Name: Key Period: __________ Date: __________

Physics Unit Practice

Vocabulary definitions:

Reference Point: An object or point used for comparison to observe motion

Motion: A change in position relative to a reference point.

Distance: The total length traveled

Displacement: The length between the end point & start point.

Speed: Change in position per unit of time

Velocity: Speed plus direction

Contact force: : a push or pull on an object by another that is touching it.

Noncontact force: a force that can be applied without contact between objects.

Gravity: The attractive force between all objects with mass.

Force: A push or pull on an object.

Static friction: A contact force between objects that aren't moving that resists motion between them

Sliding friction: A contact force between moving objects that resists motion & slows the objects.

Fluid friction: A contact force between an object and a fluid (liquid or gas) that resist is motion & slows the objects.

Net force: The total of all forces being applied to an object.

Inertia: The resistance to a change in motion that all objects with mass have.

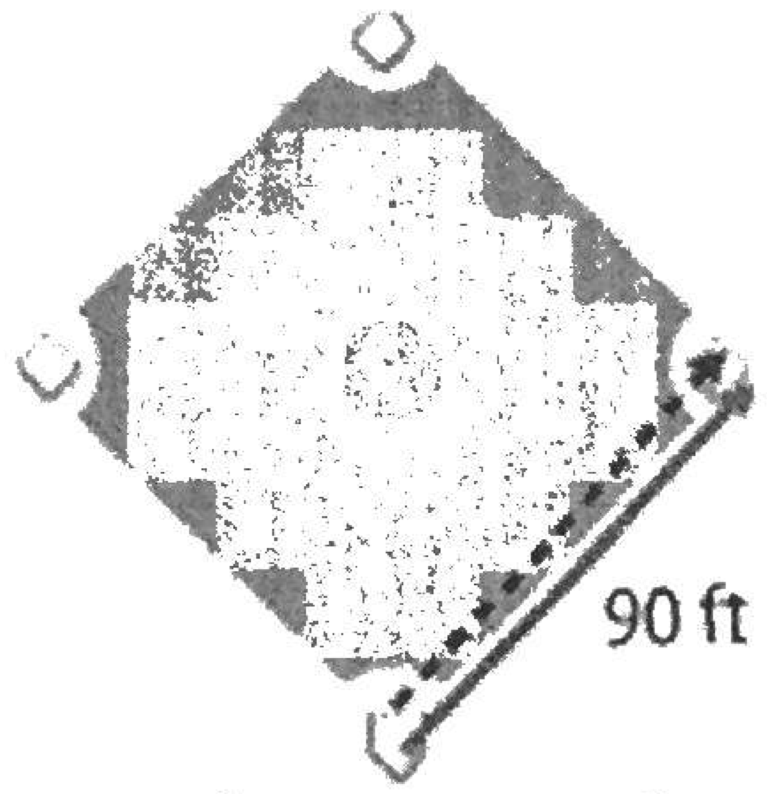
Practice Problems:

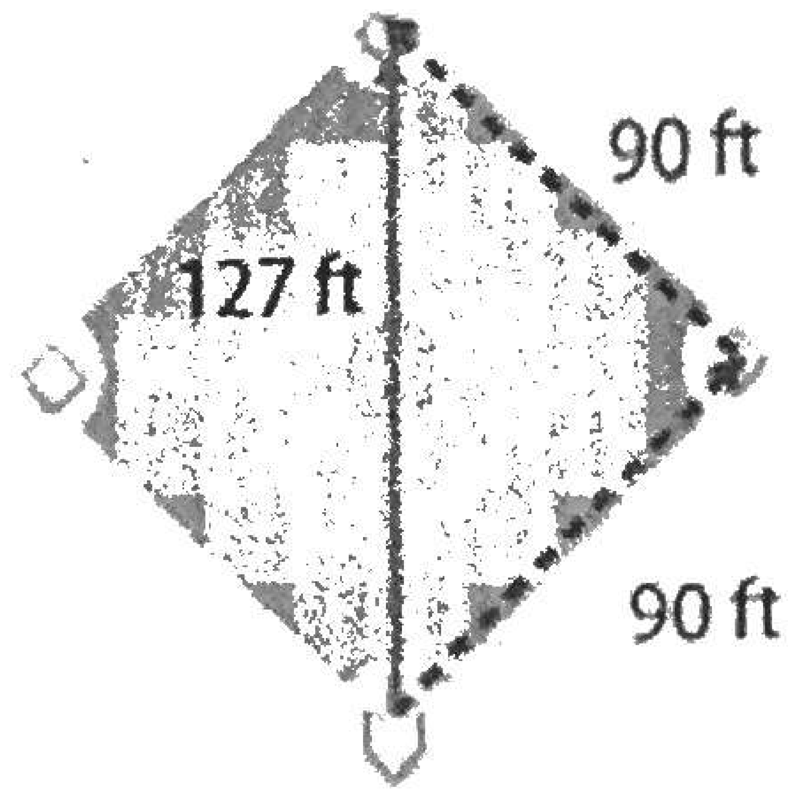
1. When is an object considered to be in motion?

