Student Name:_____   Date:_____

PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION
Career Cluster: Information Technology

Program Name: Computer Programming/Programmer, General   CIP: 110201   Effective August 2012
National Standard: Association of Computing Machinery Model Curriculum for K-12 Computer Science: Level 3

Competencies (statement that provides the overview and defines the instructional area) **Student will:**	Knowledge, Content and Skills (what a student needs to know and be able to do and upon which they will be assessed) **Student will:**	**NH Common Core State Standards** – Aligned • **English/Language Arts/Literacy: E** • **Mathematics: M** • **Science: S** • **Art: A**	Rating Scale -Sample Performance Assessments (Performance tasks the student needs to demonstrate in order to be rated proficient in meeting the competency)
Understand the basic principles of computer program development in order to create a foundation on which to base more complex software design.	1. Perform analysis of application requirements to develop a computer program		1 2 3 4 Example: As a new software engineer your supervisor has asked you to design a medical record system. You must create a list of all functions required to support your design. Write pseudo code or flow charts to develop algorithms to meet functional requirements. This design will be presented to the manager and the medical staff. (Cont. to #2-5)
	2. Perform program design functions in developing an application that meets specified requirements.		1 2 3 4
	3. Develop algorithms to implement program design.		1 2 3 4
	4. Write a technical description of the tasks that the software program performs (functional description) individually and as part of a team.		1 2 3 4

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PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION
Career Cluster: Information Technology

Program Name: Computer Programming/Programmer, General   CIP: 110201   Effective 8/09

National Standard: Association of Computing Machinery Model Curriculum for K-12 Computer Science

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	5. Discuss and demonstrate the Software Development Life Cycle i.e.: waterfall, spiral, agile, extreme, etc.		1 2 3 4
	6. Use software debugging tools and techniques to insure verification of program operation both individually and as part of a software development team.		1 2 3 4 Example: You are a programmer you are provided with bug ridden Source code That was written 25 years ago and has no documentation. Your team is tasked to find and correct the bugs and design a new modern Interface for it. Present the corrected operational code to your Supervisor. (Cont. to #7)
	7. Demonstrate the ability to design an intuitive software user interface that possesses a high degree of usability **AAI 5. Underlying Principles of Technology:** Explain through discussion the technological systems used within this industry.		1 2 3 4

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Career Cluster: Information Technology

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Understand the fundamentals of programming languages that are critical to the creation of methods and the concept of structured programming	8. Discuss and demonstrate the program creation process including the concepts of source code, object code, and executable code. **AAI 4. Technical and Production Skills:** Identify specific production and technical skills required for this industry.		1 2 3 4 Example: As a software engineer you have been hired by a music company to design and develop a GUI music player with internal database. Develop appropriate classes and methods for this project (i.e.: CD, song, library, player). Design class interaction and data utilization to implement the player system. Write and test the code. Present the operational program to the company supervisors. (Cont.#9-25)
	9. Demonstrate the ability to write computer programs using both compiled and interpreted programming languages.		1 2 3 4
	10. Discuss and apply fundamental concepts of programming language. (i.e.: Data types, memory models, data structures, etc.)		1 2 3 4
	11. Demonstrate and use a variety of software development tools for program implementation. **AAI 5. Underlying Principles of Technology:** Explain through discussion the technological systems used within this industry.		1 2 3 4

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National Standard: Association of Computing Machinery Model Curriculum for K-12 Computer Science

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	12. Write computer programs utilizing the structured programming paradigm.		1 2 3 4
	13. Write computer programs utilizing the object oriented programming paradigm.		1 2 3 4
	14. Write programs using modularization techniques to reduce program complexity and improve program maintainability		1 2 3 4
	15. Discuss and demonstrate the fundamental level of object oriented design principles including the use of classes and objects in the context of program design.		1 2 3 4
	16. Discuss and demonstrate the fundamental level of instantiation, encapsulation, inheritance, and polymorphism as it applies to object oriented program design.		
	17. Write a program that involves the design and implementation of a custom class.		
	18. Discuss and demonstrate the relationship between class definition and a class implementation.		1 2 3 4

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Career Cluster: Information Technology

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Understand event handling and user interaction in order to understand data flow and control.	19. Write programs that use events to cause program execution to react to the event by writing the appropriate event handler code. **AAI 4. Technical and Production Skills:** Identify specific production and technical skills required for this industry.		1 2 3 4
	20.Write programs that use a graphical user interface to provide user interaction with a program.(i.e.: MFC, AWT, HTML, CSS)		1 2 3 4
	21. Discuss and develop a good user interface design.		1 2 3 4
	22. Conduct usability testing of software.		
	23. Write programs that access external data files.		
	24. Write programs that input from and output to external devices.		1 2 3 4
	25. Discuss and demonstrate the different file formats and structures.		1 2 3 4

