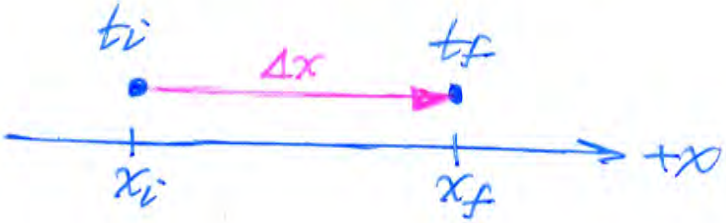
Title x-displacement

Ingredients

Sketch	
At/Through	t_i, t_f, $[t_i, t_f]$
Owner	System
Quantity	x-position, x-displacement
Variable	x_i, x_f, Δx
Giver	

Recipe

Diagram the relationship	
Graphically present quantities	Displacement vector 
Mathematical relationship	$x_i + \Delta x = x_f$

Recipe number **K1**: The **title** of this recipe sheet is "**x-displacement**".

The top half of this sheet consists of an "**Ingredients**" section with a row labeled "Sketch", a row labeled "At/Through", a row labeled "Owner", a row labeled "Quantity", a row labeled "Variable", and a row labeled "Giver." In this sheet, the row labeled "Giver" isn't used.

For the "Sketch", draw two snapshots showing a cart moving toward the right across a firm surface. Draw trailing motion-blur streaks or so-called "whooshies" to emphasize instantaneous motion in each snapshot. Draw a dashed bubble around the earlier snapshot of the cart, at the left, to indicate that the cart is the so-called "System". Draw an arrow labeled +x to indicate that the positive-x direction points to the right.

In the rows of the "Ingredients" section other than the row for the sketch, document the following relationships, using flowchart paths, if helpful: The "Owner" is the "System". At initial time t_i (t-sub-i), the system has the "Quantity" initial "x-position" denoted x_i (x-sub-i). At final time t_f (t-sub-f), the system has the "Quantity" final "x-position" denoted x_f (x-sub-f). Through or on the time interval from the initial time t_i (t-sub-i) to the final time t_f (t-sub-f), the system accrues the "Quantity" "x-displacement" and labeled (Delta x).

The bottom half of this sheet consists of a "**Recipe**" section with a row labeled "Diagram the relationship", a row labeled "Graphically present quantities", and a row labeled "Mathematical relationship".

In the row labeled, "Diagram the relationship", draw a flowchart arrow showing that initial x-position x_i (x-sub-i) contributes to final x-position x_f (x-sub-f). Draw another arrow showing that x-displacement (Delta x) also contributes to final x-position x_f (x-sub-f). Recite a story: "Where you start contributes to where you end up, but where you end up might differ from where you started thanks to an additional change in where you are."

In the row labeled "Graphically present quantities", write the title "Displacement vector". Draw two dots from left to right, simplistically representing snapshots of the cart from the sketch. Label the dot at the left with the initial time t_i (t-sub-i) and the dot at the right with the final time t_f (t-sub-f). Under the dots, draw a horizontal axis pointed toward the right and labeled +x. On the x-axis, draw a tickmark for the initial x-position x_i (x-sub-i) directly underneath the dot at the left and draw a tickmark for the final x-position x_f (x-sub-f) directly underneath the dot at the right. Draw an arrow with its tail on the dot at the left connecting toward the right with its head ending on the dot at the right. Label this arrow the x-displacement (Delta x).

In the row labeled, "Mathematical relationship", write (x-sub-i plus Delta x equals x-sub-f).