

# PHYSICS

Name: \_\_\_\_\_

## Worksheet - Non Equilibrium Applic. of Newton's 2nd Law

Date \_\_\_\_\_

Hr \_\_\_\_\_

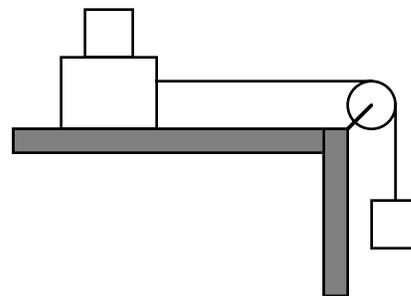
### Problem Solving Method:

1. Isolate the object to be analyzed.
2. Draw a Free Body Diagram of that object.
3. Choose **convenient** x,y axes.
4. Make sure all measurements are in consistent units.
5. Write  $\sum \mathbf{F} = \mathbf{ma}$  for each direction (horizontal, vertical).
6. Solve the equations to find unknown(s).

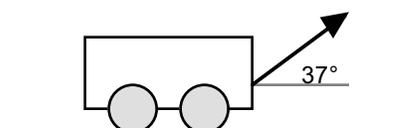
1. A 20.0 kg object hangs from a rope attached to the ceiling of an elevator. Find the tension in the rope if:
  - a.) The elevator is moving up with a constant speed of 3.00 m/s
  - b.) The elevator accelerates up at 3.00 m/s/s
  - c.) The elevator accelerates down at 3.00 m/s/s
  - d.) The elevator accelerates down at 9.80 m/s/s

2. A 5400 lb truck loses breaking power on the highway while traveling at 55 mi/h. It leaves the highway and drives up a 20% grade emergency ramp. Since the truck is rolling friction can be ignored. How long will it take to stop? How far will it go before stopping? [Hint: choose the x-axis parallel to the ramp]

3. A 200 g block is glued to the top of a 800 g block as shown to the right. If a 1.0 kg block is hung on the string find the acceleration of the blocks. Ignore friction.

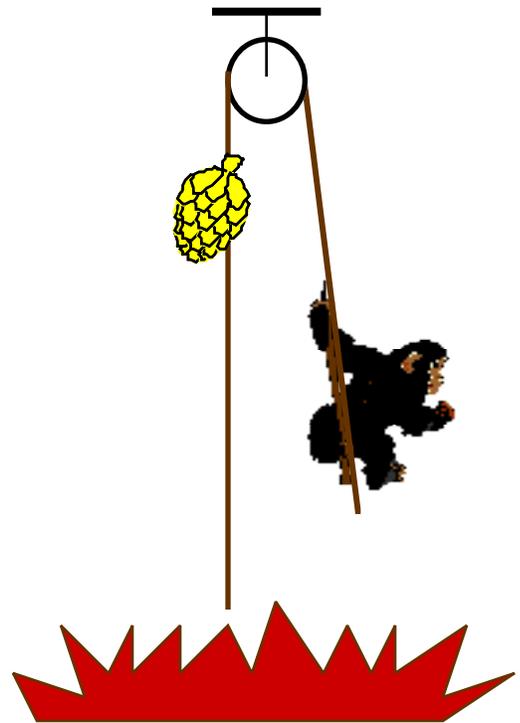


4. A child pulls a wagon with a force of 100 N as shown below. If the wagon has a weight of 90.0 N find:
  - a.) the force of the ground on the wagon
  - b.) the acceleration of the wagon[HINT: the pull is not directly horizontal but you can break it up into its horizontal and vertical components, remember special triangles and SOHCAHTOA]



5. A 50.0 lb monkey has a firm hold on a rope that passes over a pulley and is attached to a 50.0 lb bunch of bananas (as shown at right). The rope is VERY long, there is an incredibly deep abyss below...filled with fire and molten lava...The monkey sees the bananas and starts to climb upward:

- a.) as he climbs do the bananas move closer, farther, or stay the same distance from the monkey?
- b.) the monkey lets go of the rope for a second, do the bananas get closer? Explain.
- c.) before he hits the ground he grabs the rope to stop his fall, what do the bananas do?
- d.) how can the monkey satisfy his banana craving?



**EXTRA:** Resolve #3 with a coefficient of friction  $\mu = 0.55$  and with the two top blocks NOT glued together. Assume the coefficient of friction *between the blocks* is the same as that between the block and the table.