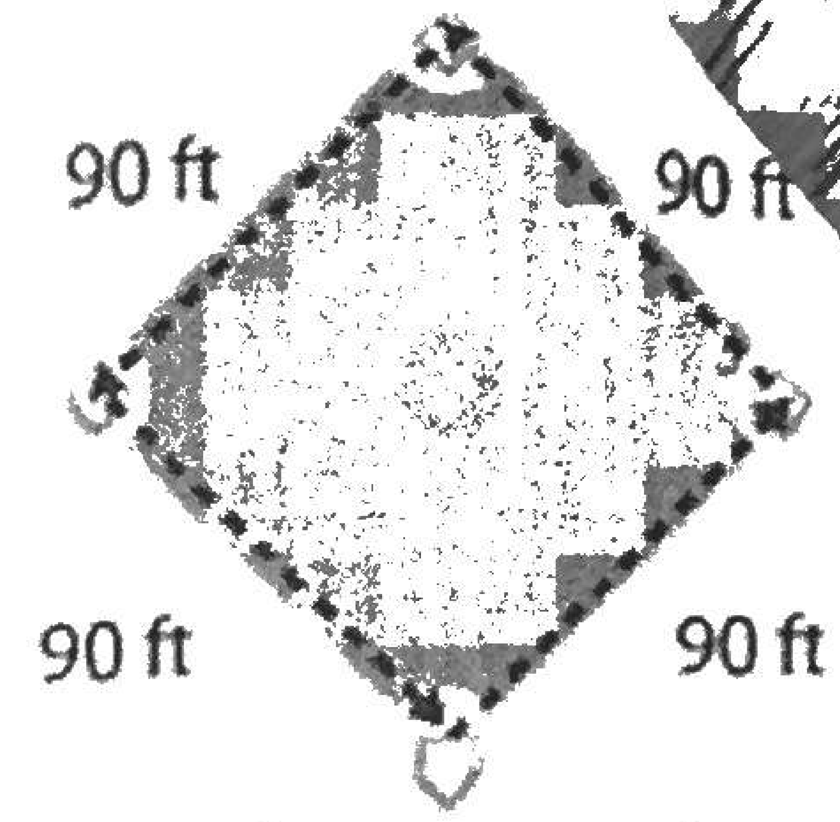
When its distance or direction from a reference point changes

2. When is an object NOT considered to be in motion?

When its distance and direction from a reference point does not change







Distance: 90ft

Displacement: 90ft

Distance: 180ft

Displacement: 127ft

Distance: 360ft

Displacement: 0ft

Speed Problems: (d / s | t)

1. A girl cycles for 3 hours at a speed of 40km/hr. What distance did she travel?

$d = s \times t$ $\quad d = 40km/hr \times 3hr$ $\quad \boxed{d = 120km}$

2. Mohammed is a runner. He runs the 100m sprint in 10.6 seconds. How fast did he travel?

$S = d/t$ $\quad S = \frac{100m}{10.6s} = \boxed{9.43\ m/s}$

3. Raja walks 100 meters in half a minute. What must her speed have been to travel at this distance? $S = d/t$

$S = 100m/30s = \boxed{3.33\ m/s}$

OR

$S = 100m/0.5min = \boxed{200m/min}$

4. Tanya backstrokes at an average speed of 8 meters per second, how long will it take her to complete the race of 200 meters length?

