

6039 Information Technology Industry Sector Overview

6040 Information Technology (IT) careers involve the design, development, support, and
 6041 management of hardware, software, multimedia, and systems integration services.
 6042 The IT industry is a dynamic and entrepreneurial working environment that has had
 6043 a revolutionary impact on the economy and society. In addition to careers in the IT
 6044 industry, IT careers are available in every sector of the economy, from Agriculture
 6045 and Natural Resources to Transportation. Employment of IT support specialists is
 6046 expected to increase faster than the average for all occupations through 2012, as
 6047 organizations continue to adopt and integrate increasingly sophisticated
 6048 technology. Employment in the Information Technology sector is expected to
 6049 increase by 18.5 percent by 2012. IT sector contains some of the fastest-growing
 6050 industries such as software publisher; Internet publishing; and Internet service
 6051 providers, Web search portals, and data processing services.

6052 Information Technology careers are divided into four pathways: Information Support
 6053 and Services is the foundation for all successful business organizations today;
 6054 Media Support and Services involves creating, designing and producing multimedia
 6055 products and services; Network Communications involves network analysis,
 6056 planning, and implementation; and Programming and Systems Development
 6057 involves the design, development, and implementation of computer systems and
 6058 software.

6059 Information Technology Sector Pathways:

- 6060 • Information Support and Services
- 6061 • Media Support and Services
- 6062 • Network Communications
- 6063 • Programming and Systems Development

6064 Information Support and Services

6065 ***Sample sequence of courses in the Information Support and Services*** 6066 ***pathway:***

<i>CTE Introductory Courses</i>	<i>CTE Concentration Courses</i>	<i>CTE Capstone Courses</i>	<i>Related Courses</i>
<ul style="list-style-type: none"> • Keyboarding • Computer Applications • Business Communications 	<ul style="list-style-type: none"> • Office Technology 	<ul style="list-style-type: none"> • Microsoft Office Specialist Certification 	<ul style="list-style-type: none"> • Word Processing • Spreadsheet • Database • Presentations

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6068**Sample of appropriate foundation and pathway standards for the Computer Applications course in the Information Support and Services pathway:**

<i>Sample appropriate foundation standards</i>
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3: Use clear research questions and suitable research methods to elicit and present evidence from primary and secondary sources.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.8: Design and publish documents by using advanced publishing software and graphic programs.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.5: Write business letters: <ul style="list-style-type: none"> a. Provide clear and purposeful information and address the intended audience appropriately. b. Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipient. c. Highlight central ideas or images. d. Follow a conventional style with page formats, fonts, and spacing that contribute to the document's readability and impact.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting): <ul style="list-style-type: none"> a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide). d. Anticipate readers' problems, mistakes, and misunderstandings.
Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4: Deliver multimedia presentations: <ul style="list-style-type: none"> a. Combine text, images, and sound and draw information from many sources. b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience's response and revise the presentation accordingly.
Career Planning and Management 3.1: Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers.
Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
<i>Sample appropriate pathway standards</i>
A1.0: Students understand the potential impact of information systems in different organizations.
A3.0: Students understand important aspects of project management.
A7.0: Students understand software applications and life-cycle phases.
A8.0: Students understand the importance of reading, writing, and comprehending documentation in a technical environment.

6069 **Sample analysis (or “unpacking”) of a standard for the Computer**
 6070 **Applications course in the Information Support and Services pathway:**

<i>Standard</i>	Information Support & Services Pathway A7.0: Students understand software applications and life-cycle phases.	
<i>Standard subcomponent</i>	Information Support & Services Pathway A 7.1: Know common industry-standard software and its applications.	
<i>Course level</i>	Introductory <input type="checkbox"/> Concentration <input type="checkbox"/> Capstone	
	Concepts	Benchmark
<i>What do students need to know? At what level?</i>	<ol style="list-style-type: none"> 1. Know the industry-standard software programs for word processing. 2. Know the industry-standard software programs for spreadsheets. 3. Know the industry-standard software programs for presentations. 4. Know the industry-standard software programs for databases. 	<ol style="list-style-type: none"> 1. Cite two word processing programs and identify their strengths and differences. 2. Cite two programs for spreadsheets and identify their strengths and differences. 3. Cite two presentation programs and identify their strengths and differences. 4. Cite two database programs and identify their strengths and differences.
	Skills	Benchmark
<i>What should students be able to do? At what level?</i>	<ol style="list-style-type: none"> 1. How to create an electronic presentation 2. How to use a word processing program 	<ol style="list-style-type: none"> 1. Able to create an electronic presentation with imported photos and graphics; various transitions 2. Able to use a word processing program to write a short report
<i>Topics/contexts What must be taught?</i>	<ol style="list-style-type: none"> 1. Basic knowledge concepts 1–4 2. How to create an electronic/multimedia presentation 3. How to use a word processing program 	

