Unit V:
Constant Force Particle Model

Relationship between
Acceleration, mass, and force

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- Unit Learning Expectation
  - We are learning to **describe the relationship between an object's mass and the resulting uniform acceleration due to a constant net force acting on the object.**

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- Introductory Lab Exploration
  - Newton 500
    - Constant force, varied mass
    - Constant mass, varied net force
    - Calculate acceleration
  - Newton 500 Lab Document

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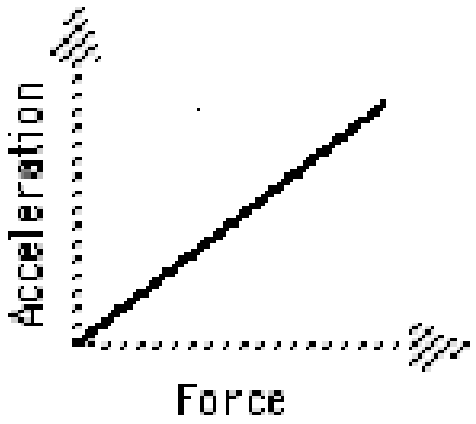
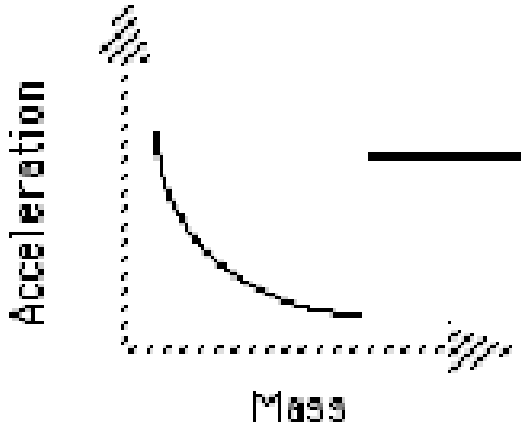
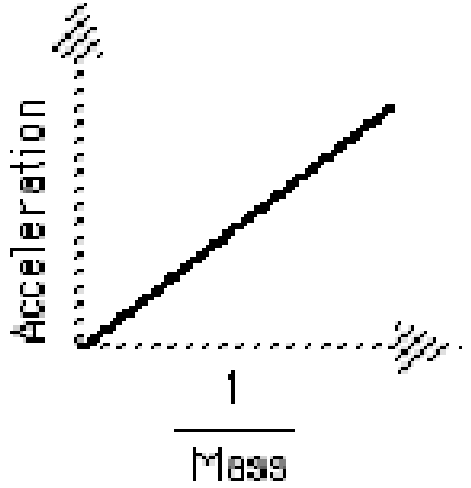
Newton 500 Graphs

See whiteboard exemplars







$$a \propto F_{net} \qquad a \propto \frac{1}{m} \Rightarrow a \propto \frac{F_{net}}{m}$$

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Unit 5 Timeline: Anticipated Schedule

(Week 1-3 to 1-7) Day 1: Review comments from Unit 4 and 6 test. Have students self assess work.

Pre-Lab Modified Atwood experiment / Rubber Band Dynamics Cart

HW: Honors Zit. 6.1 CP Hsu: 2.2 p.32-37

(Week 1-3 to 1-7) Day 2: Lab: Modified Atwood

WB: Results and graphs

Form Fnet $\neq$ 0N model (Fnet=ma)

HW: Full page showing model and representations of model.

(Week 1-3 to 1-7) Day 3: FA: Quiz 1 (Description: Forces LE 1.1, 1.2, 1.3)

Demo: Elevator Measurements/video

Practice Problem

HW: Wkst 1

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Unit 5 Timeline: Anticipated Schedule

(Week 1-10 to 1-14) Day 4: WB: Wkst 1
HW: Wkst 2

(Week 1-10 to 1-14) Day 5: WB: Wkst 2
FA: Quiz 2 (Description: Forces LE 1.4)
HW: Honors Wkst 3 CP Wkst 2a

(Week 1-10 to 1-14) Day 6: WB: Honors Wkst 3 CP Wkst 2a

Demo: Static friction

HW: Wkst 4

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Unit 5 Timeline: Anticipated Schedule

(Week 1-18 to 1-24) Day 7: WB: Wkst 4
Application of Net Force: Circular Motion
HW: Review

(Week 1-18 to 1-24) Day 8: Review

(Week 1-18 to 1-24) Day 9: Assessment

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Terms	Written description	Symbol	Units

Unit V:
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Lab	What we did	Results (include graph)

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New mathematical representations

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By the time you finish all labs, worksheets and related activities, you should be able to:

1. Use Newton's 2nd Law to qualitatively describe the relationship between **m** and **a**, **F** and **a**, **m** and **F**. (e.g., if you double the mass, the acceleration will…)
2. Given a **v** vs **t** graph, draw the corresponding **a** vs **t** and **F** vs **t** graphs.
3. Determine the net force acting on an object by:

a. drawing a force diagram for an object given a written description of the forces acting on it.

b. resolving forces into **x** and **y** components, then finding the vector sum of the forces.

c. analysis of the kinematic behavior of the object.

4. Solve quantitative problems involving forces, mass and acceleration using Newton's 2nd Law.

a. Having determined the net force (as in #3), and given the mass, find the acceleration.

b. Continue to use the kinematical models from unit III to determine the velocity or displacement of the object, once the acceleration is known.