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| TRI-TECH SKILLS CENTER – CYBER SECURITY - 110901 | | |
| **Course:** Cyber Security | | **Total Framework Hours up to:** 540/1080 |
| **CIP Code:** 110901 | **Exploratory Preparatory** | **Date Last Modified:** 01/20/2015 |
| **Career Cluster:** Information Technology | | **Cluster Pathway:** Network Systems |
| **The course is designed to prepare students for employment with the entry level skills in Cyber Security.**  **CORE CONCEPTS**  **C1: Safety**  **C2: Career planning (Tri-Tech Portfolio)**  **C3: Security ethics, security levels, security threats and defensive security.**  **C4: Linux installation (Debian), configuration, directory structure and Bash. Linux users and permissions**  **C5: Linux command line and introduction to BASH scripting. (BASH)**  **C6: Linux server service installation and configuration. (Apache2, VSFTPD, Samba, and SSH)**  **C7: HTML (Columbia Basin College course equivalency. CS 114: HTML5 and CS 115:HTML5-Cascading Style Sheets**  **C8: Authentication: Google.com, Github.com, Microsoft.com( Imagine) and Amazon.com (https://www.awseducate.com/Registration)**  **C9: Github.com basics.**  **C10: Introduction to computer programming (Python, PHP, C, C++, Java, and SQL)**  **C11: Computer basics (Power supply, motherboard, RAM, CPU, video, audio, inputs, USB, and Ethernet)**  **C12: Networking hardware and protocol (OSI Model) (Ethernet, wireless)**  **C13: Network monitoring tools (Wireshark, Linux tools)**  **C14: Wired network fundamentals (IPV4, Subnetting, Routing, DHCP and Switching)**  **C15: CISCO Networking (Packertracer and introductory CLI)**  **C16: Linux Virtualization (KVM (Kernel Virtual Machine) and Virt Manager)**  **C17: Windows client installation and networking. (Virtual Machine and on harddrive)**  **C18: Base conversions, logic and computer science mathematics.**  **C19: Introduction to electronic and micro-controllers (Arduino)**  **C20: Culminating Small Group Project**  **ADVANCED CONCEPTS**  **A1: Windows server installation and configuration**  **A2: TCP/IP IPV4 and IPV6 DHCP**  **A3: Advanced Linux server configuration.**  **A3: Windows server installation and configuration**  **DNS, DHCP, HTTPD FTP, SQL, MAIL.**  **A4: Advanced Computer Programming (Python, PHP, C, C++, Java, and SQL)**  **A5: Cryptography, encryption and standard security keys introduction.**  **A6: Wireless networking setup.**  **A7: Advanced projects: Docker, Kubernetes, and Facebook CTF (Capture The Flag)**  **A8: USCyberPatriot Team competition. https://www.uscyberpatriot.org/**  **A9: AWS (Amazon Web Services) Linux configuration and security rules.**  **A10: Culminating Individual or Small Group Project**  **Notes:**  **Google Apps For Education**  **Git Hub**  **Amazon Services**  **US CyberPatriot**  **Docker Community Edition for AWS** | | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will complete the safety course and assessment with a focus on eye safety, electricity safety, hand tool safety and general lifting safety.  Teacher Lecture  Teacher Demonstration  Read Text/Manual  Student Guided Practice  Student Independent Practice  Safety Rules Activity A  Safety Activity 1  Safety Activity 2  Students are assessed with a rubric | | |
| **Leadership Alignment:**  The students participate in Tri-Tech Skills Center Associated Student Body activities throughout the year including election of officers and regular meetings. The students also act as ambassadors for Tri-Tech Skills Center conducting tours for grade school, middle school and other high school students. The students compete against other Tri-Tech programs in such community events such as Polar Plunge and Heart Race.  Communicate Clearly: Communicate effectively in diverse environments (including multi-lingual).  Collaborate with Others: Demonstrate ability to work effectively and respectfully with diverse teams. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C1: SAFETY** | | |
| **Competencies** | | **Total Learning Hours for Unit: 20/40** |
| C-1.1 Know location of first aid kit.  C-1.2 Know procedure for eye wash.  C-1.3 Know procedure for cut washing.  C-1.4 Know procedure for testing VDC (Voltage Direct Current) and VAC (Voltage Alternating Current) using muti-testers and simple voltage testers.  C-1.5 Know location of fire extinguisher.  C-1.6 Know location of fire alarm.  C-1.7 Know location of emergency exit.  C-1.8 Understand and practice safe soldering technique.  C-1.9 Understand and practice safe hand tool use.  C-1.10 Understand and practice simple power tool use. (Drills and screw guns)  C-1.11 Students will have documentation on file with the instructor that demonstrates they have had safety training.  C-1.12 Illustrate First Aid procedures for potential injuries and other health concerns in the occupational area  C-1.13 Describe the importance of emergency preparedness and an emergency action plan  C-1.14 Illustrate procedures used to handle emergency situations and accidents, including identification, reporting, response, evacuation plans, and follow-up procedures  C-1.15 Identify practices used to avoid accidents  C-1.16 Identify and describe fire protection, precautions and response procedures  C-1.17 Discuss the role of the individual and the company/organization in ensuring workplace safety  C-1.18 Discuss ways to identify and prevent workplace/school violence | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | **Making Inferences and Justifying Conclusions S-IC**  **Understand and evaluate random processes underlying statistical experiments**  1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.  2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model* *says a spinning coin falls heads up with probability 0.5. Would a result of 5* *tails in a row cause you to question the model?*  **Make inferences and justify conclusions from sample surveys, experiments, and observational studies**  3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.  4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.  5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.  6. Evaluate reports based on data.  **The Real Number System N -RN**  **Extend the properties of exponents to rational exponents. (Standard)**  **(Clusters)**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. *For example, we define 51/3 to be the cube root of 5* *because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.*  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.  **Use properties of rational and irrational numbers.**  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  **Seeing Structure in Expressions A-SSE**  **Interpret the structure of expressions**  1. Interpret expressions that represent a quantity in terms of its context.★  a. Interpret parts of an expression, such as terms, factors, and coefficients.  b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P*(1+*r*)n *as the product* *of P and a factor not depending on P.*  2. Use the structure of an expression to identify ways to rewrite it. *For example, see x*4 – *y*4 *as* (*x*2)2 – (*y*2)2, *thus recognizing it as a difference of squares that can be factored as* (*x*2 – *y*2)(*x*2 + *y*2).  **Write expressions in equivalent forms to solve problems**  3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★  a. Factor a quadratic expression to reveal the zeros of the function it defines.  