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Understand the basic common algorithms of computer science to show how they affect ways to solve mathematical or programming problems.	26. Write programs that sort data.		1 2 3 4 Example: Company Z has hired you to upgrade their music player to add search and sort capabilities. Add functionality to code to allow for sorting and searching. Test and debug the upgrades and present the finished product to their manager. Cont. #27
	27. Write programs that search data.		1 2 3 4
	28. Write programs to solve mathematical problems through numerical analysis concepts.		1 2 3 4 Example: You are working for a Defense contractor and you have been tasked to develop software to analyze sonar signals. Develop algorithms to calculate sound velocity through water. Implement the code and present software to the Department of the Navy for testing. (Cont. #29-30)
	29.Demonstrate and write programs that simulate physical processes (i.e.: force, geometry, physics, projectile motion)		1 2 3 4

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	30. Demonstrate general problem solving techniques to solve a variety of computational problems.		| 1 | 2 | 3 | 4 |
Understand the basic concepts of computer networks and security to reinforce knowledge of ethical computing.	31. Discuss computer security and its relationship to the computer programmer.		| 1 | 2 | 3 | 4 | Example: While working for the Department of Defense you are asked to analyze the security risks of the recently submitted sonar program. Present your findings to the Naval security task force.
	32.Explain and demonstrate principles of computer networks.(i.e.: client-server, web server, peer to peer)		| 1 | 2 | 3 | 4 | Example: You have been hired to develop a new music file structure to prevent music piracy when you exchange music file over a network. Your system must be designed to include an encrypted key, only obtainable from a verified source. Present the design to the music company. (Cont.# 33-34)
	33. Discuss the ethical issues involved in computer programming.		| 1 | 2 | 3 | 4 |

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	34. Discuss computer hacking and cracking and how it relates to the computer programmer.		1 2 3 4
Understand the fundamental concepts of entrepreneurship and how entrepreneurship influences the economy	35. Discuss and assess venture creation possibilities and identify the steps in planning the venture. **AAI 1. Planning:** Explain key elements of a long-term plan for a successful company. **AAI 2. Management:** Discuss the different forms of management and ownership within this industry. **AAI 3. Finance:** Explain the key components of financial management of a company.		1 2 3 4 Example: You have developed a portfolio of projects to which you still maintain intellectual property rights. You are seeking Start- up capital to start your own software company. Develop a business plan and that you will be presenting to SCORE for evaluation. (Cont. #36-37)
	36. Discuss the resources needed for venture startup and operation.		1 2 3 4

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	37. Discuss the options in planning the venture's future (growth, development, demise). **AAI 6. Labor Issues:** Explain the employees' and employers' rights and responsibilities in this industry. **AAI 7. Community Issues:** Discuss the ways a company can impact its community and the ways a community can impact a company.		1 2 3 4
	38. Identify and discuss the traits and behaviors of an entrepreneur (leadership, personal assessment, personal management).		1 2 3 4 Example: You are contemplating starting your own business and have scheduled to meet with a business owner to discuss and assess if you possess the personal traits that are typical characteristics of an entrepreneur.
Understand the importance of personal growth and leadership to enhance career success	39. Demonstrate personal growth, community leadership, democratic principles and social responsibility by participating in activities/events offered through student organizations.		1 2 3 4 Example: As the student president, the local chamber of commerce has asked you and your team members to speak at their annual event. You have decided a power point will be the visual aid .

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Understand the necessary employability skills in order to achieve success in today's workplace	40. **Decision-Making & Problem-Solving:** Demonstrate and apply good decision-making and problem-solving skills by outlining issues in situations/problems and determining, collecting, and organizing information needed in order to formulate a solution.		1 2 3 4 **For Example:** - create an outline - create a troubleshooting log - make class presentation - develop and test strategies or options that work - provide examples of the strategies or options tested or tried - compare and analyze pros and cons of identified strategies or options - through teamwork, arrive at a decision or determine a solution that is well suited to the task - independently arrive at a decision or determine a solution that is well suited to the task - communicate in a clear format how the solution was formed - justify or describe how and why a particular solution option was chosen

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	41. **Self –Management:** Demonstrate and apply self-management skills by adhering to regulations, being responsible, and following through on commitments.		1 2 3 4 **For Example:** - have a written test on applicable policies and procedures - assess student orientation knowledge through instructor observations and written unit test - review student handbook - adhere to regulations in school, classroom, and everyday settings - build trust by being consistent, dependable, and verbally positive with others - ask questions and listen to others - keep track of assignments and/or responsibilities - have work done on time - respond positively to constructive feedback - show respect for others and their points of view - set individual goals and document progress toward achieving those goals - take initiative to pursue learning - adapt as necessary to create a positive outcome for self and others - advocate appropriately for himself/herself

