Unit H: Arrays & ArrayList

Content Area: **Business/Tech.**
Course(s): **Advance Placement Computer Science A - Java**
Time Period: **January**
Length: **1 Month**
Status: **Published**

Unit Overview

In this unit, students will learn many of the different aspects of arrays and the benefits of using arrays. Students will also learn a variety of sorts and searches in this unit. The students will learn the following:

- What are Arrays and what is the purpose

- Passing arrays as Arguments

- String Arrays

- Multi-dimentional arrays

- Sequential searches

- Binary searches

- Selection sorts

- Insertion sorts

- Merge sorts

- ArrayList Classes

Enduring Understandings

- Arrays and ArrayList collections are useful for storing lists of data that can be easily manipulated.

- Students will understand the time that can be saved by using arrays throughout their codes

- Sorting and searching techniques are necessary to effectively organize and process large amounts of data.

Essential Questions

TEC.K-12.8.1.A.a	In a world of constant technological change, what skills should we learn?
TEC.K-12.8.1.A.b	How do I choose which technological tools to use and when it is appropriate to use them?
TEC.K-12.8.1.B.a	How can I transfer what I know to new technological situations/experiences?

TEC.K-12.8.1.B.b	What are my responsibilities for using technology? What constitutes misuse and how can it best be prevented?
TEC.K-12.8.2.B.a	How does technology extend human capabilities? What are the positive and negative consequences of technology? Should technologies that produce negative impact continue to be used?
TEC.K-12.8.2.B.b	When are the most sophisticated tools required and when are the simplest tools best?
TEC.K-12.8.2.C.a	Can a system continue to operate with a missing or malfunctioning component?

Lesson Titles/Objectives

- Homework: Chapter 7 Review Questions and Exercises
- Lesson: Array Structurres
- Lesson: ArrayList Classes
- Lesson: Different Kinds of Searches
- Lesson: Different Kinds of Sorts
- Lesson: Multi-Dimensional arrays
- Program: 12 Days of Star Wars Array
- Program: Account Number Validation
- Program: Array Lottery Number Picker
- Program: Baseball Parallel Array
- Program: CD Collection
- Program: Letter Count
- Program: Parallel Array College Nicknames
- Program: PhoneBook ArrayList
- Program: Physics Array
- Program: Using For Each

Standards

TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.2	Analyze the relationships between internal and external computer components.
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.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Indicators

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Career Readiness, Life Literacies, & Key Skills

12.9.3.IT-PRG.1	Analyze customer software needs and requirements.
12.9.3.IT-PRG.2	Demonstrate the use of industry standard strategies and project planning to meet customer specifications.
12.9.3.IT-PRG.3	Analyze system and software requirements to ensure maximum operating efficiency.
12.9.3.IT-PRG.4	Demonstrate the effective use of software development tools to develop software applications.
12.9.3.IT-PRG.5	Apply an appropriate software development process to design a software application.
12.9.3.IT-PRG.6	Program a computer application using the appropriate programming language.
12.9.3.IT-PRG.7	Demonstrate software testing procedures to ensure quality products.
12.9.3.IT-PRG.8	Perform quality assurance tasks as part of the software development cycle.
12.9.3.IT-PRG.9	Perform software maintenance and customer support functions.
12.9.3.IT-PRG.10	Design, create and maintain a database.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
	With a growth mindset, failure is an important part of success.

Inter-Disciplinary Connections

- Art
- English
- History
- Math
- Music
- Science

	Key Ideas and Details
	Integration of Knowledge and Ideas
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
SCI.9-12.5.2.12	All students will understand that physical science principles, including fundamental ideas

about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, ð˜ˆ = ((ð˜£â,+ð˜£â,,)/2)ð˜©, can be solved for ð˜© using the same deductive process.

Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $x + 1 = 0$ is an integer, not a whole number; the solution of $2x + 1 = 0$ is a rational number, not an integer; the solutions of $x^2 – 2 = 0$ are real numbers, not rational numbers; and the solutions of $x^2 + 2 = 0$ are complex numbers, not real numbers.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

Warm-Up

- Students will enter room log onto computers and load appropriate program(s) for class

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Apply Concepts previously learned
- Connect through arrays
- Create Programs
- Critically Think by 2D
- Debug Code
- Design 2D Charts
- IS: • Extra Time to complete Programs
- IS: • NHS Assistance and Tutoring

- IS: • One on One tutoring during Delsea One
- Organize 2D charts

ELL Modifications

-
  - Choice of test format (multiple-choice, essay, true-false)
  - Continue practicing vocabulary
  - Provide study guides prior to tests
  - Read directions to the student
  - Read test passages aloud (for comprehension assessment)
  - Vary test formats

IEP & 504 Modifications

-
  - Allow for redos/retakes .
  - Assign fewer problems at one time (e.g., assign only odds or evens) .
  - Differentiated center-based small group instruction .
  - Extra time on assessments .
  - Highlight key directions .
  - If a manipulative is used during instruction, allow its use on a test .
  - Opportunities for cooperative partner work .
  - Provide reteach pages if necessary .
  - Provide several ways to solve a problem if possible .
  - Provide visual aids and anchor charts .
  - Test in alternative site .
  - Tiered lessons and assignments .
  - Use of a graphic organizer .
  - Use of concrete materials and objects (manipulatives) .
  - Use of word processor .

G&T Modifications

-
  - Alternate assignments/enrichment assignments
  - Enrichment projects
  - Extension activities
  - Higher-level cooperative learning activities
  - Pairing direct instruction with coaching to promote self-directed learning

- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

At Risk Modifications

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples
- Extra visual and verbal cues and prompts
- Follow a routine/schedule
- Graphic organizers
- Have students restate information
- No penalty for spelling errors or sloppy handwriting
- Peer or scribe note-taking
- Personalized examples
- Preferential seating
- Provision of notes or outlines
- Reduction of distractions
- Review of directions
- Review sessions
- Space for movement or breaks
- Support auditory presentations with visuals
- Teach time management skills
- Use of a study carrel
- Use of mnemonics
- Varied reinforcement procedures
- Work in progress check

Alternative Assessments

Performance tasks
Project-based assignments
Problem-based assignments
Presentations

Reflective pieces
Concept maps
Case-based scenarios
Portfolios

Benchmark Assessments

Skills-based assessment
Reading response
Writing prompt
Lab practical

Formative Assessment

- Load and Save Programs
- Prepare Workstations

Summative Assessment

- Quiz: Nested For Loops with Array
- Test: ArrayList Classes
- Test: Arrays, Multi-Dimensional Arrays, String Arrays, amd ArrayList
- Test: Searches and Sorts

Resources & Materials

- College Board. AP Case Study Materials
- Eclipse IDE
- Internet
- Microsoft Office
- Student Handout
- Tony Gaddis: Starting Out with Java: Early Objects. 4/E., 2010, Pearson

Technology

- ClearTouch
- Computer

- Eclipse IDE
- Google Classroom
- Google Docs
- Internet

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.