LS01: The Ideas Behind Coding

Things to Note

- Tuesday is virtual videos you can watch at any time
  - But we will be available during class time on Campuswire to answer any questions!
  - There will be questions on Gradescope for you to answer ***Tuesday night!***
- LS00 (syllabus) due TONIGHT
  - If you're still waiting to be enrolled, email comp110help@gmail.com for an extension.
- EX00 released!
- OPEN HOUSE in Sitterson Lower Floor Today and Tomorrow 12-6 pm

Today’s Format is A Little Different…

- Little more lecture-y
- Shorter
- A little more vague

Why?

- A gentler introduction
- Want you to get a bigger picture of the little things we’re going to talk about later
- **I don’t expect you to be able to do any of these things tomorrow… that’s what this class is for!**

Computational Thinking

- Strategic thought and problem-solving
- Can help perform a task better, faster, cheaper, etc.
- Examples:
  - Meal prepping
  - Making your class schedule
  - “Life Hacks”

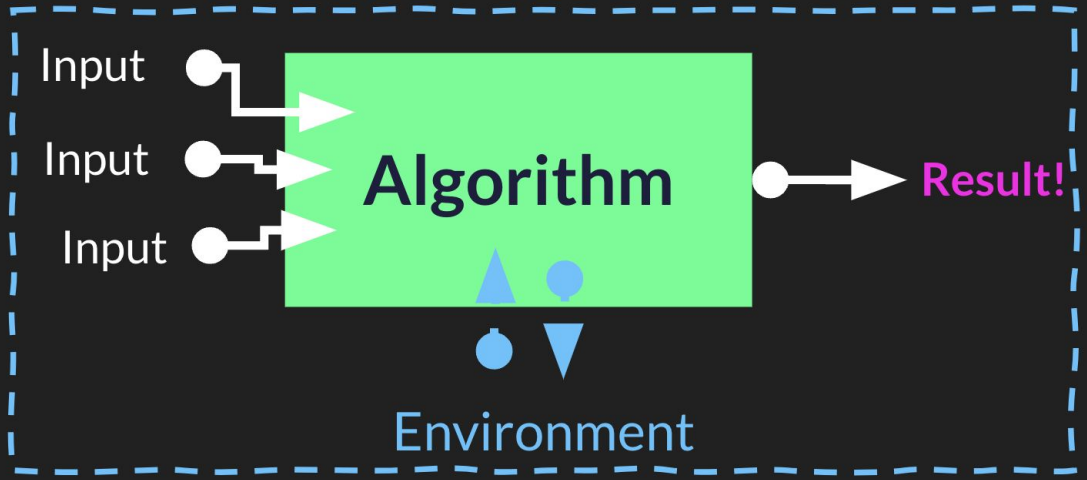
Algorithms

Input is data given to an algorithm

An **algorithm** is a series of steps

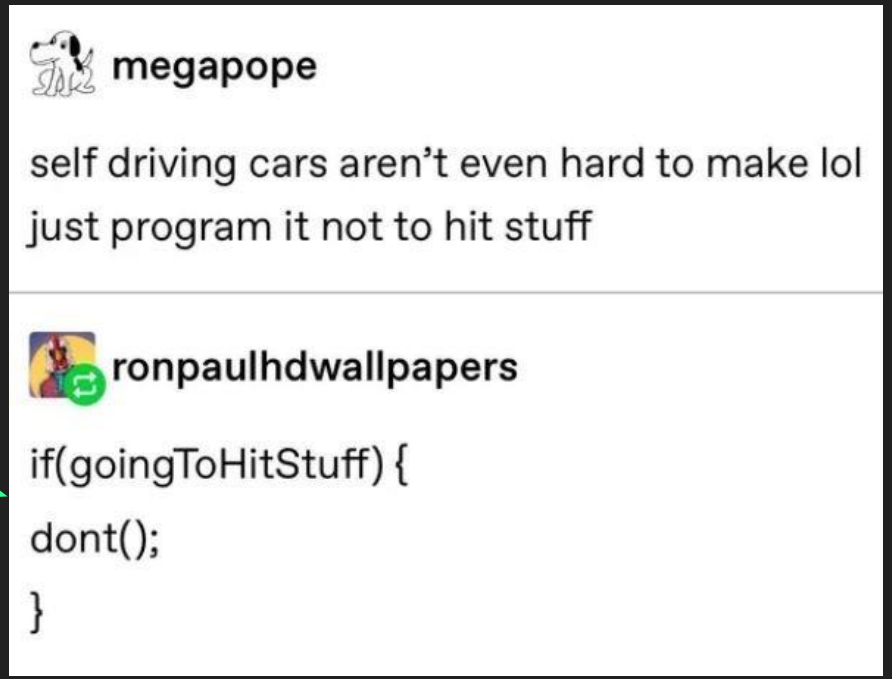
An algorithm **returns** some **result**

An algorithm *may* be influenced by its **environment** and it *may* produce side-effects which influence its environment.



Example: My dissertation

Algorithm



Discussion

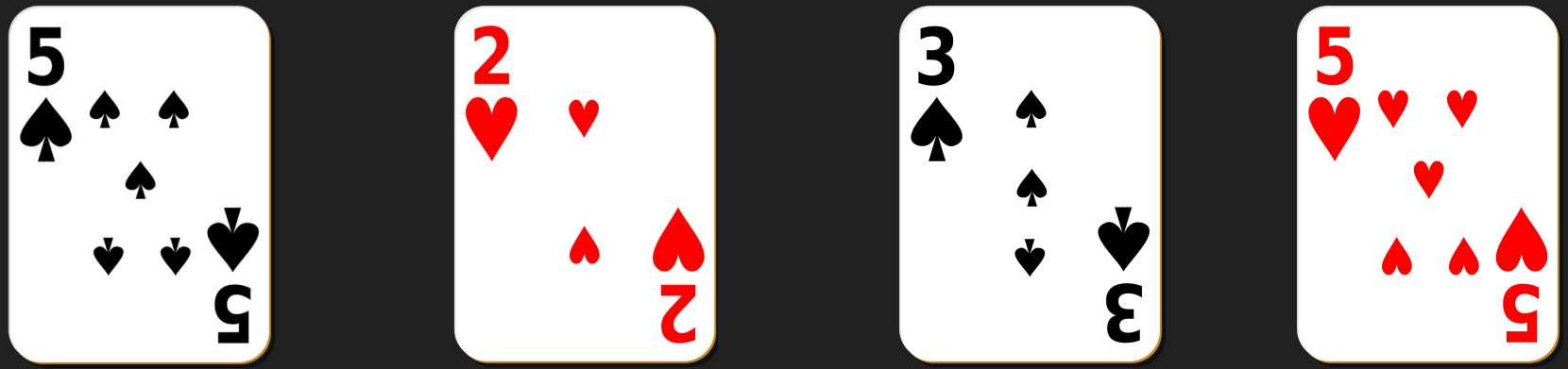
What are examples of computational thinking that you use day to day?