$t = d/s$ $\quad t = 200m/8m/s = \boxed{25s}$

5. Maya's SUV was detected exceeding the posted speed limit of 60 kilometers per hour, how many kilometers per hour would she have been traveling over the limit if she had covered the a distance of 10 kilometers in 5 minutes?

$S = d/t$

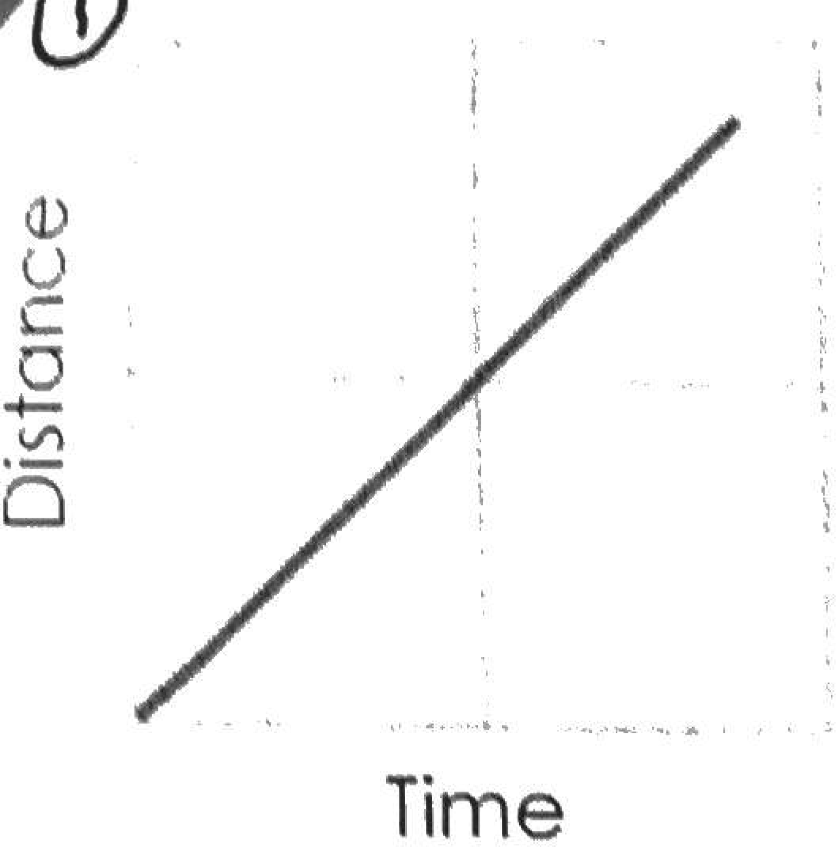
$5min = 0.08\bar{3}hr$

$S = \frac{10km}{0.08\bar{3}hr} = 120km/hr$

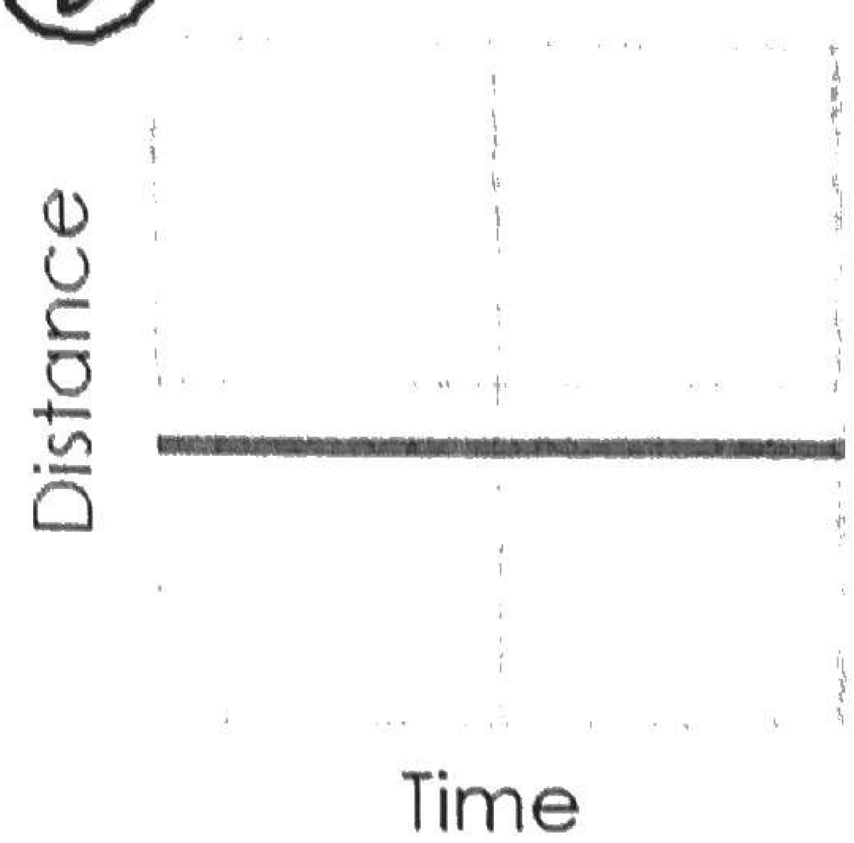
She is driving 60km/hr over the speed limit.

