the kinematics equations for constant v_x or constant v_y

***x* equation**	***y* equation**
$\Delta x = v_x \Delta t$	$\Delta y = v_y \Delta t$

kinematics equations for constant a_x with changing v_x, or constant a_y with changing v_y

***x* equations**	**missing variables**	***y* equations**	**missing variables**
$\Delta x = v_{ix}\Delta t + \frac{1}{2}a_x(\Delta t)^2$	v_{fx}	$\Delta y = v_{iy}\Delta t + \frac{1}{2}a_y(\Delta t)^2$	v_{fy}
$v_{fx}^2 = v_{ix}^2 + 2a_x\Delta x$	Δt	$v_{fy}^2 = v_{iy}^2 + 2a_y\Delta y$	Δt
$v_{fx} = v_{ix} + a_x\Delta t$	Δx	$v_{fy} = v_{iy} + a_y\Delta t$	Δy

how to solve general one-dimensional kinematics problems

1. Check if the problem involves **constant velocity** or **constant acceleration with changing velocity**—these are the situations to which the kinematics equations apply.
   Velocity is constant over an interval of time when the net force is zero over that interval.
   Acceleration is constant when the net force on the object is constant.
   If the net force and acceleration are changing, then you cannot use the kinematics equations.
   Identify the **object** and the **interval of time** to which the kinematics equations apply.
2. Check that **all given units are consistent**.
3. For symbolic problems, write down **the "given" symbols**.
4. Begin the **sketch** by drawing the object's **path**. **Build any given distance info into the sketch.**
5. Write down the **key points in time** in your sketch (t_0, t_1, etc.). Set $t_0 = 0$. **Build any given time information into your sketch.**
6. Write down your **axes,** usually pointing in the object's direction of motion.
7. **Identify the question** with a "?" and a symbol; if possible, **build the question into the sketch**.
8. Write down the **"initial" and "final" positions** on the path. For a multi-part problem, you may need to choose different initial and final positions for different parts of the problem.

9. If the problem involves *constant velocity*, write down this "setup": $\Delta x = v_x \Delta t$ or $\Delta y = v_y \Delta t$	9. If the problem involves *constant acceleration with changing velocity*, write down this "setup": $\Delta t, \Delta x, v_{ix}, v_{fx}, a_x$ or $\Delta t, \Delta y, v_{iy}, v_{fy}, a_y$

10. In the setup from step 9, **indicate the question** with a "?" and a symbol, or label **what variable you need** to answer the question.
11. In the setup from step 9, write down **a number or symbol for each remaining variable.**
    If the object starts at rest, then v_{ix} or v_{iy} is 0; if it ends at rest, then v_{fx} or v_{fy} is 0.

12. For *constant velocity*: When you know values for two of the three variables in your setup, you can **solve** the equation for the remaining variable.	12. For *constant acceleration with changing velocity*: When you know values for three variables in your setup, you can **choose an equation** to solve for one of the unknowns. Identify the variable you don't care about, and choose the equation that is missing that variable. **Plug in and solve**.

13. **Check** that you answered the right question, that you answered all parts of the question, and that your answer makes sense. For numerical answers, **check** that you included units. For symbolic answers, **check** that your answer includes only the "given" symbols.