b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.  c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15t *can be* *rewritten as* (1.151/12)12*t* ≈ 1.01212t *to reveal the approximate equivalent* *monthly interest rate if the annual rate is 15%.*  4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 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.  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 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.  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 in to the text selectively to maintain the flow of ideas, avoiding plagiarism and over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Employability: All students are assessed on an employability rubric consisting of: Positive Attitude and Teamwork: Works effectively with others and contributes productively as a member of the team; Professional Etiquette: Understands and uses professional behavior and language; Appearance and Hygiene: Exhibits appropriate professional appearance and hygiene; Attendance and Punctuality: Contributes to the learning environment by consistent attendance; Self and Resource Management: Appropriate use of materials, resources and time; Equipment Safety and Maintenance: Utilizes equipment efficiently and safely. The Employability Rubric is integrated into all standards. The students are assessed on the employability rubric each week by the instructor.  Academic Portfolio: All students are required to complete an academic portfolio, which includes a resume, application, application letter, mission statement, employability skills rubric, program competency checklist (grades, progress report, transcripts, industry certifications, leadership, final project including a presentation and reflection paper, best works, high school & beyond plan, and log of outside hours (30 hours minimum including community service).  The student’s culminating (final project) is a presentation of their final reflection paper and academic portfolio. The project is assessed by the teacher, students, and guests using rubrics.  Students are required to complete a cost projection for educational training and design a spreadsheet for long term amortization of loan payment in order to estimate the cost of paying of student education loans. | | |
| **Leadership Alignment:**  The students present the portfolio and culminating project to a group of judges including administrators, teachers, students and guests.  The students complete 30 hours of individual community service as part of their portfolio requirement.  Communicate Clearly: Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.  Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate  Produce Results: Manage time and projects effectively. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C-2**  **CAREER PLANNING** | | |
| **Competencies** | | **Total Learning Hours for Unit: 20/40** |
| C-2.1 Complete, discuss, and analyze the results of personality, career interest, and aptitude assessments;  C-2.2 Create a personal career portfolio  C-2.3 Determine academic/training or certification requirements for transition from one learning level to the next and explore opportunities for earning credit/certifications in high school such as advanced placement, tech prep, International Baccalaureate, college in the high school, military and apprenticeship opportunities.  C-2.4 Students will research careers related to computers, electronics, programming, networking, security and related occupations using bls.org, <http://jobs.nodejs.org/a/jobs/list/> and other web sites.  C-2.5 Develop an awareness of financial aid, scholarships, and other sources of income to support postsecondary education/training and discuss the impact of effective college and career planning.  C-2.6 Students will compile and save career data to secure cloud storage. (Google drive) | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | 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.  a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.  b. Work with peers to promote civil, democratic discussions and decision making, set clear goals and deadlines, and establish individual roles as needed.  c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.  d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.  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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.  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.  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. | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | **Summarize, represent, and interpret data on a single count or measurement variable**  1. Represent data with plots on the real number line (dot plots, histograms, and box plots).  2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).  4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.  **Summarize, represent, and interpret data on two categorical and quantitative variables**  5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.  6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*  b. Informally assess the fit of a function by plotting and analyzing residuals.  c. Fit a linear function for a scatter plot that suggests a linear association. | |
| **Reading** | 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.  2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.  3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.  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  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem | |
| **Writing** | 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose and audience.  5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.  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.  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 in to the text selectively to maintain the flow of ideas, avoiding plagiarism and over reliance on any one source and following a standard format for citation. | |
| **Language** | 1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.  2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.  4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts and consulting general and specialized reference materials, as appropriate. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments**:   * RESEARCH: Long term cost analysis of security deployment in industry. Cost comparison for Virus protection and cost to consumer. * RESEARCH: Cost analysis to repair malware and viruses. Is it cheaper to re-install or repair? (OWT.COM in Kennewick charges $60 to $70 per hour.) * WORKSHEET: Linux Permissions based on value. Decimal to binary. * Students do hands on activities (configure security level on a client work station and server; cyber security threats to computers and networking hardware; defensive security strategies and manage cloud storage ethically) * Students monitor Google Apps for Education (GAFE) * All assessments and activities will be assessed by the instructor with rubrics. | | |
| **Leadership Alignment:**  The students participate in an online security competition for two weeks in the fall. <https://picocf.com/>  Produce Results: Present oneself professionally and with proper etiquette.  Manage Goals and Time: Set goals with tangible and intangible success criteria.  Analyze Media: Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C-3:**  **SECURITY ETHICS, SECURITY LEVELS, SECURITY THREATS AND DEFENSIVE SECURITY. GOOGLE APPS FOR EDUCATION** | | |
