Unit 1: Computational Thinking
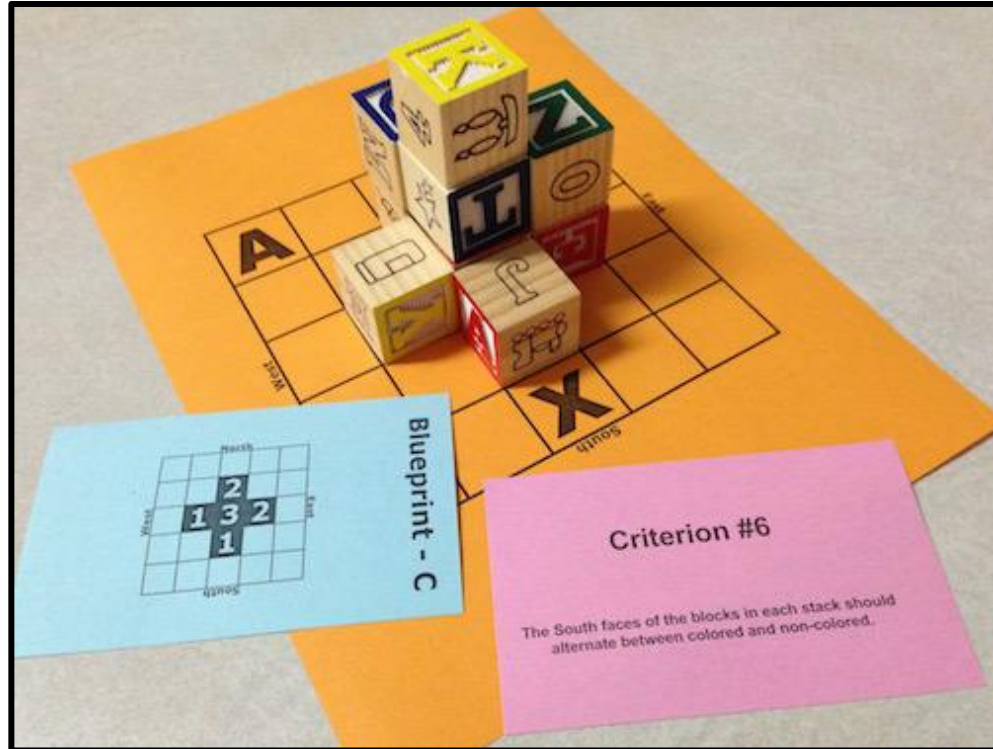
"Building Blocks"

Building Blocks

2-Stage Activity

1) **Programming Stage:**
    - Each team of 4 will be given a unique problem to solve
    - Each team will collaborate on writing a single "people program" to solve their problem
    - Each team should test and validate their solution as they develop their program

2-Stage Activity

2) **Role-play Stage:**

- Teams will exchange programs with another group who will execute their solution
- Teams will test their programs by simulating the basic operations of a computer
- Each member will assume 1 role:
  - *Supervisor (processor)*
  - *Supplier (input/output)*
  - *Worker (data bus)*
  - *Inspector (logic unit)*
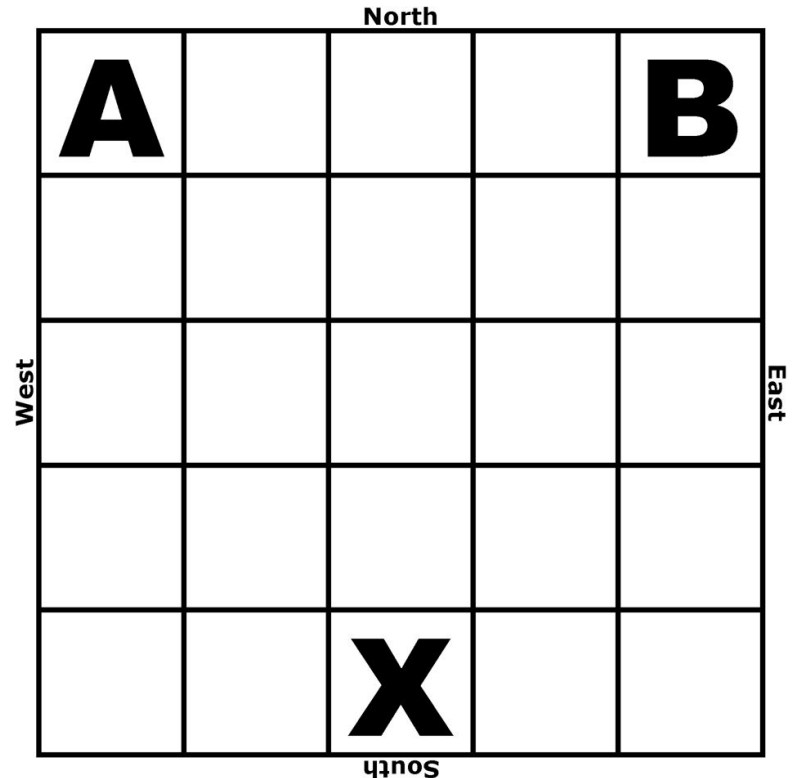
Materials

