Newton's 2nd law: _____   EN: _____
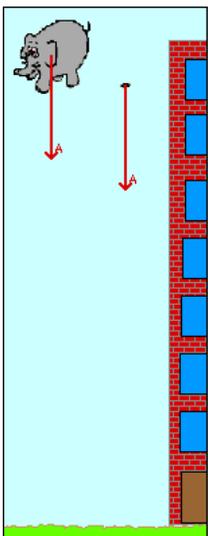
Positive acceleration =

Negative acceleration =

KEY: velocity / acceleration
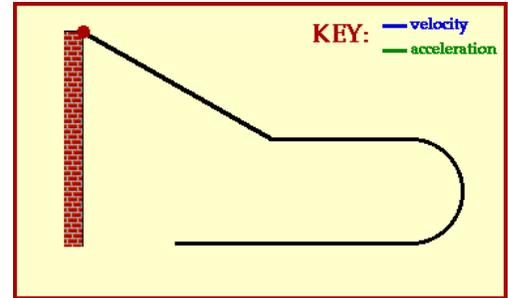
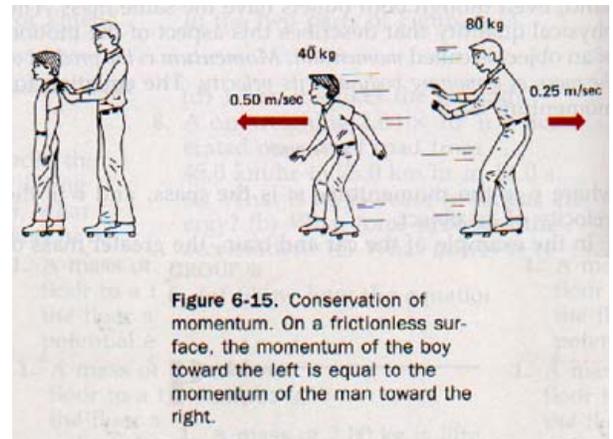In order to have acceleration, you must have something that disturbs an object's equilibrium

_____ Force changes an object's velocity or acceleration: Symbol:

_____

– a is in m/s^2

– m is in kg,

– F is kg·m/s^2 or _____

Weight is a _____

_____

Acceleration due to Gravity (9.8 m/s^2)

Figure 6-15. Conservation of momentum. On a frictionless surface, the momentum of the boy toward the left is equal to the momentum of the man toward the right.

_____ = (a) of a body is directly proportional to the net force applied (Fnet), and inversely proportional to the mass(m). Look at the diagram to the right. What magnitude of momentum does each person experience :   I = mv

II. Acceleration of Gravity on Earth

a = Δv/Δt   and   Newton's 2nd Law   F = ma

The force pulling on your mass (toward the ground) is called your _____

What are the units of weight (force) ?

As the skydiver falls what are the magnitudes of the forces acting on him.

Neglecting Air Resistance – (Vacuum = no air molecules)

- two things with differing masses dropped from the same distance will hit the ground @ the same time.

- in free fall the only thing influencing the rate is

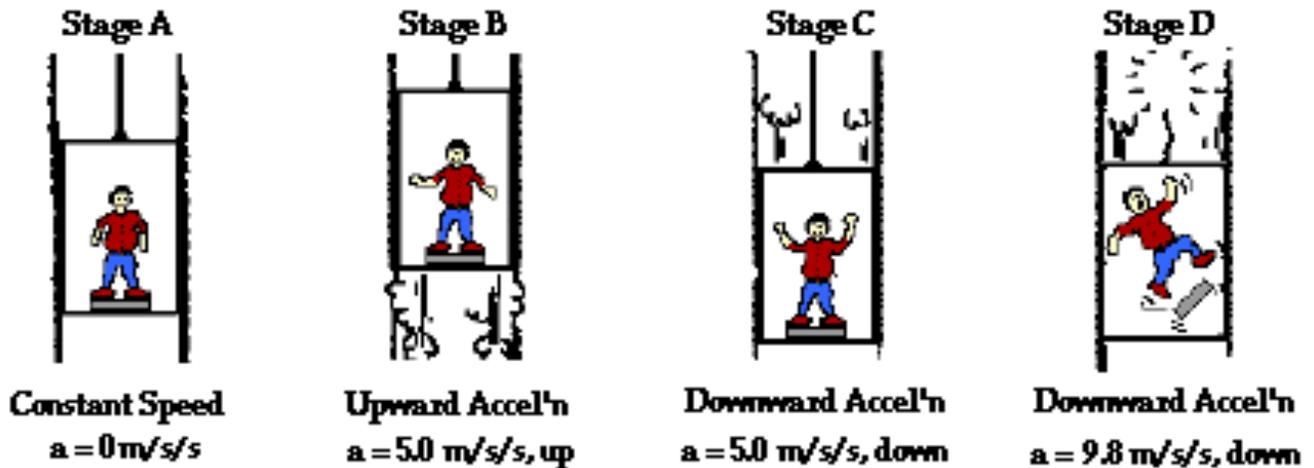* w/air resistance surface area and friction matter

Apparent Weight
   Is your weight always the same on the Earth?

   What about in an elevator?

Elevator diagrams

Stage A	Stage B	Stage C	Stage D
Constant Speed	Upward Accel'n	Downward Accel'n	Downward Accel'n
$a = 0 \text{ m/s/s}$	$a = 5.0 \text{ m/s/s, up}$	$a = 5.0 \text{ m/s/s, down}$	$a = 9.8 \text{ m/s/s, down}$

Apparent Weight:
• When accelerating up …. W_A = mg + ma

• When accelerating down… W_A = mg - ma

Practice:
   1) On the Big Dipper at the bottom of the first hill you experience an acceleration of 27 m/s^2 (about 3 g's) What is your apparent weight at that point?

   2) What is your apparent weight at the top of the 2nd hill when you experience an acceleration of 2.2 m/s^2 ?

Weightlessness and Free Fall

<u>Free fall</u>

When an object is freely falling (disregarding friction) its acceleration is _____ m/s^2 (rounded = 10 m/s^2) or for every second that it falls, it will be traveling 9.8 m/s faster. Since this acceleration is due to _____ we can call it "g" instead of "a".

- We can modify the previous formula to: *v = g t*

How fast will an object be traveling after it has fallen 8 s?

When an object is thrown straight up it will _____ at 10 m/s^2, at the point at which the object will begin to fall back down, the velocity will be _____. When it reaches its starting point the object will have the _____ speed with which it was thrown, but in the _____ direction.

If you were standing on a cliff and you threw one ball up with the same speed as you threw one ball down, which would hit the ground with more speed?

- Since: average velocity = distance/ time   then,

              distance = average velocity x time   then,

              d = <u>initial velocity + final velocity</u> x time

                            2

              d = <u>0 + gt</u> x t   or   d = 1/2 gt^2

                  2

  ➔ How far will an object fall in 3 seconds?

- We can rearrange this formula to solve for time:

  ➔ How long will it take an object to fall 30 meters?

Practice Quiz: TRUE or FALSE. Draw a diagram and make into a correct statement

1. The elephant and the feather each experience the same force of gravity.

2. The elephant experiences a greater force of gravity, yet both the elephant and the feather have the same mass.

3. On Earth, all objects (whether elephant or feather) have the same acceleration

4. The elephant clearly has more mass than the feather, yet each weigh the same.

5. The elephant has the greatest acceleration, yet the amount of gravity is the same for each.