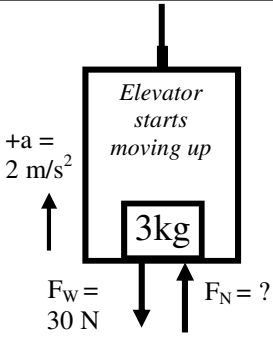
You've also experienced this change of perceived weight in an elevator.

***a* = −.** *When the elevator starts moving down (negative acceleration) you feel lighter because $F_N < F_W$.*



***a* = +.** *When the elevator starts moving up (positive acceleration) you feel heavier because $F_N > F_W$.*

*Between floors (at constant speed) **a = 0** and your weight feels normal. So $F_N = F_W$.*



Example: How heavy does the 3 kg object feel, if the elevator accelerates up at 3 m/s^2?

Since all forces are vertical, use $\Sigma F_y = ma_y$.

$F_N - 30 = 3(2)$

$F_N - 30 = 6$

$F_N = 6 + 30 = 36$ N

It seems heavier!