| **Competencies** | | **Total Learning Hours for Unit: 20/40** |
| C-3.1 – Students will understand the importance of information assurance and how it relates to our society,  C-3.2 - Students will be instructed in computer ethics and how violation of ethical standards will effect careers in technology.  C-3.3 – Students will relate Isaac Asimov’s "Three Laws of Robotics" to computer ethics. (See notes posted below)  C-3.4 – Student will develop a personal “Code of Ethics” and place it in their employment portfolio.  C-3.5 – Student will understand the different types of security threats to client stations, servers and networking hardware.  C-3.6 – Students will understand the various types of encryption methods used by servers and services. (Such as htaccess and php password encryption.)  C-3.6 – Student will implement defensive strategies on clients and servers.  C-3.7 – Students will be introduced to router security using off the shelf routers configured with DD-WRT.  C-3.8 – Students will maintain an organized cloud storage account. GAFE (Google Apps For Education) <http://tritechsc.org>  C-3.9 – Students will publish content related to Computer Science, Linux and Cyber Security on a Google site at <http://tritechsc.org>  C-3.10 – Students will demonstrate professional educate when publishing content online. | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone use. | |
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| **Math** | **Interpreting Categorical and Quantitative Data S-ID**  **Summarize, represent, and interpret data on a single count or measurement variable**  1. Represent data with plots on the real number line (dot plots, histograms, and box plots).  2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).  4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate.  Use calculators, spreadsheets, and tables to estimate areas under the normal curve.  **Summarize, represent, and interpret data on two categorical and**  **quantitative variables**  5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies) Recognize possible associations and trends in the data.  6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose* *a function suggested by the context. Emphasize linear, quadratic, and* *exponential models.*  b. Informally assess the fit of a function by plotting and analyzing residuals.  c. Fit a linear function for a scatter plot that suggests a linear association.  **Interpret linear models**  7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.  8. Compute (using technology) and interpret the correlation coefficient of a linear fit.  9. Distinguish between correlation and causation.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | 1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.  2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.  3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.  Craft and Structure  4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.  5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.  6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.  Integration of Knowledge and ideas  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments**:    Students will set up a computer work station, make sure it is networked, install the appropriate development tools and maintain that working environment while in class.   1. LAB: Frequency and period Lab (f = 1 / t)   Sine Curve Lab. Modeling the Sine Curve.   1. LAB: Custom computer bid. Estimate the cost for building a computer and report in spreadsheet with functions. 2. Install device drivers on computers (Linux and Windows) 3. Create and maintain an Ethernet star network using available networking equipment. 4. Install and configure programming languages on a computer such as C, C++, Java, Python and Arduino. 5. Install source code development tools on a computer. 6. RESEARCH: Cost comparison of computers. Students will get prices for two or more different client workstation from a well know vendor. (Dell, HP, Apple, Lenovo, and IBM) 7. RESEARCH: Cost analysis to upgrade a computer. Students will be given the make and model of a mother board, laptop or tower and get a cost to upgrade the RAM, power supply and hard drive.   All activities are assessed by rubrics by the instructor. | | |
| **Leadership Alignment:**  Students create online tutorials made available to other students needing assistance.  Produce Results: Be accountable for results.  Guide and Lead Others: Use interpersonal and problem-solving skills to influence and guide others toward a goal.  Apply Technology Effectively: Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C-4:**  **COMPUTER BASICS** | | |
| **Competencies** | | **Total Learning Hours for Unit: 30/60** |
| C-4.1 - Take apart a computer tower and reassemble it and ensure this it POSTS. (Power supply, RAM, motherboard, CPU (Central Processing Unit), hard drive, optical drive, USB, Firewire, Thurderbolt, video card, NIC (network interface card), and various peripherals.)  C-4.2 – Install RAM (Random Access Memory), hard drives, power supplies, and interface cards.  C-4.3 – Set up a Raspberry Pi and associate it parts with a computer tower.  C-4.4 – Set up a computer tower and a Raspberry Pi and ensure it has an IP Address.  C-4.5 – Set up a star network from scratch with computer towers and Raspberry Pi’s  C-4-6 – Identify simple computer hardware problems and determine a plan to solve the problem.  (Power, Ethernet, wireless, ram, video, keyboard and mouse)  C-4-7 – Set up a custom start network with static IP addresses.  C-4-8 – Students will set up a custom start network with dynamic IP addresses using a Router and Linux system for DHCP.  C-4-9 – Students will install software development software on Linux systems (C, C++, Java, Python and Arduino)  C-4.7 - Students will connect a computer to a network printer if available.  C-4.7 – Install device drivers on computer systems (Linux and Windows).  C-4.8 - Install source code development tools on a computer. | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | 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. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Math** | **Interpreting Categorical and Quantitative Data S-ID**  **Summarize, represent, and interpret data on a single count or measurement variable**  1. Represent data with plots on the real number line (dot plots, histograms, and box plots).  2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).  4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate.  Use calculators, spreadsheets, and tables to estimate areas under the normal curve.  **Summarize, represent, and interpret data on two categorical and**  **quantitative variables**  5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies) Recognize possible associations and trends in the data.  6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose* *a function suggested by the context. Emphasize linear, quadratic, and* *exponential models.*  b. Informally assess the fit of a function by plotting and analyzing residuals.  c. Fit a linear function for a scatter plot that suggests a linear association.  **Interpret linear models**  7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.  8. Compute (using technology) and interpret the correlation coefficient of a linear fit.  9. Distinguish between correlation and causation.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | 2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.  3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.  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.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Language** | 4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts and consulting general and specialized reference materials, as appropriate. | |