6071 **Sample performance task based on the skills and concepts:**

6072 **Standards:** This sample performance task targets the following Information
 6073 Technology sector foundation standards and Information Support and Services
 6074 (ISS) pathway standards:

<i>Standard #</i>	<i>Standard</i>
Foundation: Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4	Deliver multimedia presentations: <ol style="list-style-type: none"> a. Combine text, images, and sound and draw information from many sources. b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience’s response and revise the presentation accordingly.

Foundation: Career Planning and Management 3.1	Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: ISS A7.1	Know common industry-standard software and its applications.

6075 **Assignment:** Select and research a career that interests you [Career Planning and
6076 Management 3.1]. Using an industry-standard word processing program, write a
6077 short report (1,000 words) on the career selected and why you are interested in that
6078 career [Career Planning and Management 3.1; ISS A7.1].

6079 Prepare a ten-minute overview of your exploration of yourself and your career
6080 choice. The format will be an oral presentation using industry-standard presentation
6081 software, with a minimum of 12 slides. It must include at least one imported digital
6082 photograph, taken at school; others, including ones downloaded from the Internet,
6083 can also be used. Pictures and graphics should be included, but your slides should
6084 not be cluttered. Use a consistent theme for backgrounds and color choices to
6085 make your presentation professional in appearance [Communications 2.4 Listening
6086 and Speaking 2.4; ISS A7.1].

6087 Electronic Presentation Slides:

- 6088 1 Introduction slide; includes your name, title of presentation
6089 3–5 Slides include information about yourself (likes, dislikes, hobbies,
6090 interests)
6091 4–12 Slides with description of career selected, why you chose it,
6092 educational requirements, qualifications, advantages and
6093 disadvantages of the career, why you think you would be good at it

6094 **Performance task rubric:** Your grade will be based on the following rubric.

<i>Standard</i>	<i>Advanced</i>	<i>Proficient</i>	<i>Basic</i>	<i>Unacceptable</i>
ISS A7.1: Know common industry-standard software and its applications. (60 points)	Report is prepared in correct format using industry-standard software; 12 slides include all necessary visual, graphic, and organizational elements, plus additional slides with high levels of transitions and animation are	Report is prepared in correct format using industry-standard software; 12 slides include all necessary visual, graphic, and organizational elements. The slides have features such as background designs and	Report or slide show uses industry-standard software but is missing one to three required visual, graphic, and organizational elements. (30 points)	Report or slide show shows minimal effort or does not use industry-standard software. (10 points)

	<p>included.</p> <p>The student uses advanced features of the software to add visual appeal and interest. (60 points)</p>	<p>transitions. (50 points)</p>		
<p>Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4: Deliver multimedia presentations.</p>	<p>The slide show enhances the presentation by providing concise and interesting information; the slides have no grammatical or typographical errors.</p> <p>The presentation is up to professional standard in both appearance and delivery. (20 points)</p>	<p>The slide show enhances the presentation by providing concise and interesting information, and there are one or two grammatical or typographical errors in the slideshow. (10 points)</p>	<p>The slide show enhanced the presentation by providing information in a concise and interesting way; however, the slides had two to four grammatical or typographical errors. (5 points)</p>	<p>The slide show detracts from the presentation; it is disorganized, unprofessional, or inappropriate.</p> <p>There are more than four grammatical or typographical errors. (2 points)</p>
<p>Career Planning and Management 3.1: Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers. (20 points)</p>	<p>The report describes the career in detail, including qualifications, educational requirements, and advantages and disadvantages.</p> <p>The student links the qualifications closely to personal interests and aptitudes. Report includes interviews with people in the career area as well as traditional research. (20 points)</p>	<p>The report describes the career in detail, including qualifications, educational requirements, and advantages and disadvantages.</p> <p>The student links the qualifications to personal interests and aptitudes. (10 points)</p>	<p>The report's description of the career is minimal and does not include all items required; the student does not relate the career's qualifications to personal interests and aptitudes. (5 points)</p>	<p>Description of career is inaccurate or incomplete. (2 points)</p>

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Note: Demonstration and Application standard 11.0 is included in all the above.