e- Time Practice:

escribe the motion
①



Describe the motion
②



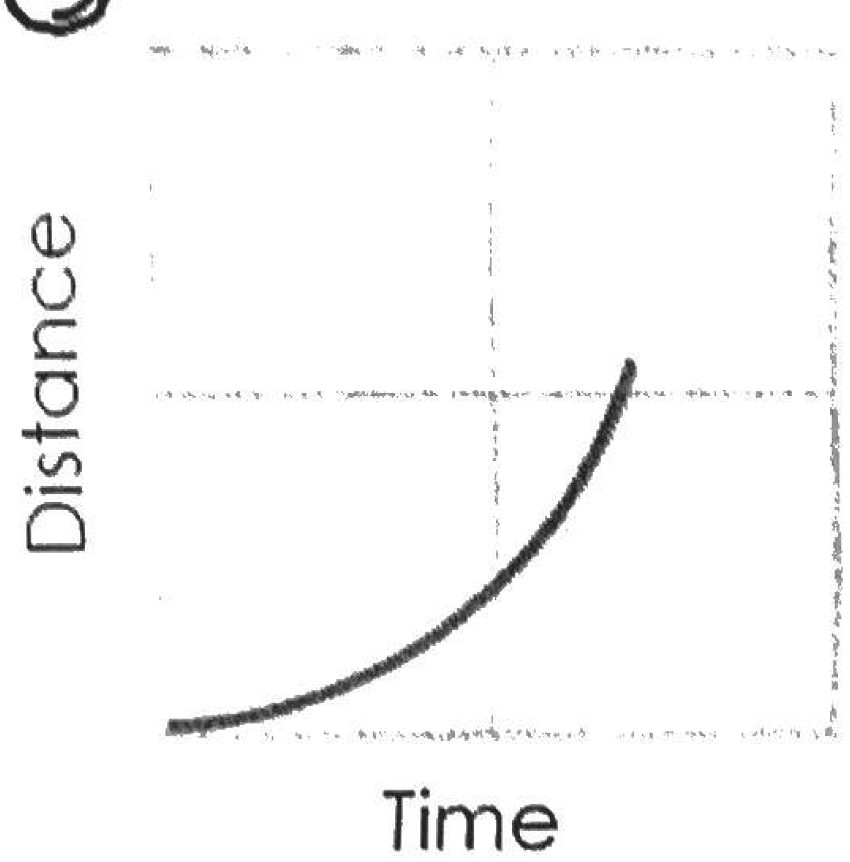
1. Constant velocity

* Slope of line does not change so velocity is constant.

