

(AP[®]) Computer Science Principles

Kentucky Academic Standards (KAS) for Computer Science

This document aligns the Code.org (AP[®]) Computer Science Principles (CSP) course with the KAS for Computer Science. At least one KAS for Computer Science standard is aligned with each CSP lesson. The structure is as follows:

- **Standard Identifier** (Identifier1, Identifier2) reflects consistent coding for the identification of a standard representing the grade (or grade band), the concept area and the numerated standard number per concept.
 - **Example**

Grade Band	Concept	Standard (number)
H	- NI -	03
E = Grades K-5 ES M = Grades 6-8 MS H = Grades 9-12 HS	Algorithms & Programming (AP) Computing Systems (CS) Data & Analysis (DA) Impacts of Computing (IC) Networks & the Internet (NI)	Standard Number per Concept

- **Standard** (Standard1, Standard2) outlines what students are expected to know and be able to do.

For more information about Kentucky Academic Standards, visit <https://kystandards.org/>.

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For teachers who choose to teach Computer Science Principles as an AP[®] course, this document includes Enduring Understandings from the AP[®] Computer Science Principles Course and Exam Description. For more information, visit <https://apcentral.collegeboard.org/courses/ap-computer-science-principles>.

Standards Alignment

Unit 1: The Internet

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Representing and Transmitting Information					
1: Personal Innovations	H-IC-03	Research how computational innovations that have revolutionized aspects of our culture might have evolved from a need to solve a problem.			7.1, 7.2, 7.3, 7.4
2: Sending Binary Messages	H-AP-09	Evaluate and refine computational artifacts to make them more usable and accessible using systematic testing and debugging.	H-AP-07	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.	2.1, 3.3
3: Sending Binary Messages with the Internet Simulator	H-NI-04	Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *			2.1, 2.3, 3.1, 3.3, 6.1, 6.2
4: Number Systems	H-DA-09	Evaluate the ability of models and simulations to test and support the refinement of hypotheses. *	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.	2.1, 2.3
5: Binary Numbers	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.			2.1, 2.3, 3.1
6: Sending Numbers	H-DA-09	Evaluate the ability of models and simulations to test and support the refinement of hypotheses. *			2.1, 2.3, 3.1, 6.2

7: Sending Text	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.			2.1, 2.2
Chapter 2: Inventing the Internet					
8: The Internet Is for Everyone	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.			6.1, 6.2, 7.3, 7.4
9: The Need for Addressing	H-NI-04	Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *	H-NI-01	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.	6.1, 6.2, 6.3
10: Routers and Redundancy	H-NI-04	Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *	H-NI-01	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.	3.3, 6.1, 6.2
11: Pockets and Making a Reliable Internet	H-NI-04	Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *	H-NI-01	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.	6.2
12: The Need for DNS	H-NI-01	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.	H-NI-02	Give examples to illustrate how sensitive data can be affected by viruses, malware and other attacks.	6.1, 6.2
13: HTTP and Abstraction on the Internet	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.	H-NI-01	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.	6.1, 6.2

14: Practice PT – The Internet and Society	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	H-IC-08	Debate laws and regulations that impact the development and use of software and the protection of privacy.	6.3, 7.1, 7.4
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Unit 2: Digital Information

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Digital Information					
1: Bytes and File Sizes	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *			2.1, 3.3
2: Text Compression	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *			2.1, 2.2, 3.1, 3.3, 4.2
3: Encoding B&W Images	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.	1.1, 1.2, 1.3, 2.1, 2.3, 3.1, 3.2, 3.3
4: Encoding Color Images	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *	H-CS-02	Compare levels of abstraction and interactions between application software, system software and hardware layers.	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3
5: Lossy vs. Lossless Compression	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *	H-AP-01	Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.	3.3, 7.3, 7.5

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
6: Rapid Research - Format Showdown	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *	H-IC-03	Research how computational innovations that have revolutionized aspects of our culture might have evolved from a need to solve a problem.	1.1, 1.2, 2.1, 2.2, 3.2, 3.3, 7.3, 7.5

Unit 3: Intro to Programming

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Intro to Programming					
1: The Need for Programming Languages	H-AP-07	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.			4.1, 5.2
2: The Need for Algorithms	H-AP-07	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.			4.1, 4.2, 5.4
3: Creativity in Algorithms	H-AP-07	Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.	H-AP-14	Evaluate algorithms in terms of their efficiency, correctness, and clarity. *	2.2, 4.1, 5.2
4: Using Simple Commands	H-AP-07	Create prototypes that use algorithms to solve computational problems by leveraging prior	H-AP-17	Construct solutions to problems using student-created	5.1, 5.2, 5.4

