

# INDIANA CORE ASSESSMENTS FOR EDUCATOR LICENSURE

## FIELD 068: COMPUTER SCIENCE

### TEST FRAMEWORK

SEPTEMBER 2020

<b>Domain</b>	<b>Range of Objectives</b>	<b>Approximate Percentage of Test Score</b>
I. Data and Analysis	0001–0003	20%
II. Computing Devices and Networks	0004–0006	20%
III. Algorithms	0007–0009	20%
IV. Programming	0010–0012	20%
V. Impacts of Computing; Instruction and Assessment	0013–0015	20%

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Data and Analysis  
Computing Devices and Networks  
Algorithms  
Programming  
Impacts of Computing; Instruction and Assessment

#### DATA AND ANALYSIS

##### **0001 Understand the collection, analysis, evaluation, and interpretation of data.**

For example:

- Apply strategies for conducting research to support learning across the curriculum.
- Apply knowledge of tools and techniques (e.g., search engines, user surveys, mobile devices, GPS, real-world data sets) for locating and collecting a variety of data sets.
- Demonstrate knowledge of tools, techniques, and processes for analyzing data and data sets.
- Apply strategies for evaluating the accuracy, appropriateness, and biases of data from electronic information sources.
- Apply strategies for interpreting data in a variety of formats (e.g., charts, tables, graphs, reports).

##### **0002 Understand the representation and presentation of data.**

For example:

- Apply knowledge of binary, decimal, and hexadecimal representations of data and conversions between them.
- Apply knowledge of how data (e.g., text, image, sound) can be represented using binary sequences.
- Demonstrate knowledge of how computer models can be used to simulate and analyze real-world systems and problems.
- Apply visual representations of data (e.g., charts, graphs, network diagrams, flowcharts) to problem situations.
- Apply knowledge of digital tools to present data for a given purpose.

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### **0003 Understand the storage, management, and manipulation of data.**

For example:

- Demonstrate knowledge of data storage systems (e.g., drives, data warehousing, cloud storage, data compression).
- Demonstrate knowledge of processes used to search, manipulate, and modify data in spreadsheets and databases (e.g., queries, filters, formulas, formatting).
- Demonstrate knowledge of types of databases and principles of database design (e.g., tables, keys, SQL), management, and administration.
- Demonstrate knowledge of issues related to data security.

### **COMPUTING DEVICES AND NETWORKS**

### **0004 Understand computing devices, their components, and basic troubleshooting strategies.**

For example:

- Demonstrate knowledge of computing and computing devices (e.g., wireless Internet, audio and video files, microcontrollers, mobile devices, smart homes) in daily life.
- Demonstrate knowledge of informatics and developing trends in computing (e.g., machine learning, robotics, cloud computing, Big Data).
- Demonstrate knowledge of components and criteria (e.g., input/output, memory, peripherals, processing speed) for evaluating a computing device for a given purpose.
- Demonstrate knowledge of the characteristics and uses of operating systems.
- Demonstrate knowledge of the relationship between hardware and software, and troubleshooting strategies for routine problems.

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**0005 Understand networks and the Internet.**

For example:

- Demonstrate knowledge of concepts related to networks and network components (e.g., types of networks, communication protocols, routers).
- Demonstrate knowledge of concepts related to the Internet (e.g., bandwidth, structure of the Internet, packet switching).
- Apply knowledge of Web site design and Web development tools (e.g., HTML, CSS, scripting languages).
- Apply knowledge of issues related to cybersecurity (e.g., data integrity, encryption, denial of service attacks).
- Apply knowledge of security principles in the design and management of computer systems and networks (e.g., assigning privileges, authentication protocols, continuity planning).

**0006 Understand concepts related to digital tools, resources, and design principles.**

For example:

- Apply knowledge of productivity software applications (e.g., word processing, spreadsheet, presentation).
- Apply knowledge of concepts related to digital information (e.g., graphics, sound, animations, multimedia).
- Apply knowledge of digital tools and resources for research, communication, and collaboration.
- Apply knowledge of digital tools for students' design, development, publication, and presentation of products (e.g., videos, podcasts, multimedia projects) to communicate curriculum concepts and facilitate learning.