What kind of algorithms do you use to implement these ideas?

What is an algorithm?

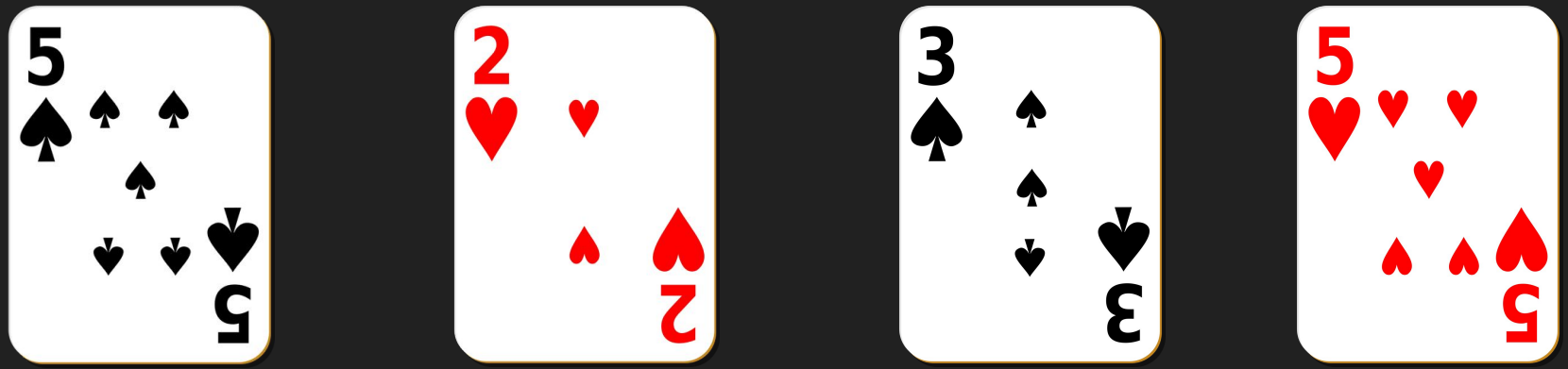
- A set of steps to solve a general problem
- Finite
- Can handle a problem of arbitrary size

Classic Algorithm: Sorting



Instructions to sort these cards (or any set of cards) from least to greatest?

Insertion Sort: Build sorted deck.



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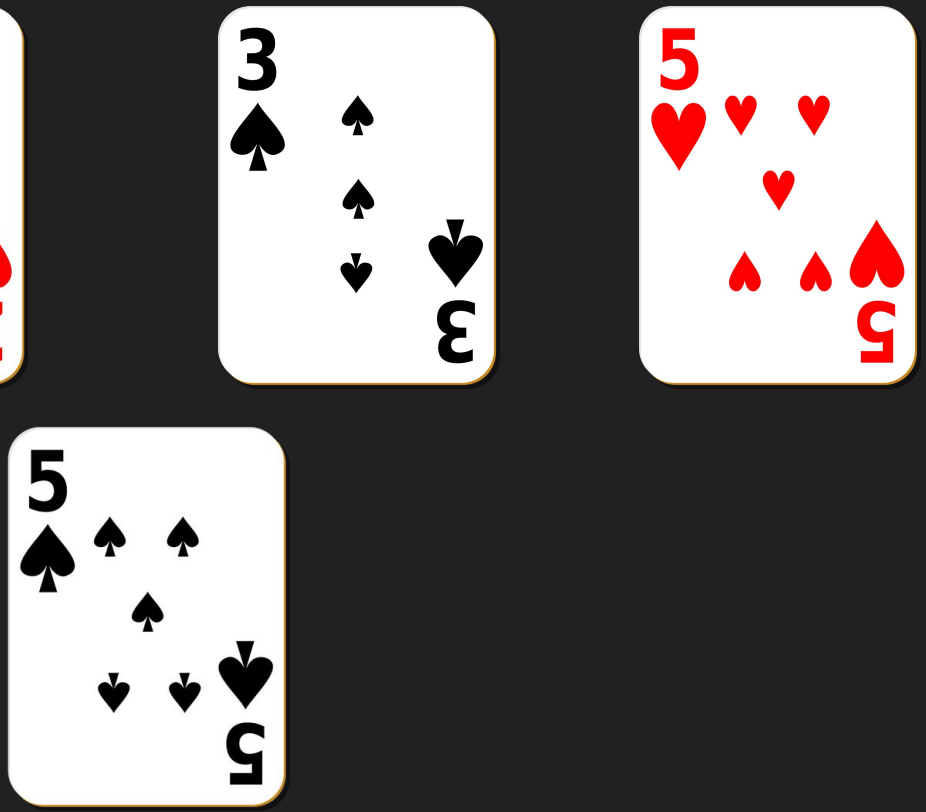

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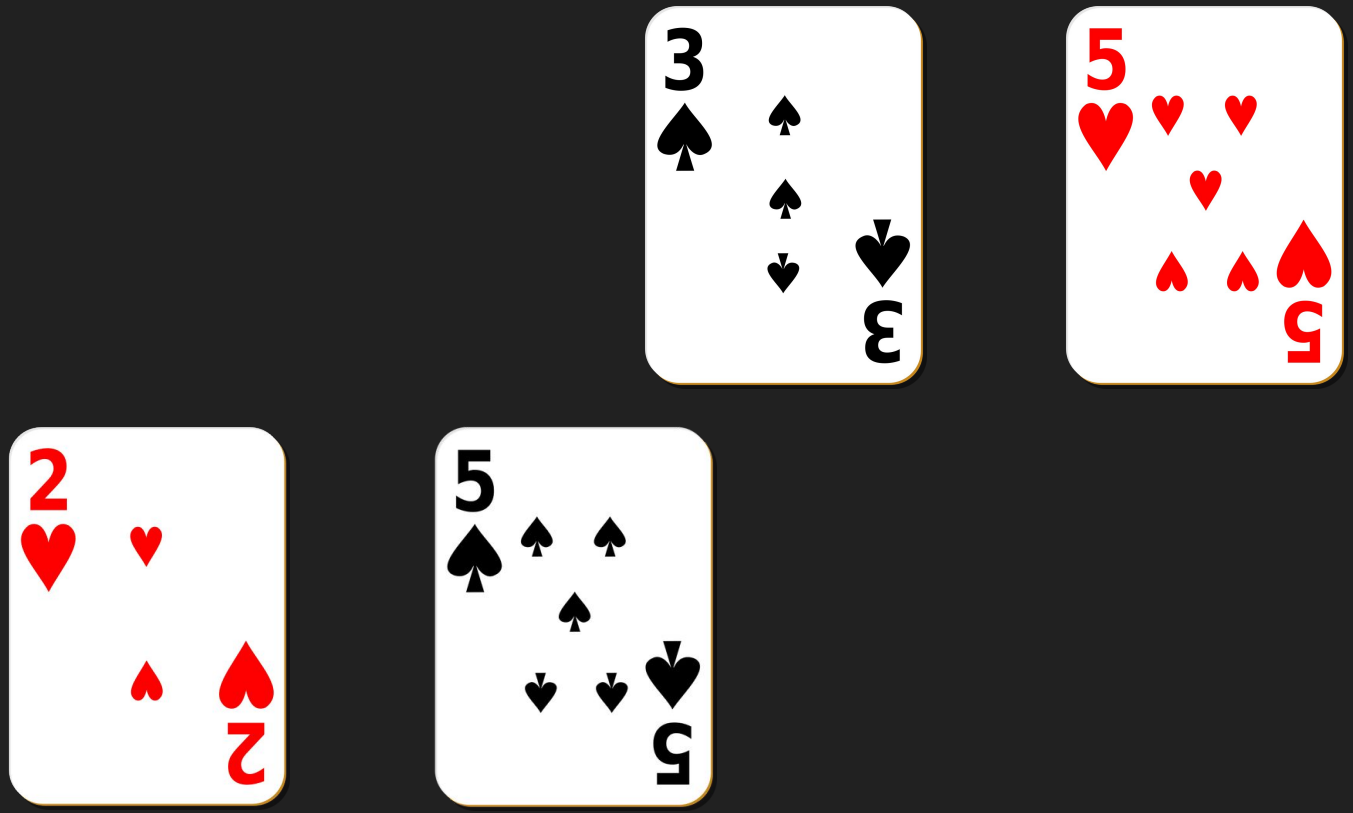

