

SIQuENC for

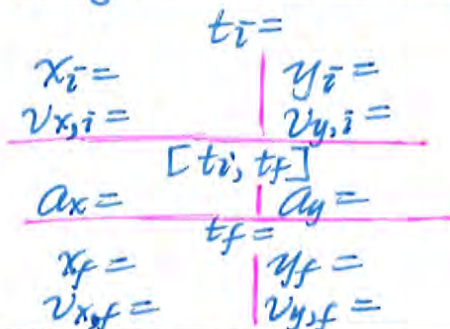
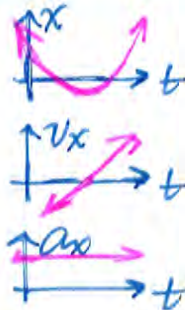
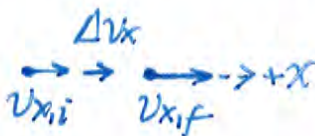
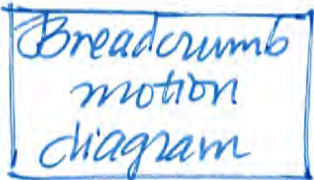
Kinematics (motion)

K SIQuENC

- Neatly and graphically represent Situation(s)
1. **Read** a few words.
 2. Make sure the meaning of those words is **illustrated** in your sketches/tables.
 3. **Underline** the words.
 4. **Repeat** with the next few words, if any.

- Draw **bubble** around system.
 - Draw **dot** for each "particle."
- Label:**
- At/Through: t_i, t_f , maybe t
 - Axes: $+x$, maybe $+y$.

Graphically represent Quantities



Identify allowed Equation(s)

$$v_{x,i} \Delta t + \frac{1}{2} a_x \Delta t^2 = \Delta x$$

$$v_{x,i}^2 + 2a_x \Delta x = v_{x,f}^2$$

Analyze

Cross out quantities that are obviously 0.

$$a_x = 0? \quad v_{x,i} = 0?$$

Substitute constitutive relationships.

$$v_{x,avg} = \frac{\Delta x}{\Delta t} \quad v_x = \frac{\delta x}{\delta t} \quad a_{x,avg} = \frac{\Delta v_x}{\Delta t} \quad a_x = \frac{\delta v_x}{\delta t}$$

Perform algebraic and proportional reasoning.

Communicate

"The system is the"

Recipe

"By [relationship], the [quantity] [prepositional phrase] ... equals [or is proportional to] ..."

By $v_{x,i} \Delta t + \frac{1}{2} a_x \Delta t^2 = \Delta x$, the x-displacement is proportional to duration squared when initial x-velocity is 0.

"The ... is 0, so, by [relationship], the [adjective] [quantity] [prepositional phrase] ... [verb] ..."

The average x-acceleration is 0, so, by $a_{x,avg} = \frac{\Delta v_x}{\Delta t}$, the change in x-velocity $\Delta v_x = 0$...

"... the [total quantity] ([quantity 1] [prepositional phrase 1] [plus] ...) ..."
... the total trip duration (duration for journey segment 1 + duration for journey segment 2 + ...) ..."

Equal

"The ... stays the same."

Altered

"The ... [increases/decreases] ..."

So what?

"So the ... must ..."

Next?

(Check whether you've addressed all directives).

SiQuENC for Kinematics (Motion)

The letters S and i stand for Situations: Neatly and graphically represent **S**ituation(s)

1. **Read** a few words.
2. Make sure the meaning of those words is **illustrated** in your sketches/tables.
3. **Underline** the words.
4. **Repeat** with the next few words, if any.
 - Draw **bubble** around system.
 - Draw **dot** for each "particle."

Label:

- At/Through: t-sub-I, t-sub-f, maybe t
- Axes: +x, maybe +y

The letters Q and u stand for Quantities: Graphically represent **Q**uantities

Breadcrumb motion diagram

Drawing contains +x axis

Consecutive dots indicating consecutive snapshot locations

Arrows anchored on those dots pointing in directions of instantaneous velocities and sized in proportion to instantaneous speeds

Velocity arrows are labeled, for example, as v-sub-x-i and v-sub-x-f

Arrow between two consecutive velocity arrows indicates velocity change and is labeled Delta-v-sub-x

Stacking initial velocity arrow and velocity-change arrow head to tail creates an overall arrow with the same overall direction and size as the final velocity arrow

Time plots

Drawing of an example set of consistent x-t, v-sub-x-t, and a-sub-x-t plots

Beginning-Middle-End Chart

Table:

Row: t-sub-i = blank space

Row: Two columns: x-sub-i = blank space, y-sub-i = blank space

Row: Two columns: v-sub-x-i = blank space, v-sub-y-i = blank space

Row: open bracket, t-sub-i, comma, t-sub-f, closed bracket

Row: Two columns: a-sub-x = blank space, a-sub-y = blank space

Row: t-sub-f = blank space

Row: Two columns: x-sub-f = blank space, y-sub-f = blank space

Row: Two columns: v-sub-x-f = blank space, v-sub-y-f = blank space

E stands for Equation(s): Identify allowed **E**quation(s)

v-sub-x-i times Delta t + half a-sub-x times the square of Delta t = Delta x

the square of v-sub-x-i + 2 times a-sub-x times Delta x = the square of v-sub-x-f

N is the second letter of "**AN**alyze".

Cross out quantities that are obviously 0.

a-sub-x = 0? v-sub-x-i = 0?

Substitute constitutive relationships.

v-sub-x-AVG = Delta x divided by Delta t

v-sub-x = lowercase delta x divided by lowercase delta t

a-sub-x-AVG = Delta v-sub-x divided by Delta t

a-sub-x = lowercase delta v-sub-x divided by lowercase delta t

Perform algebraic and proportional reasoning.

C stands for **C**ommunicate.

Phrasal template: "The system is the dot-dot-dot"

REASoN is spelled R, E, A, So, and N.

R stands for **R**ecipe.

Phrasal template: "By [relationship], the [quantity] [prepositional phrase] ... equals [or is proportional to] ..."

Example phrase: By $v\text{-sub-x-i}$ times Δt + half $a\text{-sub-x}$ times the square of Δt = Δx , the x-displacement is proportional to duration squared when initial x-velocity is 0.

Phrasal template: "The ... is 0, so, by [relationship], the [adjective] [quantity] [prepositional phrase] ... [verb]"

Example phrase: The average x-acceleration is 0, so, by $a\text{-sub-x-AVG} = \Delta v\text{-sub-x}$ divided by Δt , the change in x-velocity $\Delta v\text{-sub-x} = 0$ dot-dot-dot

Phrasal template: "... the [total quantity] ([quantity 1] [prepositional phrase 1] [plus] ...) ..."

Example phrase: dot-dot-dot the total trip duration (duration for journey segment 1 + duration for journey segment 2 + dot-dot-dot) dot-dot-dot

E stands for **E**qual

Phrasal template: The blank stays the same.

A stands for **A**ltered.

Phrasal template: The blank [increases/decreases] dot-dot-dot.

The So stands for **S**o what?

Phrasal template: So the blank must blank.

N stands for **N**ext?

(Check whether you've addressed all directives).