Washington Office of Superintendent of
PUBLIC INSTRUCTION

Career & Technical Education
Curriculum Framework

Required Form

Course Information		
Course: AP Computer Science A		**Total Framework Actual Hours:** 180
CIP Code: 110201	☐ **Exploratory** ☒ **Preparatory** *Preparatory courses are best built with a min. of 140 hours.*	**Date Last Modified:** 05.2023
Career Cluster: Information Technology		**Cluster Pathway:** Programming and Software Development
Course Summary: Units: Intro to Java Programming Primitive Data and Definite Loops Parameters, Return, String & Math Classes Arrays Classes Inheritance and Interfaces Recursion Comparing, Searching, and Sorting Review, Capstone Project, and Presentation		

Industry-Recognized Credentials:
You Science Precision Exams - 21st Century Success Skills
You Science Precision Exams - Computer Programming II (Java)
You Science Precision Exams - Computer Programming II (Python)
You Science Precision Exams - Computer Programming, Advanced
You Science Precision Exams - Computer Science Principles

Work-Based Learning:
Career Research and Job Interview/Job Shadow in Course-Related Area
Guest Speaker (In-person and/or remote)

Industry Related Field Trips

CTSO:
TSA

Suggested Course Language:
Java

Course Software:
Currently not available

Course Equipment:
Currently not available

Unit Information	
Unit: Intro to Java Programming	**Total Learning Hours for Unit:** 20
Unit Summary:	
Components and Assessments	
Performance Assessments: • Develop algorithms and code solutions in Unit Project • Write effective and concise code	
Leadership Alignment: Students will manage time and work independently to complete their unit project completely and on time. A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events	
Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Compare and contrast interpreter and compiler terms • Know the steps the system performs to create a Java executable class file • Define bytecode • Use printing and print statements • Know and use escape sequences, identifiers and keywords • Create comment statements • Identify errors and classify by error type	

- Understand overall program structure with classes, methods and statements
- Perform procedural decomposition
- Understand program flow of control
- Determine output of software programs
- Design and implement a class with a main method and other static methods
- Count in base 2, 8 and 16
- Convert numbers between base 10, 2, 8 and 16
- Demonstrate proper position and stretches used to prevent muscle injury from repetitive motions.
- ESS01.02.03 Organize oral and written information.
- ESS01.03.01 Identify whole numbers, decimals, and fractions.
- ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.
- ESS01.03.03 Demonstrate the use of relational expressions such as equal to, not equal, greater than, less than, etc.

Aligned Washington State Learning Standards	
Computer Science	3A-CS-02: Compare levels of abstraction and interactions between application software, system software, and hardware layers. (P. 4.1) 3A-DA-09: Translate between different bit representations of real-world phenomena, such as characters, numbers, and images. (P. 4.1) 3B-AP-20: Use version control systems, integrated development environments (IDEs), and collaborative tools and practices (code documentation) in a group software project. (P. 2.4) 3B-AP-21: Develop and use a series of test cases to verify that a program performs according to its design specifications. (P. 6.1)
Educational Technology	5. a. Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data.

	N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Unit Information	
Unit: Primitive Data and Definite Loops	**Total Learning Hours for Unit:** 20
Unit Summary:	

Components and Assessments

Performance Assessments:

- Develop algorithms and code solutions in Unit Project
- Write effective and concise code

Leadership Alignment:

Students will manage time and work independently to complete their **unit project** completely and on time.

A variety of leadership activities are also available through clubs and activities described in SPS CS POW

Additional 21st Century skills options:

TSA Competitive Events

Industry Standards and/or Competencies

Name of standards:	**Website:**

- Understand and use primitive data types int and double
- Declare and assign variables
- Know and use the arithmetic operators
- Know and apply arithmetic precedence
- Perform string concatenation
- Mix int and double data types
- Understand and apply variable scope
- Explain when to use a for-loop structure
- Use for loops and nested for loops
- Understand and write pseudocode given a problem to solve
- Know when to use class constants
- ESS02.03.02 Organize information to use in written and oral communications.
- ESS01.03.01 Identify whole numbers, decimals, and fractions.
- ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.
- ESS01.03.03 Demonstrate the use of relational expressions such as equal to, not equal, greater than, less than, etc.

Aligned Washington State Learning Standards

Computer Science	3A-CS-03: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. (P. 6.2) 3A-AP-13: Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. (P. 5.2)

	3A-AP-17: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. (P. 3.2) 3B-AP-10: Use and adapt classic algorithms to solve computational problems. (P. 4.2)
Educational Technology	1.a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes 1. c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. 4.c. Students develop, test and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. 7. b. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints. 7. c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
English Language Arts	RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics.* SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to the task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

	W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, and purposes.
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data. N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems, chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Unit Information	
Unit: Parameters, Return, String & Math Class	**Total Learning Hours for Unit:** 30
Unit Summary:	
Components and Assessments	
Performance Assessments: • Develop algorithms and code solutions in Unit Project • Write effective and concise code	
Leadership Alignment: Students will think creatively and reason effectively to solve problems, managing time and goals effectively to produce results on their **unit project** on time throughout multiple checkpoints A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events	
Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Understand when to use parameters • Declare and call methods with parameters • Understand and apply value semantics • Understand when and how to use the return keyword • Use return to get a value from a method • Use Math class • Define class and object • Use string methods to manipulate strings	

