# COMMON STATE COMPETENCIES

Upon completion of their selected pathway program, all NH CTE students will:

**CTE Professionalism and IT Essentials**

* **Terminology and Communications**
  + Use correct terminology, vocabulary and appropriate language to communicate effectively in the workplace
* **Tools and Equipment**
  + Select and safely use appropriate tools, supplies, and equipment for a specific task or set of tasks.
* **Project Management**
  + Employ effective time and project management strategies to complete work efficiently and proficiently.
* **Applied Mathematics**
  + Apply math concepts, including measurement, operations, and higher mathematics to relevant applications and specific tasks.
* **Safety**
  + Demonstrate awareness strategies to safely work in a variety of workspaces and locations.

# PATHWAY STATE COMPETENCIES

Upon completion of the Computer and Information Sciences general pathway, students will achieve competency in five areas.

Learner will be able to:

* **Algorithms and Programming**:
  + Create meaningful and efficient programs including choosing which information to use and how to process and store it, breaking apart large problems into smaller ones, recombining existing solutions, and analyzing different solutions.
* **Networks and the Internet**:
  + Apply networking concepts, using various models to implement protocols and standards when moving data. Design systems with working switching and routing "packets" to ensure data flows to the correct destination. Ensure data traffic flows through the internet effectively.
* **Computing Systems**:
  + Apply concepts of physical components and software that make up a computing system which communicate and process information in digital form, along with practices and methodology for troubleshooting issues in those systems.
* **Data and Analysis**:
  + Synthesize concepts, practices and processes of data collection, resource management, and techniques to different types of data in order to discover useful information that can communicate storytelling and to inform decision-making.
* **Cybersecurity**:
  + Prove how to detect, prevent and mitigate threats in order to secure a computing system or network in an ethical manner, and in accordance with international, federal,state, local and cyber laws and regulations.

## [General Computer Science](https://docs.google.com/document/d/1t1KQjHTStJ8TemLd-JlWIj_24nreJSPoTzG7EmRoHvY/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Algorithms and Programming | Algorithms and Programming | Program Design  Data Structures  Modularity  Algorithms | I can…   * **Explain** program design and the process to designing a program * **Utilize** data structures within a program * **Create** abstraction and modularity in a program * **Explain** and **utilize** algorithms |
| Networks and the Internet | Networks and the Internet | Tools and procedures  Network System hardware  Network Protocols | I can…   * **Use** Safety Procedure and proper tools * **Explain** network system hardware * **Explain** Systems network protocols |
| Computing Systems | Computing Systems | Hardware  Software  Troubleshooting | I can…   * **Explain** Computing System Hardware * **Explain** Computing System Software * **Apply** computing system troubleshooting techniques |
| Data and Analysis | Data and Analysis | Storing  Collecting & Visualizing  Modeling & Inferencing | I can…   * **Utilize** Storage and understand how it functions in a computer system * **Collect, Visualize and Transform** data * **Apply** Inference and models to a data set |
| Cybersecurity | Cybersecurity | Communication Cybersecurity  Technical, Legal and Ethical Issues | I can…   * **Evaluate** Network, Communication and Organization * **Recognize** Security Issues * **Examine** Legal And Ethical Issues Related To Information Technology |