Blocks:

- Each team will receive a bag of blocks
- Each block is analogous to 1 unit of data
- Common characteristics:
  - Colored letters or numbers
  - Non-colored letters and numbers
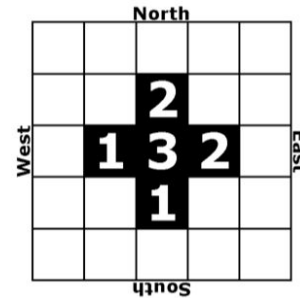 - Pictures
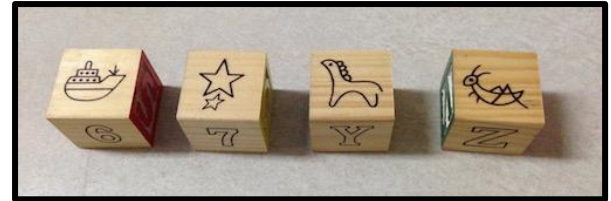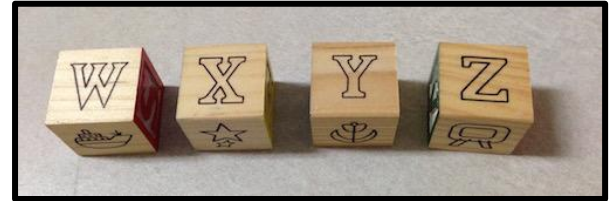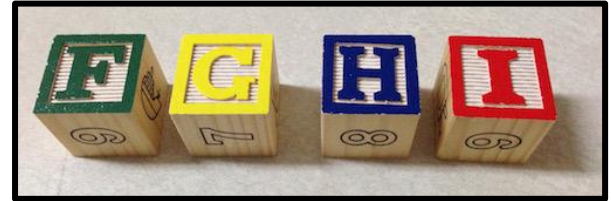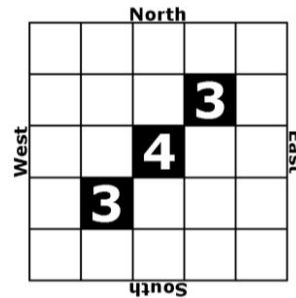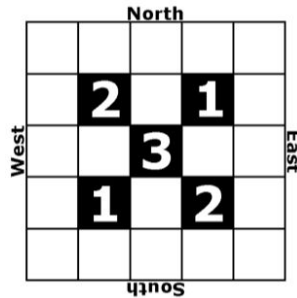
Materials

Construction Site:

- Inspection Zones: **A**, **B**
- Loading Zone: **X**
- Each square can hold 1 stack of blocks
- Analogous to memory (**A**, **B**, and **X**)

Materials

Blueprints:

- Each team receives 1 blueprint describing the locations and number of blocks in each of the towers to build

Materials

Criteria:

- Each team receives 1 criterion that describes a characteristic that the blocks in the towers must meet

Criterion #1
The top face of each stack must be a colored letter.

Criterion #3
Blocks with colored numbers on them are not allowed in the finished construction.

Criterion #2
All colored letters and numbers must be on the North and South faces of each block.

Criterion #4
The East and West faces of the top block in each stack must be pictures.