| **Writing** | 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.  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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   1. LAB: Hands on labs to create vidual models of multiples of bytes: kilo, mega, giga, tera, peta, exa, zetta and yotta. With kilo, mega and giga being the most important. 2. Students ( hands on) building a computer. 3. Students install RAM. 4. Students intall operating systems. 5. LAB: Student will generate a bid for proposal spreadsheet for purchasing network equipment for a small business with less than 24 nodes with wireless capabilities including more than one wireless access point. This bid will eventually include work stations and servers. 6. WORKSHEET: Students will document the difference between a 10BASET, 100BASET and 1000BASET switch and the maximum frequencies of each represented in ( KB, MB, GB and TB ) per second. 7. LAB: HOMEWORK. tracert (DOS) traceroute (BASH)   Complete a trace route and output the result as a text file. Analyze the mathematics on the output. (Example:  3 103 ms 92 ms 102 ms dtr03knwcwa-tge-0-4-0-9.knwc.wa.charter.com [96.34.106.145]   1. 19 ms 33 ms 68 ms dtr01yakmwa-bue- 2. The OSI (Open System Interconnection) model and services in each of the 7 levels Activity.   Physical , Data link, Network, Transport Session, Presentation and Application   1. The TCP/IP (Transmission Control Protocol/Internet Protocol) Activity. 2. Maintain a star network in the classroom. 3. Student hands on making Ethernet Cat5e cable. 4. Setting up a local intranet using a specified Internet Protocol. | | |
| **Leadership Alignment:**  The Cyber Security Program has a computer donation program. Computers are donated to the program, students fix and enhance the computers and then they will be donated to Tri-Tech students not in our program.  Work Effectively in Diverse Teams: Respond open-mindedly to different ideas and values.  Guide and Lead Others: Demonstrate integrity and ethical behavior in using influence and power.  Be Responsible to Others: Act responsibly with the interests of the larger community in mind. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C-5:**  **NETWORKING HARDWARE AND PROTOCOL (OSI MODEL) (ETHERNET AND WIRELESS)** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-5.1 – Students will document the layers of the OSI (Open System Interconnection) model and associate an actual protocol with each layer,  C-5.2 - Students will understand TCP/IP (Transmission Control Protocol/Internet Protocol) is the basic communication language or protocol of the Internet and associate it with an OSI layer.  C-5.3 – Students will understand IPV4 and IPV6 and the Subnet Mask.  C-5.3 - Student will connect Ethernet to an existing start network and maintain a connection.  C-5.4 – Students will set up a star network from scratch and configure it with DHCP and static IP (Internet Protocol) addresses.  C-5.5 – Student will make RJ45 Ethernet cable with modular jacks.  C-5.6 – Students will use 568A/B jacks to make an Ethernet connection. (568B is preferred)  C-5.7 - Students will use Linux command line tools to view nodes on a network.  C-5.8 – Students will add Wireless to an existing start network.  C-5.9 – Students will configure an off the shelf router (router, switch and dhcp) to serve as a switch. | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Math** | **The Real Number System N -RN**  **Extend the properties of exponents to rational exponents. (Standard)**  **(Clusters)**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. *For example, we define 51/3 to be the cube root of 5* *because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.*  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.  **Use properties of rational and irrational numbers.**  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   1. Students will install Linux on more than one system. (Tower and Raspberry Pi) 2. Students will install more than one Linux distribution. 3. Student will install Linux packages using more than one file management system. (apt, yum and rpm) 4. Students will understand the Linux directory and file structure and how it related to the operation of the operating system 5. Students will learn basic command line command to operate a Linux system. (Bash http://tritechsc.org/linux/) 6. Students will learn combinations of Bash commands. 7. Students will install Linux on a VirtualBox (Or equivalent such as Centos Box) 8. Students will configure a Linux system to perform and array of services 9. Students will configure Linux to serve at a client. 10. Students will configure Linux to serve as a server with multiple services. 11. Students will write and implement Crontab script. | | |
| **Leadership Alignment:**  Students install Linux on all donated computers.  Be Self-directed Learners: Reflect critically on past experiences in order to inform future progress.  Interact Effectively with Others: Know when it is appropriate to listen and when to speak. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C6:**  **LINUX INSTALLATION, CONFIGURATION, DIRECTORY STRUCTURE AND BASH. LINUX USERS AND PERMISSIONS** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-6.1 – Students will install Centos / Fedora and Debian Linux on more than one system. (Tower and Raspberry Pi)  C-6.2 – Students will update Linux system with command line commands. (apt-get, yum or emerge (Gentoo))  C-6.3 – Students will document the function of each Linux directory and it function. (/etc /home /boot . . . )  C-6.4 – Students will write the function of important /dev/ devices such as volumes (/dev/sda) and others. (http://tritechsc.org/linux/dev.html)  C-6.5 – Student will create custom directories to enhance usage and configure services. (Examples: /ztmp/ for configuration file backup and /home/use/html for web services.  C-6.5 – Students will write Bash shell script to perform multiple tasks.  C-6.6 – Students will document use of Bash commands, (Aka. Command line and as we say at Tri-Tech “tty”)  C-6.6 – Students will install VirtualBox (Or a similar application) on a Linux system and install another operating system in that Virtual Box.  C-6.7 – Students will install Linux software that will enable desktop publishing and computer graphics.  C-6.8 -- Students will write multiple crontab scripts controlling \*.sh, and \*.py scripts. These scripts could include network traffic and security logs.  C-6.9 – Students will create and modify users and groups using command line. | | |
| ***Aligned Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will monitor and collect network traffic using command line and GUI (Graphic User Interface) applications.  Students will install, customize and use Wireshark. (Tower and Raspberry Pi)  Student will install and use standard Linux command line applications such as ping, traceroute, arp, and nmap. Netcat (nc) will be advanced.  Students will collect and mathematically interpret network data from applications such as Wireshark and nmap. | | |