## [Programming Focus](https://docs.google.com/document/d/1bu_yk5rXY22UbQZamOqDVdkC5sDlc5bthm3-KbQYVjE/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Program Development | Algorithms and Programming | Program Design  User Design  Visual Design  Documentation | I can..   * **Implement** the agile development process * **Design** an application that meets customer requirements and maintains industry protocols * **Collaborate** with others to collect feedback on a digital project they or their team made, **identify** areas for improvement, and implement changes. * **Successfully apply** algorithm codes for an application that meets customer specifications * **Debug and test** of all aspects of an application * **Document and justify** their own or their team’s computational processes when creating a program in a way that allows others to follow and understand * **Apply** the principles of UI (user interface) design to create a digital project that balances aesthetic design with practical application |
| Programming | Data Structure  Modularity  Modeling & Abstraction  Debugging | I can…   * **Write** a program code that includes common algorithms **to meet customer requirements** and maintains industry protocols * **Create** repositories and manage branches in GitHub * **Create** technical documentation with all industry-expected components\* for an application * **Build** a data structure (e.g., an array) that can be used in a program * **Create** modules to separate their computer programs into smaller parts, which can be applied in multiple programming contexts * **Evaluate** the limitations of existing models or algorithms, and **design** new models to add missing abstractions and behavior |
| Algorithms | Algorithms  Search  Sort  Simulate Process | I can…   * **Develop** algorithms implementing mathematical formulas and algorithmic strategies to **calculate** needed results from data, based on a combination of computational strategies, using functions, objects, conditionals, and arrays * **Assess** different strategies and formulas used to sort and search for data within algorithms * **Implement** formulas to represent/simulate physical forces in algorithms * **Test and debug** algorithms for accuracy using industry-expected problem-solving techniques |
| Data and Analysis | Data and Analysis | Storing  Collecting & Visualizing  Modeling & Inferencing  Data Validity | I can…   * **Develop** a simple algorithm or program that allows them to organize and represent a dataset to analyze findings, predict future outcomes, or infer trends * **Create** a computational model based on patterns observed in data and use it to predict future outcomes * **Understand and be able to advocate** for their data rights and the rights of others * **Define** AI and give real-world examples of how it has been used to extract information from data |
| System & Security | Cybersecurity  Networks and the Internet  Computing Systems | Hardware & Software  Connected Devices  Troubleshooting  Digital Connectivity  Cybersecurity | I can…   * **Program** a physical device that collects and exchanges information between its hardware and software components * **Create** a system by connecting multiple computing devices through physical or wireless connections * **Document** the steps followed to solve a problem in a way that allows others to solve a similar technical problem * **Define and model** Internet protocols and explain their importance in connecting billions of devices * **Assess** the role that people play in creating, preventing, and minimizing the impacts of cyberattacks as well as consider how they affect people and society |

## Networking Focus

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Algorithms and Programming | Algorithms and Programming  Data Analysis | Program Design  Data Structures  Modularity  Storage  Collect & Visualize Data | I can…   * Develop a program * Utilize and create Community Resources * Test and Debug to verify program operation * Apply User Design Principles to include websites and applications * Utilize Primitive data Types and strings in writing programs * Utilize basic data structures in writing programs * Utilize conditional structures in writing programs * Breakdown program in smaller, more manageable parts * Utilize iterative structures in writing programs * Perform basic mathematics in information technology * Create encryption and decryption programs * Utilize Storage and understand how it functions in a computer system * Collect, Visualize and Transform data * Apply Inference and models to a data set |
| Networks Systems | Networks and the Internet | Safety Procedures and Proper Tools  Network System Hardware  Construct Network Systems  Maintain Network Systems | I can…   * Utilize Safety Procedures * Utilize Proper Tools * Explore Routers And Switches * Investigate Wireless Networks * Troubleshoot Hardware * Practice Installation Of Hardware And Network Systems * Configure, Install, And Maintain Peripherals * Identify Network System Needs * Design And Evaluate Network Systems * Construct Network Systems * Perform Network Administration And Monitoring * Demonstrate Network Troubleshooting And Diagnostics * Demonstrate Network Maintenance |
| Internet Service | System Network Protocols  Security of Physical Layers, Software, and Network Access  Industry Standards, Practices, and Network Theory  Computer Service | I can…   * Communicate Effectively With Customers * Understand Network Protocols * Implement Network Protocols * Protecting Networks * Configuration * Event Handling |
| Computing Systems | Computing Systems | Hardware  Software  Operating Systems  Troubleshooting | I can…   * Identify basic hardware components * Install and configure Motherboard * Install and configure audio and video components * Install and configure storage and other external devices * Install and maintain printers * Evaluate, install and secure operating systems * Employ and configure windows tools * Troubleshoot common windows operating system and software * Analyze other operating systems, mobile, and cloud technologies * Compare features of laptops and tablets |
| Cybersecurity | Cybersecurity | Evaluate Network, Communication, And Organization  Cybersecurity  Technical, Legal, and Ethical Issues  Computer Forensics Concepts | I can…   * Analyze legal and ethical issues related to technology * Evaluate privacy issues related to technology * Describe the importance of customer relations * Explain the Cybersecurity lifecycle * Develop an incident response plan * Design specific plans for the protection of property, systems, and data * Explain incident and event handling functions in a system * Determine investigative objectives * Examine exploits, threats, attacks, and targets * Describe forensic response tools and methods * Perform forensic analysis and reverse engineering malware |