Roles

Supervisor:

- "Construction Foreman"
- Equivalent to a computer's _processor_
- Reads and follows the team's solution
  - Must follow the written instructions exactly
  - Instructs _Supplier_ and _Worker_ on what to do
  - Makes decisions based on information received from the _Inspector_ (i.e., the Supervisor cannot look at the blocks him/herself)

Roles

Supplier:

- Can supply a random block from the bag to the Loading Zone (**X**)
- Can remove a block from the Loading Zone (**X**) and place it back in the bag
- Equivalent to a computer's *input/output*
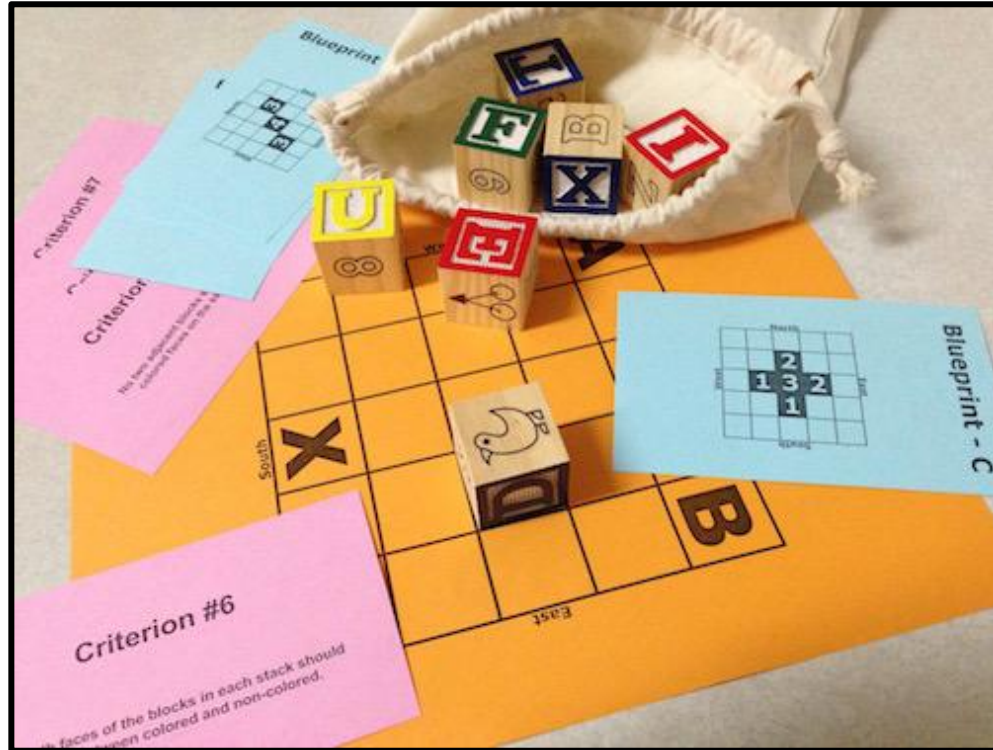
Roles

Worker:

- Can only manipulate 1 block at a time
- Can only manipulate blocks on the grid
- Only knows about the grid (direction, distance, **A**, **B**, and **X**), but not the blocks
- May NOT use any personal judgment in selecting, manipulating, or placing blocks
- Equivalent to a computer's _data bus_

Roles

Inspector:

- Can only answer "**YES**" or "**NO**" questions about the blocks on either of the Inspection Zones (**A** or **B**)
- May NOT communicate anything else
- Equivalent to a computer's _logic unit_

Let's Write a People Program!

Summary of Roles

Supervisor:
- *Reads* the instructions
- Makes all decisions
- *Tells* Supplier, Worker, and Inspector what to do

