INTRO TO COMPETITIVE PROGRAMMING

Baibhav Bista

PRESENTATION FLOW

Points of Discussion

Introduction to C++ STL

An example: Generating Prime Numbers

Problem Solving Paradigms

1) Greedy

2) Dynamic Programming

3) Divide and conquer

C++ STL

C++ STL

```
vector<data_type> name_vector(size_of_vector,
optional_default_value);
name_vector[i]
name_vector.push_back(51);

map<data_type_key, data_type_value> dictiona;
dictiona.find(5) != dictiona.end()
dictiona[5] = 45;
```

PRIME NUMBER GENERATION

Prime Numbers: Integers that are divisible by 1 and themselves only

Lets go through the code:

PRIME NUMBER GENERATION: NAIVE SOLUTION

PRIME NUMBER GENERATION: A SOMEWHAT BETTER SOLUTION

PRIME NUMBER GENERATION: SIEVE OF ERASTOTHENES

TIME AND SPACE COMPLEXITY

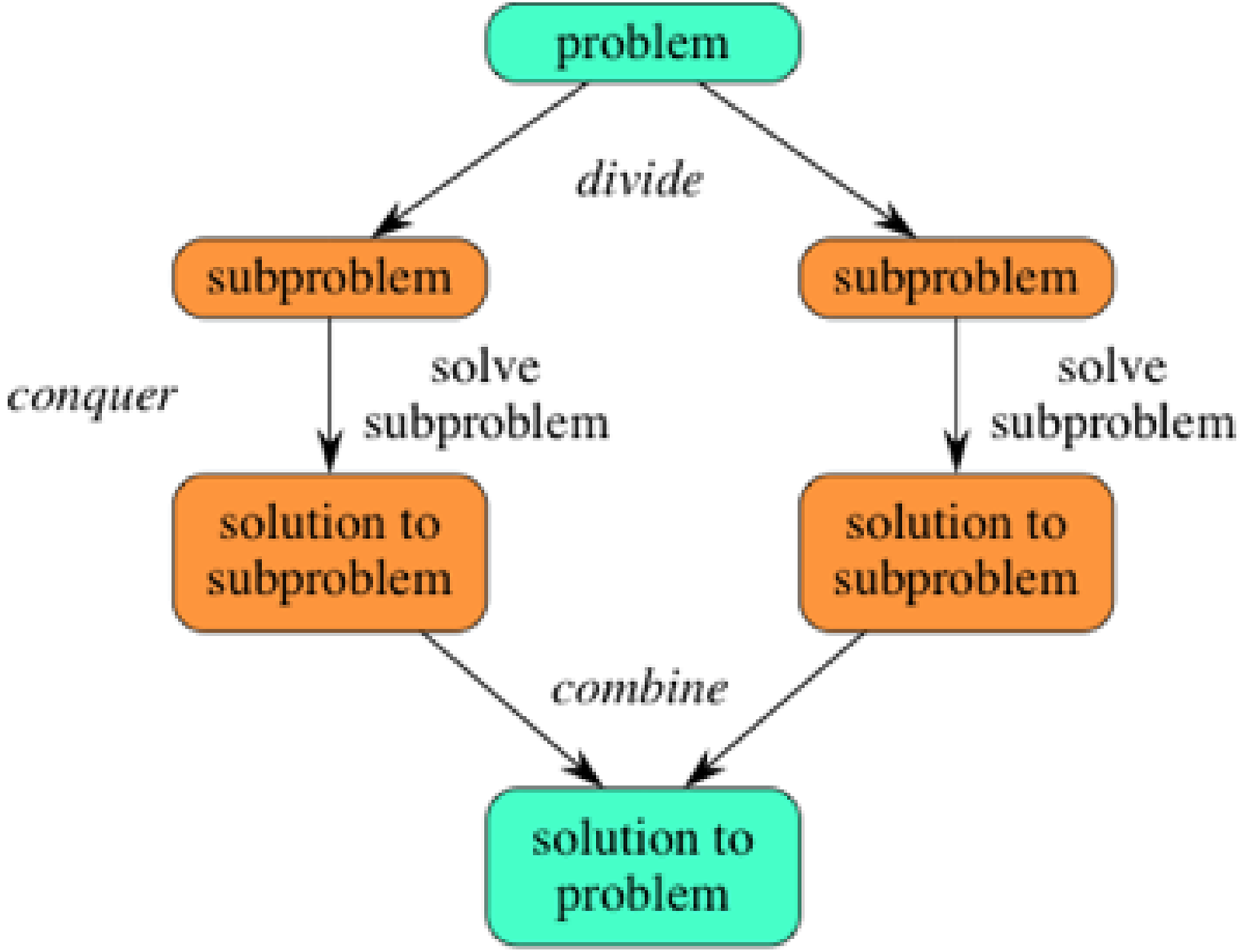
QUESTION

You are given a number n. You have to find, using the fastest algorithm you know, whether the n'th prime number is even or odd.