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
		student knowledge and personal interests.		components, such as procedures, modules and/or objects. *	
5: Creating Functions	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.	2.2, 5.3, 5.4
6: Functions and Top-Down Design	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.	2.2, 5.1, 5.3
7: APIs and Using Functions with Parameters	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.	2.2, 5.1, 5.3
8: Creating Functions with Parameters	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.			2.2, 5.3, 5.4
9: Looping and Random Numbers	H-AP-06	Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance and explain the benefits and drawbacks of choices made.	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.	4.1, 5.1, 5.3, 5.4
10: Practice PT - Design a Digital Scene	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as	H-AP-14	Evaluate algorithms in terms of their efficiency, correctness, and clarity. *	2.2, 4.1, 5.1, 5.3, 5.4

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
		procedures, modules, and/or objects.			

Unit 4: Big Data and Privacy

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Big Data and Privacy					
1: What is Big Data?	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	3.2, 7.2, 7.5
2: Finding Trends with Visualizations	H-DA-01	Evaluate the tradeoffs in how data elements are organized and where data is stored. *	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	3.1, 3.2
3: Check Your Assumptions	H-DA-02	Collect data using appropriate data collection tools and techniques to support a claim or to communicate information.	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	3.1, 3.2, 7.4
4: Rapid Research - Data Innovations	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	1.2, 3.2, 7.1, 7.4, 7.5
5: Identifying People with Data	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	H-IC-04	Explain the beneficial and harmful effects that laws governing data (intellectual property, privacy etc.) can have on innovation.	3.2, 3.3, 7.3

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
6: The Cost of Free	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.	H-IC-04	Explain the beneficial and harmful effects that laws governing data (intellectual property, privacy etc.) can have on innovation.	3.3, 7.3
7: Simple Encryption	H-NI-03	Recommend security measures to address various scenarios based on factors such as usability, efficiency, feasibility, and ethical impacts.	H-NI-05	Compare ways software developers protect devices and information from unauthorized access. *	1.2, 3.3, 6.3, 7.3
8: Encryption with Keys and Passwords	H-NI-03	Recommend security measures to address various scenarios based on factors such as usability, efficiency, feasibility, and ethical impacts.	H-NI-05	Compare ways software developers protect devices and information from unauthorized access. *	2.3, 3.1, 4.2, 6.3
9: Public Key Cryptography	H-NI-03	Recommend security measures to address various scenarios based on factors such as usability, efficiency, feasibility, and ethical impacts.	H-NI-05	Compare ways software developers protect devices and information from unauthorized access. *	4.2, 6.3
10: Rapid Research - Cybercrime	H-NI-03	Recommend security measures to address various scenarios based on factors such as usability, efficiency, feasibility, and ethical impacts.	H-NI-05	Compare ways software developers protect devices and information from unauthorized access. *	6.2, 6.3, 7.3

Unit 5: Building Apps

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Event-Driven Programming					
1: Introduction to Event-Driven Programming	H-AP-04	Design and iteratively develop event-driven computational artifacts for practical intent, personal expression, or to address a societal issue.			1.1, 1.2, 5.1, 5.4

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
2: Multi-Screen Apps	H-AP-04	Design and iteratively develop event-driven computational artifacts for practical intent, personal expression, or to address a societal issue.			1.1, 1.2, 5.1, 5.4
3: Building an App: Multi-Screen App	H-AP-10	Systematically design and develop programs for broad audiences by incorporating feedback from users.			1.1, 1.2, 5.1, 5.4
4: Controlling Memory with Variables	H-AP-03	Use functions, data structures or objects to simplify solutions, generalizing computational problems instead of repeated use of simple variables.			5.2, 5.4, 5.5
5: Building an App: Clicker Game	H-AP-05	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.			1.1, 1.2, 5.1, 5.2, 5.4, 5.5
6: User Input and Strings	H-AP-17	Construct solutions to problems using student-created components, such as procedures, modules and/or objects. *			5.1, 5.3
7: If-statements Unplugged	H-AP-06	Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance and explain the benefits and drawbacks of choices made.			4.1, 5.2
8: Boolean Expressions and "if" Statements	H-AP-03	Use functions, data structures or objects to simplify solutions, generalizing computational			4.1, 5.3