Worker:
- *Moves* and *turns* the blocks exactly as instructed by the Supervisor
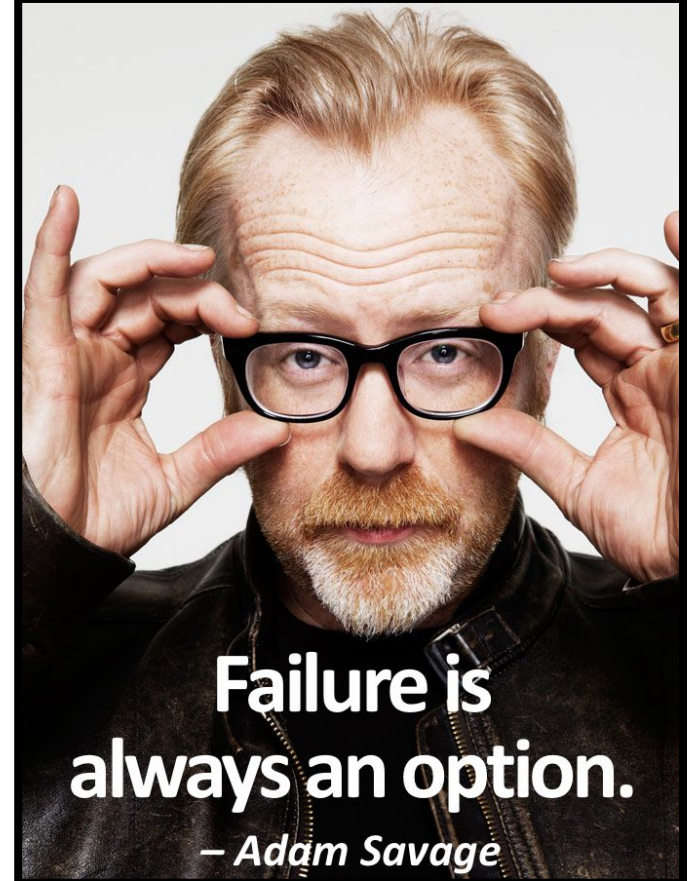
Supplier:
- *Supplies* a block from the bag to the **X**
- *Removes* a block from the **X** and puts it back in the bag
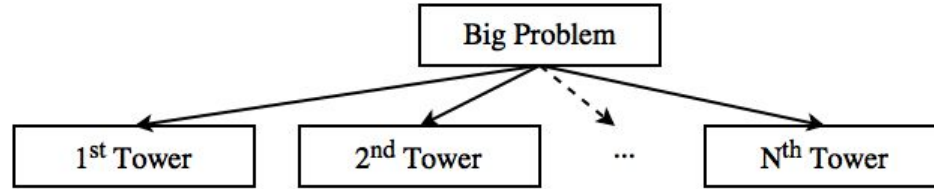
Inspector:
- *Answers* **YES/NO** questions about blocks on either Inspection Zone (**A** or **B**)
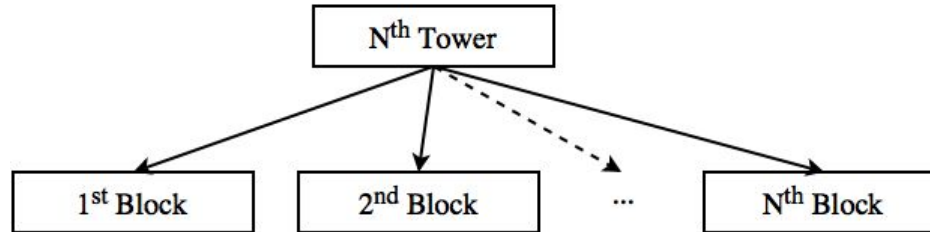
What Have We Learned?

- Seemingly simple tasks can be surprisingly complex

- Topics addressed:
  - Sequencing
  - Selection
  - Repetition

- English is a lousy language
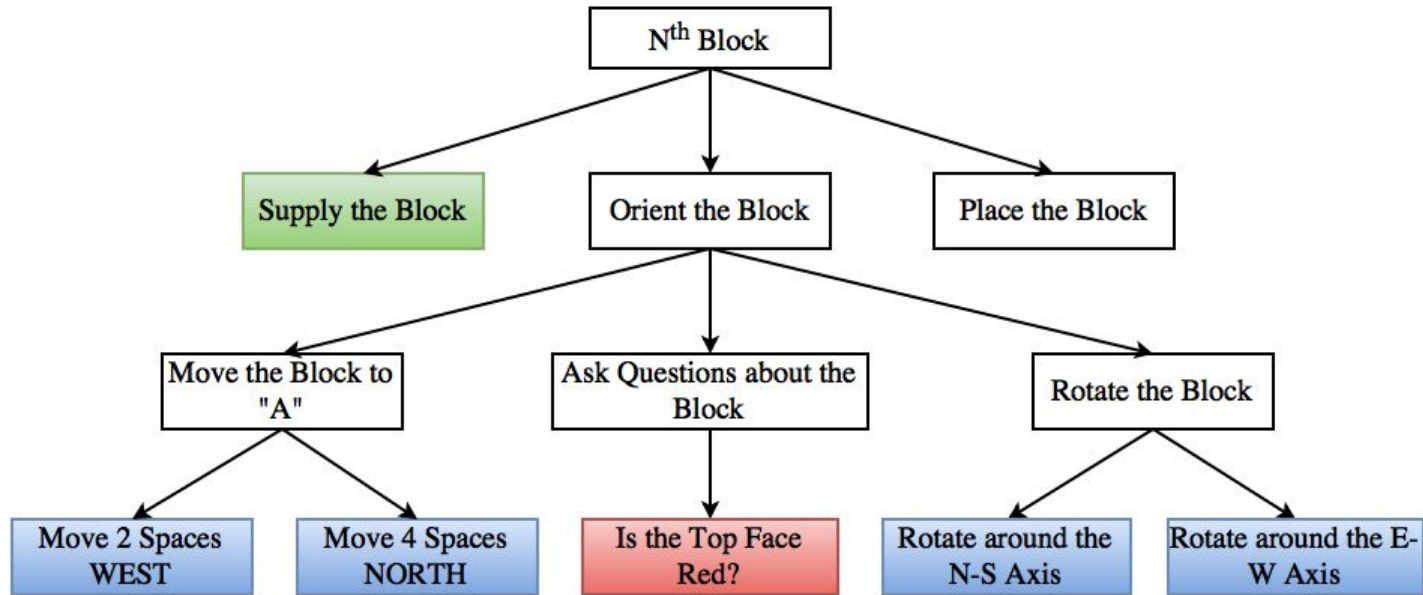 - Imprecise
  - Ambiguous
  - Wordy