- Use scanner input
- Create and use overloaded methods
- Understand when and how to use the if else conditional structure
- Know relational and logic operators and where they fit in the precedence chart
- Use conditionals with methods
- Know and apply the procedural design heuristics
- Use exceptions
- Understand and use preconditions and post-conditions
- Use conditionals and previously learned to create a program
- Use conditionals with methods
- Handle round-off errors from real number calculations
- Factor if/else structures
- Compare objects within an if/else structure
- Know when to use while and do/while structures
- Use while and do/while structures
- Use the math random () method
- Understand and use Boolean type
- Use the logical operators and where they are in the precedence chart
- Know and use short-circuit evaluation
- Know and use DeMorgan's laws
- Know and use fencepost Algorithms
- Know and use the term Sentinels
- Understand and evaluate programs using Assertions
- Use indefinite loops, Booleans, and previous learning to create a program
- Create a fraction calculator that reads input from the user and responds with the answer
- ESS01.02.03 Organize oral and written information.
- ESS01.03.01 Identify whole numbers, decimals, and fractions.
- ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.
- ESS01.03.03 Demonstrate the use of relational expressions such as equal to, not equal, greater than, less than, etc.

Aligned Washington State Learning Standards	
Computer Science	3A-DA-12: Create computational models that represent the relationships among different elements of data collected from a phenomenon or process. (P. 4.4) 3A-AP-17: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. (P. 3.2) 3A-IC-25: Demonstrate ways a given algorithm applies to problems across disciplines. (P. 3.1) 3B-AP-10: Use and adapt classic algorithms to solve computational problems. (P. 4.2) 3B-AP-14: Construct solutions to problems using student-created components, such as procedures, modules and/or objects. (P. 5.2)

	3B-AP-16: Demonstrate code reuse by creating programming solutions using libraries and APIs. (P. 5.3) 3B-AP-21: Develop and use a series of test cases to verify that a program performs according to its design specifications. (P. 6.1)
Educational Technology	1. a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes 1. c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. 4. c. Students develop, test, and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. 7. b. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints. 7. c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data. N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems, chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Unit Information	
Unit: Arrays	**Total Learning Hours for Unit:** 20
Unit Summary:	

Components and Assessments
Performance Assessments: • Develop algorithms and code solutions in Unit Project • Write effective and concise code
Leadership Alignment: Students will manage time and work independently to complete their **unit project** completely and on time. A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events

Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Declare, initialize and use one-dimensional arrays • Determine the length of an array • Know and use the for-each loop • Know when to use arrays and limitations of arrays • Declare, initialize and use two-dimensional arrays • Use toString( ), equals( ) and arrays deep toString array methods • Understand and use arrays of type object • Use arrays as parameters and return values • Use arrays in a variety of common algorithms • Understand and apply value and reference semantics • Understand and apply arrays that are passed by reference, array elements by value • Understand and use List and ArrayList • Know when to use ArrayList and when to use array • Use the Integer and Double Wrapper classes • ESS01.02.03 Organize oral and written information. • ESS01.03.01 Identify whole numbers, decimals, and fractions. • ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division. • ESS01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	

Aligned Washington State Learning Standards	
Computer Science	3A-DA-12: Create computational models that represent the relationships among different elements of data collected from a phenomenon or process. (P. 4.4) 3A-AP-17: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. (P. 3.2) 3A-IC-25: Demonstrate ways a given algorithm applies to problems across disciplines. (P. 3.1) 3B-AP-10: Use and adapt classic algorithms to solve computational problems. (P. 4.2) 3B-AP-14: Construct solutions to problems using student-created components, such as procedures, modules, and/or objects. (P. 5.2)

	3B-AP-16: Demonstrate code reuse by creating programming solutions using libraries and APIs. (P. 5.3) 3B-AP-21: Develop and use a series of test cases to verify that a program performs according to its design specifications. (P. 6.1)
Educational Technology	**1.a**. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes **1. c**. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. **4.a.** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. **4.b.** Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. **4. c.** Students develop, test, and refine prototypes as part of a cyclical design process. **4.d.** Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. **7. b**. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints. **7.c.** Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data. N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays

Unit Information	
Unit: Classes	**Total Learning Hours for Unit:** 20
Unit Summary:	

Components and Assessments
Performance Assessments: • Develop algorithms and code solutions in Unit Project • Write effective and concise code
Leadership Alignment: Students will manage time and work independently to complete their **unit project** completely and on time. A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events

Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Know and use class and object terms • Create and use new classes and objects • Know and use projects and UML (Unified Modeling Structure) • Understand keyword 'this' used as a field, method & constructor • Understand cohesion • ESS01.02.03 Organize oral and written information. • ESS01.03.01 Identify whole numbers, decimals, and fractions. • ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division. • ESS01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	

