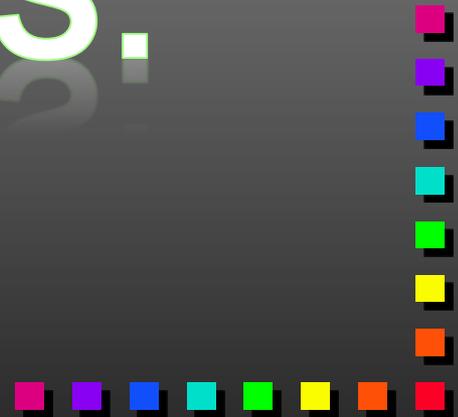




NEWTON'S LAWS:



NEWTON'S 1ST LAW OF MOTION

- “The velocity of an object will remain constant unless a net force acts on it.”
 - This is called the “Law of Inertia”
- *Inertia*: is the tendency of an object to remain at rest or in motion
 - Inertia is dependent upon an object’s mass.
- *Force*: a push or pull that one object exerts on another
 - It is measured in Newtons (N).
 - If one object has a greater force, then net force must be calculated



FORCES

- Balanced Force: forces on a object are equal
 - Object will not move
- Unbalanced Force: unequal forces on an object
 - Object will move

$F_2 =$ 18 Newtons $F_1 =$ 20 Newtons



Net Force =
2 Newtons



How does this relate to Newton's First Law????

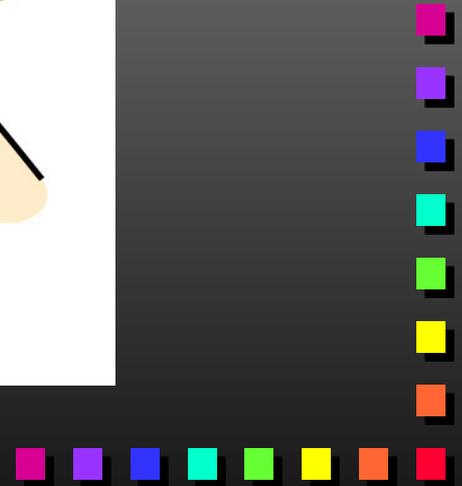


Your body wants to keep moving in the direction the car was just going. Because of inertia, seat belts provide that opposing force that can prevent a passenger from being thrown from the vehicle.



THE OLD TABLECLOTH TRICK...

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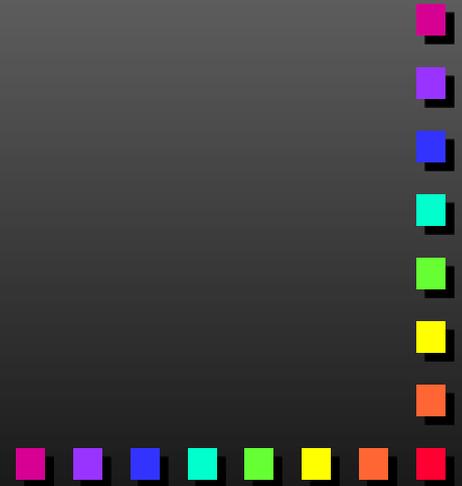


CRITICAL THINKING QUESTION

Will a bullet fired in outer space
slow down?

(low gravity and no air resistance)

No!!



NEWTON'S 2ND LAW OF MOTION

- “When a net force acts on an object, it will accelerate in the direction of the net force”
- The larger the force, the greater the acceleration
- The larger the mass, the smaller the rate of acceleration
- Force = Mass (acceleration) or
[$F = m \times a$]





NEWTON'S 3RD LAW OF MOTION

- “When one object exerts a force on a second object, the second object exerts a force on the first that is equal in magnitude and opposite in direction.”