## 

## System Administration (Hardware) Focus

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Algorithms and Programming | Algorithms and Programming  Data and Analysis | Program Design  Data Structures  Modularity  Algorithms  Collect & Visualize Data | I can… |
| Networks and the Internet | Networks and the Internet  Cybersecurity | System Network Protocols  Industry Standards, Practices, and Network Theory  Cybersecurity  Technical, Legal, and Ethical Issues | I can… |
| Hardware Systems | Computing Systems | Hardware  Connected Devices  Troubleshooting | I can… |
| Software Systems | Software  Storage  File Management | I can… |
| Network Systems | Network System Hardware  Safety Procedures and Proper Tools | I can… |

## System Administration (Software) Focus

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Algorithms and Programming |  |  | I can… |
| Networks and the Internet |  |  | I can… |
| Hardware Systems |  |  | I can… |
| Software Systems |  |  | I can… |
| Network Systems |  |  | I can… |

## 

## [Data Science Focus](https://docs.google.com/document/d/16xeQ-d7Zu6GsBKBmKiJojMkPT73bM8A22AxnQgLxLQM/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Program Development | Algorithms and Programming | Program Design  User Design  Visual Design  Documentation | I can…   * **Explain** the rationale or purpose behind programs and digital tools commonly used. **Explain** how programs are built for a purpose * **Discuss** the basic principles of design thinking (i.e., empathy, brainstorming, prototyping, testing, iterating) * **Illustrate** the design of a program (i.e., pseudocode) * **Explain** how debugging works and the process to debug code |
| Programming | Data Structure  Modularity  Modeling & Abstraction  Debugging | I can…   * **Explain** how data structures (e.g., numbers and strings) work and how they are used to create algorithms. Describe their strengths and weaknesses * **Compare** Common programming concepts that **apply** to programming language algorithm development (sequence, selection, and Iteration) * **Compare** Common data structures and syntax terms used within languages * **Create** functions by organizing a sequence of instructions that accomplish a sub-task * **Create** a model or a simple algorithm that organizes and analyzes systematic and persistent patterns seen in everyday life |
| Data | Data and Analysis | Storing  Collecting  Data Validity | I can…   * **Save, retrieve, copy, and delete** files from a computing device * **Explain** how computers store information in bits and bytes and define what information is stored. * **Describe** how numbers, text, and media are represented in bits/bytes and stored as files. * **Assess the benefits and drawbacks** of various storage models, including cloud storage, by considering factors such as cost, speed, reliability, accessibility, privacy, and integrity. * **Collect** data using an appropriate tool and organize it. |
| Math & Statistics | Linear Functions  Plotting  Slope and Intercept  Std. Deviation  Variance  Correlation | I can…   * **Formulate** questions to clarify the problem at hand and formulate one (or more) questions that can be answered with data. * **Design and implement** a plan to collect the appropriate data to answer the statistical question. * **Summarize** data using appropriate statistics (e.g., describe or compare measures of center, spread, association). * **Select** appropriate graphical and numerical methods and use these methods to represent the data in a way that supports interpretation (e.g., dot plots, histograms, scatter plots). * **Interpret** descriptive statistics and linear models within the context of the data and the original question. * **Design** and conduct probability experiments for given authentic situations. * **Compute** probabilities, including conditional probabilities, of compound events in a uniform probability model. * **Apply** probability concepts to analyze and evaluate potential decisions and strategies |
| Visualization | Visualizing  Modeling & Inferencing | I can…   * **Collect, organize, and present** data in at least three different formats and use it to support a claim or tell a story * **Analyze** how data collection and visualization/storytelling can be shaped by human motive, perspective, and bias * **Create** a simple model that organizes patterns observed in data, charts, and/or graphs * **Make predictions** based on patterns found in data, charts, and/or graphs. * **Create** a computational model based on patterns observed in data and use it to predict future outcomes. |
| System & Security | Cybersecurity  Networks and the Internet  Computing Systems | Hardware & Software  Connected Devices  Troubleshooting  Digital Connectivity  Cybersecurity | I can…   * **Create** a system by connecting multiple computing devices through physical or wireless connections * **Document** the steps followed to solve a problem in a way that allows others to solve a similar technical problem * **Define and model** Internet protocols and explain their importance in connecting billions of devices * **Assess** the role that people play in creating, preventing, and minimizing the impacts of cyberattacks as well as consider how they affect people and society |

