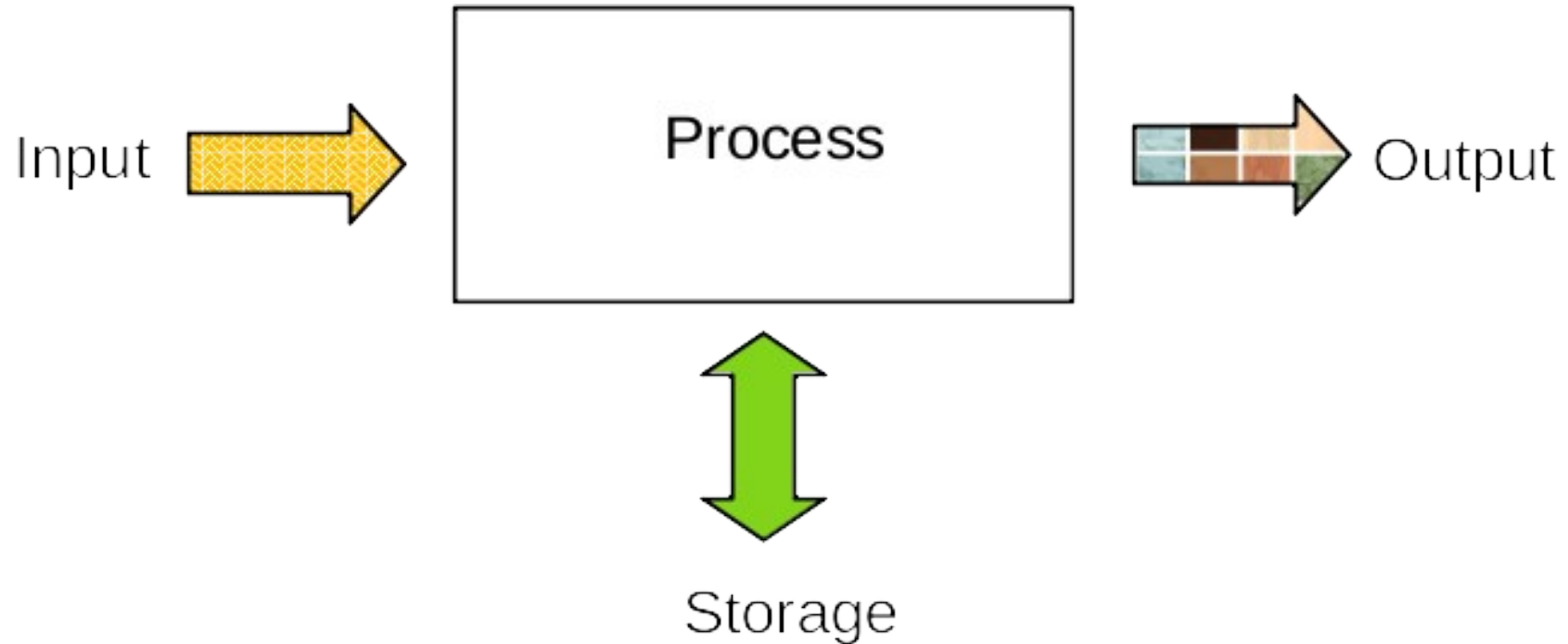


Building Blocks of Computers and Programs



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Loop and decision graphics by vecteezy.com

4 Basic Operations of a Computer



4 Basic Operations of a Computer

- **Input** – Data is entered into the computer (text, sound, video, taps and swipes)
- **Process** – Data is transformed into information
- **Storage** – Data or information is recorded for retrieval
- **Output** – Information is produced by the computer (print, display, sound, video)

What is a computer program?

- Programs are composed of
 - Sequences of statements
 - Decision statements (selection)
 - Repeated statements (iteration)
- Computer programs are descriptions of solutions (people describe the steps to solve the problem)
- Computers carry out (execute) the instructions

What is a computer program?

- Data is transformed by a program into information.
- A *program* is a set of steps that will accomplish a specific task.
- A set of steps that always performs a specific task is called an *algorithm*.
- A program is the implementation of an algorithm into a form that a computer can understand.

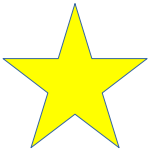
Algorithms vs. Heuristics

- Algorithm – a stepwise procedure (or process) that always accomplishes a specific task.
Algorithms never fail.
- Heuristic – a stepwise procedure (or process) that usually accomplishes a specific task.
Heuristics might fail.

Note: Algorithms (and heuristics) can be performed with or without a computer.

Program Building Blocks

- Sequence
- Selection
- Iteration

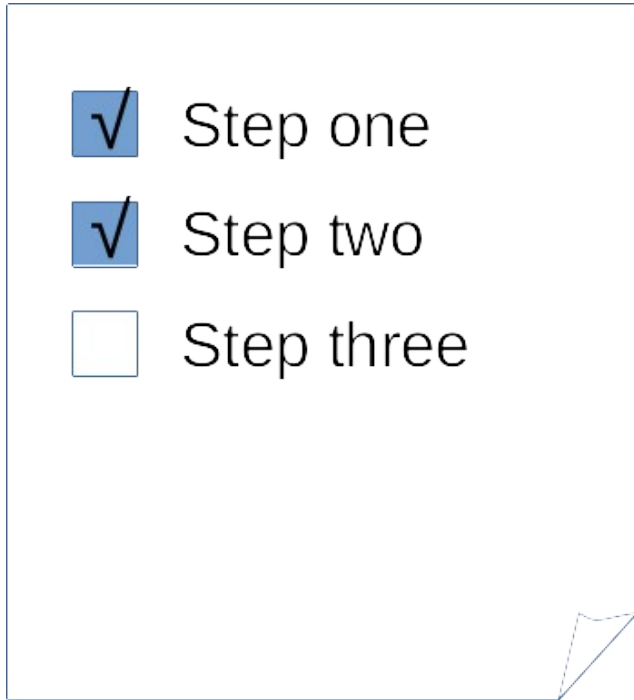


These three building blocks are all that is needed for a program. All programs use a combination of these three building blocks.

There are other building blocks that are used as programs become more complex, but they are not necessary. The other building blocks organize code and data to make them easier for humans to manage.

Program Building Blocks

- Sequence – a linear or sequential set of steps



Program Building Blocks

- Selection – a decision step (also called a conditional)



Program Building Blocks

- Iteration – repetition or repeating steps (also called looping)



Technically iteration is one form of looping.
The other type of looping is called recursion and we will ignore it.

Programming Languages

- Because natural languages like English or Spanish are ambiguous, computer programs are written in special, more restrictive languages called *programming languages*
- Programming languages may be textual or graphical (words or pictures)
- Programs are also called *code* or more formally source code
- Source code is translated (using programs) into very simple instructions that the machine can understand