Examples:

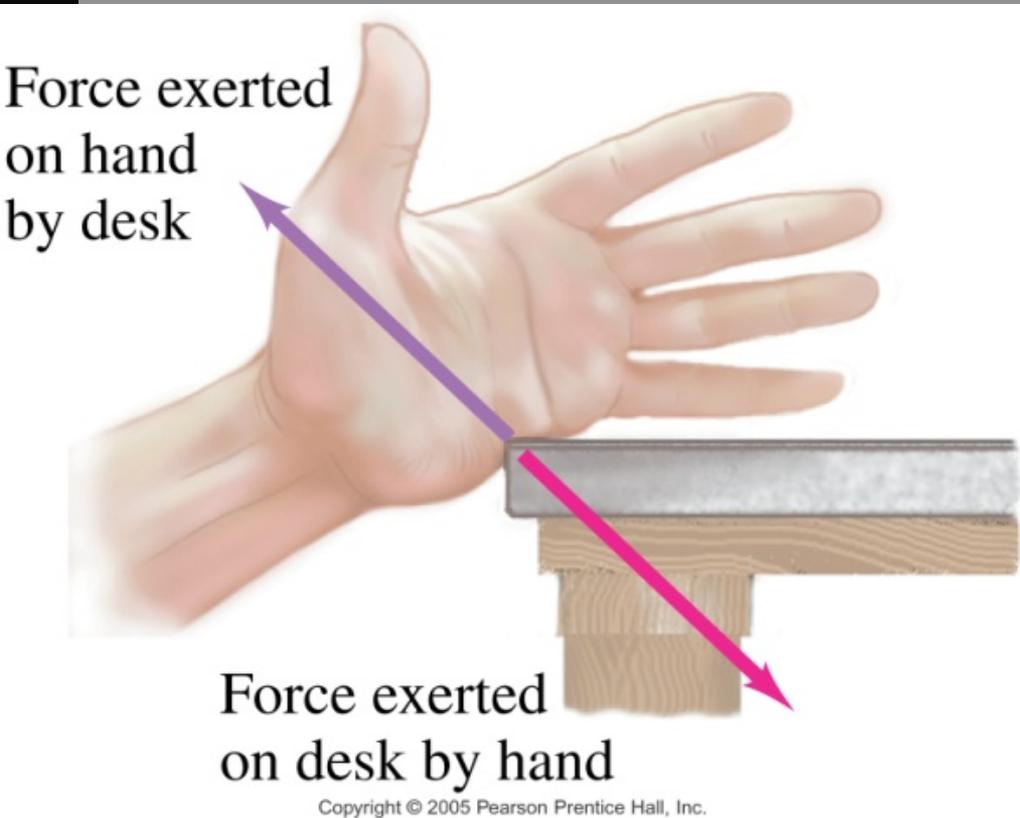
1. a swimmer pushes on the water, and the water pushes back

2. a ball thrown on a wall, bounces off





Examples of Newton's 3rd Law



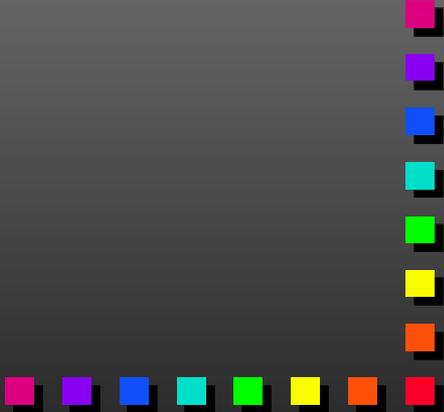
A REVIEW OF NEWTON'S 3 LAWS OF MOTION IN RELATION TO FLYING...



- 1. Which is easier to stop, a row boat or a cruise ship going at the same speed? Why?**
- 2. Your friend suddenly turns the car and you fly into the side, are you hitting the side of the car or is the car hitting you?? Why?**
- 3. Newton's 1st Law of Motion is also called _____.**
- 4. According to Newton's 2nd Law of Motion, $F = \underline{\hspace{2cm}}$.**
- 5. Inertia varies depending on the object's _____.**



FORCE, MASS AND ACCELERATION



NEWTON'S 2ND LAW OF MOTION

- “The acceleration of an object is in the same direction as the net force on the object”
- The larger the force, the greater the acceleration
- The larger the mass, the smaller the rate of acceleration



NEWTON'S 2ND LAW OF MOTION

- How is pushing a shopping cart a good example of Newton's 2nd Law?