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## [Cybersecurity Focus](https://docs.google.com/document/d/1EtZgN40PH443Nrx-opkFthJ-6FM8ENzz0RevHqhoip4/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Algorithms and Programming | Algorithms and Programming  Data Analysis | Program Design  Data Structures  Modularity  Storage  Collect & Visualize Data | I can…   * Develop a program * Utilize and create Community Resources * Test and Debug to verify program operation * Apply User Design Principles to include websites and applications * Utilize Primitive data Types and strings in writing programs * Utilize basic data structures in writing programs * Utilize conditional structures in writing programs * Breakdown program in smaller, more manageable parts * Utilize iterative structures in writing programs * Perform basic mathematics in information technology * Create encryption and decryption programs * Utilize Storage and understand how it functions in a computer system * Collect, Visualize and Transform data * Apply Inference and models to a data set |
| Networks and the Internet | Networks and the Internet | Safety Procedures and Proper Tools  Industry Standards, Practices, and Network Theory  Network System Hardware  System Network Protocols | I can…   * Demonstrate proper safety procedures * Identify, categorize, and Employ industry standards tools * Determine ISO layers * Demonstrate the basics of network theory and concepts * Configure equipment location using next practices * Install networks * Utilize and implement network security practices and techniques * Practice network troubleshooting * Describe network architecture * Use appropriate monitoring tools * Metrics and reports from monitoring and tracking performance tools * Use appropriate resources to support configuration management * Explain the importance of implementing networking segmentation * Apply system patches and updates * Configure a switch using proper setup and features |
| Computing Systems | Computing Systems | Hardware  Software  Troubleshooting  Connected Devices | I can…   * Identify basic hardware components * Install and configure Motherboard * Install and configure audio and video components * Install and configure storage and other external devices * Install and maintain printers * Evaluate, install and secure operating systems * Employ and configure windows tools * Troubleshoot common windows operating system and software * Analyze other operating systems, mobile, and cloud technologies * Compare features of laptops and tablets |
| Cybersecurity | Cybersecurity | Evaluate Network, Communication, And Organization  Cybersecurity  Technical, Legal, and Ethical Issues  Cybersecurity Lifecycle  Computer Forensics concepts | I can…   * Analyze legal and ethical issues related to technology * Evaluate privacy issues related to technology * Describe the importance of customer relations * Explain the Cybersecurity lifecycle * Develop an incident response plan * Design specific plans for the protection of property, systems, and data * Explain incident and event handling functions in a system * Determine investigative objectives * Examine exploits, threats, attacks, and targets * Describe forensic response tools and methods * Perform forensic analysis and reverse engineering malware |

## [Game Design Focus](https://docs.google.com/document/d/1xjaOHYYgidLBndnrhURBUShPz1RCiJqC_QFqIBKP6Tk/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Foundations Of Game Design And Development | Algorithms and Programming | Fundamentals Of Production  Game Structure  Game Documentation  Industry Standard Game Mechanics | I can…   * **Explain** the Fundamentals of Production * **Explain** Game Structure * **Create** Game Documentation * **Describe** Industry Standard Game Mechanics |
| Game Design | Fundamentals Of Design  Design Levels  Design Assets And Characters  Design Custom Mechanics | I can…   * **Apply** Fundamentals of Design * **Design** Levels * **Design** Assets and Characters * **Design** Custom Mechanics |
| Programming For Digital Game Development | Logic In Game Development  Programming Language Concepts  Programming In Game Development  Develop Game Levels  Graphical User Interface (Gui) | I can…   * **Utilize** Logic In Game Development * **Apply** Programming Language Concepts * **Perform** Programming In Game Development * **Develop** Game Levels * **Utilize** Graphical User Interface (GUI) |
| Data and Analysis | Data and Analysis | Storage  Collect & Visualize Data  Modeling & Inferencing | I can…   * **Utilize** Storage and understand how it functions in a computer system * **Collect, Visualize and Transform** data * **Apply** Inference and models to a data set |
| System & Security | Cybersecurity  Networks and the Internet  Computing Systems | Legal Considerations In Game Development  Security Issues In Relation To Game Development And Design  Cybersecurity | I can…   * **Explain** Legal Considerations In Game Development * **Describe** Security Issues In Relation To Game Development And Design * **Explain** Ethics, Diversity, And Inclusion * **Use** Safety Procedure and proper tools * **Explain** network system hardware * **Explain** Cybersecurity In Terms of Game Design |