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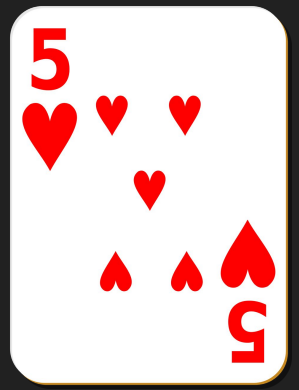

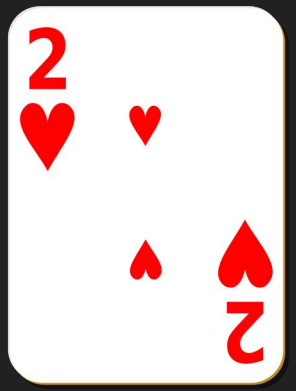

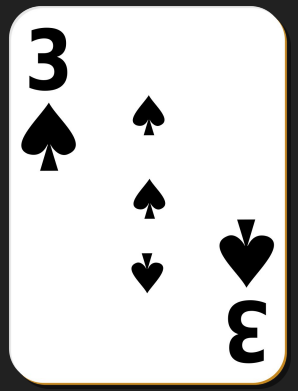

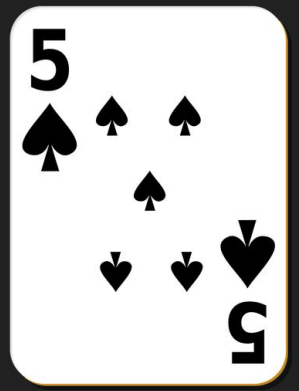

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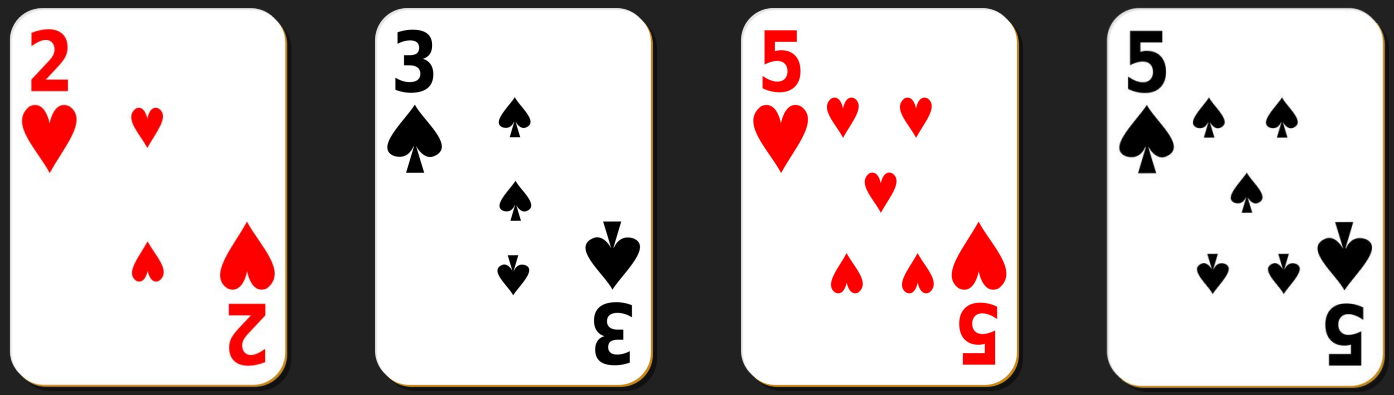
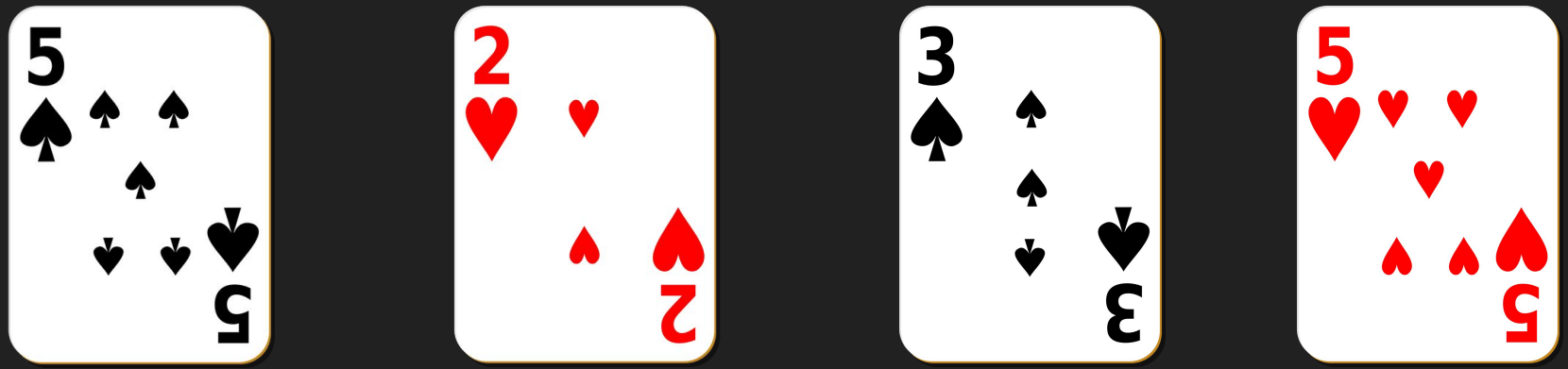