Failure is always an option.
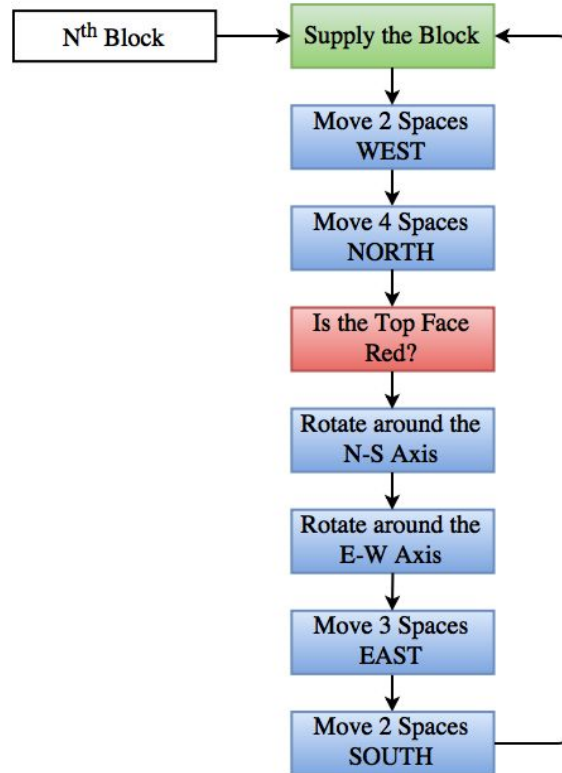— Adam Savage
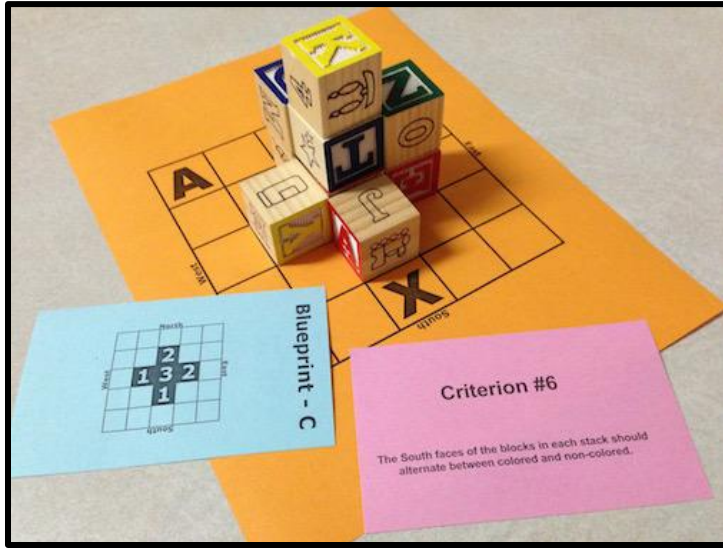
Breaking Down a Big Problem

Breaking Down a Big Problem

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Building Blocks

is a game about *computational thinking* — which is what **AP® Computer Science Principles** is all about.

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