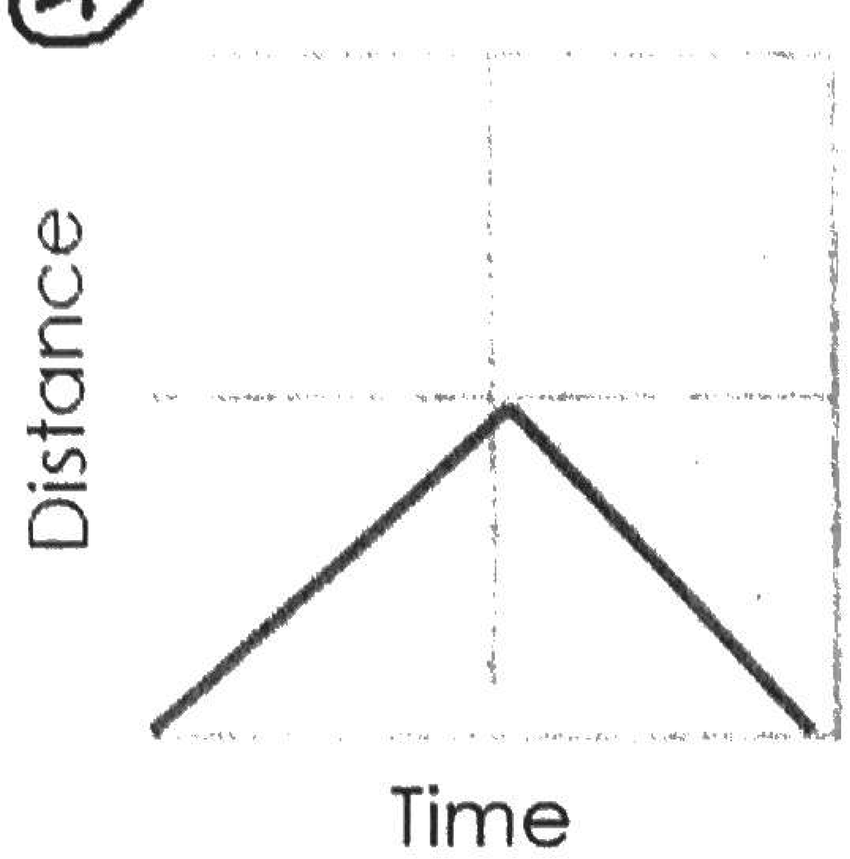
2. No motion (stationary)

* Distance does not change over time.

Describe the motion
③



Describe the motion
④



3. Acceleration

*Slope is increasing so velocity is increasing over time.

4. Constant forward velocity followed by constant backwards velocity.

* Slope does not change in first half then becomes negative in second half.

Gravity questions:

1. If the moon was closer to the Earth the force between them would:
   a. get smaller
   b. disappear
   c. stay the same
   d. get bigger

2. Which of these will feel the biggest gravitational pull on Earth?
   a. A 1,000kg elephant
   b. A 100g mouse
   c. A 100kg football player
   d. A 10kg bicycle

3. Which of these is not a correct statement?

a. Gravitational pull is less on the Moon than on Earth

b. Gravitational pull is less on top of Mount Everest than at sea level

c. There is no gravitational pull on the Moon

d. There is a greater gravitational pull on Jupiter than on Earth

Static, Sliding, or Fluid Friction?

