SiQuENC for Dynamics (Forces) — D 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
- Axes: $+x$, maybe $+y$

Graphically represent Quantities

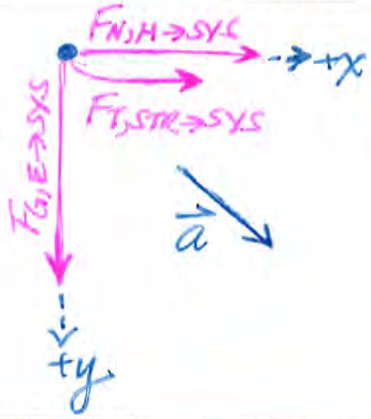
Force diagram

Bubble the system

Earth nearby?

Touching?

Axis system



Force-components chart

$\vec{F}$	F_x	F_y
ΣF		

Identify allowed Equation(s)

$\vec{a} = \frac{\Sigma \vec{F}}{m_I}$ ∴ $a_x = \frac{\Sigma F_x}{m_I}$ $a_y = \frac{\Sigma F_y}{m_I}$

ANalyze

Cross out quantities that are obviously 0.

$a_x = 0$? $a_y = 0$?

Substitute constitutive relationships.

$F_{G,E\to SYS} = m_G g$ $f_s \le \mu_s F_N$ $f_k = \mu_K F_N$ $F_{SPR\to SYS} = k|\Delta x|$

Perform algebraic and proportional reasoning.

Communicate

"The system is the …."

Recipe

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

By N2L, the x-acceleration of the block equals the ratio of the net x-force on the block to the block's inertial mass.

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

The y-acceleration is 0, so by N2L, the upward tension must be just as strong as the downward gravitational force …

"… the [total quantity] ([quantity 1] [prepositional phrase 1] [plus] …) …"

… the net upward force (strength of tension force minus strength of gravitational force) …

Equal: "The … stays the same."

Altered: "The … [increases/decreases] …."

So what?: "So the … must …."

Next?: (Check whether you've addressed all directives).

Page **D SiQuENC**

SiQuENC for Dynamics (Forces)

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

1. **Read** a few words.
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- Draw **bubble** around system.
- Draw **dot** for each "particle."

Label:

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

The letters Q and u stand for Quantities: Graphically represent **Qu**antities
Title of first section: Force diagram
Acronym BETA, spelled B-E-T-A:
B stands for Bubble the system.
E stands for Earth nearby?
T stands for Touching?
A stands for Axis system.

Illustration of sample force diagram represents system as a dot. Gravitational force of Earth on system is represented by a downward arrow originating from dot and labeled F-sub-G,E-on-sys. Tension force string exerts on system is represented by an arrow extending horizontally to the right from the dot and labeled F-sub-T,STR-on-sys. Normal force hand exerts on system is represented by an arrow extending horizontally to the right from the dot and labeled F-sub-N,H-on-sys. Where two arrows would otherwise overlap, the arrows are deliberately slightly misprinted offset and parallel. Where this deliberate misprinting would cause a tail of a force arrow to detach from the system dot, a small curve is attached to the tail of the force arrow to keep the force arrow and system dot connected. An acceleration vector pointing diagonally toward the lower-right is labeled a-vector. Dashed axis arrows extend out from the dot to indicate that the +y direction points downward and the +x direction points toward the right, in this example.

Title of second section: Force-components chart
Table, three rows
Header for 1st column: F
Header for 2nd column: F-sub-x
Header for 3rd column: F-sub-y
Three blank rows
Then, in the subsequent, final row, the entry in the 1st column is Sigma-F.

E stands for Equation(s): Identify allowed **E**quation(s)
a-vector = Sigma-F-vector divided by m-sub-I
a-sub-x = Sigma-F-sub-x divided by m-sub-I
a-sub-y = Sigma-F-sub-y divided by m-sub-I

N is the second letter of "A**N**alyze".
Cross out quantities that are obviously 0.
a-sub-x = 0? a-sub-y = 0?
Substitute constitutive relationships.
F-sub-G,E-on-sys = m-sub-G times g
lowercase f-sub-S is less than or equal to mu-sub-S times F-sub-N
lowercase f-sub-K = mu-sub-K times F-sub-N
F-sub-SPR-on-sys = k times absolute value of Delta x
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 N2L, the x-acceleration of the block equals the ratio of the net x-force on the block to the block’s inertial mass.

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

Example phrase: The y-acceleration is 0, so by N2L, the upward tension must be just as strong as the downward gravitational force dot-dot-dot.

Phrasal template: “… the [total quantity] ([quantity 1] [prepositional phrase 1] [plus] …) …”

Example phrase: dot-dot-dot the net upward force (strength of tension force minus strength of gravitational force) 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 **So** what?

Phrasal template: So the blank must blank.
N stands for **N**ext?
(Check whether you’ve addressed all directives).