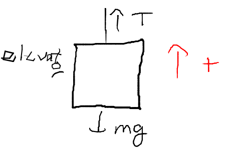
# Newton's 2nd Law

$\vec{a} = \frac{\vec{F}_{net}}{m}$




A) $T > mg$
B) $T = mg$
C) $T < mg$

1) Elevator moves up at constant speed

$0 = a = \frac{F_{net}}{m}$ $\quad F_{net} = T - mg = 0$

$\therefore T = mg$

2) Elevator moving up, slowing down.

$a \downarrow$ $\quad F_{net} \downarrow$ $\quad mg > T$

3) Elevator moving up, getting faster

$T > mg$

also $T > mg$
when going down & slowing down
$\uparrow a$

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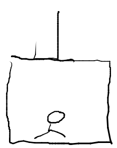
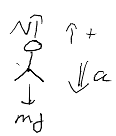


suddenly starts moving downward


A) $N > mg$
B) $N = mg$
$\boxed{C)\ N < mg}$

Our experience of gravity is really the force of the floor pushing up on us
"apparent weight"

Elevator is accelerating downward
Minimum acceleration so that your feet leave the floor?



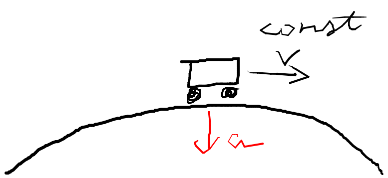

$F_{net} = N - mg = -ma$

$N = 0$ when feet leave floor

$-mg = -ma \rightarrow a = g$
free fall

If $a > g$, $N_{floor} = 0$

elevator falls at $a > g$
You ~~ont~~. only feel $F_{net} = mg$
Elevator ends up faster than you until you hit the ceiling




N: normal force of road on car

mg: weight of car

A) N > mg    B) N = mg    C) N < mg

centripetal acceleration towards center

Fnet ↓ ⇒ mg > N

$a = \frac{v^2}{r}$ so if v is too big or r is too small

then N → 0 and you go into free fall — Yee haw!

Object moving in a circle is accelerating towards the center

$F_{net} = ma_c = m\frac{v^2}{r}$ centripetal force

Almost all types of forces can be centripetal

- Normal: car above
- Tension: rock spinning on string
- Gravity: orbits
- Static Friction: walking in a circle
- Kinetic Friction: NO
  - never ⊥ to motion