6096 **Sample pathway occupations:** Information Support and Services

<i>Sample of pathway occupations organized by level of education and training required for workforce entry.</i>		
High School (diploma)	Postsecondary Training (certification and/or an AA degree)	College/University (bachelor's degree or higher)
<ul style="list-style-type: none"> • Administrative Assistant • Help Desk Support Technician • Word Processing Operator 	<ul style="list-style-type: none"> • Desktop Publisher • Information Systems Specialist • Database Administrator • Technical Writer 	<ul style="list-style-type: none"> • Software Engineer–Applications • Information Systems Architect • Information Technology Manager/Director • Chief Technology Officer • Business Teacher

6097 **Media Support and Services**

6098 **Sample sequence of courses in the Media Support and Services pathway:**

<i>CTE Introductory Courses</i>	<i>CTE Concentration Courses</i>	<i>CTE Capstone Courses</i>	<i>Related Courses</i>
<ul style="list-style-type: none"> • Computer Applications • Introduction to Business • Introduction to Desktop Publishing 	<ul style="list-style-type: none"> • Desktop Publishing • Web Design 	<ul style="list-style-type: none"> • Multimedia and Image Management • Advanced Web Design 	<ul style="list-style-type: none"> • Graphic Design

6099 **Sample of appropriate foundation and pathway standards for the Multimedia**
6100 **and Image Management course in the Media Support and Services pathway:**

<i>Sample appropriate foundation standards</i>
Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites and on the Internet).
Communications 2.4 Listening & Speaking Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations: <ol style="list-style-type: none"> a. Establish clearly the speaker's point of view on the subject of the presentation. b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement). c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
Technology 4.0: Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.
Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical

thinking, and problem-solving techniques.
Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
Technical Knowledge and Skills 10.7: Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
<i>Sample appropriate pathway standards</i>
B1.0: Students understand the effective use of tools for media production, development, and project management.
B2.0: Students understand the effective use of communication software to access and transmit information.
B3.0: Students understand the use of different types of peripherals and hardware appropriate to media and technology.

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Sample analysis (or “unpacking”) of a standard for the Multimedia and Image Management course in the Media Support and Services pathway:

<i>Standard</i>	Media Support and Services Pathway B1.0: Students understand the effective use of tools for media production, development, and project management.	
<i>Standard subcomponent</i>	Media Support and Services Pathway B1.2: Use appropriate software to design and produce professional-quality images, documents, and presentations.	
<i>Course level</i>	<input type="checkbox"/> Introductory <input type="checkbox"/> Concentration <input checked="" type="checkbox"/> Capstone	
	Concepts	Benchmark
<i>What do students need to know? At what level?</i>	<ol style="list-style-type: none"> 1. What data mapping is 2. What tools are available in mapping software 3. What purpose a data map can serve for a business 4. How businesses use data mapping programs 	<ol style="list-style-type: none"> 1. Give a basic definition of data mapping. 2. Cite three standard mapping tools. 3. Cite five purposes of a data map and give examples. 4. Cite five data mapping programs and explain how a business would use each program.
	Skills	Benchmark
<i>What should students be able to do? At what level?</i>	<ol style="list-style-type: none"> 1. Search for different types of mapping software. 2. Determine what is available on the Internet compared to software that can be installed directly on a computer. 3. Analyze findings from Internet research on various mapping software. 	<ol style="list-style-type: none"> 1. Identify three types of mapping software using at least three resources. 2. Identify at least three types of mapping software that are available on the Internet and three that can be installed directly on the computer. 3. Use research findings to compare and contrast features of the mapping software.

<i>Topics/contexts What must be taught</i>	<ol style="list-style-type: none"> 1. Basic knowledge concepts 1–4 above 2. Creating a visual display of software available 3. Comparing and contrasting features and costs of software available
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6103 **Sample performance task based on the skills and concepts:**

6104 **Standards:** This sample performance task targets the following Information
6105 Technology sector foundation standards and Media Support and Services (MSS)
6106 pathway standards:

<i>Standard #</i>	<i>Standard</i>
Foundation: Communications 2.4 Listening & Speaking Strategies and Applications (grades nine and ten) 2.6	Deliver descriptive presentations: <ol style="list-style-type: none"> a. Establish clearly the speaker's point of view on the subject of the presentation. b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement). c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
Foundation: Technical Knowledge and skills 10.7	Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: MSS B1.0	Students understand the effective use of tools for media production, development, and project management.

