Spokane Public Schools
AP Computer Science & Computer Programming

Course: AP Computer Science & Computer Programming	Total Framework Hours up to: 360
CIP Code: 110201 ☐Exploratory ☒Preparatory	Date Last Modified: 1/7/13
Career Cluster: Information Technology	Cluster Pathway: Programming

COMPONENTS AND ASSESSMENTS

Performance Assessments: Create a flowchart;   Create a chart demonstrating applications and programming languages;   Illustrate programming structures

IT Academy Resources:

- Preparation Guide for MTA exam 98-361: Software Development Fundamentals.
- Exam Review Kit 98-361: Software Development Fundamentals (20 sets of 50-minute lesson plans, slide decks, student activities).
- Student Study Guide 98-361: Software Development Fundamentals – Chapter 1, Understanding Core Programming.

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Programming Concepts

Competencies	Total Learning Hours for Unit: 20
- Define what a computer program is - Define how a computer program runs - Identify the applications appropriate for each programming language - Define functions/methods/procedures - Define programming structures - Differentiate between procedural and object oriented programming - Define purpose and use of flowcharting and pseudo code	

Aligned Washington State Standards

CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

	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.	
	SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.	
	SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	
	SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.	
Communications		
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.	
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	
Math		
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with	

	scaffolding as needed at the high end of the range.
Science	9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 SYSD Systems can be changing or in equilibrium. 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Common Core State Standards- Writing	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 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, purposes

COMPONENTS AND ASSESSMENTS

Performance Assessments: Develop passwords illustrating secure pass wording strategies, Review case studies of major security breaches in recent times

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Security and Risk Awareness Issues

Competencies	Total Learning Hours for Unit: 10
- Discuss security principles, privacy issues, vulnerability and threats - Explain principles of secure passwording strategies - Illustrate what fundamental legal issues involved with security management	

Aligned Washington State Standards

Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively 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.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies

Health and Fitness	
Math	S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. Reasoning: When looking at passwording strategies, it is important to understand how many possible passwords exist with a given number of characters. Permutations and combinations are one way to analyze password strategies effectiveness
Reading	RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
Science	9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Language	L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Common Core State Standards- Writing	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 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, purposes.

COMPONENTS AND ASSESSMENTS
Performance Assessments: Develop a project plan to manage the workflow of a project from start to finish to monitor and complete a project on time and budget
Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy) **Air Force Association's Cyber Patriot National High School Cyber Defense Competition-**

Standards and Competencies

Standard/Unit: Project Management

Competencies	Total Learning Hours for Unit: 10
- Define scope of work to achieve individual and group goals. - Identify stakeholders and decision makers. - Identify escalation procedures. - Develop work breakdown structures. - Evaluate project requirements. - Identify required resources and budget. - Estimate time requirements. - Develop initial project management flow chart. - Identify interdependencies within a project management plan. - Identify and track critical milestones. - Evaluate risks and prepare contingency plan. - Participate in project phase review and report project status. - Identify project management software. - Develop method of evaluation. - Formulate a task strategy. - Prioritize tasks according to customer needs. - Devise plan of action. - Identify means of managing change.	

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

	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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Health and Fitness	
Math	N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Reasoning: Project management timelines are based in hours, days, months, etc. Using appropriate units of measure, and ability to convert between, are a part of project management. Analyzing due dates, time required, etc. requires a grasp of units of measure. Scale in project management timelines is important. S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). Reasoning: Unions, intersections and complements of other events are common items to analyze in a project management plan, looking for interdependencies in determining project scheduling and deliverable dates. Project management requires that one be able to analyze those interdependencies.
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

	L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.	
	L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	
Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.	
	9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.	
	9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.	
	9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.	
	9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.	
	9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.	
	9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.	
	9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.	
	9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.	
	9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.	
	9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies.	
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	9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.	
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.	
	RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical	

	meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
Common Core State Standards- Writing	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 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, purposes

COMPONENTS AND ASSESSMENTS
Performance Assessments: Develop algorithms and code solutions
Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy) **Air Force Association's Cyber Patriot National High School Cyber Defense Competition-**

Standards and Competencies	
Standard/Unit: Computer Programming Theory	
Competencies	**Total Learning Hours for Unit: 20**

- Describe the relationship between hardware and software.
- Analyze programming languages for uses, structure, and environment.
- Classify the various programming languages by communication level.
- Summarize the function and operation of compilers and interpreters.
- List the stages of program development.
- Analyze a problem identifying desired outputs for given inputs.
- Describe the fundamental data types and their operations (including arrays).
- Design program logic using graphical techniques (flow charts).
- Design program logic using pseudo code techniques.
- Identify the use of program design tools.
- Explain structured/modular programming.
- Describe the information system (IS) life cycle.
- List the characteristics and uses of batch processing.
- List the characteristics and uses of interactive processing.
- List the characteristics and uses of event-driven, object-oriented procession.
- Illustrate characteristics of technical documentation associated with software development.
- Understand the complexity and efficiency of given algorithms.

