

East Penn School District
Curriculum and Instruction

Curriculum for:

Course(s): AP Computer Science Principles

Grades: 10 - 12

Department: Computer Science

Length of Period (average minutes): 41

Periods per cycle: 6

Length of Course (yrs): 1

Type of offering: _____ required ____X____elective

Credit(s) awarded: 1.0

Developed by: Cindy Brashear, Beth Stoudt, College Board

ADOPTED:

Enduring Understanding	Essential Questions	Content	Standard **	Skills
Computing is a creative activity	<p>How can a creative development process affect the creation of computational artifacts?</p> <p>How can computing and the use of computational tools foster creative expression?</p> <p>How can computing extend traditional forms of human expression and experience?</p>	<p>Creative development can be an essential process for creating computational artifacts.</p> <p>Computing enables people to use creative development processes to create computational artifacts for creative expression or to solve a problem.</p>	<p>CT.L3A-11: Describe how computation shares features with art and music by translating human intention into an artifact.</p> <p>CL.L2-02: Collaboratively design, develop, publish, and present products</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Apply a creative development process when creating computational artifacts.● Create a computational artifact for creative expression.● Create a computational artifact using computing tools and techniques to solve a problem.● Create a new computational artifact by combining or modifying existing artifacts.● Collaborate in the creation of computational artifacts.● Analyze the correctness, usability, functionality, and sustainability of computational artifacts.● Use computing tools and techniques for creative expression.
Abstraction reduces information and detail to facilitate focus on relevant concepts	<p>How are vastly different kinds of data, physical phenomena, and mathematical concepts represented on a computer?</p>	<p>A variety of abstractions built on binary sequences can be used to represent all digital data.</p>	<p>CT.L2-07: Represent data in a variety of ways including text, sounds, pictures, and numbers.</p> <p>CT.L3A-05: Describe the relationship between binary and hexadecimal representations.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Describe the variety of abstractions used to represent data.

	<p>How does abstraction help us in writing programs, creating computational artifacts, and solving problems?</p> <p>How can computational models and simulations help generate new understanding and knowledge?</p>	<p>Multiple levels of abstraction are used to write programs or create other computational artifacts.</p> <p>Models and simulations use abstraction to generate new understanding and knowledge.</p>	<p>CT.L3A - 09: Discuss the value of abstraction to manage problem complexity.</p> <p>CT.L2-12: Use abstraction to decompose a problem into sub problems.</p> <p>CT.L3A-03: Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.</p> <p>CT.L2-09: Interact with content-specific models and simulations to support learning and research.</p>	<ul style="list-style-type: none">● Explain how binary sequences are used to represent digital data.● Develop an abstraction when writing a program or creating other computational artifacts.● Use multiple levels of abstraction to write programs.● Identify multiple levels of abstractions that are used when writing programs.● Use models and simulations to represent phenomena.● Use models and simulations to formulate, refine, and test hypotheses.
<p>Data and information facilitate the creation of knowledge</p>	<p>How can computation be employed to help people process data and information to gain insight and knowledge?</p> <p>How can computation be employed to facilitate exploration and discovery when working with data?</p> <p>What considerations and trade-offs arise in the computational manipulation of data?</p>	<p>Computer programs are used to process information to gain insight and knowledge.</p> <p>Computing facilitates exploration and the discovery of connections in information</p> <p>There are trade-offs when representing information as digital data.</p>	<p>CL.l2-03: Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.</p> <p>CT.L3B-05: Use data analysis to enhance understanding of complex natural and human systems.</p> <p>CT.L3B-09: Analyze data and identify patterns through modeling and simulation.</p> <p>CPP.L3A-11: Describe techniques for locating and collecting small and large-scale data sets.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Find patterns and test hypotheses about digitally processed information to gain insight and knowledge.● Collaborate when processing information to gain insight and knowledge.● Explain the insight and knowledge gained from digitally processed data by using appropriate

	<p>What opportunities do large data sets provide for solving problems and creating knowledge?</p>			<p>visualizations, notations, and precise language.</p> <ul style="list-style-type: none">● Extract information from data to discover and explain connections or trends.● Determine how large data sets impact the use of computational processes to discover information and knowledge.● Analyze how data representation, storage, security, and transmission of data involve computational manipulation of information.
<p>Algorithms are used to develop and express solutions to computational problems</p>	<p>How are algorithms implemented and executed on computers and computational devices?</p> <p>Why are some languages better than others when used to implement algorithms?</p> <p>What kinds of problems are easy, what kinds are difficult, and what kinds are impossible to solve algorithmically?</p> <p>How are algorithms evaluated?</p>	<p>Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.</p> <p>Algorithms can solve many, but not all, computational problems.</p>	<p>CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions</p> <p>CT.L2-04: Evaluate ways that different algorithms may be used to solve the same problem.</p> <p>CT.L3B-01: Classify problems as tractable, intractable, or computationally unsolvable.</p> <p>CT.L3B-03: Critically examine classical algorithms and implement an original algorithm.</p> <p>CT.L3B-04: Evaluate algorithms by their efficiency, correctness, and clarity.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Develop an algorithm for implementation in a program.● Express an algorithm in a programming language.● Explain the difference between algorithms that run in a reasonable time and those that do not run in a reasonable time.● Explain the difference between solvable and unsolvable problems in computer science.