6107 **Assignment:** In this assignment, you will analyze mapping software used for
6108 business purposes. Working either in small groups or by yourself, complete the
6109 following steps:

6110 1. Locate and analyze various mapping software used by business [MSS B1.0].

6111 a. Use your computer and varied resources such as magazines from your
6112 classroom and library.

6113 b. List five mapping software programs available for business use.

6114 2. Determine the function and purpose of the selected programs for various
6115 applications [MSS B1.0].

6116 a. Cite the purpose each mapping software application serves and explain
6117 how each program would be used in business.

6118 b. Provide an example of each purpose (this can be accomplished by cutting
6119 pictures out of magazines and/or printing a sample from software or the
6120 Internet).

- 6121 3. Cite your findings by creating a display board or poster showing each software
6122 application and describe the tools used for your selected business using your
6123 collection of pictures.
- 6124 a. Determine appropriate pictures to be displayed.
6125 b. Provide captions explaining how each program would be used in business.
- 6126 4. Critique the tools used in each example and give a brief (three to five minutes)
6127 persuasive talk to a group about which software they should purchase for your
6128 selected business use [Communications 2.4 Listening & Speaking Strategies
6129 and Applications 2.6; Technical Knowledge and Skills 10.7].
- 6130 a. Determine the type of business that will use the software.
6131 b. Determine the contents of the persuasive talk.
6132 c. Develop presentation to a group.

6133 **Performance task rubric:** Your grade will be based on the following rubric.

<i>Standard</i>	<i>Advanced</i>	<i>Proficient</i>	<i>Basic</i>	<i>Unacceptable</i>
MSS B1.0: Understand the effective use of tools for media production, development, and project management. (70 points)	All relevant information about five sample mapping software programs is included, and all tools in each program are cited and evaluated. Mapping tools are demonstrated with professional clarity and thoroughness, using appropriate terminology, visuals, and tools applied for business use. (70 points)	Most relevant information about five sample mapping software programs and most of the tools used in each program is included. Mapping tools are demonstrated with clarity. The student is able to use common, familiar, and most newly acquired terminology correctly, and uses visuals to demonstrate tools applied for business use. (60 points)	Most relevant information about three sample mapping software programs and the basic tools used in each program is included. Mapping tools are demonstrated through visuals, including tools applied for business use, but the demonstration is incomplete or unclear. (40 points)	The assignment includes fewer than three sample mapping programs, or the tool list is either incomplete or absent. Mapping concepts demonstration is incomplete, unclear, or missing. (0 points)
Communications 2.4 Listening and Speaking	Arguments and ideas are accurate and	Arguments and ideas are mostly accurate and	Arguments and ideas are somewhat	Arguments and ideas are inaccurate and

<p>Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations:</p> <p>Establish clearly the speaker's point of view on the subject of the presentation.</p> <p>Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement).</p> <p>Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details. (15 points)</p>	<p>complete and delivered in a logical fashion; the listeners' concerns are anticipated and addressed; the speaker's position is presented in a clear and precise manner. (15 points)</p>	<p>nearly complete and delivered in a logical fashion; the listeners' concerns are anticipated and addressed; the speaker's position is presented in a clear and precise manner. (10 points)</p>	<p>accurate and complete and delivered in a logical fashion; the listeners' concerns may not be anticipated and addressed; the speaker's position is presented in a clear and precise manner. (5 points)</p>	<p>incomplete and are not delivered in a logical fashion; the listeners' concerns are not anticipated or addressed; the speaker's position is not presented in a clear and precise manner. (0 points)</p>
<p>Technical Knowledge and skills 10.7: Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities. (15 points)</p>	<p>Analysis of mapping tools, functions, and features is thorough and detailed and focuses on the business applications of the software, with specific, detailed examples.</p> <p>The analysis completely communicates the processes observed and measured. (15 points)</p>	<p>Analysis of mapping tools, functions, and features is general and focuses on the business applications of the software.</p> <p>The analysis communicates the processes observed and measured. (10 points)</p>	<p>Analysis of mapping tools, functions, and features lacks detail and focus on business applications.</p> <p>The analysis does not successfully communicate the processes observed and measured. (5 points)</p>	<p>Analysis of mapping tools, functions, and features is incomplete or missing. (0 points)</p>

