In the last session we talked about a problem solving strategy and these steps:

1. Construct an informative diagram of the physical situation.
2. Identify and list the given information in variable form.
3. Identify and list the unknown information in variable form.
4. Identify and list the equation that will be used to determine unknown information from known information.
5. Substitute known values into the equation and use appropriate algebraic steps to solve for the unknown information.
6. Check your answer to insure that it is reasonable and mathematically correct.

Also the formulas we derived last session are on the next page.

Use the formulas and the steps to solve the questions on the following page. There are also some bonus questions that you can get more experience by solving them. If you wanted even more problems to solve, shoot me an email and I'll be glad to provide you more.

If you found any question difficult, feel free to email me with your thoughts about the problem and I'll email you back with some hints soon.

Please bring your answer sheet with your name on it and I'll check your answers.

We will have a short quiz on the next session mostly from these questions (including the bonus ones).

Good luck,

Kiarash

Equation	Involved Quantities	Unneeded Quantity
1) $v_f = v_i + at$	v_i, v_f, a, t	Δx
2) $v_f^{\,2} = v_i^{\,2} + 2a\Delta x$	$\Delta x, v_f, v_i, a$	t
3) $\Delta x = v_i t + \frac{1}{2}at^2$	$\Delta x, v_i, a, t$	v_f
4) $\Delta x = \frac{1}{2}(v_f + v_i)t$	$\Delta x, v_f, v_i, t$	a
5) $\Delta x = v_f t - \frac{1}{2}at^2$	$\Delta x, v_f, a, t$	v_i

** $\Delta x = (x_f - x_i)$

**** These equations work for motion in ANY <u>one</u> direction**

**** If Δx also represents the *total* distance in *only* 1 direction, you can replace Δx with d (*for distance*) and then think of v_f and v_i in terms of *speed* rather than *velocity***

1. A bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. Determine the acceleration of the bike.

2. An engineer is designing the runway for an airport. Of the planes that will use the airport, the lowest acceleration rate is likely to be 3 m/s2. The takeoff speed for this plane will be 65 m/s. assuming this minimum acceleration, what is the minimum allowed length for the runway?

3. A ship has a maximum speed in still water of 13 m/s. To be operated legally on the Rhine River, it must be able to come to a complete stop in 350 m. What acceleration would the ship need to do this?

4. A car traveling at 22.4 m/s skids to a stop in 2.55 s. Determine the skidding distance of the car (assume uniform acceleration).

5. If Michael Jordan has a vertical leap of 1.29 m, then what are his takeoff speed and his hang time (total time to move upwards to the peak and then return to the ground)?

6. A baseball is popped straight up into the air and has a hang-time of 6.25 s. Determine the height to which the ball rises before it reaches its peak. (Hint: the time to rise to the peak is one-half the total hang-time.)

7. The observation deck of tall skyscraper 370 m above the street. Determine the time required for a penny to free fall from the deck to the street below.

8. A policeman is lurking behind a billboard beside the highway when someone speeds by him at 38 m/s. The policeman immediately accelerates at a constant rate of 6.7 m/s2 until he has caught up with the speeder. How long does it take for the policeman to catch up?

9. [Bonus] It was once recorded that a Jaguar left skid marks that were 290 m in length. Assuming that the Jaguar skidded to a stop with a constant acceleration of -3.90 m/s2, determine the speed of the Jaguar before it began to skid.

10. [Bonus] A plane has a takeoff speed of 88.3 m/s and requires 1365 m to reach that speed. Determine the acceleration of the plane and the time required to reach this speed.

11. [Bonus] A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the car and the distance traveled.

12. [Bonus] During the annual shuffleboard competition, Renee gives her puck an initial speed of 9.32 m/s. Once leaving her stick, the puck slows down at a rate of -4.06 m/s/s.
    a. Determine the time it takes the puck to slow to a stop.
    b. Use your initial speed and the calculated time to determine the average speed and the distance which the puck travels before stopping.

13. [Bonus] Suzie Lavtaski has reached the end of the ski slope and abruptly decelerates from 29.0 m/s to 1.8 m/s in 1.45 seconds. Determine Suzie' acceleration rate and the distance she moved during this braking period.

14. [Bonus] A typical airline jet needs to reach a speed of 360 km/h to take off. Assuming a constant acceleration and a short runway length of 1.0 km, what is the minimum acceleration that the jet needs if it starts from rest? Write your answer in terms of g, where g =10 m/s2.