Selection Sort: repeatedly choose minimum



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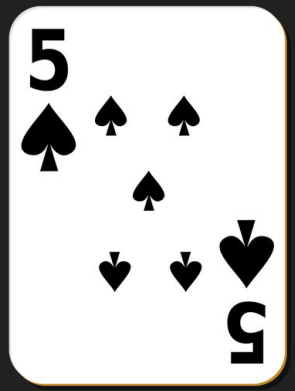

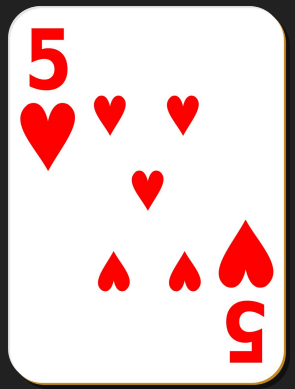

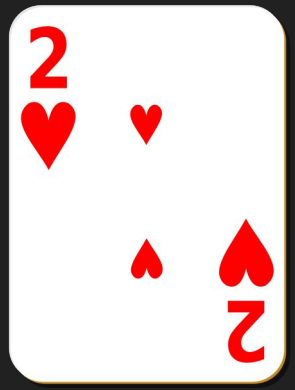

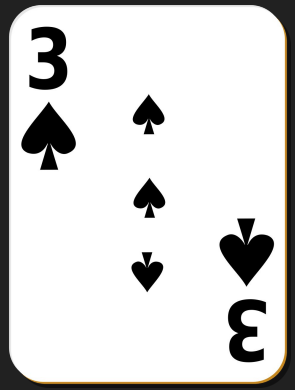

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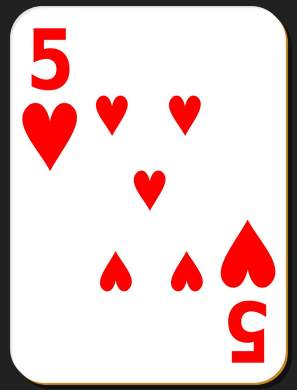

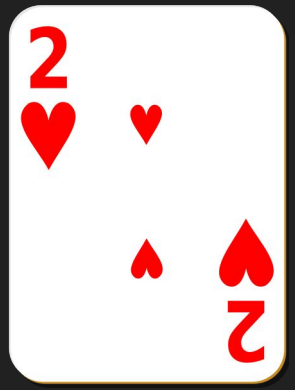

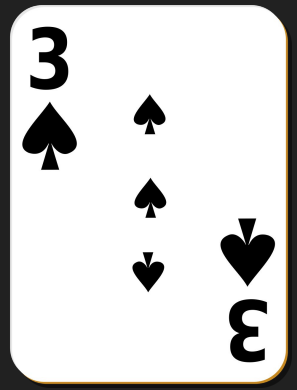

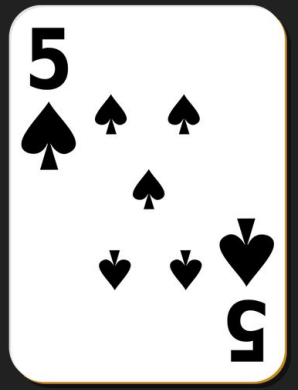

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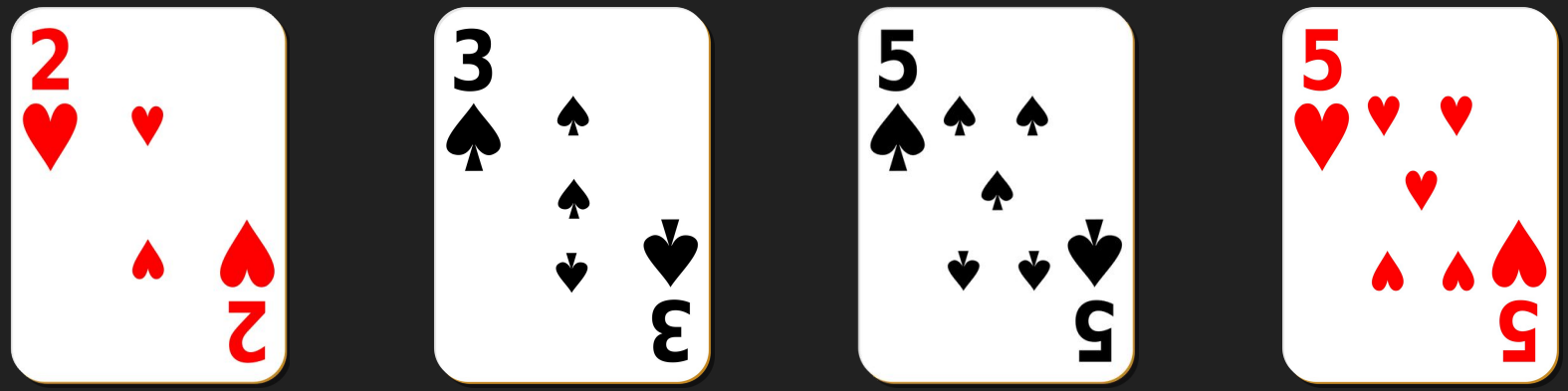

How do we express these steps?

Selection Sort:

- You’re going to make a new, sorted deck, so let’s call that our “new deck”
- From your old deck, repeatedly find the card with the lowest value and add it to the new deck until the old deck is empty

Pseudocode

Looks like code, but simplified and readable.

Not meant to run on a computer.

Helps you outline what your algorithm is going to look like.

You should be able to expand on your pseudocode to help you write actual code!

Back to Selection Sort…

Original instructions

- You're going to make a new, sorted deck, so let's call that our "new deck"
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Pseudocode:

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new_deck = new CardDeck()
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Assignment

Back to Selection Sort…

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Pseudocode:

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new_deck = new CardDeck()

Repeatedly until old_deck is empty:

    low_card = find_lowest_card(old_deck)

    new_deck = new_deck + low_card
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Back to Selection Sort…

Original instructions

- You're going to make a new, sorted deck, so let's call that our "new deck"
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Pseudocode:

Loop

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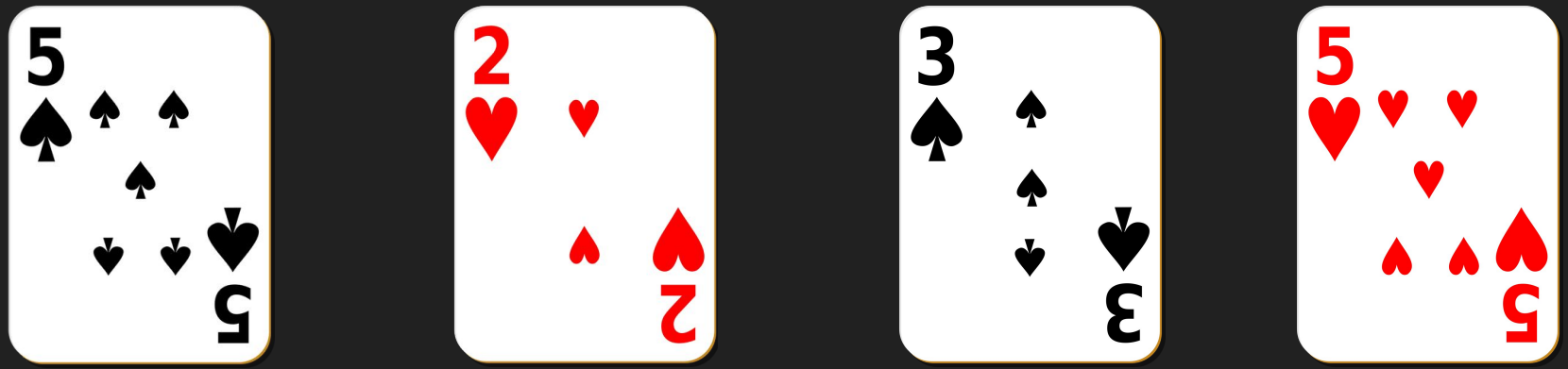

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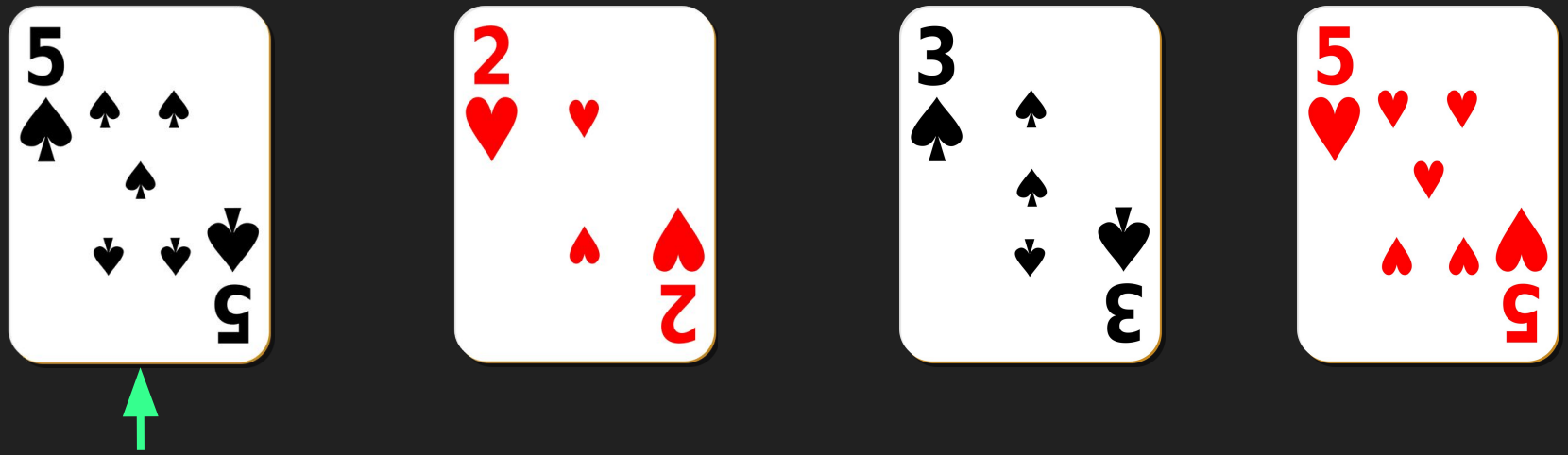
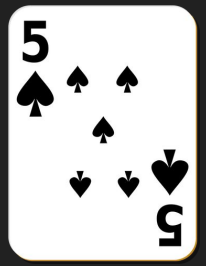


Low card:



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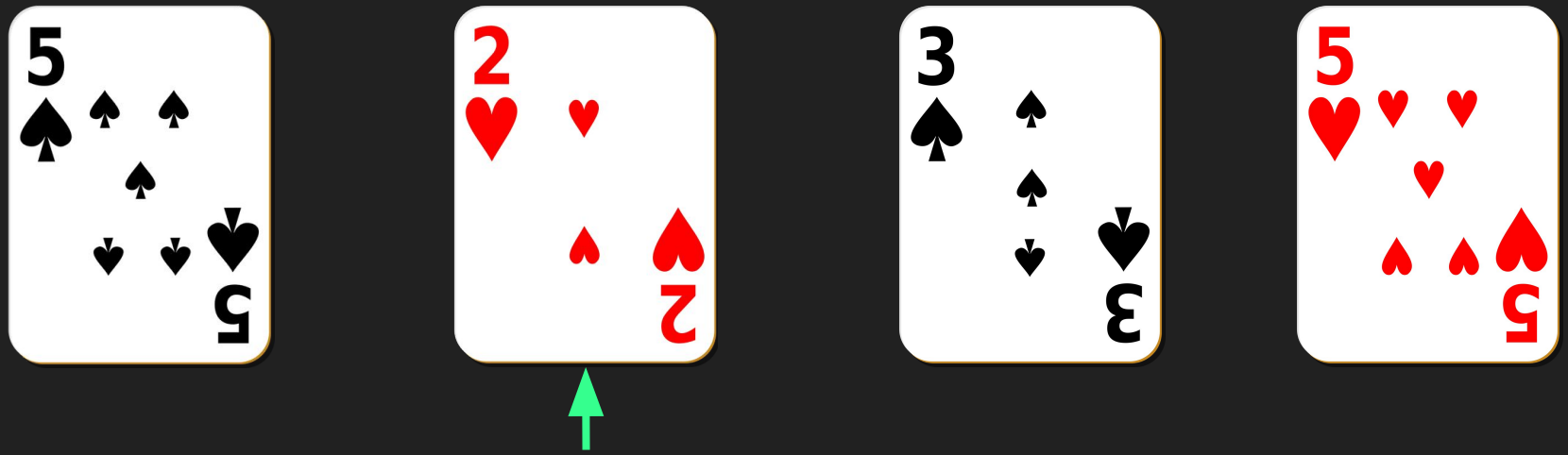

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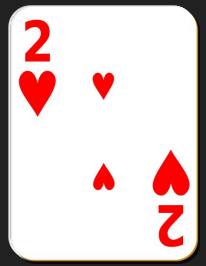

