

Name _____
 Period _____

Gravity, Mass, Weight And Inertia

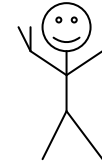
Matter is anything that has MASS & VOLUME

BUT.....If it has MASS and it's on Earth(or any place else with gravity) ...it also has WEIGHT!



Earth lots of mass= lots of gravity

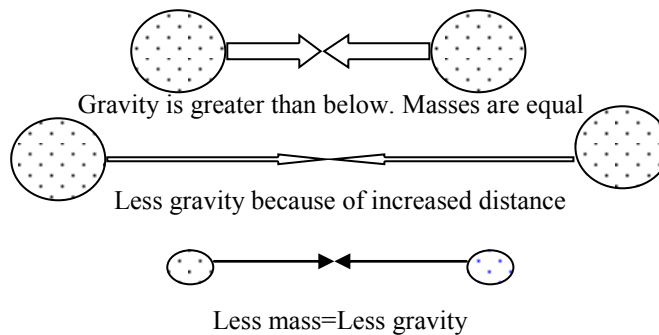
All Matter has **MASS**
GRAVITY is the Force of attraction between objects due to their masses
 THEREFORE, **ALL MATTER** experiences **GRAVITY**.



Humans have little mass= very little gravity

GRAVITY DEPENDS ON 2 THINGS

1. **MASS** of the objects
2. **DISTANCE** between them



Weight

A measure of the Force of Gravity



Measured using a spring scale.

Units are **Newtons (N)** =Measure of **FORCE**

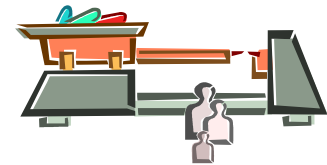
1N= Force needed to accelerate 1Kg@1m/s²

Force = Mass X Acceleration due to Gravity (F=mg)
 Acceleration of gravity on earth = 9.8m/s/s

MASS

A measure of the Amount of Matter

Measured with a triple Beam Balance



Units are _____

Mass of an object can only change if matter is added or taken away.

Mass does not change with location in the universe!!!

Example: An object with a 10 kg mass will have what weight on earth?

ANSWER:
 Force(N)= Mass (kg) X Acc. Due to Gravity (m/s/s)
 10kg X 9.8 m/s/s (earth)= 98N

Weight will change with an objects location in the Universe.

For example: A person on earth (9.8m/s/s) has a MASS of 75kg therefore his weight is _____

What will this person's *Mass* be on the moon? His weight? (What do you need to know?)

Inertia

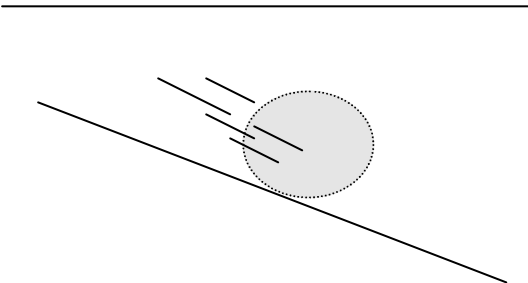
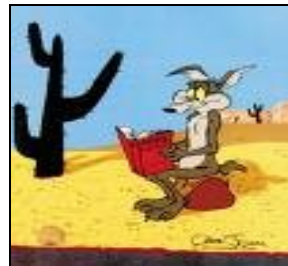
An object's *resistance* to changes in its state of motion.

- All Matter has Inertia.
- Inertia is dependent on *mass*!
- Greater the mass, the greater inertia.

An object in motion will remain in motions unless acted upon by an outside force.



An object at rest will remain at rest unless acted upon by an outside force.



In order to overcome an objects inertia, whether it be moving or static (not moving), the force must be greater than the force of the object.

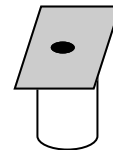
Circle the object with a greater inertia.

1. Baseball / Bowling ball
2. Empty grocery cart / full grocery cart
3. An egg / A paper towel tube
4. Dishes / tablecloth
5. A train / A Car

AT HOME LAB

Materials: Quarter, drinking glass and index card.

Set up:



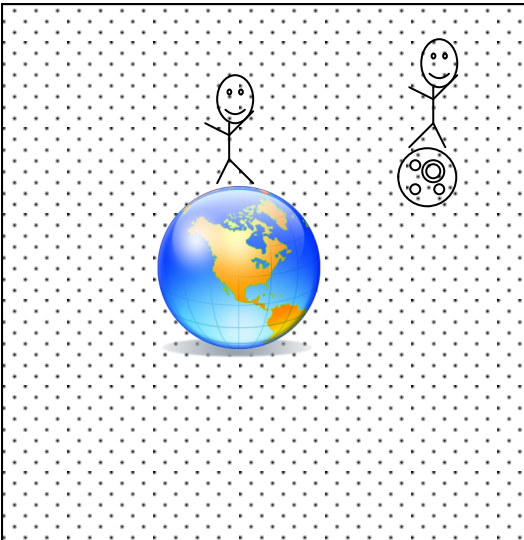
Problem: Can the card be moved without overcoming the inertia of the coin?

Name _____
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Weight and Mass

Choose weight or mass. (W or M)

- | | |
|---|--|
| 1) Measure of the amount of matter. _____ | 6) Depends on the acceleration due to gravity. _____ |
| 2) Measure of the force of gravity. _____ | 7) Units are Newtons. _____ |
| 3) Measured with a spring scale. _____ | 8) Measured with a triple beam balance. _____ |
| 4) Units are grams. _____ | 9) Measure of the amount of force. _____ |
| 5) Changes with location in the universe. _____ | 10) Inertia increases as _____ increases. |



Calculate the Stick Figure's weight on both earth and the moon.

Mass of stick figure on earth: 100kg

Acceleration due to gravity on Earth _____
 $F_N = \text{mass} \times \text{gravity}$

Weight on earth _____

Acceleration due to gravity on moon: 1.62m/s/s

Mass On MOON _____

Weight on Moon _____

Using your NASA App, Click on a planet and scroll down the left side and look for the surface gravity of that planet. Should be the number with m/s². Use the formula $F_N = \text{mass (Kg)} * \text{gravity (m/s}^2)$ to calculate the weight of an 80Kg person on three planets.

Planet 1
 Planet _____

Planet 2
 Planet _____

Planet 3
 Planet _____

Surface Gravity _____

Surface Gravity _____

Surface Gravity _____

To get weight or Force in Newtons,
 multiply 80Kg x surface gravity

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Weight_(N) = _____

Weight_(N) = _____

Weight_(N) = _____

What is the mass of the object?
Density 3.g/cm³
Volume 3cm³
Mass = _____
What if the object was on the surface of MARS? What would it's mass be? _____



REMEMBER:
MASS IS THE SAME FOR ALL MATTER EVERYWHERE.
WEIGHT CHANGES WITH LOCATION IN THE UNIVERSE