



Science Virtual Learning

6th Grade Science

Newton's 2nd Law

April 15, 2020



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Lesson: April 15, 2020

Objective/Learning Target:

-I can explain and apply Newton's 2nd Law of Motion.

****You will need paper for this lesson****

Warm up #1 - Let's Get Started



Quickwrite:

Let's say you push an empty cart and a full cart with the SAME amount of force. Will one move quicker than the other or will they move at the same speed? How do you know?



Warm up #1 - Answer Key

The full shopping cart will move slower than the empty shopping cart because it has more mass. You would have to use more force on the full shopping cart for it to move quicker.



Warm up #2 - Let's Get Started

Terms to know:

Force: a push or a pull

Net force: sum of forces acting on an object

Mass: amount of matter in something

Acceleration: change in an object's speed or direction over time

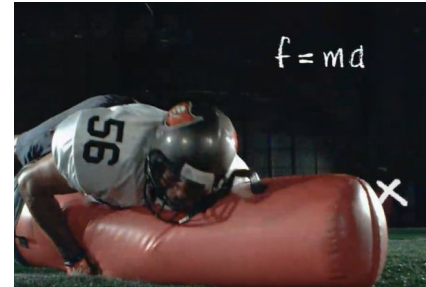
Newton's 2nd Law of Motion: the net force of an object is equal to the product of its mass and acceleration, $F=ma$.

Practice #1


While watching the following videos, take sketchnotes on your own piece of paper. Sketchnotes include words and pictures in a design that makes sense to you! (Watch this [video](#) for more understanding on sketchnotes.)

Videos for Newton's 2nd Law sketchnotes:

- [Newton's 2nd Law in Football](#)
- [Science of Basketball](#)
- [Nasa STEMonstration](#)



Practice #1 - Example Sketchnotes



$f = ma$

THE magnitude OF force IS EQUAL TO mass MULTIPLIED BY acceleration.

Momentum = mass \times velocity

$$\sum \overset{\text{force}}{f} = \frac{d(mv)}{dt}$$

change in time

NEWTON'S 2ND LAW OF MOTION

ACCELERATION
 IS PRODUCED WHEN A force ACTS ON A mass

FORCE f
 THE net force ACTING ON THE OBJECT, MEASURED IN Newton's (N)

MASS m
 THE mass OF THE OBJECT, MEASURED IN kilograms (kg)

ACCELERATION a
 THE acceleration OF THE OBJECT, MEASURED IN metres per second (m/s²)

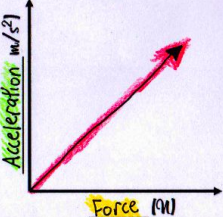
EXAMPLE QUESTION

What is the force needed to accelerate a 30 kg shopping cart 3m/s²?

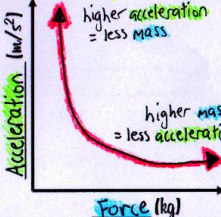
Force = $f = 90$
 Mass = $m = 30\text{kg}$
 Acceleration = $a = 3\text{m/s}^2$

$f = M \times a$
 $f = 30\text{kg} \times 3\text{m/s}^2$
 $f = 90\text{N}$

when mass is constant



when force is constant



DID YOU KNOW?
 Mass is a measure of inertia - the resistance of an object to acceleration.

THE greater THE mass OR acceleration, THE GREATER THE force.

2kg vs 20kg
 less force vs more force

The greater the mass, the greater force required to increase its acceleration. Therefore, acceleration is inversely proportional to mass when the force is constant!

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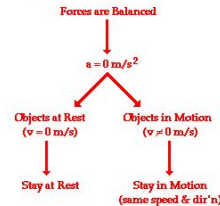
Practice #2

Read through this [website](#), answer the four questions on the bottom of the page. Don't forget to check your answers by clicking "see answer".

Newton's Second Law

Newton's Second Law
 The Big Misconception
 Finding Acceleration
 Finding Individual Force Values
 Free Fall and Air Resistance
 Two-Body Problems

Newton's first law of motion predicts the behavior of objects for which all existing forces are balanced. The first law - sometimes referred to as the law of **inertia** - states that if the forces acting upon an object are balanced, then the acceleration of that object will be 0 m/s². Objects at **equilibrium** (the condition in which all forces balance) will not accelerate. According to Newton, an object will only accelerate if there is a **net** or **unbalanced force** acting upon it. The presence of an unbalanced force will accelerate an object - changing its speed, its direction, or both its speed and direction.





Additional Practice

- Test your knowledge about Newton's 2nd Law on this [Quizizz!](#)
- Watch this [video](#) for more understanding.