6135 **Sample pathway occupations: Media Support and Services**

<i>Sample of pathway occupations organized by level of education and training required for workforce entry.</i>		
High School (diploma)	Postsecondary Training (certification and/or an AA degree)	College/University (bachelor's degree or higher)
<ul style="list-style-type: none"> • Computer Operator • Production Technician • Web Page Developer 	<ul style="list-style-type: none"> • Computer Graphic Artist • Desktop Publisher • Multimedia Specialist • Web Designer • Webmaster 	<ul style="list-style-type: none"> • Graphic Designer • Multimedia Artist/Animator • Multimedia Producer • Web Architect • Corporate Communications Manager

6136 **Network Communications**

6137 **Sample sequence of courses in the Network Communications pathway:**

<i>CTE Introductory Courses</i>	<i>CTE Concentration Courses</i>	<i>CTE Capstone Courses</i>	<i>Related Courses</i>
<ul style="list-style-type: none"> • Keyboarding • Computer Applications 	<ul style="list-style-type: none"> • Advanced Computer Operations • Network Systems I 	<ul style="list-style-type: none"> • Network Systems II 	<ul style="list-style-type: none"> • Entrepreneurship • Technical Business Communications

6138 **Sample of appropriate foundation and pathway standards for the Network Systems I course in the Network Communications pathway:**
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<i>Sample appropriate foundation standards</i>
Academics 1.1 Mathematical Reasoning (grade seven) 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information and observing patterns.
Academics 1.1 Mathematical Reasoning (grade seven) 2.2: Apply strategies and results from simpler problems to more complex problems.
Academics 1.2 Investigation and Experimentation 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Communications 2.1 Reading Comprehension (grades nine and ten) 2.5: Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting): <ol style="list-style-type: none"> Report information and convey ideas logically and correctly. Offer detailed and accurate specifications. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide). Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
Technical Knowledge and Skills 10.1: Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
<i>Sample appropriate pathway standards</i>
C1.0: Students understand how to identify and analyze the customer’s organizational network system needs and requirements.
C2.0: Students understand and use various types of networking models.
C3.0: Students understand network maintenance and user-support services.

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Sample analysis (or “unpacking”) of a standard for the Network Systems I course in the Network Communications pathway:

<i>Standard</i>	Network Communications Pathway C2.0: Students understand and use various types of networking models.	
<i>Standard sub-component</i>	Network Communications Pathway C2.1: Know the types of networks and their features and applications.	
<i>Course level</i>	<input type="checkbox"/> Introductory <input checked="" type="checkbox"/> Concentration <input type="checkbox"/> Capstone	
	Concepts	Benchmark
<i>What do students need to know? At what level?</i>	<ol style="list-style-type: none"> 1. What a computer network is 2. Types of computer networks 3. The features of the computer networks 4. The advantages and disadvantages of each of the types of networks 5. What network operating systems are available 6. The advantages and disadvantages of each of the network operating systems 	<ol style="list-style-type: none"> 1. Basic definition of computer networks 2. Identify four computer network types. 3. Identify at least three features for each type of computer network 4. Identify at least two advantages and two disadvantages for each type of network 5. Identify four network operating systems 6. List at least two advantages and two disadvantages of each of the network operating systems
	Skills	Benchmark
<i>What should students be able to do? At what level?</i>	<ol style="list-style-type: none"> 1. How to analyze findings from research on computer networks 2. How to apply findings to customer needs 3. How to share network information with customers 	<ol style="list-style-type: none"> 1. Research three computer networks and present features of each in a comparison chart. 2. Compare features of a given computer network with mock-scenario customer needs and requirements. 3. Present research findings and recommendations in a clear and concise manner to the mock-scenario customer.

<i>Topics/contexts</i> <i>What must be taught?</i>	<ol style="list-style-type: none"> 1. Basic knowledge concepts 1–6 2. Researching information both electronically and in reference materials 3. Reaching conclusions that match computer network system with the needs of the customer
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6142 **Sample performance task based on the skills and concepts:**

6143 **Standards:** This sample performance task targets the following Information
6144 Technology sector foundation standards and Network Communications (NC)
6145 pathway standards:

<i>Standard #</i>	<i>Standard</i>
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.5	Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3	Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
Foundation: Technical Knowledge and Skills 10.1	Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
Pathway: NC C2.0	Students understand and use various types of networking models.

6146 **Assignment:** You work for a technology consulting firm that provides technology
6147 assistance to area businesses for networking and telecommunication problems.
6148 ABC Company is a local business. The business has two stores. ABC Company
6149 also sends supplies nationwide to customers using a toll-free number to place their
6150 orders. The company is considering adding a web site to facilitate the ordering
6151 process for its customers. The company has hired the consulting firm you work for
6152 to provide them with information on the type of network that would best serve their
6153 needs as well as the Network Operating System that would benefit the company
6154 the most [NC C2.0].