Swimming in water: fluid

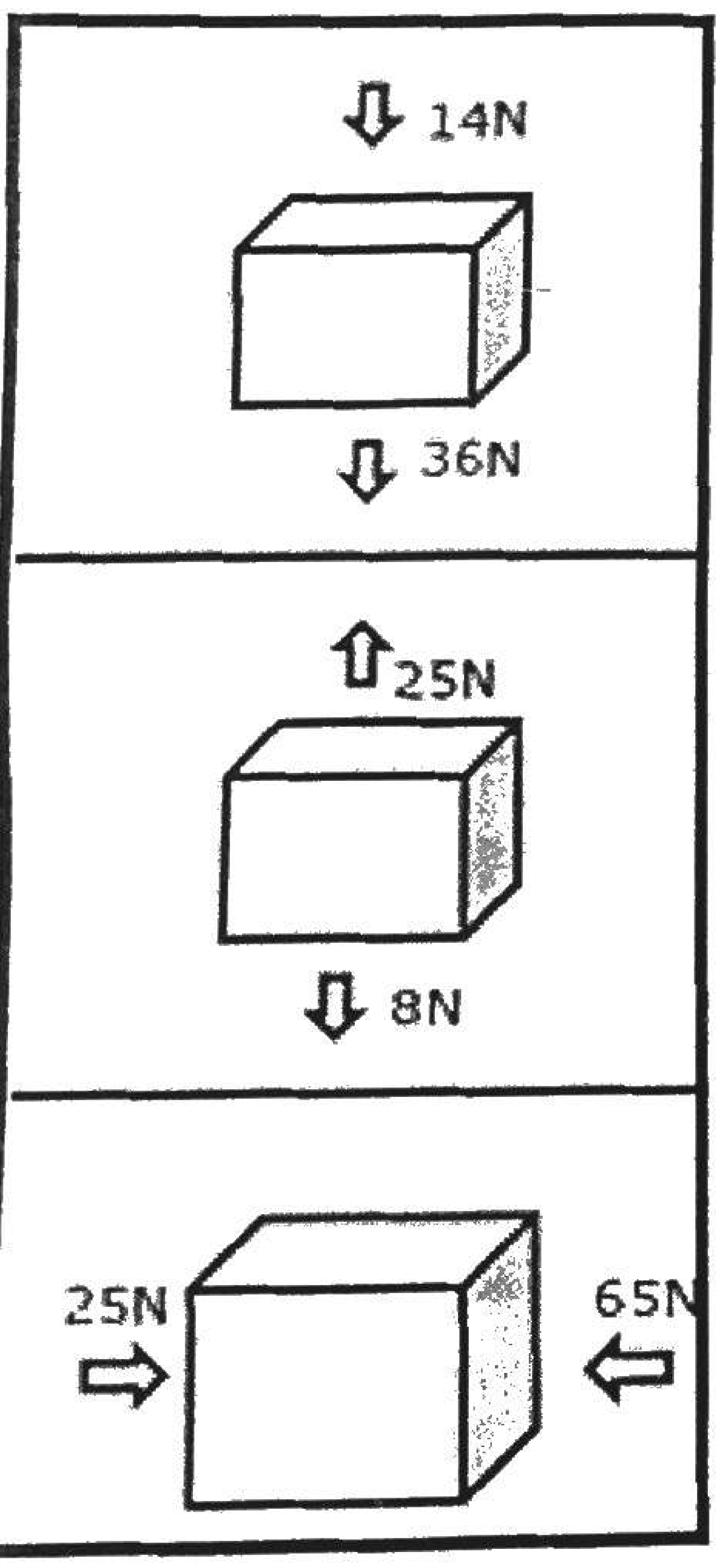
Leaning against a wall: Static

Ice skating: Sliding

Dragging a sled: Sliding

Walking: Static

What is the Net force?