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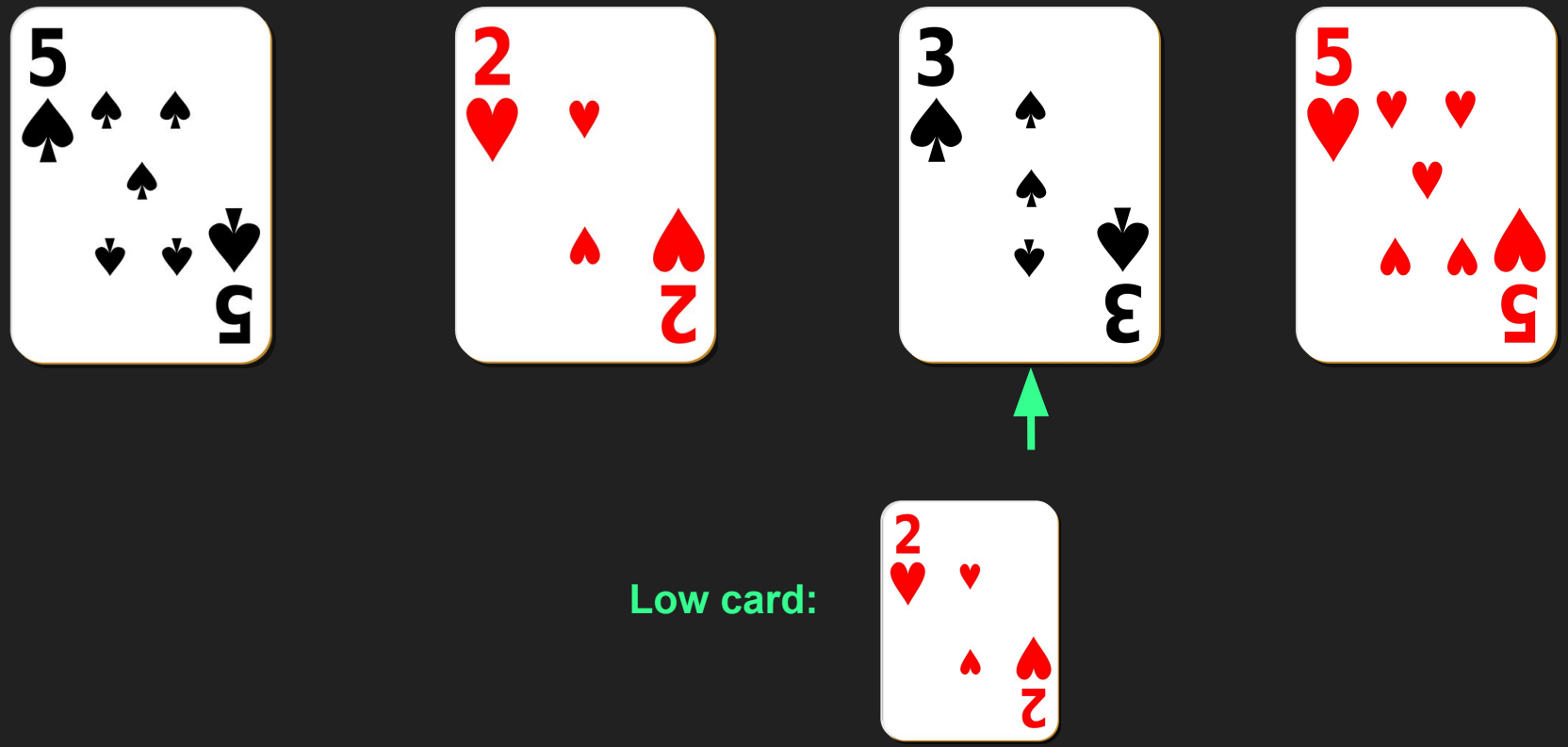

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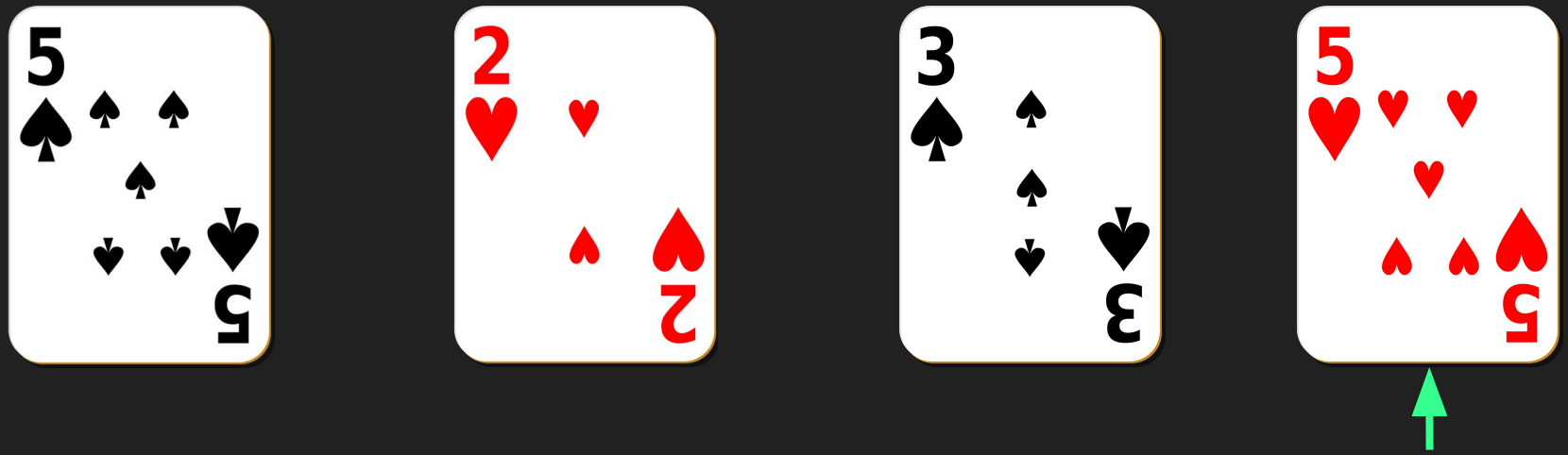

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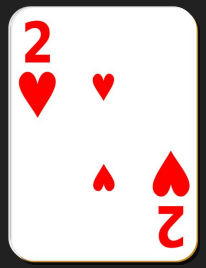