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
		problems instead of repeated use of simple variables.			
9: "if-else-if" and Conditional Logic	H-AP-03	Use functions, data structures or objects to simplify solutions, generalizing computational problems instead of repeated use of simple variables.			4.1, 5.1, 5.5
10: Building an App: Color Sleuth	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.			1.1, 1.2, 2.2, 4.1, 5.1, 5.2, 5.3, 5.4, 5.5
Chapter 2: Programming with Data Structures					
11: While Loops	H-AP-14	Evaluate algorithms in terms of their efficiency, correctness, and clarity. *			3.1, 4.1, 5.2, 5.4, 5.5
12: Loops and Simulations	H-AP-14	Evaluate algorithms in terms of their efficiency, correctness, and clarity. *	H-DA-09	Evaluate the ability of models and simulations to test and support the refinement of hypotheses. *	2.3, 4.1, 5.1
13: Introduction to Arrays	H-AP-15	Compare and contrast fundamental data structures and their uses. *			1.1, 5.1, 5.3, 5.5
14: Building an App: Image Scroller	H-AP-02	Use a development process in creating a computational artifact that leads to a minimum viable product followed by reflection, analysis, and iteration.			5.1, 5.2, 5.3, 5.4, 5.5
15: Processing Arrays	H-AP-13	Use and adapt classic algorithms to solve computational problems. *			1.2, 4.1, 4.2, 5.1, 5.3, 5.5

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
16: Functions with Return Values	H-AP-03	Use functions, data structures or objects to simplify solutions, generalizing computational problems instead of repeated use of simple variables.			1.1, 1.2, 2.2, 4.1, 5.2, 5.3, 5.5
17: Building an App: Canvas Painter	H-AP-04	Design and iteratively develop event-driven computational artifacts for practical intent, personal expression, or to address a societal issue.			1.2, 1.3, 2.2, 4.1, 5.1, 5.3, 5.4, 5.5

Unit 6: AP Explore PT Prep

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
1: Explore PT - Review the Task	H-IC-02	Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.			1.1, 1.2, 7.5
2: Explore PT - Make a Plan	H-IC-03	Research how computational innovations that have revolutionized aspects of our culture might have evolved from a need to solve a problem.			1.1, 1.2, 7.5
3: Explore PT - Complete the Plan (8 hours)	H-IC-04	International differences in laws and ethics have implications for computing in a global society (i.e. privacy, data, property, information, and identity). Students should be aware of intellectual property laws and be able to explain how they are used	H-IC-05	Within the context of computing, one must account for the factors of equity, security, ethics, access and privacy in the design of computational artifacts for diverse populations. Students should be able to identify potential bias in the work of others and make	1.2, 3.1, 3.2, 3.3, 7.1, 7.2, 7.3, 7.4, 7.5

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
		to protect the interests of innovators or abused for financial gain.		suggestions in order to make them more beneficial in a diverse society as well as decrease security deficits that could result in harms to culture, society or the economy.	

Unit 7: AP Create PT Prep

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
1: Create PT - Review the Task	H-AP-14	Evaluate algorithms in terms of their efficiency, correctness, and clarity. *			1.1, 1.2, 5.1
2: Create PT - Make a Plan	H-IC-05	Evaluate and design computational artifacts to maximize their benefit to society. *			1.2, 7.5
3: Create PT - Complete the Plan (12 hours)	H-AP-08	Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.			1.2, 2.2, 4.1, 5.1, 5.2, 5.3, 5.4, 5.5, 7.5

Unit 8: Post AP

Lesson	Identifier1	Standard1	Identifier2	Standard2	CSP Enduring Understandings
Chapter 1: Manipulating and Visualizing Data					
1: Introduction to Data	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	H-DA-02	Collect data using appropriate data collection tools and techniques to support a claim or to communicate information.	3.1, 3.2, 7.3
2: Good and Bad Data Visualizations	H-DA-02	Collect data using appropriate data collection tools and techniques to support a claim or to communicate information.	H-DA-09	Evaluate the ability of models and simulations to test and support the refinement of hypotheses. *	1.2, 3.1
3: Making Data Visualizations	H-DA-08	Create interactive data visualizations using software tools to help others better understand real-world phenomena.	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	1.2, 3.1
4: Discover a Data Story	H-DA-07	Create computational models that represent the relationships among different elements of data.			1.1, 1.2, 1.3, 3.1
5: Cleaning Data	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.			1.1, 3.1, 3.2, 7.1
6: Creating Summary Tables	H-DA-05	Use data analysis tools (e.g. formulas and other software data / statistical tools) to process and transform the data to make it more useful and reliable.	H-IC-05	Evaluate and design computational artifacts to maximize their benefit to society. *	1.1, 1.2, 3.1, 3.2
7: Tell a Data Story	H-DA-06	Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.	H-IC-05	Evaluate and design computational artifacts to maximize their benefit to society. *	1.2, 3.1, 7.3