Net force = 50N↓

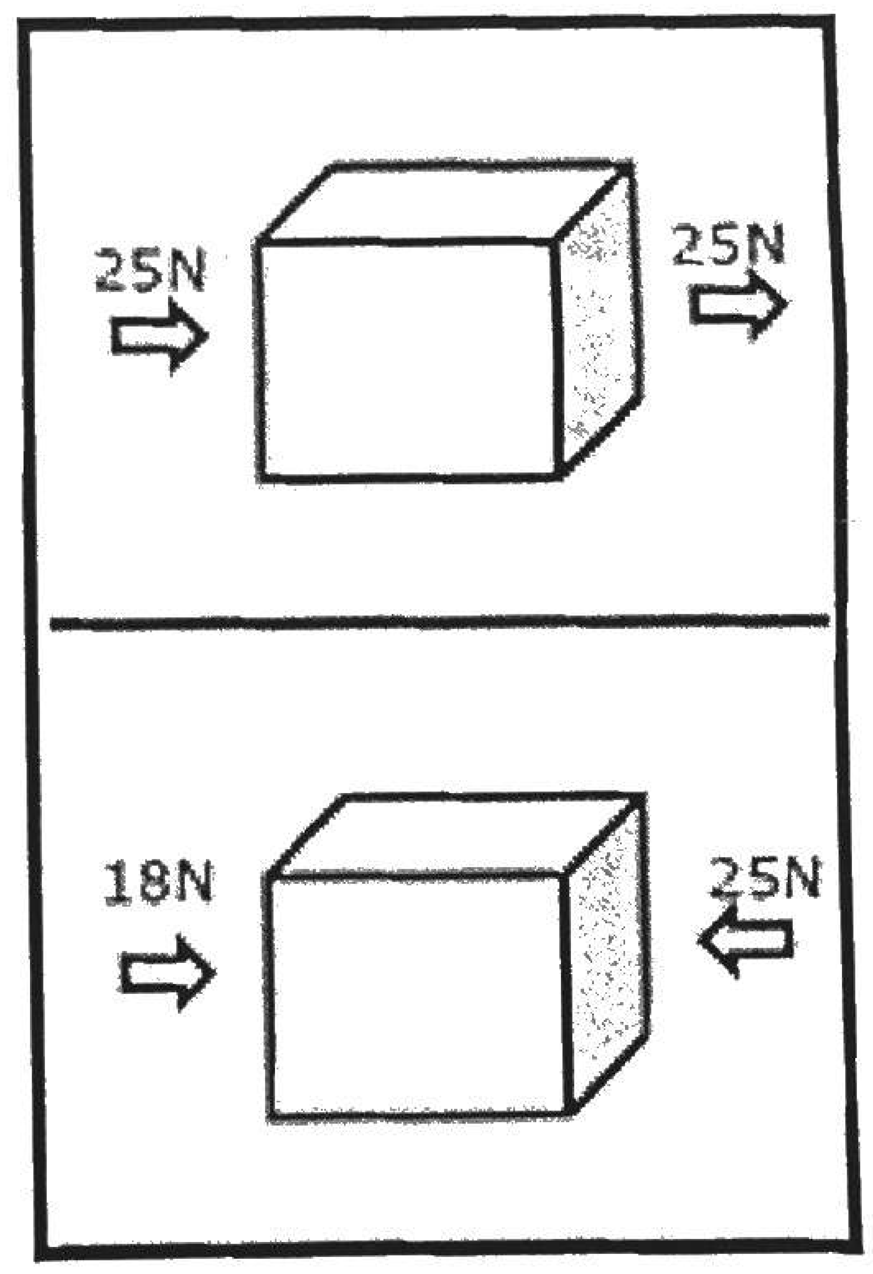
Balanced? no

Net force = 17N↑

Balanced? NO

Net force = 40N ←

Balanced? NO



Net force = 50N →

Balanced? No

Net force = 7N ←

Balanced? No

Write 3 made up examples of contact forces:

1. Leaning on a wall

2. loosing an arrow

3. Leaves blown in the wind

Write 3 made up examples of noncontact forces:

1. Static makin hair raise

2. Magnets on chalkboard

3. A skydiver falling

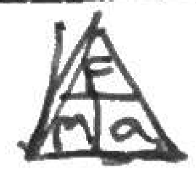
's Laws of Motion:

ain which law of motion relates to why we need to wear seatbelts: The 1st law of motion states that an object in motion stays in motion. Seatbelts apply an unbalanced force that stops the motion of passengers before they collide with the window.

Explain in your own words what would happen if you were standing on a skateboard and then pushed the wall: The reaction force to your push (3rd Law) would make you roll backwards since you have less inertia than the wall.

Explain which law of motion relates to why GPS satellites haven't stopped orbiting Earth:

An object in motion stays in motion. The forces on a satellite are balanced so their motion does not change.

Second Law Questions: 

1. A soccer ball was kicked. It had the mass of 0.42 kg and accelerated at 25m/s². What was the force? $F=ma$ $F=(0.42kg)(25m/s^2)=$ 10.5N

2. A force of 20 N acts upon a 5 kg block. Calculate the acceleration of the object.

$a=F/m$ $a=\frac{20N}{5kg}=$ 4 m/s²

3. An object with a mass of 300 kg is observed to accelerate at the rate of 4 m/s². Calculate the total force required.

$F=ma$ $F=(300kg)(4m/s^2)=$ 1200N

4. If objects A and B have the same mass, but object A was accelerating more than object B, which object would need more force to stop? (Hint: F=ma) Object A

5. If objects A and B were pushed with the same force but object B had more mass than object A, which object would accelerate more? (Hint: a=F/m) Object A

6. If objects A and B were pushed with the same force but object A was accelerating more than object B, which object would have more mass? (Hint: m=F/a) Object B

Define Newton's First Law: An Object at rest will remain at rest & an object in motion will remain at constant velocity unless acted on by an unbalanced force

Define Newton's Second Law: The acceleration of an object depends on the object's mass and the net force acting on the object.

Define Newton's Third Law: For every action force there is an equal and opposite reaction force.

Directions: Can you identify the correct energy transformation? For each situation in every box, write what the energy transformation would be.

For some, there could be **more** than two forms of energy involved!

Example: Rubbing hands

Energy transformation: Mechanical energy (ME)→ Thermal energy (TE)

If the movement of thermal energy is involved, can you identify if it is conduction, convection, or radiant?

