

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}
$v_{fx}^2 = v_{ix}^2 + 2 a_x \Delta x$	Δt	$v_{fy}^2 = v_{iy}^2 + 2 a_y \Delta y$	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

<p>1. Check if the problem involves constant velocity or constant acceleration with changing velocity—these are the situations to which the kinematics equations apply. <u>Velocity is constant</u> over an interval of time when the net force is zero over that interval. <u>Acceleration is constant</u> when the net force on the object is constant. If the acceleration is changing, then you cannot use the kinematics equations.</p>	
<p>2. Check that all given units are consistent.</p>	
<p>3. For symbolic problems, write down the “given” symbols.</p>	
<p>4. Begin the sketch by drawing the object's path. Build any given distance info into the sketch.</p>	
<p>5. Write down your axes, usually pointing in the object's direction of motion.</p>	
<p>6. Write down the key points in time in your sketch (t_0, t_1, etc.). Set $t_0 = 0$. Build any given time and velocity information into your sketch.</p>	
<p>7. Identify the question with a “?” and a symbol; if possible, build the question into the sketch.</p>	
<p>8. Write down the “initial” and “final” positions on the path. For complicated problems, you may need to choose different initial and final positions for different parts of the solution.</p>	
<p>9. If the problem involves <i>constant velocity</i>, write down this “setup”: $\Delta x = v_x \Delta t$ or $\Delta y = v_y \Delta t$</p>	<p>9. If the problem involves <i>constant acceleration with changing velocity</i>, write down this “setup”: $\Delta t, \Delta x, v_{ix}, v_{fx}, a_x$ or $\Delta t, \Delta y, v_{iy}, v_{fy}, a_y$</p>
<p>10. In the setup from step 9, label the variable the question is asking for with a “?”, or label the variable you need to know in order to answer the question with the word “need”.</p>	
<p>11. In the setup from step 9, write down a number or symbol for each remaining variable. If the object starts at rest, then initial velocity is zero; if it ends at rest, then final velocity is zero.</p>	
<p>12. For <i>constant velocity</i>: When you know values for two of the three variables in your setup, you can solve the equation for the remaining variable.</p>	<p>12. For <i>constant acceleration with changing velocity</i>: 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.</p>
<p>13. Check that you answered the right question, and that you answered all parts of the question. Check that your results makes sense. For numerical answers, check that you included units. For symbolic answers, check that your answer includes only the “given” symbols.</p>	