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## ALGORITHMS

### **0007 Understand concepts and processes related to problem solving and algorithm development.**

For example:

- Demonstrate knowledge of choosing and using algorithms to solve real-world problems.
- Demonstrate knowledge of algorithmic problem solving (e.g., problem statement, design, implementing a solution, testing, evaluation).
- Demonstrate knowledge of using abstraction to manage program complexity.
- Apply knowledge of sequence, selection, and iteration in algorithm design.

### **0008 Understand concepts and processes related to the use of algorithms.**

For example:

- Analyze an algorithm in terms of correctness and flow of execution.
- Predict the output of algorithms.
- Demonstrate knowledge of common algorithms (e.g., finding an average, counting matches, finding a maximum or minimum).
- Demonstrate knowledge of characteristics and uses of searching and sorting algorithms.
- Demonstrate knowledge of issues related to complexity and efficiency of algorithms.

### **0009 Understand concepts and processes related to computer science and program design and development.**

For example:

- Demonstrate knowledge of computer science concepts and processes (e.g., event-driven, heuristic) in a variety of applications (e.g., developing games and mobile applications).
- Demonstrate knowledge of software development processes (e.g., spiral, waterfall, iterative).
- Demonstrate knowledge of the characteristics and uses of program development tools (e.g., IDEs, libraries, mobile device simulators, APIs).
- Demonstrate knowledge of the characteristics and features of programming languages (e.g., block-based, procedural, object-oriented).

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### PROGRAMMING

#### 0010 Understand concepts of programming.

For example:

- Demonstrate knowledge of input validation and error handling.
- Apply functions/methods for enhancing program logic and support code reuse.
- Apply knowledge of object-oriented programming concepts (e.g., abstraction, inheritance, encapsulation).
- Apply knowledge of classes, objects, instance variables, and methods in object-oriented programming.
- Apply knowledge of debugging techniques for testing, verifying, and refining programs.

#### 0011 Understand data types and variables.

For example:

- Apply knowledge of the characteristics and uses of primitive data types (e.g., integer, float, Boolean).
- Apply knowledge of the characteristics and uses of variables.
- Apply knowledge of the characteristics and uses of strings and string methods (e.g., concatenation, substrings, locating characters).
- Apply knowledge of the characteristics and uses of lists and arrays.

#### 0012 Understand characteristics and uses of operators, conditional statements, and loops.

For example:

- Apply knowledge of the characteristics and applications of operators and expressions (e.g., arithmetic, comparison, logical).
- Apply knowledge of the characteristics and applications of conditional statements (e.g., if-then, if-then-else).
- Apply knowledge of characteristics and applications of *for* statements.
- Apply knowledge of characteristics and applications of *while* statements.

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**IMPACTS OF COMPUTING; INSTRUCTION AND ASSESSMENT**

**0013 Understand digital citizenship and the responsible use of technology and information.**

For example:

- Demonstrate knowledge of the personal impacts of technology (e.g., social media, cyberbullying, health and safety).
- Demonstrate knowledge of legal and ethical issues related to technology (e.g., equity of access, security, privacy, hacking, intellectual property, copyright).

**0014 Understand the social and global impacts of computer science and technology.**

For example:

- Demonstrate knowledge of the social impact of technology (e.g., virtualization, automation, social media, mobile computing, inequity, access).
- Demonstrate knowledge of the global impact of technology on communication, careers, and economic development.

**0015 Understand effective instruction and assessment in computer science.**

For example:

- Demonstrate knowledge of state and national learning standards.
- Demonstrate knowledge of instructional strategies and adaptive technologies (e.g., talk-to-text, alt text, special characters) that meet the needs of diverse student populations.
- Demonstrate knowledge of strategies and communication methods that promote critical thinking, foster real-world problem solving, and broaden understanding of computer science concepts.
- Demonstrate knowledge of instructional strategies and activities for teaching concepts and skills related to the programming process.
- Demonstrate knowledge of instructional strategies and activities for facilitating individual and collaborative technology-based learning.
- Demonstrate knowledge of strategies for assessing student understanding and mastery of concepts and skills related to computer science.