1. The first step in solving any motion problem is to sketch a speed-time graph. Any information you need can easily be obtained from it. Example: ***"A car accelerates uniformly from 0 to 25 m/s in five seconds. Find its acceleration and the distance covered."*** This car's speed-time graph must be a straight line because the problem stated that the acceleration is "uniform". The coordinates of the initial and final points are given, so the graph is completely described. Draw it and label it.

2. The second routine step in solving a motion problem is to write the definition of "acceleration" as an equation. Remember to indicate (on your graph) the meaning of each symbol that you use. After re-reading the question you may find that this equation has only one unknown. If that is the case, solve for that unknown and then plug in the given quantities with units. *Do that now for example 1.*

3. The third routine step is to write an equation describing the *area* of the speed-time graph, using symbols only. (As you know, this area represents the travelling distance.) Do it now for the example in #1, using the hints below. *Always define your symbols clearly, avoid using two different symbols to represent the same thing, and avoid using one symbol to represent two different things.*
   a. If the area is rectangular or triangular then the area equation is trivial.
   b. If the shape is a trapezoid then there are four ways to go: You can treat it as a rectangle plus a triangle, you can treat it as a rectangle with a triangular piece subtracted, you can treat it as a big triangle with a smaller one subtracted, or you can multiply its average height by its width.
   c. You can invent similar tricks for finding areas of many other shapes. For example, regions with circular boundaries can be easy. With calculus you can create area formulas for many other shapes.

4. You may find that the distance equation contains only one unknown quantity. If that is the case, solve for the unknown and *then* plug in the given numbers with their units. *Do it now for example 1.*

5. If either equation has *two* unknowns, you can use the other equation to **"eliminate"** one of them:
   a. First decide which unknown you want to find. That's the one you must *keep* in the equations. The *other* unknown (the one must be eliminated) is called the **"unwanted"** variable.
   b. Solve *one* of the equations for the unwanted variable. (Either equation will do.)
   c. Use the resulting formula to *replace* the unwanted variable in the *other* equation. That gives you a single equation with just *one* unknown.
   d. Solve it for the unknown and plug in the given numbers, along with their units.
   e. If necessary, plug that result into equation 5b to find the value of the other unknown.

6. Here's another example: A car being driven fast on level, dry pavement requires several hundred feet to stop. If the car's deceleration is uniform you can use the easily-measured quantities (stopping distance and initial speed) to calculate the time required to stop the car and the rate of deceleration. *Remember that "deceleration" is negative acceleration.*
   a. Sketch the speed-time graph. *In this example the initial speed is not zero.*
   b. Choose symbols: "Let ___ represent the stopping time, let ____ represent the initial speed, let ____ represent the acceleration, and let ___ represent the stopping distance."
   c. Make *squares* around the symbols in 6b representing easily-measured quantities. Make *circles* around the symbols representing the quantities that we wish to calculate.
   * d. Use the methods explained above *(including #5)* to create plans (equations) for finding the values of the two unknowns. *The left side of each equation must be one of the letters circled in 6c. The right side of each equation may contain only the letters that you drew _________s around.*
   e. Find a typical highway speed and stopping distance in a driver's manual or auto magazine: *"When driving at ___ mph, stopping the car requires roughly ___ feet."*
   f. Convert that speed into more convenient units: (___ mi/hr)(5280 ft/mi.)(1/3600 hr/sec) = ____ ft/sec.
   * g. Plug that speed and stopping distance into the equations created in 6d to obtain numerical values for the stopping time and deceleration. *Don't forget the units. Round off properly.*

7. How does skidding distance depend on initial speed for a set of identical objects skidding to a stop on a level surface? Create a formula for that skidding distance *in terms of the acceleration and original speed.* Explain your solution clearly. A copy of this valuable formula is being saved in #__ on RS __.