| **Leadership Alignment:**  Students participate in competitions (Bytefest) fall and spring sponsored by PNNL.  Create Media Products: Understand and utilize the most appropriate media creation tools, characteristics and conventions.  Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate  Think Creatively: Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts  Work Creatively with Others: Develop, implement and communicate new ideas to others effectively.  Reason Effectively: Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.  Use Systems Thinking: Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.  Make Judgments and Decisions: Effectively analyze and evaluate evidence, arguments, claims and beliefs.  Communicate Clearly: Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade). | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C7:**  **NETWORK MONITORING TOOLS (WIRESHARP, NMAP, ARP)** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-7.1 – Install Wireshark on multiple system and customize a profile.  C-7.2 – Watch video from Chappell University with respect to Wireshark and apply concepts from video. Note taking.  C-7.3 – Students will document time spent with free online training with Wireshark at <https://www.chappellu.com>.  C-7-4 - Mathematically analyze network data.  C-7-5 - Achieve network data.  C-7-6 - Move network data to a visible location.  C-7.7 – Students will write multiple crontab scripts controlling \*.sh, and \*.py scripts to collect networking data using nmap and arp.  C-7.8 - Research use of network monitoring tools.  C-7.9 - Begin using simple netcat commands.  C-7.10 - LAB: Create Wireshark data graphs. (1 HOUR)  C-7.11 - WORKSHEET: Analysis of Wireshark’s graph output. (Linear or Non-Linear) (0.5 HOURS) | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | **Interpreting Functions F-IF**  **Understand the concept of a function and use function notation**  1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y*=*f*(*x*).  2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.  3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the* *Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) +* *f(n-1) for n* ≥ *1.*  **Interpret functions that arise in applications in terms of the context**  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. *Key features include: intercepts; intervals where the* *function is increasing, decreasing, positive, or negative; relative maximums* *and minimums; symmetries; end behavior; and periodicity.*★  5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function* *h(n) gives the number of person-hours it takes to assemble n engines in a* *factory, then the positive integers would be an appropriate domain for the* *function.*★  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.\*  **Analyze functions using different representations**  7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*  a. Graph linear and quadratic functions and show intercepts, maxima, and minima.  b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.  d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.  e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.  8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.  b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change* *in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and* *classify them as representing exponential growth or decay.*  9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and* *an algebraic expression for another, say which has the larger maximum* | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will install and configure Linux server applications.  Students will secure Linux server applications. | | |
| **Leadership Alignment:**  Students participate in a field trip to EWU. They must write a reflective summary of the activities.  Communicate Clearly: Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.  Communicate Clearly: Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C8:**  **LINUX SERVER SERVICE INSTALLATION AND CONFIGURATION** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-8.1 – Install Apache, Nginx (Raspberry Pi), VSFTPD, Bind, MariaDB (MySQL) and PHP.  C-8.2 - Configure Apache, Nginx, VSFTPD, Bind, MariaDB (MySQL), and PHP.  C-8.3 - Configure Apache to run PHP and MariaDB.  C-8.4 - Configure Apache to run a CMS (Drupal)  C-8.5 - Install, configure and test DHCP in a secure network.  C-8.6 - Work on classroom activities that prepare students to take Linux+ and RHEL (Red Hat Enterprise Linux) Exams | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
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| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will install Windows 7 and 8 and completely configure device drivers. | | |
| **Leadership Alignment:**  The students install Windows Laptop and Tower virus removal (Ccleaner, Anit-Malware Bytes, AVG, and Windows tools)  Access and Evaluate Information: Evaluate information critically and competently.  Use and Manage Information: Use information accurately and creatively for the issue or problem at hand  Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate  Apply Technology Effectively: Information. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C9:**  **WINDOWS CLIENT INSTALLATION AND NETWORKING** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-9.1 – Install windows 7 and 8  C-9.2 – Install device drivers for all devices.  C-9.3 – Download current drivers.  C-9.4 – Update system software.  C-9.5 – Install Open Source applications and software development tools.  C-9.6 – Install Wireshark and configure a profile.  C-9.7 – Install Email security software GnuPG – Gnu Privacy Guard and OpenPGP  C-9.8 – Install Virus and Malware software.  C-9.9 – Benchmark standard Windows installation using Process Explorer and / or HiJack This.  C-9.10 – Connect a Windows computer to a network  C-9.11 – Map a Windows computer to a drive. (Windows and Linux Samba) | | |
| ***Aligned Common Core and Washington State Standards*** | | |
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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will write code for an interpreted language at least once to understand the difference between an interpreted and compiled language.  Students will learn the fundamentals of Java.  Students will learn the fundamentals of Python.  Students will learn the fundamentals of BASH.  Students will learn standard variable use.  Students will use standard looping techniques. (for, while and do )  Students will edit Arduino source code to control Arduino micro-controllers and robotics peripherals.  Students will write, compile and run Java source code to learn programming techniques.  Students will compute base conversions to fully understand binary representations.  Student will perform simple logic gate operations: AND, OR, XOR and NOT.  Students will apply mathematic models to algorithms. | | |