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	42. **Communication Skills:** Demonstrate and apply effective communication skills: verbal, written, visual, and listening.		1 2 3 4 **For Example:** - be given a work order that contains written instructions of a specific job and complete the work order - create a power point presentation - participate in a debate - perform mock interviews - develop a topic - include details to support a main point - use appropriate grammar and sentence structure - organize writing and/or presentation materials - use constructive feedback to improve skill - participate in discussion and conversation by listening, entering in, taking turns, responding to others' remarks, asking questions, summarizing and closing, as appropriate to the given context - use varied vocabulary for clarity and effectiveness - support his/her ideas in a public forum using the appropriate visual/audio aides - select and use the appropriate media and method(s) to communicate the subject effectively - adapt writing, speaking, and/or visual presentations effectively to a particular audience - act on or respond appropriately to verbal and non-verbal cues from the audience

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	43. **Ability to Work with Others:** Demonstrate and apply the necessary skills in order to work effectively with others. **AAI 9. Personal Work Habits**: Explain the work habits an employer looks for in an employee in this industry.		1 2 3 4 **For Example:** - role play a situation in which there is a conflict which must be resolved - compose a list of what she/he believes to be the most common problems within that profession after reviewing appropriate work ethics standards - conduct an interview with a manager and share report with classmates - demonstrate knowledge of individual strengths he/she brings to a group - demonstrate knowledge of and respect for cultural and individual differences - demonstrate beginning skills in conflict management by outlining the issues involved and others' points of view - demonstrate knowledge of the possible roles and responsibilities that individuals assume while working with others - demonstrate knowledge of group skills: listening, brainstorming, clarifying information, showing initiative, acknowledging contributions, defining group tasks, and responding positively to constructive feedback - demonstrate increasing skills in conflict management by brainstorming a variety of solutions and their possible outcomes - apply his/her individual strengths to enhance a group's performance - assume responsibilities within a group - demonstrate the use of group skills in a way that enhances a group's performance - demonstrate skills in conflict management by describing, justifying, and applying a resolution process, and reflecting on the outcome

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	44. **Information Use - Research, Analysis, Technology:** Demonstrate and apply the use of information through research, analysis, and technology. **AAI 5. Underlying Principles of Technology**: Explain through discussion the technological systems used within this industry.		1 2 3 4 **For Example:** - do a research project and develop a presentation for the class - keep a daily notebook - show use of a plan for gathering information - gather information from a variety of sources, using a variety of technologies - use sources that are current and appropriate to the topic - evaluate sources for correct and trustworthy information - document sources of information appropriately - demonstrate and apply the skills in using software applications (MS Office) - use a filing/organization system for information, such as notebook, disk, etc. - justify the use of a particular organizational system for a particular product - demonstrate effective communication skills (written, oral, listening) - effectively present a thesis, supporting evidence, and a conclusion using a variety of media

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	45. **Mathematical Concepts:** Demonstrate mathematical and computation skills as applied to real world situations.		1 2 3 4 **For Example:** - keep a log of all possible uses of mathematics noticed throughout the class/lab/worksite - compute accurately, applying addition, subtraction, multiplication, and division on real numbers, fractions, percents, and decimals - collect, interpret, organize and display relevant data for solving a mathematics problem - translate real world problems into mathematical representations - express and present mathematical ideas clearly in everyday written and oral language - express in written and oral language how mathematics connects to other contexts outside the mathematics classroom - use basic numerical concepts such as whole numbers and percentages in practical situations; make reasonable estimates of arithmetic results without a calculator; and use tables, graphs, diagrams, and charts to obtain or convey quantitative information - approach practical problems by choosing appropriately from a variety of mathematical techniques; use quantitative data to construct logical explanations for real world situations; express mathematical ideas and concepts orally and in writing; and understand the role of chance in the occurrence and prediction of events

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	46. **General Safety:** Demonstrate and apply safe practices and procedures in the workplace. **AAI 8. Health, Safety, and Environment**: Explain the health and safety laws and practices affecting the employee, the surrounding community, and the environment in this industry.			1	2	3	4	**For Example:** - develop scenarios of hazards and accidents using publications and the internet - be observed by teacher - take written quizzes/written tests - demonstrate knowledge of safety and sanitation practices and procedures - identify and report hazardous conditions and safe working procedures - use personal protective equipment and clothing
	47. **Career Development:** Demonstrate personal/career development skills by completing a career plan.			1	2	3	4	**For Example:** - complete a self-awareness inventory - develop a career portfolio - use a career software, such as Choices, to measure their aptitudes and abilities for particular careers - use available resources (college catalogs and websites) to research information about postsecondary educational opportunities - select a career in the field and outline educational and skill requirements, expected job growth, and salaries - review with teacher software printout to assess their aptitudes and abilities - make appropriate choices in pursuit of postsecondary education or training and/or direct entry into the world of work - plan a senior experiential project to review and evaluate a variety of career choices

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