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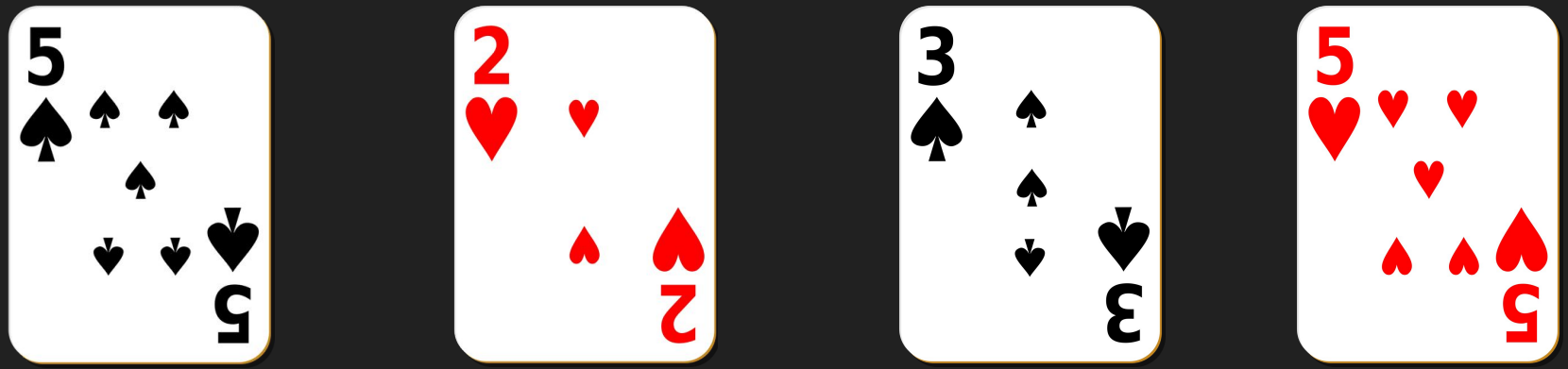

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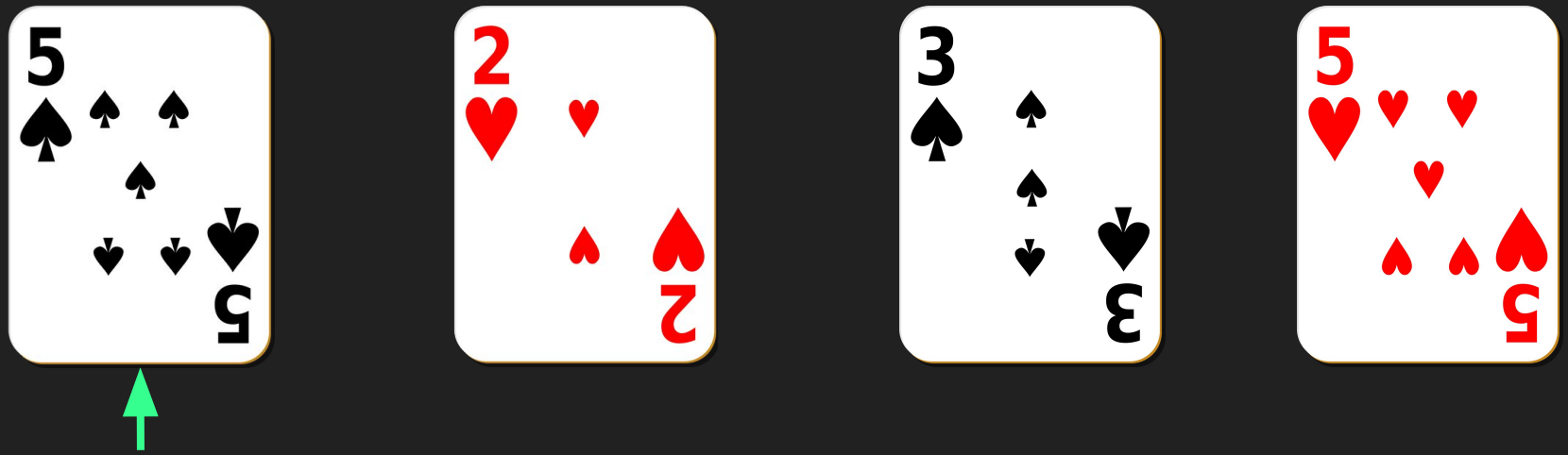

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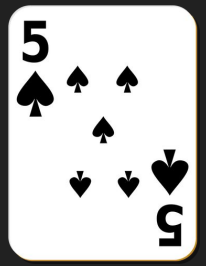

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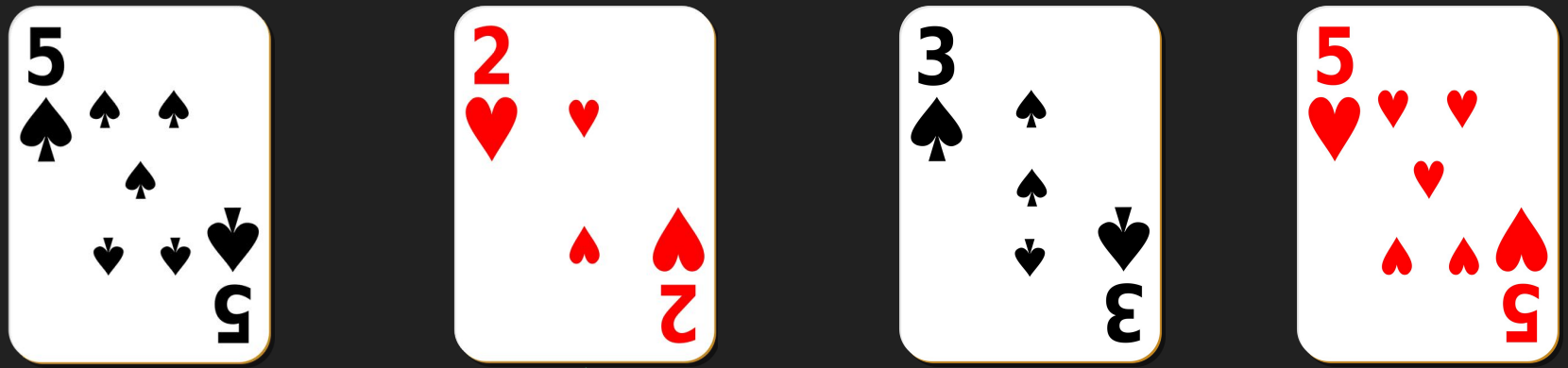
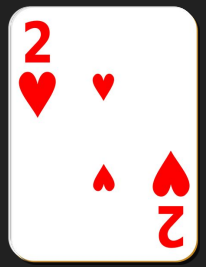


2 < 5? ✓

Low card:



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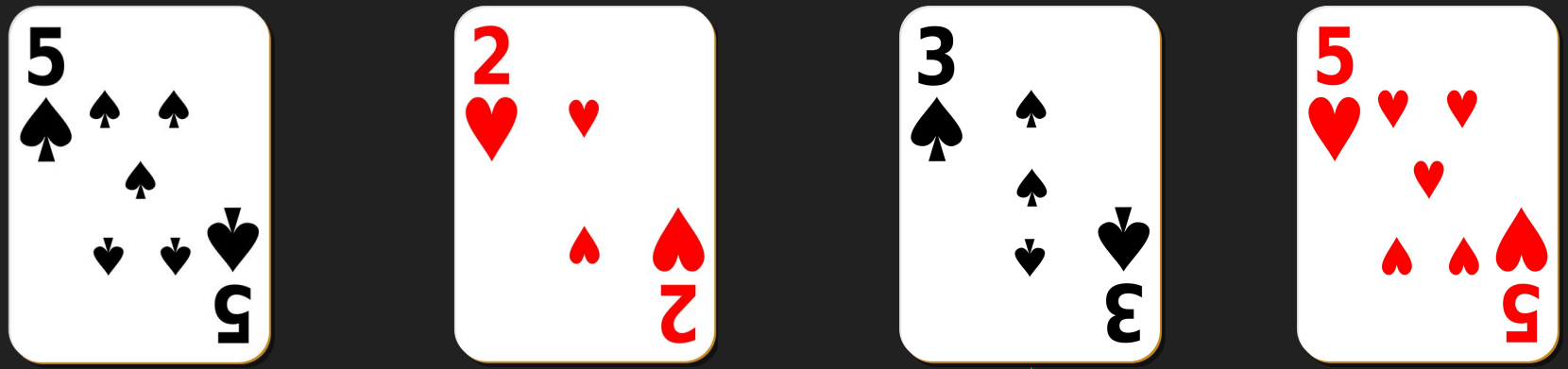
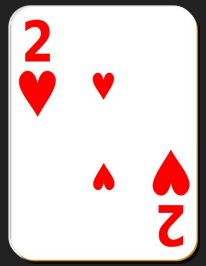


3 < 2? ✗

Low card:



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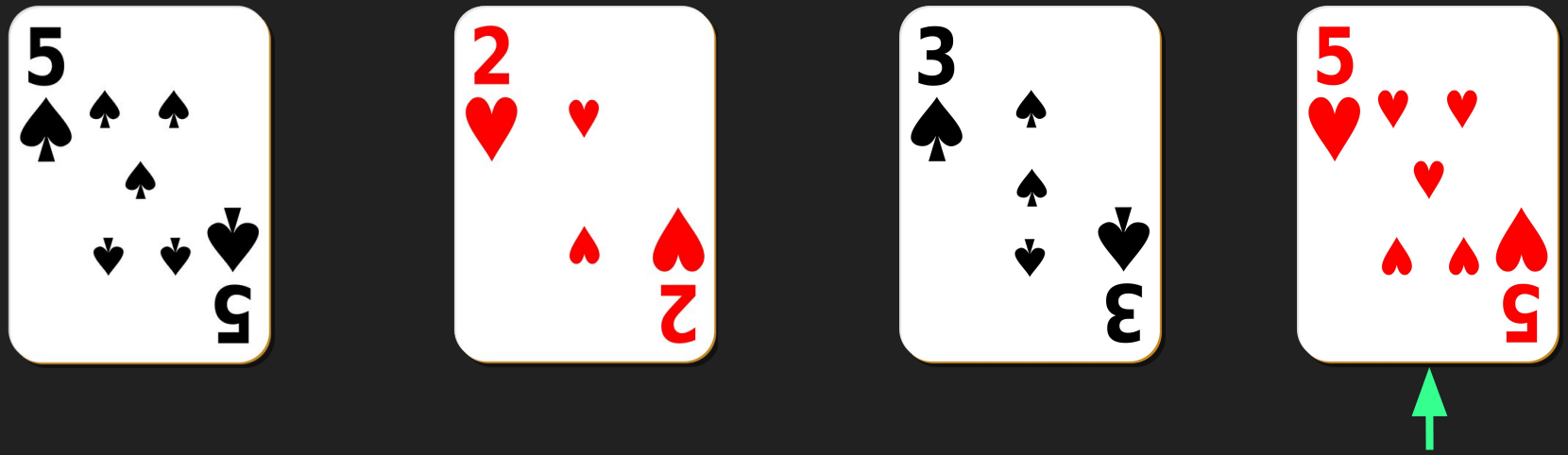
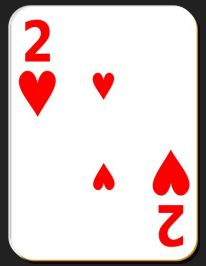


5 < 2?

Low card:



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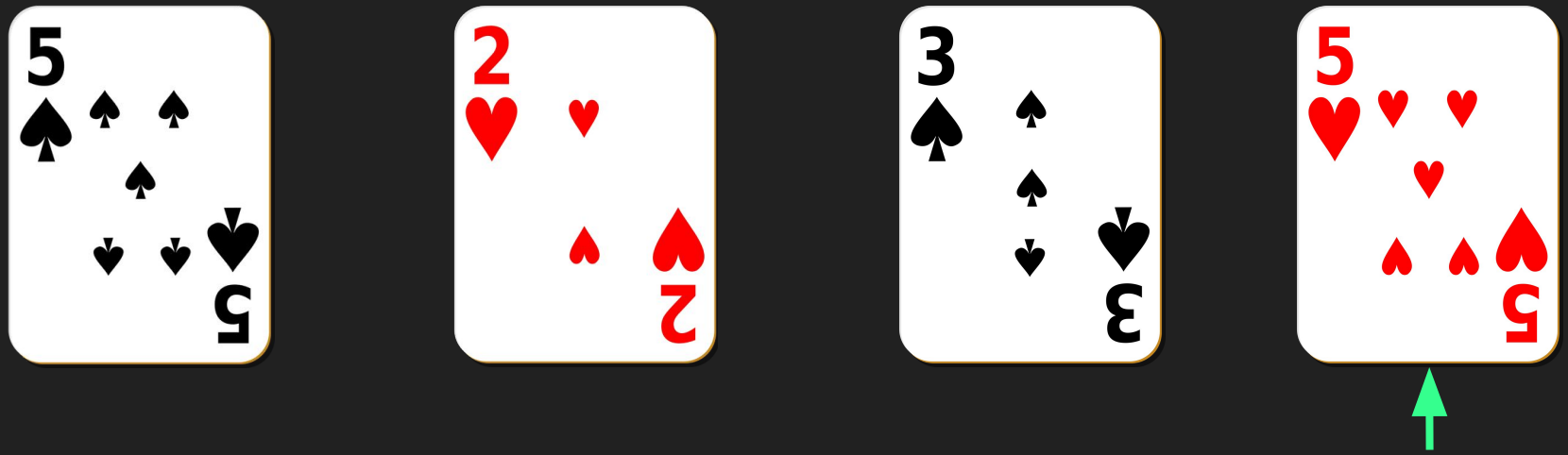
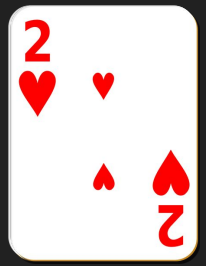


5 < 2?

Relational Operator

Low card:



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Conditional

Takeaways

- Pseudocode: simple and readable version of algorithm that resembles code
- Assignment Operator: Assigns a variable some value
- Loop Statement: Repeatedly performs an action a fixed number of times
- Relational Operator: Compares two values
- Conditional Statement: A statement that only performs an action under certain conditions

Again, you don't need to know these right now, but I want you to have a point of reference when you do learn them!

What is an algorithm?