| **Leadership Alignment:**  Students get Google Apps Training.  Create Media Products: Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C10:**  **INTRODUCTION TO COMPUTER PROGRAMMING** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-10.1 – Write code in a Hello World program in Java, Python, Javascript and PHP.  C-10.2 – Use variables in Java, Python and Bash  C-10.3 – Use looping techniques in Arduino, Java, Python and Bash code.  C-10.4 – Code complex base conversion using Java.  C-10.5 – Code simple base conversion using Python.  C-10.6 – Write encryption algorithms in Arduino, Python and Java code.  C-10.7 – Apply mathematical models to Arduino, Python and Java code.  C-10.8 – Apply BASH to system operations.  C-10.9 – Apply Python to system operations.  C-10.10 – Apply Python to CRONTAB.  C-10.11 – LAB: Students code programs to convert decimals to binary and hexadecimal numbers.  C-10.12 – LAB: MODULUS and INTEGER division study.  C-10.13 – LAB: Student will code programs to graph data for clients to better understand data outputs.  C-10.14 – LAB: Students will code random generation of numbers to model random entities in computer science. (One example TCP/IP and OpenStack) (1 HOUR)  C-10.15 – LAB: Students will write code to generate prime numbers which are used in Cryptography.  C-10.16 – LAB: Students will write code to collect data from network traffic and analyze that data.  C-10.17 – LAB: Frequency sound coding. RELATE TO MATH WORKSHEET (Relate frequency to audio signals. f(n) = 440(2^(n-1))^(1/12) | | |
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| **Math** | The Real Number System N -RN  Extend the properties of exponents to rational exponents.  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. For example, we define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. Use properties of rational and irrational numbers.  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  The Complex Number System N -CN  Perform arithmetic operations with complex numbers.  1. Know there is a complex number i such that i2 = –1, and every complex number has the form a + bi with a and b real.  2. Use the relation i2 = –1 and the commutative, associative, and  distributive properties to add, subtract, and multiply complex numbers.  Represent and model with vector quantities.  1. Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., *v*, |*v*|,||*v*||, *v*).  2. Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.  3. Solve problems involving velocity and other quantities that can be represented by vectors.  Perform operations on matrices and use matrices in applications.  6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.  7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.  8. (+) Add, subtract, and multiply matrices of appropriate dimensions.  9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.  10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.  11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.  12. (+) Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.  Interpret functions that arise in applications in terms of the context  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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★  5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★  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.\*  Analyze functions using different representations  7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*  a. Graph linear and quadratic functions and show intercepts, maxima, and minima.  b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.  d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.  e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.  8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.  b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.  9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.    Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Student will learn the contemporary part of a computer and how they are related to computer programming (software engineering.)  Student will create and maintain an Ethernet star network using available networking equipment.  Student will understand how computer languages are an integral part of software and operating system development.  Students will save and backup files in the cloud. | | |
| **Leadership Alignment:**  Students participate in the online security competition two weeks in the fall. <https://picoctf.com/>  Communicate Clearly: Utilize multiple media and technologies, and know how to judge their effectiveness a priority as well as assess their impact.  Communicate Clearly: Communicate effectively in diverse environments (including multi-lingual). | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C11:**  **INTRODUCTION TO CRYPTOGRAPHY, ENCRYPTION, AND STANDARD SECURITY KEYS** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-11.1 - Learn the contemporary part of a computer and how they are related to computer programming (software engineering.)  C-11.2 - Create and maintain an Ethernet star network using available networking equipment.  C-11.3 - Understand how computer languages are an integral part of software and operating system development.  C-11.4 - Understand the mathematics of computer hardware. Decimal, hexadecimal and binary numbers.  C-11.5 - Entry task that is math related to computers or computer programming.  C-11.6 - MODULUS and INTEGER division.  C-11.7 - Students will be able to convert from Decimal to binary and hexadecimal as measured with a paper and pencil test once a quarter.  C-11.8 - Simple logic gates with inputs of one byte. AND , OR, XOR NAND, NOR , XNOR and NOT  C-11.9 – Model y = x, y = x^n, y = 1/x, and y = x^(a/b) for data analysis of linear and non-linear relationships.  C-11.10 - Create visual models of multiples of bytes: kilo, mega, giga, tera, peta, exa, zetta and yotta.  C-11.11 - Graphically model Linux permissions based on decimal representation of binary numbers 0 to 7.  C-11.12 - LAB: Standard deviation from a collected set of data. Graph standard deviation data.  C-11.13 - LAB: Using spreadsheets to create mathematic sequences used for BASH operations.  C-11.14 - LAB: Use a spreadsheets to represent decimal, binary and hexadecimal relationships.  C-11.15 - LAB: Use a spreadsheet to create graphics and charts.  C-11.16 - Use a spreadsheet to solve problems involving equations.  C-11.17 - Use python as a calculator and document the results.  C-11.18 - Introduction to logarithms and exponential functions. Used in advanced cryptography.  C-11.19 - Use<http://www.wolframalpha.com/> to solve problems and calculate quantities.  C-11.20 - Use Khan Academy and view Cryptography Lessons | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | The Real Number System N -RN  Extend the properties of exponents to rational exponents.  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. For example, we define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. Use properties of rational and irrational numbers.  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  The Complex Number System N -CN  Perform arithmetic operations with complex numbers.  1. Know there is a complex number i such that i2 = –1, and every complex number has the form a + bi with a and b real.  2. Use the relation i2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.  Represent and model with vector quantities.  1. Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., *v*, |*v*|,||*v*||, *v*).  2. Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.  3. Solve problems involving velocity and other quantities that can be represented by vectors.  