ALGORITHM DESIGN PARADIGMS

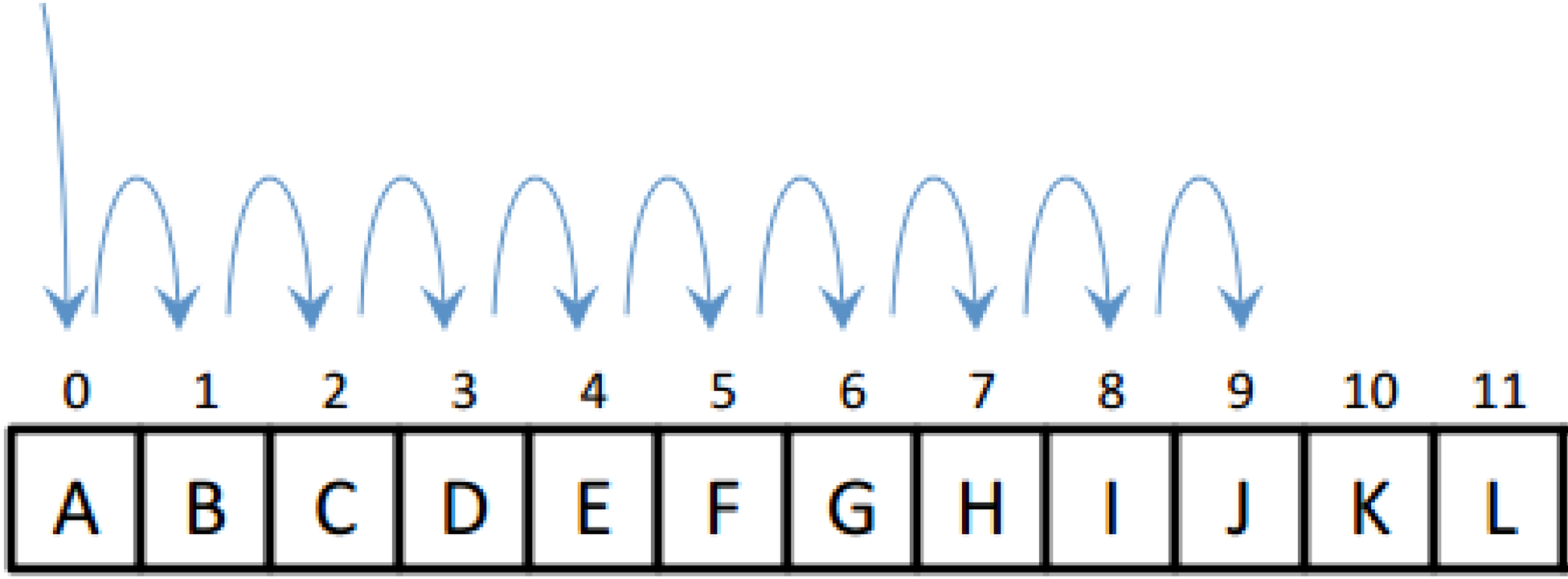
- Divide and Conquer Algorithms
- Dynamic Programming Algorithms
- The Greedy Method
- Backtracking and Search methods (tomorrow)

DIVIDE AND CONQUER



LINEAR SEARCH

Find "J"

