

Unit OVERVIEW

1	Introduce the four steps of the problem solving process.
2	Apply the problem solving process. Use different strategies to plan and carry out the plan to solve several problems.
3	Reinforce the four steps of the problems solving process
4	Introduce the linear and binary search algorithms.
5	Explore sorted and unsorted lists and various sorting algorithms.
6	Introduce minimal spanning trees and how graphs can be used to help solve problems.
7	Group Project – Putting it all together

Unit Concepts

- Algorithm
 - ▣ The four steps to solving a problem
- Searching Data
 - ▣ Linear Vs Binary Search Algorithms
- Sorting data
 - ▣ Selection Sort and Quick Sort
- Graphs

Main Concepts - **ALGORITHMS**

Step by step problem solving process

- ▣ Understand the problem
 - Known
 - Unknown
 - What are the conditions
- ▣ Plan the solution
- ▣ Carry out the plan
- ▣ Looking back

WHY?

Main Concepts - **SEARCHES**

90% of all computer actions are searching for data.

- ▣ Putting data in alphabetical order
- ▣ Computer games with graphics and game play

WHY?

Main Concepts - **SEARCHES**

LINEAR

Start the search at the beginning, look at each item until you find it or there is no more data. Data can be sorted or not.

BINARY

A search where you look at the middle item, eliminate the half where the value is not located. Find the new middle element and continue the process until you find it, or there is no more data.

Main Concepts - **SORTING**

What is necessary in order to use a binary search?

The list must be sorted.

How do we put the data in order?

Selection Sort

Quick Sort

Main Concepts - **Sorting**

SELECTION SORT

- ▣ Find the minimum value in the list
- ▣ Swap it with the value in the first position
- ▣ Repeat the steps above for the remainder of the list (starting at the second position and advancing each time)

Watch

Main Concepts - **Sorting**

QUICK SORT

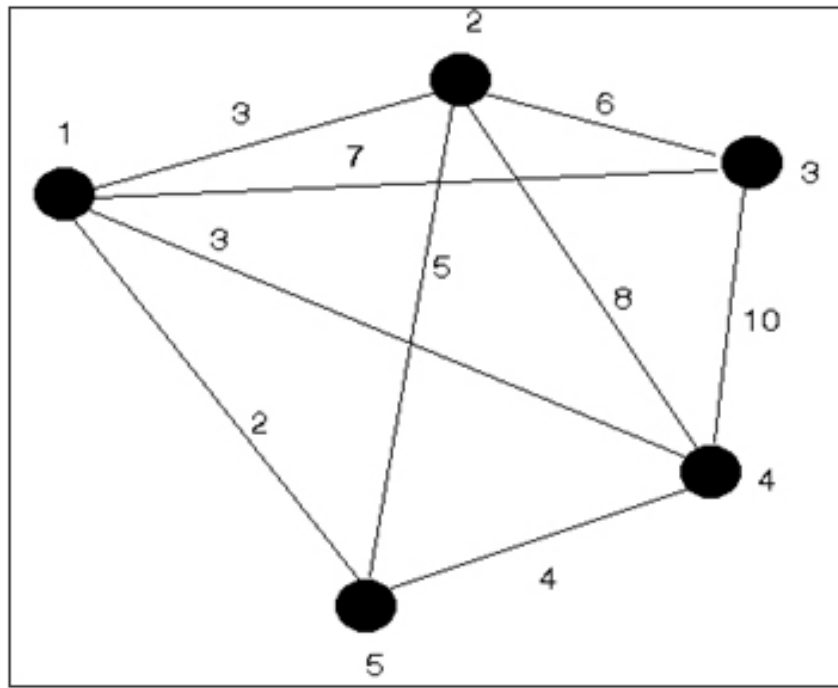
Quick sort is a divide and conquer algorithm.

- ▣ Pick an element, called a *pivot*, from the list.
- ▣ Reorder the list so that all elements with values less than the pivot come before the pivot, while all elements with values greater than the pivot come after it
- ▣ Repeat the process with the remaining groups (less group and the greater group)

[Watch](#)

Main Concepts - **GRAPH**

- Finding the shortest path between different points



REVIEW QUESTIONS



Which type of search is faster?

Linear

Binary

What is a binary search



A search where you look at the middle item, eliminate the half where the value is not located. Find the new middle element and continue the process until you find it, or there is no more data.

What must be done to the data to make a binary search work?

The data has to be sorted

3	8	15	25	36	45	49	50

Please give us two possible strategies that can be used to solve a problem.

- Make a table
- Make an equation
- Make a diagram
- Guess and check
- Work backwards
- Look for a pattern
- Look at a similar problem to better understand the original

What is another word for a translation
in Geometry?

SLIDE



A Reflection matches each point on a figure with its mirror image.

What does the following statement describe:

A transformation that turns a figure around a point.

- A. Translation
- B. Reflection
- C. Iteration
- D. Rotation

What is the 4th step in the problem solving process? Explain.

Looking Back – Examine your result

- ▣ Is there a better way to solve it?
- ▣ Can you repeat this process and get the correct result?
- ▣ How can you know that the answer is correct?

What is the special name in computer science for the 4 problem solving steps?

ALGORITHM

Which sorting algorithm is faster?



Quick Sort
Selection Sort

Explain in your own words what a linear search is?

Start the search at the beginning, look at each item until you find it or there is no more data. Data can be sorted or not.

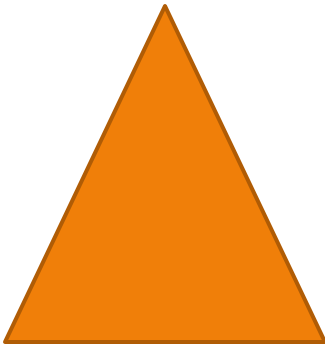
What is the first step of an algorithm and its three sub-Questions?

- Understand the Problem
 - ▣ What is known?
 - ▣ What is unknown?
 - ▣ What are the conditions?



Define a geometric translation.

- The shape moves from one location to another without rotating, resizing, or anything else.
- It slides



“Carry Out the Plan” is what step in the problem solving process?

