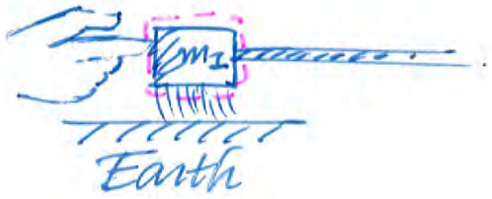
D7

Title Newton's 2nd Law (N2L)

Ingredients

Sketch



At/Through t

Owner System

Quantity

- Net force
- Inertial mass
- Acceleration

Variable

- $\Sigma\vec{F}$
- m_I
- $\vec{a}$

Giver External environment

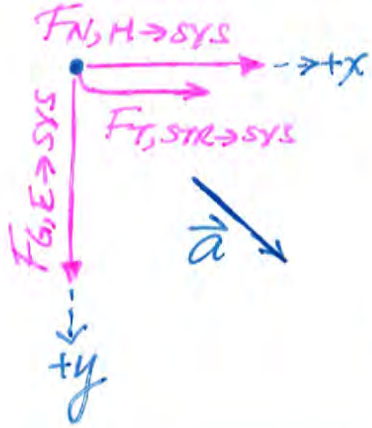
Recipe

Diagram the relationship

Graphically present quantities

Force diagram

- Bubble the system
- Earth nearby?
- Touching?
- Axis system



Force-components chart

	F	F_x	F_y
ΣF			

Mathematical relationship

$$\vec{a} = \frac{\Sigma\vec{F}}{m_I}$$

$$a_x = \frac{\Sigma F_x}{m_I} \qquad a_y = \frac{\Sigma F_y}{m_I}$$

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Title: Newton's 2nd Law (N2L)

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."

Sketch: Block is surrounded by a dashed system bubble and contains label that reads m-sub-I. Curved trailing whooshies underneath block indicate block is in midst of upward motion and has been recently transitioned from diagonal motion toward the upper left. A surface underneath is near, but not touching, the block. Under the surface is a label for "Earth". A string is attached to the right side of the block and extends horizontally to the right with no slack. The index finger of a hand to the left of the block is touching the left side of the block.

Remaining rows of Ingredients section are used for a flowchart illustrating the following:
At time t, the Owner is the System. The System owns the Quantity Net force denoted by variable Sigma-F-vector given by Giver External environment. The System also owns the Quantity Inertial mass denoted by Variable m-sub-I. The System also owns the Quantity Acceleration denoted by Variable a-vector.

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".

Diagram the relationship
A flowchart arrow shows that net-x-force Sigma-F-sub-x contributes to x-acceleration a-sub-x. Another curve with a flat terminus (hammerhead shark symbol) shows that inertial mass m-sub-I inhibits x-acceleration a-sub-x.

Graphically present quantities
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.

Mathematical relationship
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