				<ul style="list-style-type: none">● Explain the existence of undecidable problems in computer science.● Evaluate algorithms analytically and empirically for efficiency, correctness, and clarity.
Programming enables problem solving, human expression, and creation of knowledge.	<p>How are programs developed to help people, organizations, or society solve problems?</p> <p>How are programs used for creative expression, to satisfy personal curiosity, or to create new knowledge?</p> <p>How do computer programs implement algorithms?</p> <p>How does abstraction make the development of computer programs possible?</p> <p>How do people develop and test computer programs?</p> <p>Which mathematical and logical concepts are fundamental to computer programming?</p>	<p>Programs can be developed for creative expression, to satisfy personal curiosity, to create new knowledge, or to solve problems.</p> <p>People write programs to solve algorithms.</p> <p>Programming is facilitated by appropriate abstractions.</p> <p>Programs are developed, maintained, and used by people for different purposes.</p> <p>Programming uses mathematical and logical concepts.</p>	<p>CT.L2-01: Use the basic steps in algorithmic problem-solving to design solutions.</p> <p>CL.L3A-03: Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.</p> <p>CL.L3B-01: Use project collaboration tools, version control systems, and Integrated Development Environments (IDEs) while working on a collaborative software project.</p> <p>CPP.L3A-03: Use various debugging and testing methods to ensure program correctness.</p> <p>CPP.L3A-04: Apply analysis, design, and implementation techniques to solve problems.</p> <p>CPP.L3A-12: Describe how mathematical and statistical functions, sets, and logic are used in computation.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Develop a program for creative expression, to satisfy personal curiosity, or to create new knowledge.● Develop a correct program to solve problems.● Collaborate to develop a program.● Explain how programs implement algorithms.● Use abstraction to manage complexity in programs.● Evaluate the correctness of a program.● Employ appropriate mathematical and logical concepts in programming.
The Internet pervades modern computing	<p>What is the Internet? How is it built? How does it function?</p> <p>What aspects of the Internet’s design and development have helped it scale and flourish?</p>	<p>The Internet is a network of autonomous systems.</p> <p>Characteristics of the Internet influence the systems built on it.</p>	<p>CD.L3A-09: Describe how the Internet facilitates global communication.</p> <p>CD.L2-06: Describe the major components and functions of computer systems and networks.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Explain the abstractions in the Internet and how the Internet functions.● Explain the characteristics of the

	<p>How is cybersecurity impacting the ever-increasing number of Internet users?</p>	<p>Cybersecurity is an important concern for the Internet and the systems built on it.</p>	<p>CD.L3B-04: Describe the issues that impact network functionality (e.g.,latency, bandwidth, firewalls, server capability)</p>	<p>Internet and the systems built on it.</p> <ul style="list-style-type: none">● Explain how the characteristics of the Internet influences the systems built on it.● Identify existing cybersecurity concerns and potential options to address these issues with the Internet and the systems built on it.
<p>Computing has global impact</p>	<p>How does computing enhance human communication, interaction, and cognition?</p> <p>How does computing enable innovation?</p> <p>What are some potential beneficial and harmful effects of computing?</p> <p>How do economic, social, and cultural contexts influence innovation and the use of computing?</p>	<p>Computing enhances communication, interaction, and cognition.</p> <p>Computing enables innovation in nearly every field.</p> <p>Computing has global effects - both beneficial and harmful - on people and society.</p> <p>Computing innovations influence and are influenced by the economic, social, and cultural contexts in which they are designed and used.</p> <p>An investigative process is aided by efective organization and selection of resources. Appropriate technologies and tools facilitate the accessing of information and enable the</p>	<p>CI.L2-03: Analyze the positive and negative impacts of computing on human culture.</p> <p>CI. L3A-04: Compare the positive and negative impacts of technology on culture.</p> <p>CI.L3A-05: Describe strategies for determining the reliability of information found on the Internet.</p> <p>CI.L3A-10: Describe security and privacy issues that relate to computer networks.</p> <p>CI.L3B-02: Analyze the beneficial and harmful effects of computing innovations.</p>	<p>Students will be able to:</p> <ul style="list-style-type: none">● Explain how computing innovations affect communication, interaction, and cognition.● Explain how people participate in a problem solving process that scales.● Explain how computing has impacted innovations in other fields.● Analyze the beneficial and harmful effects of computing.● Explain the connections between computing and real-world contexts, including economic, social, and cultural contexts.

		ability to evaluate the credibility of sources.		<ul style="list-style-type: none">● Access, manage, and attribute information using effective strategies.● Evaluate online and print sources for appropriateness and credibility.
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** All standards are from the Computer Science Teachers Association (CSTA) K-12 Computer Science Standards, Revised 2011

Materials and Resources:

- Screen Recorder: <https://screencast-o-matic.com/> - free web-based version. There will be a watermark on the video. Students will need to record their screens.
- Infographic - This can be created with inserting text boxes and images. An online site offers some free building but you need a license to download it as a pdf.
<https://piktochart.com/>
- Audacity: To create podcast or audible screen cast: <http://www.audacityteam.org/>
- Movie Maker - Microsoft Free product: <https://support.microsoft.com/en-us/help/14220/windows-movie-maker-download>
- New version of word will save to pdf? The pdf is for turning in the written response.
- Block-based software: Snap! <http://snap.berkeley.edu/>
- App Inventor: <http://appinventor.mit.edu/explore/>
- HTML - text editor: <http://brackets.io/>
- Python
- Java
- Textbook
- Online Resources