CURRICULUM ALIGNMENT GUIDE

CSTA K–12 CS Standards

100 Ideas for Secondary Teachers:

Outstanding Computing Lessons

INTRODUCTION

100 ideas: Outstanding Computing Lessons is a collection of 100 practical, tried-and-tested ideas for teaching computing. It is aimed at computing / ICT teachers of all levels, whether specialist or non-specialist, newly qualified or experienced.

For more information on 100 Ideas: Outstanding Computing Lessons and to find additional education resources and supporting materials, including more than 50 free worksheets to accompany the activities in the book, visit: teachwithict.com/100ideas

10 sample activities can be downloaded for free at teachwithict.com/bonus

Computing Systems

IDENTIFIER	STANDARD	ACTIVITY
1B-CS-01	Describe how internal and external parts of computing devices function to form a system.	Idea: 12, 40.
1B-CS-02	Model how computer hardware and software work together as a system to accomplish tasks.	Idea: 12, 35, 36, 37, 38, 59, 60.
1B-CS-03	Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies.	

Networks and the Internet

IDENTIFIER	STANDARD	ACTIVITY
1B-NI-04	Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.	Idea: 54.
1B-NI-05	Discuss real-world cybersecurity problems and how personal information can be protected.	Idea: 54, 61.

Data and Analysis

IDENTIFIER	STANDARD	ACTIVITY
1B-DA-06	Organize and present collected data visually to highlight relationships and support a claim.	Idea: 26, 28, 31, 34, 53, 57, 98, 106.
1B-DA-07	Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.	Idea: 28, 98, 106.

Algorithms and Programming

IDENTIFIER	STANDARD	ACTIVITY
1B-AP-08	Compare and refine multiple algorithms for the same task and determine which is the most appropriate.	Idea: 3, 4, 8, 11, 44, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-09	Create programs that use variables to store and modify data.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-10	Create programs that include sequences, events, loops, and conditionals.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-11	Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-12	Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.	Idea: 6, 10, 100.
1B-AP-13	Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-14	Observe intellectual property rights and give appropriate attribution when creating or remixing programs.	Idea: 100.
1B-AP-15	Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.	Idea: 3, 4, 8, 11, 44, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
1B-AP-16	Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development.	Idea: 1, 2.
1B-AP-17	Describe choices made during program development using code comments, presentations, and demonstrations.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.

Impacts of Computing

IDENTIFIER	STANDARD	ACTIVITY
1B-IC-18	Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.	Idea: 34, 41.
1B-IC-19	Brainstorm ways to improve the accessibility and usability of technology products for the diverse needs and wants of users.	Idea: 34, 41.
1B-IC-20	Seek diverse perspectives for the purpose of improving computational artifacts.	Idea: 21.
1B-IC-21	Use public domain or creative commons media, and refrain from copying or using material created by others without permission.	Idea: 25, 100.

Computing Systems

IDENTIFIER	STANDARD	ACTIVITY
2-CS-01	Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.	Idea: 96.
2-CS-02	Design projects that combine hardware and software components to collect and exchange data.	Idea: 32, 39, 96.
2-CS-03	Systematically identify and fix problems with computing devices and their components.	

Networks and the Internet

IDENTIFIER	STANDARD	ACTIVITY
2-NI-04	Model the role of protocols in transmitting data across networks and the Internet.	Idea 54, 61.
2-NI-05	Explain how physical and digital security measures protect electronic information.	Idea: 20, 27.
2-NI-06	Apply multiple methods of encryption to model the secure transmission of information.	Idea: 49.

Data and Analysis

IDENTIFIER	STANDARD	ACTIVITY
2-DA-07	Represent data using multiple encoding schemes.	Idea: 52, 58, 62, 63, 64, 65, 66, 67, 68.
2-DA-08	Collect data using computational tools and transform the data to make it more useful and reliable.	Idea: 26, 31, 39, 98, 106, 108.
2-DA-09	Refine computational models based on the data they have generated.	Idea: 28, 31, 106.