- The shopping cart will accelerate forward because of the force you are exerting on it in that direction



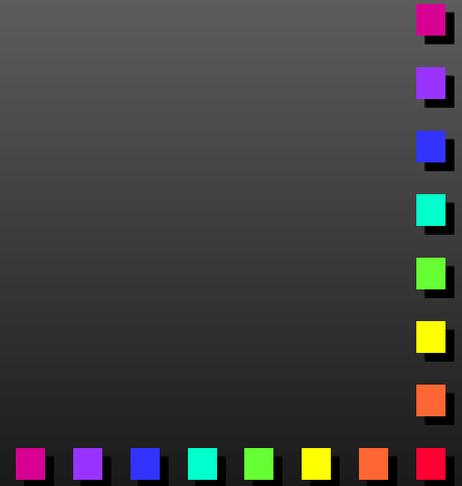
THE MATH BEHIND THE FORCE...

- Force is a derived unit
- $F = (\text{mass}) \times (\text{acceleration})$
- For us, the mass is measured in Kilograms (Kg) and the acceleration in m/sec^2 .
- Force is measured as:
 $\text{Kg} * \text{m}/\text{sec}^2$ or 1 Newton

THE MATH... DUN DUN DUN

Sample Problem #1

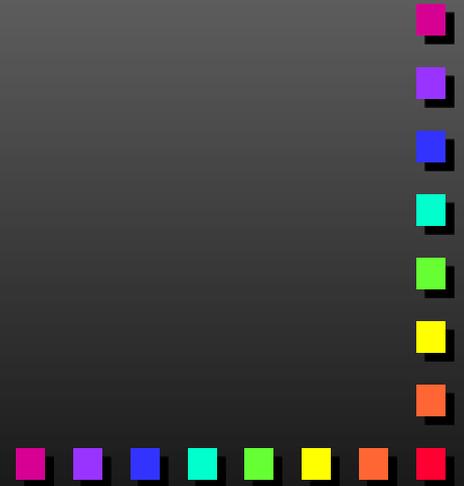
What is the force required to move a 2400 kg car with an acceleration of 4 m/sec²?



