Edition: 2025 November 30 12h19 EST

1. **Sketch** scenario.
   a. If phrase-by-phrase translation of problem statement into figure and/or table is unreliable, fill out optional phrase-translation table as you carry out substeps below.
   b. **Read** a short phrase containing one of the following items (a phrase might play multiple roles).
      i. **Object/person** (possibly with characteristics)
      ii. **Action** (possibly with characteristics)
      iii. **Location/time** (possibly with characteristics)
      iv. **Quantity** (dimension or count)
   c. **Draw** a simple representation of the phrase (unless meaning of phrase has already been sketched).
   d. **Underline** the phrase. If phrase required no additional sketching, dash-underline the phrase.
   e. Go back to step (a) and analyze **next** phrase.
2. **Sketch** (required)
   a. Initial snapshot at time t_i
   b. Final snapshot after duration t
   c. Landmarks
   d. **Bubbled** system
   e. **Axis** system (also record $+x$ and $+y$ directions in 2-d kinematics table).
3. Draw **motion diagram** (includes required and optional parts)
   a. Each **known** velocity using a **velocity arrow** (required)
   b. Sequence of **velocity arrows** throughout the story (optional).
   c. **Change-in-velocity $\Delta\vec{v}$ arrows** between consecutive velocity arrows (optional).
4. Fill in **2-d kinematics table** with all given information.
5. If you don't know the components of acceleration, use a Forces worksheet to determine the acceleration components
6. If the story's duration is unknown, deem the duration interesting (mark t entry as "?").
7. Look at the y-quantities and time quantities. Based on what's blank, pick an equation using Table 1 (replace each x with y).
8. Substitute and solve. If you've found the time, copy the time into the t entry of the 2-d kinematics table.
9. If you haven't already found what was requested, look at the x-quantities and time quantities. Based on what's blank, pick an equation using Table 1.
10. Substitute and solve. Copy determined value into 2-d kinematics table.
11. Continue using equations from Table 1 to solve for entries in the 2-d kinematics table until you've found all requested values.
12. Report your answer in an appropriate format (English sentence?) with appropriate algebraic expression, sign ($\pm$), numerical magnitude, and units.

Table 1. Choosing kinematics equations

	A. Blank variable(s)	B. Suggested equation(s)	
1.	None (t, x, v_x, and a_x are all known or wanted)	$\Delta x = v_{x,i}\Delta t + \frac{1}{2}a_x t^2$	
2.	a_x	$\Delta x = \left(\frac{v_i + v_f}{2}\right)t$	$v_{x,\mathrm{AVG}} = \frac{\Delta x}{\Delta t}$
3.	x	$v_{x,f} = v_{x,i} + a_x t$	
4.	t	$v_{x,f}^2 = v_{x,i}^2 + 2a_x\Delta x$	