6155 A meeting has been set up with the owners as well as the store managers,
6156 accountant, and warehouse supervisor. They would like you to make a presentation
6157 on networks and operating systems. To do so, you must:

- 6158 1. Research the various types of networks available including the features of
6159 each, the vendor for each, and the advantages and disadvantages of each
6160 [Communications 2.1 Reading Comprehension 2.5; NC C2.0].
- 6161 2. Analyze the needs of the company, given the handout your instructor has
6162 prepared. You may also interview a company representative (the instructor) to
6163 get more information or clarify any questions you may have.

- 6164 3. Prepare a PowerPoint presentation showing your recommendation to the
 6165 customer and the reasons you support that choice. Include the costs for a 15-
 6166 station network [Communications 2.2 Writing Strategies and Applications 1.3;
 6167 Technical Knowledge and Skills 10.1; NC C2.0].

6168 **Performance task rubric:** Your grade will be based on the following rubric.

<i>Standard</i>	<i>Advanced</i>	<i>Proficient</i>	<i>Basic</i>	<i>Unacceptable</i>
NC C2.1: Know the types of networks and their features and applications. (50 points)	Product analysis demonstrates extensive research of types of networks and operating systems that meet company needs, including detailed features, advantages, and disadvantages of each. (50 points)	Product analysis demonstrates adequate research of types of networks and operating systems that meet company needs, including most features, advantages, and disadvantages of each. (40 points)	Product analysis demonstrates some research of types of networks and operating systems that meet company needs, including basic features, advantages, and disadvantages of each. (30 points)	Product analysis demonstrates some research of types of networks and operating systems but does not address or consider the needs of the company. (10 points)
Communications 2.1 Reading Comprehension (grades nine and ten) 2.5: Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration. (20 points)	Product analysis and presentation demonstrate extensive research, including interview of company representative. The analysis is detailed and evaluates different products in relation to customer needs. The recommendation is thoroughly justified and includes cost and vendor information. (20 points)	Product analysis and presentation demonstrate adequate research, including interview of company representative. The analysis is basic, but evaluates different products in relation to customer needs. The recommendation is justified and includes cost and vendor information. (15 points)	Product analysis and presentation demonstrate some research. The analysis is basic and the product evaluation does not address specific needs of the company. (10 points)	Product analysis and/or presentation is inaccurate or incomplete. No recommendation is given. (5 points)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3:	Slide show conveys detailed information in a concise, persuasive manner with	Slide show conveys information in a concise manner with supporting information and	Slide show conveys information with some supporting information; the information may	Slide show information is incomplete and inaccurate and no recommendation

Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples. (20 points)	extensive supporting information and relevant examples; the recommendation is persuasive given the research. (20 points)	relevant examples; the recommendation is given with supporting reasons. (8 points)	be incomplete or inaccurate. A recommendation is given but no supporting reasons for choice. (6 points)	is given. (2 points)
Technical Knowledge and Skills10.1: Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards. (10 points)	Student uses industry-standard software to prepare detailed slide presentation with appropriate background design, slide transitions, and graphics. Detailed charts and graphs of research information are included. (10 points)	Student uses industry-standard software to prepare slide presentation with appropriate background design, slide transitions, and graphics. Charts of research information are included. (8 points)	Student uses industry-standard software to prepare slide presentation incorporating basic information from research. (6 points)	Student uses software to prepare slide presentation, but information is inaccurate and incomplete. (2 points)

6169 *Note: Demonstration and Application standard 11.0 is included in all of the above.*

6170 **Sample pathway occupations:** Network Communications

<i>Sample of pathway occupations organized by level of education and training required for workforce entry.</i>		
High School (diploma)	Postsecondary Training (certification and/or an AA degree)	College/University (bachelor's degree or higher)
<ul style="list-style-type: none"> • Network Systems Assistant • Network Support Technician 	<ul style="list-style-type: none"> • Software/Hardware Installer • Telecommunications Specialist • Network Administrator • Data Communications Specialist 	<ul style="list-style-type: none"> • Network Administrator • Computer Security Specialist • Network Engineer • Network Project Manager • Network Manager/Director

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Programming and Systems Development

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Sample sequence of courses in the Programming and Systems Development pathway:

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<i>CTE Introductory Courses</i>	<i>CTE Concentration Courses</i>	<i>CTE Capstone Courses</i>	<i>Related Courses</i>
<ul style="list-style-type: none"> • Computer Applications • Exploratory Business • Introduction to Programming 	<ul style="list-style-type: none"> • Programming and Software Development • Java Programming • Visual Basic Programming • Computer Programming 	<ul style="list-style-type: none"> • Game Programming • Advanced Programming • AP Computer Science 	<ul style="list-style-type: none"> • HTML Programming • Web Programming • Probability and Statistics

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Sample of appropriate foundation and pathway standards for the Computer Programming course in the Programming and Systems Development pathway:

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<i>Sample appropriate foundation standards</i>
Academics 1.1 Algebra I (grades eight through twelve) 5.0: Students solve multi-step problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.
Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
<i>Sample appropriate pathway standards</i>
D1.0: Students understand the strategies necessary to define and analyze systems and software requirements.
D2.0: Students understand programming languages.
D3.0: Students understand the creation and design of a software program.
D4.0: Students understand the process of testing, debugging, and maintaining programs to meet specifications.

6178 **Sample analysis (or “unpacking”) of a standard for the Computer**
 6179 **Programming course in the Programming and Systems Development**
 6180 **pathway:**

<i>Standard</i>	Programming and Systems Development Pathway D2.0: Students understand programming languages.	
<i>Standard sub-component</i>	Programming and Systems Development Pathway D2.1: Know the fundamentals of programming languages and concepts.	
<i>Course level</i>	<input type="checkbox"/> Introductory <input checked="" type="checkbox"/> Concentration <input type="checkbox"/> Capstone	
	Concepts	Benchmark/Level
<i>What do students need to know? At what level?</i>	<ol style="list-style-type: none"> 1. The definition of variables 2. Why variables differ in algebra and computer programming 3. What actions can be taken using variables 4. Identification of codes 	<ol style="list-style-type: none"> 1. Cite the basic definition of variables. 2. Cite differences between algebra and computer programming variables. 3. Cite five actions that can be taken using variables and give examples. 4. Identify three samples of code snippets.
	Skills	Benchmark
<i>What should students be able to do? At what level?</i>	<ol style="list-style-type: none"> 1. How to display variables within code 2. How to create code using variables 	<ol style="list-style-type: none"> 1. Complete simple searches using a variety of resources. 2. Write a 20-line code snippet that effectively and accurately uses three types of variables.
<i>Topics/contexts What must be taught?</i>	<ol style="list-style-type: none"> 1. Basic knowledge of concepts 1–4 above 2. How to create code using variables 	

6181 **Sample performance task based on the skills and concepts:**

6182 **Standards:** This sample performance task targets the following Information
 6183 Technology sector foundation standards and Programming and Systems
 6184 Development (PSD) pathway standards:

<i>Standard #</i>	<i>Standard</i>
Foundation: Technology 4.2	Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Foundation: Problem Solving and Critical Thinking 5.3	Use critical thinking skills to make informed decisions and solve problems.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: PSD D2.1	Students know the fundamentals of programming languages and concepts.

6185 **Assignment:** Understanding computer variables

6186 You spend weeks learning about variables—the most important fundamental you
 6187 will need to understand in algebra. Then you go to computer class and have to
 6188 learn all over again what a variable is. Although we call them the same thing, and
 6189 we give them the same names (like x and y), computer variables and algebraic
 6190 variables are not the same thing. If you don't believe this, consider the following
 6191 statement, which is perfectly legitimate if you are a computer programmer but has
 6192 no solution if you are a mathematician: $I = I + 1$. If you are a mathematician, this
 6193 statement suggests that there might be a number out there equal to one more than
 6194 itself. No such luck. But if you are a computer programmer, it means, "Start with a
 6195 certain value, and add one to it"—a perfectly legal computer instruction.

6196 To a computer programmer, a variable is a place to store a piece of information.
 6197 Just as you might store a friend's phone number in your own memory, you can
 6198 store this information in a computer's memory. Variables allow you to access your
 6199 computer's memory.

6200 For this activity, you will need beads, or marbles, or some other small objects, and
 6201 a desk organizer (one of those cabinets with little drawers for paper clips and
 6202 thumbtacks). Take the following steps:

- 6203 1. Label each drawer with a letter (X , Y , Z , etc.)
- 6204 2. The drawers represent variables. This is a reasonable comparison since—
 6205 unlike an algebraic variable—a computer variable is nothing more than "a
 6206 place to store something." Specifically, it is a place to store a value. The value
 6207 stored in each variable will be represented by the marbles. In the beginning,
 6208 each variable is empty because you haven't stored anything in it.
- 6209 3. Read the snippet of code below and talk through this piece of code as
 6210 described below with a partner [Technology 4.2]. Note that actions are in
 6211 brackets.

