Unit 4: Using Abstract Data Types

Content Area: **Business**
Course(s): **Java**
Time Period: **3rd Marking Period**
Length: **Weeks**
Status: **Published**

Unit Overview

Overview of object-oriented analysis and design. Linear collections, including lists, iterators, stacks, queues and priority queues. Unordered collections including sets, sorted sets, maps and sorted maps.

Transfer

Students will be able to independently use their learning to...

What kinds of long term, independent accomplilshments are desired?

Understand object-oriented ananlysis and design.

Be able to identify and use lists, stacks and queue appropriately.

Be able to identify and use sets and maps appropriately.

Meaning

Understandings

Students will understand that...

-What specifically do you want students to understand?

-What inferences should they make/grasp/realize?

The role of analysis and design in the software development process.

The role of a graphical notation in object-oriented analysis and design.

Interpret simple class diagrams and their basic features.

The basic features of lists and their applications.

Recognize the difference between index-based operations and content based operations.

Use an iterator to perform position-based operations on a list.

The difference between an iterator and a list iterator.

The behavior of a stack.

The behavior of a queue.

The behavior of a priority queue.

The features of sets and their appliocations.

The differences between a set and a sorted set.

The features of maps and their applications.

The difference between a map and a sorted map.

The features of collections and the collection interface.

Essential Questions

Students will keep considering...

What thought provoking questions will foster inquiry, meaning making and transfer?

What is the object-oriented analysis and design?

What are the basic features of lists and how are they used?

What are the differences between index-based operations and content-based operations on lists.

How is an iterator used differently than a list iterator?

Are there any restrictions to lists?

What application would a stack be useful for?

What application would a queue be useful for?

What are the basic features of sets and their applications?

What are the basic features of maps and their applications?

How do you use the collection interface?

Application of Knowledge and Skill

Students will know...

Students will know...

What facts and basic concepts should students know and be able to recall?

The UML provides a graphical notation for depicting the relationships among classes and the manner in which they communicate.

A class diagram can be constructed from an informal description of user requirements.

Classes and their attributes are derived from the nouns in a problem description.

A list is a linear collection in which elements accessed at any position.

There is one list interface and several implementations - ArrayList and LinkedList.

An iterator and a list iterator are two objects that allow clients to perform position-based operations on a list.

A stack is a linear collection that enforces a last-in, first-out order of elements.

Operations on stacks are pushed for insertion and popped for removal of elements.

A queue is a linear collection that enforces a first-in, first-out order of elements.

Operations on queues a enqueue for insertion and dequeue for removal of elements.s

A set is an unordered collection of unique objects.

The objects in a sorted set can be visited in a natural order by using an iterator.

A map associates a set of keys with values, the values can be accessed, inserted or removed by using their

keys.

Java organizes sets and lists in a hierarchy of collections.

Students will be skilled at...

Students will be skilled at...

What discrete skills and processes should students be able to use?

Understanding the role of analysis and design in the process of software development.

Understanding the role of a graphical notationin object-oriented analysis and design.

knowing the difference between aggregation and inheritance.

Understanding the basic features of lists and their applications.

Knowing how to use a itterator and a list iterator.

Understanding the behavior of a stack.

Understanding the behavior of a queue.

Using the set interface and the set implementation case.

Using the map interface and the map implementation case.

Academic Vocabulary

class diagram collaboration diagram has-a relationship is-a relationship knows-a relationship unified modeling language abstract data type abstraction backing store collection content-based operation free list graph collection head hierarchical collection index-based operation iterator linear collection list iterator object heap parent position-based operation tail unordered collection

Learning Goal 1

Understand the role of object-oriented analysis and design in the software development process.

Target 1

SWBAT understand a problem's description and pick out classes and their attributes.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 2

SWBAT understand the role of graphical notation in object-oriented analysis and design.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 3

SWBAT understand the difference between aggregation, inheritance and other relationship among classes.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Learning Goal 2

Distiguish fundamental categories of collections such as linear, hierarchial, graph and unordered.

Target 1

SWBAT understand the basic features and applications of lists and use the list interface and clasess.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 2

SWBAT recognize the difference between index-based operations and content-based operations on lists.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge

	and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 3

SWBAT use an iterator to perform position-based operations on a list and understand the difference between an iterator and a list iterator.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Learning Goal 3

Explore restricted linear collections, the stack, the queue and the priority queue.

Target 1

SWBAT understand the behavior of a stack and recognize applications in which a stack would be useful.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.

TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 2

SWBAT understand the behavior of a queue and recognize applications in which a queue would be useful.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Learning Goal 4

Explore examples of unordered collections, sets and maps, and give a clients view of these collections.

Target 1

SWBAT understand the basic features of sets and use the set interface and the set implementation class.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).

TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 2

SWBAT understand the basic features of maps and use the map interface and the map implementation class.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 3

SWBAT understand the general features of collections and use the collections interface.

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).

Summative Assessment

Unit assessment, project based assessments, tests and quizzes.

21st Century Life and Careers

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

Formative Assessment and Performance Opportunities

Oral question & answer discussion, in-class observation, written exercises, classwork & homework assignments, power point w/ notes, projects, portfolios, quizzes and tests.

Accommodations/Modifications

Extra Practice - See Attached Document

All instruction, labs, activities, and assessments will be modified and enhanced to adhere to individual student's IEPs and 504s. As well differentiated classroom management strategies will be utilized as to adhere to these students individual plans as well.

Unit Resources

Computer, textbook, supplemental textbook materials, Internet resources, teacher generated power points & notes and lab materials.

- Computer Work Station
- Internet Resources
- Lab Materials
- Supplemental Textbook Materials
- Teacher Created Power Point

- Textbook

Interdisciplinary Connections

LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
MA.F-IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.