Perform operations on matrices and use matrices in applications.  6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.  7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.  8. (+) Add, subtract, and multiply matrices of appropriate dimensions.  9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.  10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.  11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.  12. (+) Work with 2 × 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.  Interpret functions that arise in applications in terms of the context  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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★  5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★  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.\*  Analyze functions using different representations  7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*  a. Graph linear and quadratic functions and show intercepts, maxima, and minima.  b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.  d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.  e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.  8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.  b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.  9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.    Quantities N -Q  Reason quantitatively and use units to solve problems.  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Students will be introduced to the history of Cryptography.  Students will document an understanding of the fundamentals of modern Cryptography.  Students will code encryption and decryption algorithms using more than one programming language  Students will implement encryption and decryption strategies using and array of Open Source Software solutions. | | |
| **Leadership Alignment:**  Students maintain the leadership web page at <http://tritechsc.org/leadership/>  Make Judgments and Decisions: Effectively analyze and evaluate evidence, arguments, claims and beliefs.  Solve Problems: Identify and ask significant questions that clarify various points of view and lead to  Communicate Clearly: Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.  Apply Technology Effectively: Use technology as a tool to research, organize, evaluate and communicate  Apply Technology Effectively: Information. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C12:**  **INTRODUCTION TO ELECTRONICS AND MICRO-CONTROLLERS** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-12.1 – Research history of cryptography including Khan Academy videos.  C-12.2 - Document modern Cryptography methods.  C-12.3 - Custom text encryption using Java and Python.  C-12.4 - Apply Web encryption using PHP.  C-12-5 - Demonstrate htaccess passwords and Linux passwords.  C-12.6 - Apply secure password creation using PHP along with SQL (MariaDB) in Web Application.  C-12.6 - Encode and audio signal and send message and code to another user. (Audacity)  C-12.7 - Write code to encrypt and decrypt data.  C-12.8 - Collect and report results from data derived from text files.  C-12.9 - Public Key Cryptography  C-12.10 - picoctf.org | | |
| ***Aligned Common Core and Washington State Standards*** | | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence. Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | **The Real Number System N -RN**  **Extend the properties of exponents to rational exponents. (Standard)**  **(Clusters)**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. *For example, we define 51/3 to be the cube root of 5* *because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.*  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.  **Use properties of rational and irrational numbers.**  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  **Creating Equations\* A-CED**  **Create equations that describe numbers or relationships**  1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic* *functions, and simple rational and exponential functions.*  2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.  3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities* *describing nutritional and cost constraints on combinations of different* *foods.*  4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm’s law V =* *IR to highlight resistance R.*  **Interpreting Functions F-IF**  **Understand the concept of a function and use function notation**  1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).  2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.  3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the* *Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) +* *f(n-1) for n* ≥ *1.*  **Interpret functions that arise in applications in terms of the context**  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. *Key features include: intercepts; intervals where the* *function is increasing, decreasing, positive, or negative; relative maximums* *and minimums; symmetries; end behavior; and periodicity.*★  5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function* *h(n) gives the number of person-hours it takes to assemble n engines in a* *factory, then the positive integers would be an appropriate domain for the* *function.*★  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.\*  **Analyze functions using different representations**  7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*  a. Graph linear and quadratic functions and show intercepts, maxima, and minima.  b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.  d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.  e. Graph exponential and logarithmic functions, showing intercept and end behavior, and trigonometric functions, showing period, midline, and amplitude.  8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.  b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change* *in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and* *classify them as representing exponential growth or decay.*  9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example*  **Trigonometric Functions F-TF**  **Extend the domain of trigonometric functions using the unit circle**  1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.  2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.  3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–*x*, π+*x*, and 2π–*x* in terms of their values for *x*, where *x* is any real number.  4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.  **Model periodic phenomena with trigonometric functions**  5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★  6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.  7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.\*  **Prove and apply trigonometric identities**  8. Prove the Pythagorean identity sin^2(θ) + cos^2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.  9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. | |
| **Reading** | Integration of Knowledge and Ideas  Grades 9-10:  7. Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account.  Grades 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** | Reading Standards for Literacy in Science and Technical Subjects 6–12 RST  Integration of Knowledge and Ideas  7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.  8. Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.  9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.  7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem  8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.  9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**  Student will understand the basic fundamentals of electronic circuits.  Students understand the function of a microcontroller.  Student will program a microcontroller to send and receive data to and from a computer. | | |