6212 Direction set:

<i>Code snippets</i>	<i>Explanations of code process</i>	<i>Action taken</i>
1) $X = 7$	1) The first instruction says to store seven marbles in drawer X .	Put seven marbles in drawer X .
2) $Y = 2$	2) The second instruction says to store two marbles in drawer Y .	Put two marbles in drawer Y .
3) $Z = X - Y$	3)The third instruction says to find out how many marbles are in drawer X and	Open drawer X again, and count the marbles; write this down.
	Subtract the number of marbles in drawer Y and	Open drawer Y and count the marbles; write it down.
	Put that many marbles in drawer Z	$7 - 2 = 5$; put 5 marbles in drawer Z .

4) $Y = X - 6$	The fourth instruction says to find out how many marbles are in drawer X and	Once again, count how many marbles are in drawer X; write it down.
	Subtract six from that.	Write out the calculation $7 - 6 = 1$.
	Count the marbles in drawer Y. Oh, wait a minute, this drawer already has marbles in it. We need to take them out, and put in one.	Take out all marbles in drawer Y, and put one back in.
5) $Y = Y + 1$	The last instruction says to find out how many marbles are in drawer Y and	Count the marbles in drawer Y.
	Add one. And that's how many marbles we're supposed to have in drawer Y.	Empty drawer Y; then put two marbles in.

- 6213 1. Once you have walked through this process, manually putting marbles in and
6214 taking them out, write three code snippets down and have your partner “act
6215 them out” using the resources [Problem Solving and Critical Thinking 5.3; PSD
6216 D2.1].
- 6217 2. Along with your partner, write six code snippets (using pencil and paper) as
6218 shown in the Direction Set above, including the explanation of each step in the
6219 code process and the action taken [Problem Solving and Critical Thinking 5.3;
6220 PSD D2.1].

6221 **Performance task rubric:** Your grade will be based on the following rubric.

<i>Standard</i>	<i>Advanced</i>	<i>Proficient</i>	<i>Basic</i>	<i>Unacceptable</i>
PSD D2.1: Students know the fundamentals of programming languages and concepts. (80 points)	Provides six samples of code snippets with detailed explanations of each step in the coding process and appropriate identification of the action taken. Code snippets demonstrate a high degree of understanding through visuals, including appropriate tools applied for business use. (80 points)	Provides six samples of code snippets, including adequate explanation of each step in the coding process and identification of the action taken. Code snippets demonstrate the ability to use common, familiar, and most newly acquired terminology correctly through visuals, including appropriate tools	Provide six samples of code snippets with minimal explanation of each step in the coding process and identification of the action taken. Code snippets demonstrate some capacity, through visuals including appropriate tools applied for business use, but lack completeness and clarity. (40 points)	Samples are incomplete, unclear, or entirely absent. (0 points)

		applied for business use. (65 points)		
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (10 points)	Teacher observes student accessing and using resources effectively and with ease. (10 points)	Teacher observes student being assisted with accessing and using resources by other student(s). (8 points)	Teacher observes student following partner's lead in accessing and using resources. (5 points)	Teacher observes student not accessing and using resources, (0 points)
Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems. (10 points)	Code snippets and actions are analyzed in detail, allowing the instructor to measure the quality of the process easily and accurately. (10 points)	Code snippets and actions are analyzed, but could better communicate the quality of the process. (8 points)	Code snippets and actions are analyzed, but the analyses lack detail and some are weak. (5 points)	Code snippets and action features are partially analyzed or missing. (0 points)

6222 *Note: Demonstration and Application standard 11.0 is included in all the above.*

6223 **Sample pathway occupations:** Programming and Systems Development

<i>Sample of pathway occupations organized by level of education and training required for workforce entry.</i>		
High School (diploma)	Postsecondary Training (certification and/or an AA degree)	College/University (bachelor's degree or higher)
<ul style="list-style-type: none"> • Software applications support • Programmer • Software technician 	<ul style="list-style-type: none"> • Programmer • Software documentation specialist • Software applications report 	<ul style="list-style-type: none"> • Operating systems designer • Computer software/hardware engineer • Software architect • Manager software development • Chief software architect

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