Aligned Washington State Standards	
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	2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.
	2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
	L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
	L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
	L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Math	N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
	N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
	N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.
	N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
	A-CED.1. Create equations and inequalities in one variable and use them to solve problems.
	A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
	A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
	A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
	F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
	F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
	F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
	F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
	F-BF.1. Write a function that describes a relationship between two quantities.

	F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table. F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. Reasoning: Programmers must understand the complexity of their algorithms and identify whether their solution's execution time increases quadratically, logarithmically or linearly, and be able to represent that quantity correctly. F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table. F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. Reasoning: Programmers must visually understand the complexity of algorithms that increase quadratically, logarithmically and linearly, and how that complexity affects their program. F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. Reasoning: Must understand that some algorithms can be n! (n factorial, or permutations without repetition) in terms of efficiency. Programmers must understand the concept of factorial in order to analyze these algorithms.
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

	9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 SYSD Systems can be changing or in equilibrium. 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	

Common Core State Standards- Writing	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 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, purposes.

COMPONENTS AND ASSESSMENTS

Performance Assessments: Present clear documentation to end users explaining the characteristics and purpose of the program.

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Technical Documentation

Competencies	Total Learning Hours for Unit: 5
• Prepare a technical documentation report that is clear, concise, accurate, complete, appropriate, and grammatically correct. • Describe the contents, characteristics and the purpose of network documentation, user documentation, troubleshooting logs, and maintenance logs. • Evaluate technical documentation and provide revision recommendations.	

Aligned Washington State Standards

Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Health and Fitness	
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.

Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 SYSD Systems can be changing or in equilibrium. 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.

	9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Common Core State Standards- Writing	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 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, purposes

COMPONENTS AND ASSESSMENTS

Performance Assessments: Formulate a problem statement and make a plan to solve the problem

IT Academy Resources:
- Preparation Guide for MTA exam 98-361: Software Development Fundamentals
- Exam Review Kit 98-361: Software Development Fundamentals (20 sets of 50-minute lesson plans, slide decks, student activities)
- Student Study Guide 98-361: Software Development Fundamentals – Chapter 3, Understanding General Software Development

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Plan Programs

Competencies	**Total Learning Hours for Unit: 5**

- Develop a problem statement.
- Define the assumptions that define the scope of the problem.
- List strategies used to gather known information.
- Apply known information to the problem statement.
- Hypothesize expected output.
- Evaluate the viability of proposed solutions.

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Math	N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

		N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
		N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
		N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.
		N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
		A-CED.1. Create equations and inequalities in one variable and use them to solve problems.
		A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
		A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
		A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
		F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
		F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
		F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
		F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
		F-BF.1. Write a function that describes a relationship between two quantities.
		F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
		F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.
		F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.
		F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
		Reasoning: Programmers must understand the complexity of their algorithms and identify whether their solution's execution time increases quadratically, logarithmically or linearly, and be able to represent that quantity correctly.
		F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

	F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Reasoning: Programmers must visually understand the complexity of algorithms that increase quadratically, logarithmically and linearly, and how that complexity affects their program.

F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems.
Reasoning: Must understand that some algorithms can be n! (n factorial, or permutations without repetition) in terms of efficiency. Programmers must understand the concept of factorial in order to analyze these algorithms. | |
| **Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

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RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. | |
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9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge.

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	9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
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	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, purposes.

COMPONENTS AND ASSESSMENTS

Performance Assessments: Write effective and concise code.

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Develop Programs

Competencies	Total Learning Hours for Unit: 250
- Develop programs using desired language. - Develop programs that use arithmetic operations. - Develop programs that use relational operators. - Explain and apply the use of logical operators. - Explain and apply compound conditions. - Explain and apply control breaks. - Explain and apply methods of calculating subtotals and final totals. - Explain and apply iterative and conditional loops. - Describe common development environments. - Explain and apply the use of sort and search routines. - Explain and apply the use of files in programming. - Explain and apply appropriate methods of memory management. - Develop interactive programs. - Explain and apply the use of appropriate data structures, which may include arrays, linked lists, queues, and stacks. - Design and develop classes, subclasses. - Instantiate objects. - Explain and apply methods of incorporating error handling routines. - Define and apply built-in functions. - Create user-defined functions. - Apply language specific programming techniques. - Test and run a program for desired output. - Explain and apply methods used to debug a program. - Utilize reference materials for problem solving. - Provide internal documentation.	

