For each of the following problems on *a separate sheet of paper* draw a simple picture, make a force diagram, a motion map, write the fundamental mathematical model (think unit 3 (formula)) to use, rearrange it to the form required to solve the problem, then solve the problem. Be sure to label appropriately.

- 1. A body falls freely from rest on Earth (with no air resistance). Find:
  - a. its displacement at t = 3s
  - b. the time for it to reach a speed of 25 m/s
  - c. the time required for it to fall 300 m
  - d. its speed after falling 70 m
- 2. Repeat question 1 for a body falling freely on the moon. The acceleration due to gravity there is  $1.7 \text{ m/s}^2$ .
- 3. A ball is dropped from rest at a height of 80 m above the ground.
  - a. What is its speed just as it hits the ground?
  - b. How long does it take for it to reach the ground?
- 4. A marble dropped from a bridge strikes the water in 6.0 s. Calculate:
  - a. the speed with which it strikes the water
  - b. the height of the bridge

## Free Fall with $V_{yi} \neq 0$ (V<sub>iy</sub> IS NOT EQUAL TO ZERO SYD!)

- 5. A body is thrown downward with an initial speed of 20 m/s on Earth. What is the:
  - a. acceleration of the object
  - b. displacement after 4 s
  - c. time required to reach a speed of 50 m/s
  - d. time required to fall 300 m (Hint: factor the quadratic)
  - e. speed after falling 100 m
- 6. A student throws his worthless lab partner off a 120 m high bridge with an initial downward speed of 10 m/s
  - a. How long does it take the deadbeat to hit the ground below?
  - b. How fast is he going at the moment of impact?
- 7. When a kid *drops* a rock off the edge of a cliff, it takes 4.0 s to reach the ground below. When he *throws* the rock down, it strikes the ground in 3.0 s. What initial speed did he give the rock?