## [Web Design Focus](https://docs.google.com/document/d/1kdgaSol4MvKF3Z2qxZK2ZDVVybEb9I2x4I1MIbLaxNs/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Web Design and Development | Algorithms and Programming | History of Web Design  Layout and Design Theory  Terminology  Social Media and Web Development  E-Commerce | I can…   * **Understand** the history of web design and development * **Explain** layout and design theory * **Demonstrate** knowledge of industry terminology * **Describe** the relationship between social media and web development * **Describe** e-commerce |
| Constructing a Website | File Management  Proper Layout  Web Content  Media  Accessibility | I can…   * **Develop** a file management system * **Demonstrate** proper layout techniques * **Create** web content * **Create** and edit media for the web * **Demonstrate** knowledge of challenges associated with accessibility and usability |
| Web Development | Develop Website  Cascading Style Sheets  Web Scripting  Databases  Content Management | I can…   * **Develop** a website using hypertext markup language (html) * **Describe** concepts and use of cascading style sheets (css) * **Apply** foundations of web scripting * **Develop** databases * **Utilize** content management systems in web development |
| Publishing a Website | Web Hosting  Publishing  Maintain Content | I can…   * **Understand** fundamentals of web hosting * **Demonstrate** publishing to the web * **Maintain** web content |
| Data and Analysis | Data and Analysis | Storage  Collect & Visualize Data  Modeling & Inferencing | I can…   * **Utilize** Storage and understand how it functions in a computer system * **Collect, Visualize and Transform** data * Apply Inference and models to a data set |
| Ethical and Secure use of Information | Cybersecurity  Networks and the Internet  Computing Systems | Copyright Laws  Security Issues  Ethics  Hardware and Software | I can…   * **Describe** copyright laws in relation to web development * **Explain** security issues in relation to web development * **Apply** personal and professional ethics * **Describe** hardware and software components |

## [Robotics Focus](https://docs.google.com/document/d/15hJsq4cpZGXGDmTxgbdFmCK-onPe5IC2rOvwYix-1sY/edit?usp=sharing)

| **Program Competency** | **State Competency** | **Objectives** | **Learning Targets** |
| --- | --- | --- | --- |
| Programming | Algorithms and Programming | Program Design  Data Structures  Modularity  Algorithms | I can…   * Build and program a robot to perform a specified task. * Test the robot for any flaws in hardware or bugs in software components * Write a technical * report evaluating the system performance. * Create various engineering models to assemble a robot |
| Circuits | Computing Systems | Electricity  Circuits | I can…   * Calculate voltage, amperage, and resistance using Ohm's Law * Use a multimeter to measure voltage, amperage and resistance * Define and identify series and parallel circuits * Contrast energy sources including their ability to change to other forms of energy. * Use batteries, solar cells or generators to provide energy for the operation of small motors and other mechanical devices |
| Robot Systems | History of Robots  Components  Software | I can…   * Define and identify historical impacts of robotics and automated systems and their benefits * Discuss positive and negative impacts of robotics on the workforce * Explain how automation and robotics systems have improved the quality of life, increased production, precision, and safety in a variety of applications. * Identify the major components of a robot * Discuss the variety of functions performed by an industrial robot based on the manipulator. |
| Safety procedures | Safety hazards  Safe work practices | I can…   * Assess workplace conditions regarding safety and health * Identify potential safety issues and align with relevant safety standards to ensure a safe workplace/jobsite * Locate and understand the use of shop safety equipment. * Select appropriate personal protective equipment * Review safety and practices to be employed when working with robots |
| Data and Analysis | Data and Analysis | Storage  Collect & Visualize Data  Modeling & Inferencing | I can…   * Utilize Storage and understand how it functions in a computer system * Collect, Visualize and Transform data * Apply Inference and models to a data set |
| Networks and Security | Cybersecurity  Networks and the Internet | Security Issues  Network System hardware  Network Protocols | I can…   * Recognize Security Issues * Examine Legal And Ethical Issues Related To robotics * Use Safety Procedure and proper tools * Explain network system hardware * Explain Systems network protocols |