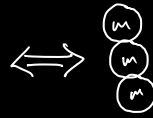First, we imagine Katie is made from three rocks each of mass m
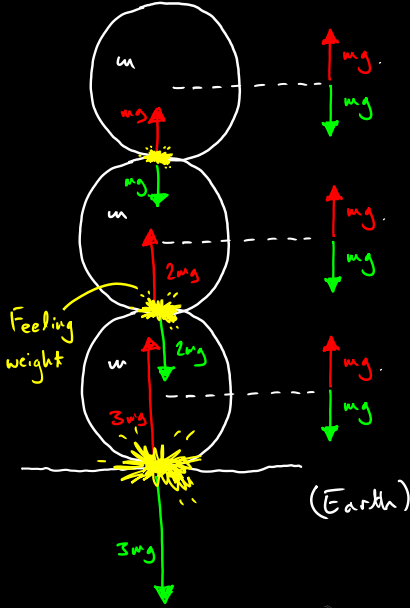
Katie ⟺ Three rocks.
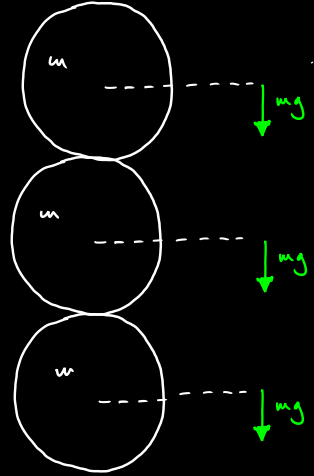
Total force on each rock

Feeling weight

(Earth)

$F = mg$ law of gravity

inertial mass

gravitational mass

$F = ma$ Newton's 2nd law

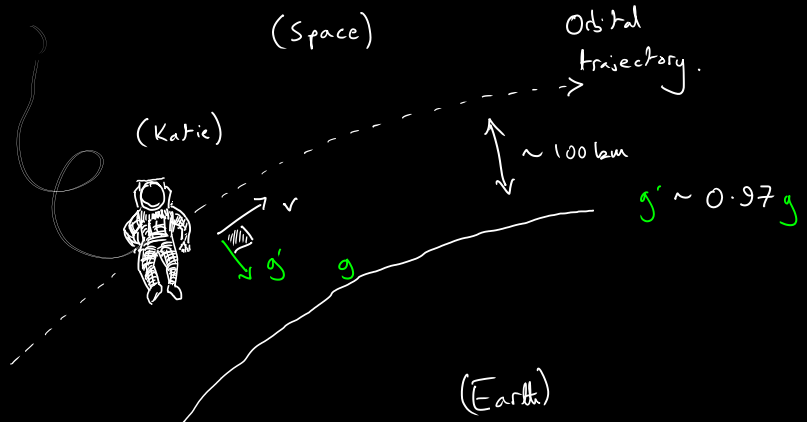$ma = mg \Rightarrow a = \dfrac{m}{m} g = g$

(Equivalence principle $m = m$)

1) floating in space = falling

2) falling = acting only under gravitational force

3) feeling of weight = transmission of reaction force

Total force on each rock

(Space)

(Space)

(Katie)

Orbital trajectory.

~ 100 km

$g' \sim 0.97 g$

(Earth)