* Sun Nuclear → radiant + thermal *radiant heat transfer*	Windmill Mechanical → mechanical	* Microwave electrical → radiant *radiant heat transfer*	Solar Calculator radiant → electrical	Crane chemical potential → mechanical + gravitational potential	Hand Crank Radio Mechanical → electrical → sound	Burning coal chemical potential → radiant + thermal
Tanning Bed electrical → radiant	Nuclear Power Plant Nuclear → electrical	*Hot-air Balloon chemical potential → thermal + gravitational potential *convection heat transfer*	*Magnifying Glass radiant → thermal *radiant heat transfer*	Car chemical potential → mechanical	Electric Guitar mechanical → sound	Firecracker chemical potential → radiant + thermal
Battery chemical potential → electrical	Piano Mechanical → sound	Light Bulb electrical → radiant	Mixer electrical → mechanical	* Iron electrical → thermal *conductive heat transfer*	Lightstick chemical potential → radiant	Breaking on a bike mechanical → thermal
Television electrical → radiant + sound	Eating chemical potential → chemical potential	Plant Radiant → chemical potential				

1. While traveling along a highway a driver slows from 24 m/s to 15 m/s in 12 seconds. What is the automobile's acceleration? (Remember that a negative value indicates a slowing down or deceleration.)

Looking for: acceleration
given: time, initial spd, final spd $\Delta V = V_f - V_i = 15m/s - 24m/s = -9m/s$
relationship: $a = \frac{\Delta V}{t}$

Solution: $a = \frac{\Delta V}{t} = \frac{-9m/s}{12s} = 0.75m/s^2$

2. A parachute on a racing dragster opens and changes the speed of the car from 85 m/s to 45 m/s in a period of 4.5 seconds. What is the acceleration of the dragster?

Looking for: acceleration
given: time(4.5s), V_f(45m/s), V_i(85m/s)
relationship: $a = \frac{V_f - V_i}{t}$

$\Delta V = V_f - V_i = 45m/s - 85m/s = -40m/s$

Solution: $a = \frac{\Delta V}{t} = \frac{-40m/s}{4.5s} = -8.89m/s^2$

3. The table below includes data for a ball rolling down a hill. Fill in the missing data values in the table and determine the acceleration of the rolling ball.

Time (seconds)	Speed (km/h) m/s
0 (start)	0 (start)
2	3
4	6
6	9
8	12
10	15

Δv / a | t

Acceleration = $\frac{\Delta V}{t} = \frac{15m/s}{10s} = 1.5m/s^2$

4. A car traveling at a speed of 30.0 m/s encounters an emergency and comes to a complete stop. How much time will it take for the car to stop if it decelerates at -4.0 m/s²?

looking for: time to stop
given: V_i(30m/s), V_f(0m/s), a(-4.0m/s²)

$a = \frac{V_f - V_i}{t} = -4.0m/s^2 = \frac{0 - 30m/s}{t}$ $t = \frac{\Delta V}{a} = \frac{-30m/s}{-4.0m/s^2} = 7.5s$

5. If a car can go from 0 to 60 mi/hr in 8.0 seconds, what would be its final speed after 5.0 seconds if its starting speed were 50 mi/hr?

Step 1: $a = \frac{60mi/hr - 0}{8s} = 7.5 mi/hr/s$
looking for: a and V_f
given: t(8s), V_i(50mi/hr), Δv (60mi/hr)

Step 2: $\Delta v = a \cdot t$
$\Delta V = 7.5mi/hr/s \cdot 5s = 37.5mi/hr$

$\Delta V = V_2 - V_1$
$37.5mi/hr = V_2 - 50mi/hr \rightarrow V_2 = 37.5mi/hr + 50mi/hr = 87.5mi/hr$

6. A cart rolling down an incline for 5.0 seconds has an acceleration of 4.0 m/s². If the cart has a beginning speed of 2.0 m/s, what is its final speed?

looking for: V_2
given: t=5s, a=4m/s², V_1=2m/s

$V_2 - V_1 = a \cdot t$ $V_2 - 2m/s = 5s \cdot 4m/s^2 \rightarrow V_2 = (5s \cdot 4m/s^2) + 2m/s = 22m/s$