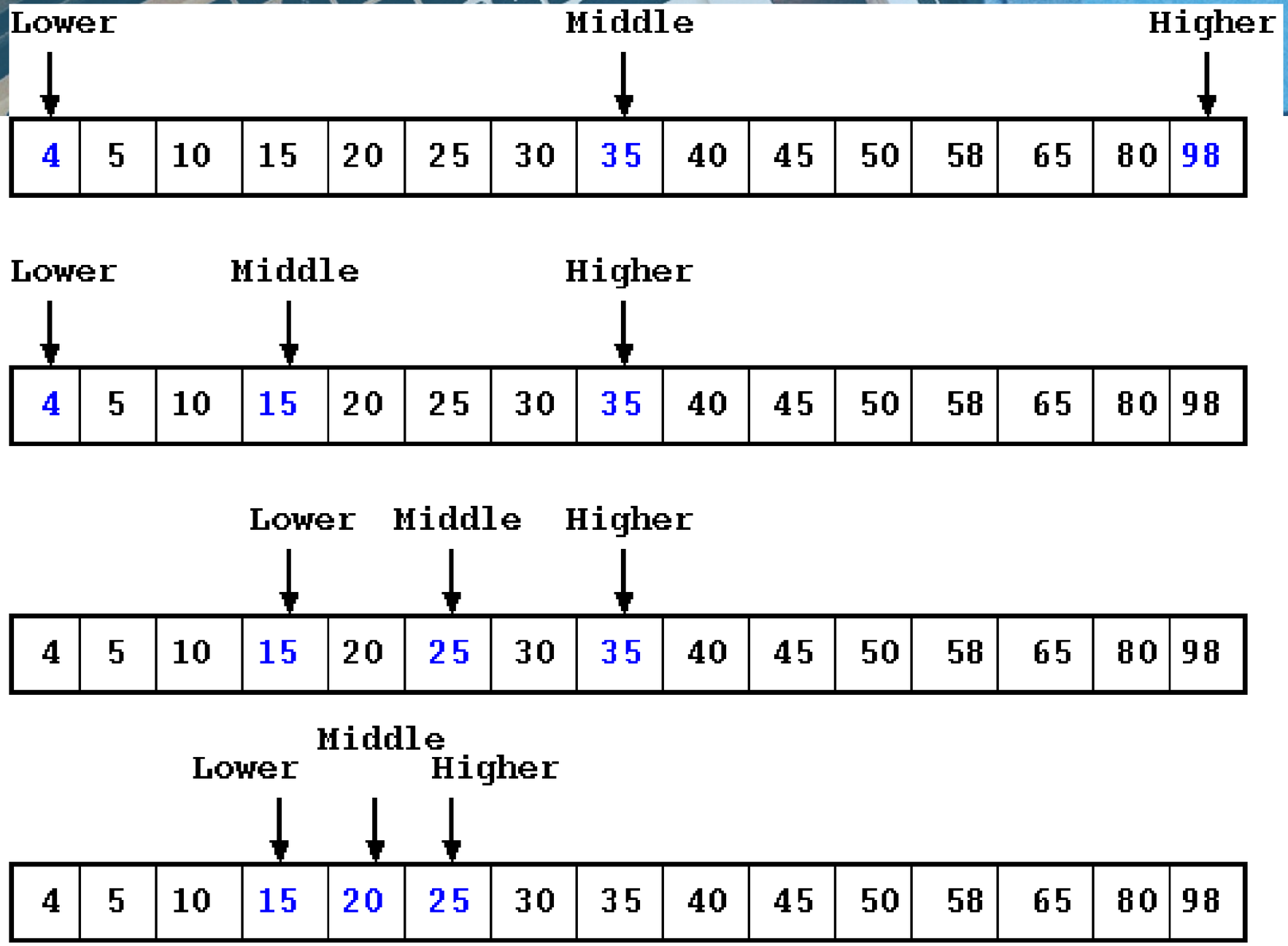


BINARY SEARCH

If searching for 23 in the 10-element array:

	2	5	8	12	16	23	38	56	72	91
23 > 16, take 2nd half	L 2	5	8	12	16	23	38	56	72	H 91
23 < 56, take 1st half	2	5	8	12	16	L 23	38	56	72	H 91
Found 23, Return 5	2	5	8	12	16	L 23	H 38	56	72	91

BINARY SEARCH



GREEDY

GREEDY: TASK SCHEDULING

QUESTION

You are a greedy shopkeeper. You have coins of the following denominations: Rs 1, 5, 6, 9. When returning change to a customer, you try to give as few coins i.e. number of coins is minimum and sum is equal to change.

QUESTION CONTD..

What answer does your algorithm give for Rs 11?

The answer: 2

Greedy not the correct answer in all cases

RECURSIVE SOLUTION

DYNAMIC PROGRAMMING

THANK YOU

Any Questions?

Resources of today: github.com/
Python version of all codes in Jupyter notebook , also in link above