THE MATH

Sample Problem #2

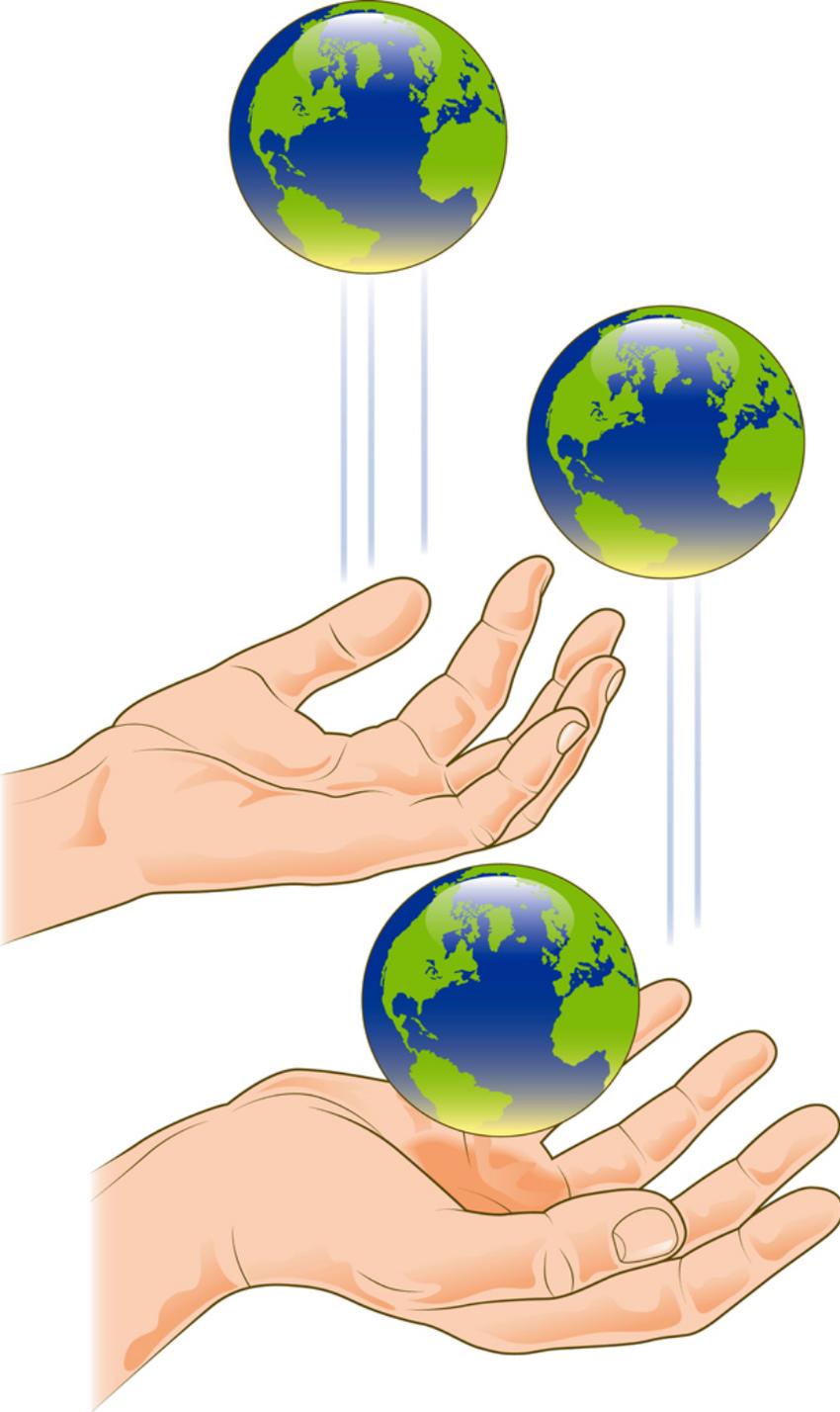
If a force of 4.2 Newtons is applied to an object with a mass of 75 kg, what is the rate of acceleration?



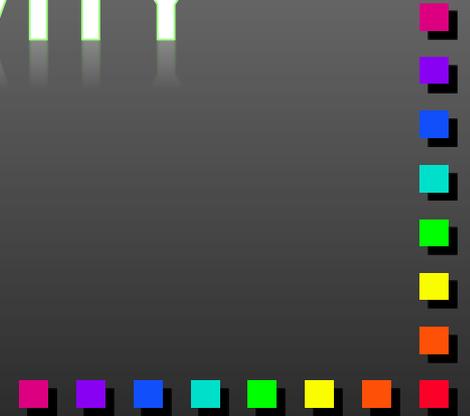
- 1. Why does a firefighter feel the hose push back as they turn the water on?**
- 2. A Newton (1 N) is equal to _____?**
- 3. A person is pushing a couch with 50 N of force. What is the force of the couch against the person if the couch does not move?**
- 4. What is the difference between mass and weight?**

According to the Population Reference Bureau, what is the approximate number of people who have ever lived on earth?

- a. 50 billion b. 100 billion c. 1 trillion d. 5 trillion



NEWTON, WEIGHT AND GRAVITY



PS 5.8 – 5.10

NEWTON'S LAW OF GRAVITATION

“There is a force of attraction between all objects in the universe.”