| **Leadership Alignment:**  Students participate in a job shadow or internship.  Students must dress and behave in a professional manner.  Think Creatively: Use a wide range of idea creation techniques (such as brainstorming)  Collaborate with Others: Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.  Be Self-directed Learners: Reflect critically on past experiences in order to inform future progress.  Interact Effectively with Others: Know when it is appropriate to listen and when to speak. | | |
| ***Standards and Competencies*** | | |
| **Standard/Unit C13:**    **INTRODUCTION TO ELECTRONICS AND MICRO-CONTROLLERS (ARDUINO) CIRCUITS BASICS (RESISTORS, CAPACITORS, LIGHT EMITTING DIODES (LEDS), MEASUREMENT, PWM, RXTX AND SOLDERING)** | | |
| ***Standards and Competencies*** | | |
| **Competencies** | | **Total Learning Hours for Unit: 50/100** |
| C-13.1 –Read resistors and capacitors.  C-13.1 - Basic breadboard techniques for circuit construction.  C-13.1 - Function and application of the following components: Resistors, capacitors, Light Emitting Diodes (LEDS), diodes, potentiometers, and transistors.  C-13.1 - Splice wires together using proper soldering techniques.  C-13.2 - Solder resistors, capacitors and more on perfboards using heat sync techniques.(If equipment is safely available)  C-13.3 - Build a solid LED circuit using a resistor and a 9 volt battery on a breadboard.  C-13.4 - Build a blinking LED circuit using and Arduino  C-13.5 - Build circuits with variable resistors.  C-13.6 - Build circuits with photosensitive resistors.  C-13.7 - Create IR (Infrared) circuits using an Arduino.  C-13.8 - Collect serial data on a computer from and Arduino.  C-13.9 - Control a simple servo motor with an Arduino (If motors are available.)  C-13.10 - Apply the concept of PWM (Pulse Width Modulation) using and Arduino.  C-13.11 - Apply the concept of RXTX (Serial) using and Arduino.  C-13.12 - Resistor codes  C-13.13 - Capacitors and capacitor codes  C-13.14 - Arduino LED and frequency.  C-13.15 - Use a multi-tester to measure OHMS, VOLTS and AMPS and understanding the output.  C-13.16 - Identify the units for each entity Ohms Law.  C-13.17 - Power and current units.  C-13.18 - Power Supply.  Measure Amps from a load generated from a computer power supply.  C-13.19 - PWM (Pulse Width Modulation) <http://arduino.cc/en/Tutorial/PWM> RXTX (<http://rxtx.qbang.org/>) RXTX is a native lib providing serial and parallel communication for the Java Development Toolkit (JDK). All deliverables are under the gnu LGPL license. | | |
| ***Aligned Common core and Washington State Standards*** | | |
| **Art** |  | |
| **Speaking and Listening** | Speaking and Listening Standards 6–12 - SL  Grades 9-10:  2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.  Grades 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.  3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used | |
| **Educational Technology** | 1. INTEGRATION: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.  1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.  1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.  1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.  1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.  1.2.1 Communicate and collaborate to learn with others.  1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.  1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.  1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.  1.3.2 Locate and organize information from a variety of sources and media.  1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.  1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.  2. DIGITAL CITIZENSHIP: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.  2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.  2.1.1 Practice personal safety.  2.1.2 Practice ethical and respectful behavior.  2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.  2.2.1 Develop skills to use technology effectively.  2.2.2 Use a variety of hardware to support learning.  2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.  2.3.1 Select and use common applications.  2.3.2 Select and use online applications.  2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.  2.4.1 Formulate and synthesize new knowledge. | |
| **Health and Fitness** | 3. The student analyzes and evaluates the impact of real-life influences on health. | |
| **Math** | **The Real Number System N -RN**  **Extend the properties of exponents to rational exponents. (Standard)**  **(Clusters)**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. *For example, we define 51/3 to be the cube root of 5* *because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.*  2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.  **Use properties of rational and irrational numbers.**  3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.  **Quantities N -Q**  **Reason quantitatively and use units to solve problems.**  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.  2. Define appropriate quantities for the purpose of descriptive modeling.  3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  **Seeing Structure in Expressions A-SSE**  **Interpret the structure of expressions**  1. Interpret expressions that represent a quantity in terms of its context.★  a. Interpret parts of an expression, such as terms, factors, and coefficients.  b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P*(1+*r*)n *as the product* *of P and a factor not depending on P.*  2. Use the structure of an expression to identify ways to rewrite it. *For example, see x*4 – *y*4 *as* (*x*2)2 – (*y*2)2, *thus recognizing it as a difference of squares that can be factored as* (*x*2 – *y*2)(*x*2 + *y*2).  **Write expressions in equivalent forms to solve problems**  3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★  a. Factor a quadratic expression to reveal the zeros of the function it defines.  b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.  c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15t *can be* *rewritten as* (1.151/12)12*t* ≈ 1.01212t *to reveal the approximate equivalent* *monthly interest rate if the annual rate is 15%.*  4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For* *example, calculate mortgage payments.*★ | |
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| **Social Studies** |  | |
| **Writing** | Writing Standards 6–12 W  Grades 9-10:  Research to Build and Present Knowledge  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.  8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  Grades 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.  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 over reliance on any one source and following a standard format for citation. | |

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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  **U**se 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 |