Algorithms and Programming

IDENTIFIER	STANDARD	ACTIVITY
2-AP-10	Use flowcharts and/or pseudocode to address complex problems as algorithms	Idea: 42.
2-AP-11	Create clearly named variables that represent different data types and perform operations on their values.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
2-AP-12	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
2-AP-13	Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	Idea: 42.
2-AP-14	Create procedures with parameters to organize code and make it easier to reuse.	Idea: 3, 4, 8, 11, 84, 85, 91, 97, 98, 99, 101, 102, 103.
2-AP-15	Seek and incorporate feedback from team members and users to refine a solution that meets user needs.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
2-AP-16	Incorporate existing code, media, and libraries into original programs, and give attribution.	Idea: 3, 4, 8, 11, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
2-AP-17	Systematically test and refine programs using a range of test cases.	Idea: 3, 4, 8, 11, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
2-AP-18	Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.	Idea: 32, 34.
2-AP-19	Document programs in order to make them easier to follow, test, and debug.	

Impacts of Computing

IDENTIFIER	STANDARD	ACTIVITY
2-IC-20	Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.	
2-IC-21	Discuss issues of bias and accessibility in the design of existing technologies.	Idea: 41.
2-IC-22	Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact.	Idea: 41.

2-IC-23	Describe tradeoffs between allowing information to be public and keeping information private and secure.	

LEVEL 3A: GRADES 9-10 (AGES 14-16)

Computing Systems

IDENTIFIER	STANDARD	ACTIVITY
3A-CS-01	Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.	Idea: 96.
3A-CS-02	Compare levels of abstraction and interactions between application software, system software, and hardware layers.	Idea: 35.
3A-CS-03	Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.	

Networks and the Internet

IDENTIFIER	STANDARD	ACTIVITY
3A-NI-04	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.	Idea: 61.
3A-NI-05	Give examples to illustrate how sensitive data can be affected by malware and other attacks.	Idea: 16.
3A-NI-06	Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts.	Idea: 16.
3A-NI-07	Compare various security measures, considering tradeoffs between the usability and security of a computing system.	Idea: 16.
3A-NI-08	Explain tradeoffs when selecting and implementing cybersecurity recommendations.	Idea: 16.

Data and Analysis

IDENTIFIER	STANDARD	ACTIVITY
3A-DA-09	Translate between different bit representations of real-world phenomena, such as characters, numbers, and images.	Idea: 52, 58, 62, 63, 64, 65, 66, 67, 68.
3A-DA-10	Evaluate the tradeoffs in how data elements are organized and where data is stored.	
3A-DA-11	Create interactive data visualizations using software tools to help others better understand real-world phenomena.	Idea: 31.
3A-DA-12	Create computational models that represent the relationships among different elements of data collected from a phenomenon or process.	Idea: 31.

Algorithms and Programming

IDENTIFIER	STANDARD	ACTIVITY
3A-AP-13	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.	Idea: 96.
3A-AP-14	Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.	Idea: 80, 81, 82, 84, 85, 86, 98, 99, 101, 102, 103, 104, 108.
3A-AP-15	Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.	Idea: 3, 4, 8, 11, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
3A-AP-16	Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.	Idea: 96.
3A-AP-17	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	Idea: 3, 4, 8, 11, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 104, 108.
3A-AP-18	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.	Idea: 108.
3A-AP-19	Systematically design and develop programs for broad audiences by incorporating feedback from users.	

3A-AP-20	Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.	
3A-AP-21	Evaluate and refine computational artifacts to make them more usable and accessible.	
3A-AP-22	Design and develop computational artifacts working in team roles using collaborative tools.	
3A-AP-23	Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs.	

Impacts of Computing

IDENTIFIER	STANDARD	ACTIVITY
3A-IC-24	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.	Idea: 16, 41.
3A-IC-25	Test and refine computational artifacts to reduce bias and equity deficits.	
3A-IC-26	Demonstrate ways a given algorithm applies to problems across disciplines.	Idea: 92, 93, 94, 96.
3A-IC-27	Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.	
3A-IC-28	Explain the beneficial and harmful effects that intellectual property laws can have on innovation.	
3A-IC-29	Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.	Idea: 16.
3A-IC-30	Evaluate the social and economic implications of privacy in the context of safety, law, or ethics.	