Aligned Washington State Standards	
Art	
CCSS- Speaking and	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse

Listening	partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Math	N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-CED.1. Create equations and inequalities in one variable and use them to solve problems.

A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F-BF.1. Write a function that describes a relationship between two quantities.

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

Reasoning: Programmers must understand the complexity of their algorithms and identify whether their solution's execution time increases quadratically, logarithmically or linearly, and be able to represent that quantity correctly.

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Reasoning: Programmers must visually understand the complexity of algorithms that increase quadratically, logarithmically and linearly, and how that complexity affects their program.

F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems.

Reasoning: Must understand that some algorithms can be n! (n factorial, or permutations without repetition) in terms of efficiency.

	Programmers must understand the concept of factorial in order to analyze these algorithms.	
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 SYSD Systems can be changing or in equilibrium. 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.	

	9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Common Core State Standards- Writing	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 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, purposes.

COMPONENTS AND ASSESSMENTS

Performance Assessments: Finish projects with documentation describing installation, use and maintenance

IT Academy Resources
- Preparation Guide for MTA exam 98-361: Software Development Fundamentals
- Exam Review Kit 98-361: Software Development Fundamentals (20 sets of 50-minute lesson plans, slide decks, student activities)

Student Study Guide 98-361: Software Development Fundamentals
- Chapter 3, Understanding General Software Development
- Chapter 4, Understanding Web Applications
- Chapter 5, Understanding Desktop Applications

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Implement and Manage Software

Competencies	Total Learning Hours for Unit: 5

- Demonstrate ability to work on a software development team
- Identify sources and techniques used to gather information needed for implementation
- Explain and demonstrate a program's use/function
- Plan and write end user documentation
- List and apply methods used to troubleshoot compatibility issues of hardware and software
- Disable/uninstall software that may interfere with installation of a program
- Document installation and configuration procedures
- Explain and demonstrate methods to verify software/program installation and operation
- Identify the issues of security in programming and software implementation
- Explain the importance of versioning and source code control
- Generate packaged code ready for delivery
- Explain release management
- Explain and apply methods used to maintain application/program

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

	SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Health and Fitness	
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.

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	9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.
	9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.
	9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.
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	9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.
	9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.
	9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies.
	9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.
	9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Common Core State Standards- Writing	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 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, purposes.

COMPONENTS AND ASSESSMENTS

Performance Assessments: Create and implement a testing plan for a program.

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy).

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Test Software throughout Software Development Process

IT Academy Resources
- Preparation Guide for MTA exam 98-361: Software Development Fundamentals
- Exam Review Kit 98-361: Software Development Fundamentals (20 sets of 50-minute lesson plans, slide decks, student activities)
- Student Study Guide 98-361: Software Development Fundamentals – Chapter 3, Understanding General Software Development

Competencies	Total Learning Hours for Unit: 5

- Create a testing plan.
- Implement a testing plan.
- Demonstrate ability to provide feedback to the development process.

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 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.
	SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
	SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Math	N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-CED.1. Create equations and inequalities in one variable and use them to solve problems. A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting

	from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. F-BF.1. Write a function that describes a relationship between two quantities. F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. Reasoning: Programmers must understand the complexity of their algorithms and identify whether their solution's execution time increases quadratically, logarithmically or linearly, and be able to represent that quantity correctly. F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table. F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. Reasoning: Programmers must visually understand the complexity of algorithms that increase quadratically, logarithmically and linearly, and how that complexity affects their program. F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. Reasoning: Must understand that some algorithms can be n! (n factorial, or permutations without repetition) in terms of efficiency. Programmers must understand the concept of factorial in order to analyze these algorithms.
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

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COMPONENTS AND ASSESSMENTS

Performance Assessments: Make appropriate decisions in programming based on computer architecture; Diagram a computer

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Computer Architecture

Competencies	Total Learning Hours for Unit: 5

- Outline the structure of the central processing unit (CPU) including the functions of the control unit (CU), the arithmetic and logic
- unit (ALU), primary memory and address buses
- Outline the meaning of the terms bit (b) and byte (B) and their derivatives.
- Outline the meaning of the terms word, register and address and their use in the storage of data and instructions.
- Outline the steps in the machine instruction cycle: fetch, decode, execute and store.
- Outline the characteristics of primary memory and the difference between volatile and non-volatile memory.
- Outline the characteristics of secondary memory and define sequential and direct access.
- Outline the function of a microprocessor designed to perform one or a limited number of functions (within a car, washing machine and so on).
- Discuss the features, advantages, disadvantages and applications of specific input and output devices and the media used by each.
- Outline recent developments in computer system architecture including processor architecture, primary memory technologies and secondary memory devices.