Aligned Washington State Learning Standards	
Computer Science	3A-CS-01: Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. (P. 4.1) 3A-DA-09: Translate between different bit representations of real-world phenomena, such as characters, numbers, and images. (P. 4.1) 3B-AP-14: Construct solutions to problems using student-created components, such as procedures, modules, and/or objects (p. 5.2) 3B-AP-16: Demonstrate code reuse by creating programming solutions using libraries and APIs. (P. 5.3) 3B-AP-22: Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality). (P. 5.3)
Educational Technology	1. a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes 1. c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

	4. c. Students develop, test, and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. 7. b. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints. 7. c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data. N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Unit Information	
Unit: Inheritance and Interfaces	**Total Learning Hours for Unit:** 30
Unit Summary:	
Components and Assessments	
Performance Assessments: • Develop algorithms and code solutions in Unit Project • Write effective and concise code	
Leadership Alignment: Students will work creatively with others, communicating clearly, as they collaborate with others to solve problems requiring students to manage projects in teams of diverse workers, where they demonstrate interacting effectively in teams to complete their **unit project** completely and on time. Within their teams, students take turns being the leader, learning to guide and lead others and be responsible to others. **Additional 21st Century skills options:** TSA Competitive Events	

Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Understand inheritance and programs using inheritance • Understand and use the 'super' keyword' with methods • Understand and use the 'super' keyword' with constructors and inherited fields • Understand and use Object class, equals method, instance of keyword and javadocs • Determine output from code that uses polymorphism • Determine output from code that uses polymorphism and casting • Recognize when to use interfaces. Use interfaces • Recognize when to use abstract classes. Use abstract classes • ESS01.02.03 Organize oral and written information. • ESS01.03.01 Identify whole numbers, decimals, and fractions. • ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division. • ESS01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	
Aligned Washington State Learning Standards	
Computer Science	3A-CS-01: Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. (P. 4.1) 3A-DA-09: Translate between different bit representations of real-world phenomena, such as characters, numbers and images. (P. 4.1) 3B-AP-14: Construct solutions to problems using student-created components, such as procedures, modules, and/or objects (p. 5.2) 3B-AP-16: Demonstrate code reuse by creating programming solutions using libraries and APIs. (P. 5.3) 3B-AP-20: Use version control systems, integrated development environments (IDEs), and collaborative tools and practices (code documentation) in a group software project. (P. 2.4) 3B-AP-22: Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality). (P. 5.3)
Educational Technology	1. a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes 1. c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. 4. c. Students develop, test, and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. 7. b. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints.

	7. c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data. N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays

Unit Information	
Unit: Recursion	**Total Learning Hours for Unit:** 20
Unit Summary:	
Components and Assessments	
Performance Assessments: • Analyze algorithms and code in Unit Project • Write effective and concise code	
Leadership Alignment: Students must access and evaluate information found in many different formats, using and managing information to apply technology effectively, to complete their **unit project** A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events	
Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Demonstrate an understanding of the concept of recursion • Know when to use recursion	

• Develop, trace and analyze recursive algorithms and programs • ESS01.02.03 Organize oral and written information. • ESS01.03.01 Identify whole numbers, decimals, and fractions. • ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division. • ESS01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	
Aligned Washington State Learning Standards	
Computer Science	3A-AP-17: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. (P.3.2) 3B-AP-13: Illustrate the flow of execution of a recursive algorithm. (P. 3.2) 3B-AP-23: Evaluate key qualities of a program through a process such as a code review. (P. 6.3)
Educational Technology	1.a. students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes 1.c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. 4. c. Students develop, test, and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems. 7. b. Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints. 7. c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
English Language Arts	SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to the purpose, audience, and task. SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on page 54 for specific expectations. RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, performing technical tasks, and attending to special cases or exceptions defined in the text. RST.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 9-10 texts and topics. WST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Mathematics	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.7 Look for and make use of structure. S-IC.6 Evaluate reports based on data.

	N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; chose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays

Unit Information	
Unit: Comparing, Searching, and Sorting	**Total Learning Hours for Unit:** 20
Unit Summary:	
Components and Assessments	
Performance Assessments: • Analyze algorithms and code in Unit Project • Write effective and concise code	
Leadership Alignment: Students will manage time and work independently to complete their **unit project** completely and on time. A variety of leadership activities are also available through clubs and activities described in SPS CS POW **Additional 21st Century skills options:** TSA Competitive Events	
Industry Standards and/or Competencies	
Name of standards:	**Website:**
• Understand and use the compare To( ) method • Understand, use and develop search and sort algorithms • Evaluate the relative runtime efficiency of each algorithm • Determine which search or sort algorithm to use • ESS01.02.03 Organize oral and written information. • ESS01.03.01 Identify whole numbers, decimals, and fractions. • ESS01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division. • ESS01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	
Aligned Washington State Learning Standards	
Computer Science	3A-DA-10: Evaluate the tradeoffs in how data elements are organized and where data is stored. (P. 3.3) 3A-AP-15: Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made. (P. 5.2)
Educational Technology	1. a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes 1. c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems. 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

	4.c. Students develop, test and refine prototypes as part of a cyclical design process. 4.d. Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. 7.b. Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints. 7.c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
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