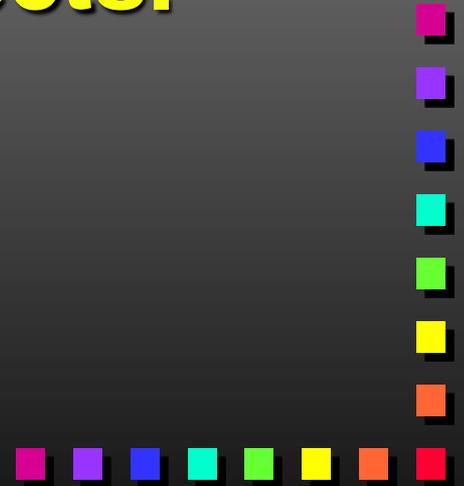
= **GRAVITY!!!!!!!!!!!!!!!!!!!!**

- The object with the larger mass will exert the greater force.
 - This is why objects weigh more on the earth than on the moon.
 - The earth is larger so it has a greater force of attraction (gravity).



Why don't we notice “all these forces” between two objects??

Because the force of the earth is so much greater than the force between the two objects.



NEWTON'S LAW OF GRAVITATION



Is there gravity on the moon??

*Yes! It is just less than on Earth
(about 1/6th of what it is on Earth,
there is no wind on the moon, and
practically no atmosphere)*

What about on the sun??

Yes!!



WHAT IS THE DIFFERENCE BETWEEN MASS AND WEIGHT?

Mass: measurement of the amount of matter in an object

Weight: the amount of force (gravity) on an object



- 1. The gravitational force between two objects depends on _____ and _____.**
- 2. When is the acceleration the greatest for a skydiver?**
 - a. in the plane before jump**
 - b. right before opening parachute**
 - c. After opening parachute**
 - d. landing on the ground**
- 3. Since the moon has less mass than Earth, how does this affect the acceleration of a falling object on the moon??**
- 4. What happens to the gravitational force between two objects if the distance increases between them?**

1. For any object, the greater the force that's applied to it, the greater its ____ will be.
a. acceleration b. gravity c. inertia d. velocity
2. The greater the mass, the _____ the gravitational force an object exerts.
3. Weight is a measure of an object's _____ and it can be found using the following formula:
4. In the formula above, what "value" do we use for the variable "a"?
5. If a woman walks 10,000 ft, how many more feet does she need to go a distance of two miles??

NEWTON'S LAW OF GRAVITATION



- We are affected by gravity at the Earth's surface
- To account for that gravity we use the equation...
- $F_w = (\text{mass}) (\text{acceleration of gravity})$
 - $F_w = \text{force weight OR just "weight"}$
 - Mass = kg
 - Acceleration of gravity = a_g or just "g" = 9.8 m/s²



THE MATH

Sample Problem #1

What is the force weight of an object with a mass of 10 Kg?



THE MATH

1. What is the weight of LCD TV that has a mass of 75 kg?

2. How much would an object with a mass of 52 kg weigh on Earth?

3. What is the mass of an object with a force weight 25 N?

4. You throw a 7 kg medicine ball while working out, what is the force weight of that ball?

5. A Boeing 747 with a force weight of 300,000 N requires a velocity of 360 km/hr west for 8 seconds to achieve lift. What force is produced to achieve this lift and allow the plane to fly?

Assignment!

Right Now:

EOC Review

Pg. 94 #1-3, 5-7, 9-11, 13-15

(Due by the end of class)



TUESDAY 11/17 - BELLRINGER

1. Whenever you see the word “weight” in a problem, what equation must you use?
2. 9.8 m/s^2 is always referred to as the _____ of _____.
3. What is the weight of a couch that has a mass of 80 kg?
4. A distance vs. time graph of a cyclist has a zero slope. What can you infer?
 - a. he’s speeding up
 - b. he’s slowing down
 - c. he is at a steady pace
 - d. he is at rest

WEDNESDAY 11/18 - BELLRINGER

Review Day!!!!

Test tomorrow! 😊

Go over:

EOC Review

Pg. 94 #1-3, 5-7, 9-11, 13-15