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
Language	L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a

	word or phrase important to comprehension or expression.
Math	A-CED.1. Create equations and inequalities in one variable and use them to solve problems. A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. Reasoning: Programmers must understand memory allocation and access of sequentially stored data, and should understand and write equations that describe that access. Programmers explain how such an equation was derived and are able to utilize such equations.
Reading	RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in. RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
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Social Studies	
Common Core State Standards- Writing	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.
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	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, purposes.

COMPONENTS AND ASSESSMENTS

Performance Assessments: Illustrate what constitutes appropriate use of technology to make ethical decisions.

IT Academy Resources:
- Microsoft Digital Literacy: Computer Basics

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy).

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Computing and Society

Competencies	Total Learning Hours for Unit: 5

- Analyze the influence of computing technologies on culture and commerce
- Discuss ethical and unethical uses of computing technology
- Describe emerging technologies and their anticipated impact
- Explain the pros and cons of hacking and cracking

Aligned Washington State Standards	
Art	
CCSS- Speaking and Listening	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively 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. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources

	2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
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COMPONENTS AND ASSESSMENTS

Performance Assessments: Create a comparison chart of different kinds of computers; Create a poster illustrating characteristics of various computer systems; Illustrate processing characteristics and the applications that use them.

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Operating Systems

Competencies	Total Learning Hours for Unit: 10

- Define the term "operating system".
- Outline the functions of operating systems.
- Discuss the characteristics of various computer systems including single users and multi-users, in both single-tasking and multi-tasking environments.
- Compare the characteristics and applications of different kinds of computers.
- Outline the principal characteristics of batch processing, online (interactive) processing and real-time processing.
- Outline applications that use each of the processing methods: batch processing (payroll and bank cheque processing); interactive (online) processing; word processing; computer games; real-time processing (air traffic control and monitoring of patients in hospital intensive care).
- Explain the relationship between master and transaction files.
- Discuss the reliability of the system including the implications of failure.

Aligned Washington State Standards

Art	
	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively
CCSS- Speaking and Listening	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.
	SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style

	are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
Educational Technology	1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies
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Science	9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.

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|---|---|

COMPONENTS AND ASSESSMENTS

Performance Assessments: Diagram a network;   Graph data transmission

IT Academy Resources:
- Microsoft Digital Literacy: Computer Basics

Leadership Alignment: Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

Air Force Association's Cyber Patriot National High School Cyber Defense Competition-

Standards and Competencies

Standard/Unit: Networked Systems

Competencies	Total Learning Hours for Unit: 10
- Define local area network (LAN), wide area network (WAN), server and client. - Explain basic network topologies. - Explain the hardware required in networking. - Define the terms "standard protocol", "data integrity" and "data security" in the context of data transmission across a network. - Explain the software involved in networking. - Describe suitable methods to ensure data integrity in the transmission of data. - Describe suitable methods to ensure data security. - Discuss the need for speed in data transmission, and how speed can be enhanced - Discuss networking applications and the implications of networking for organizations, including internal communications, electronic mail, e-commerce, conferencing	

- and distributed processing.
- Outline the functions of a web browser and search engine including displaying an HTML page, following hyperlinks and searching on key words.

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21st Century Skills
Check those that students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation
☒Think Creatively
☒Work Creatively with Others
☒Implement Innovations

Critical Thinking and Problem Solving
☒Reason Effectively
☒Use Systems Thinking
☒Make Judgments and   Decisions
☒Solve Problems

Communication and Collaboration
☒Communicate Clearly
☒Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
☒Access and /evaluate Information
☒Use and Manage Information

Media Literacy
☒Analyze Media
☒Create Media Products

Information, Communications and Technology (ICT Literacy)
☒Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
☒Adapt to Change
☒Be Flexible

Initiative and Self-Direction
☒Manage Goals and Time
☒Work Independently
☒Be Self-Directed Learners

Social and Cross-Cultural
☒Interact Effectively with Others
☒Work Effectively in Diverse Teams

Productivity and Accountability
☒Manage Projects
☒Produce Results

Leadership and Responsibility
☒Guide and Lead Others
☒Be Responsible to Others