

Information Technology Troubleshooting (IMRA26)

Subject: Career Development and Career and Technical Education

Grade: 11

Expectations: 77

Breakouts: 371

Employability Skills

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. These standards may not be offered as a standalone course. These standards shall be offered together with the essential knowledge and skills for career and technical education (CTE) courses in this chapter.

(c) Introduction.

- (1) CTE instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.
- (2) The goal of the employability skills standards is to ensure that students develop essential skills for effective performance in the workplace, regardless of the occupation.
- (3) These standards are required to be addressed in their entirety as part of each CTE course based on the level of the course in a CTE program of study.
- (4) CTE courses identified as Level 1 or Level 2 courses in a CTE program of study must address the employability skills standards identified in subsection (d)(1) of this section.
- (5) CTE courses identified as Level 3 or Level 4 courses in a CTE program of study must address the employability skills standards identified in subsection (d)(2) of this section.
- (6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

Information Technology Troubleshooting

(a) Implementation.

- (1) The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.
- (2) School districts shall implement the employability skills student expectations listed in §127.15(d)(2) of this chapter (relating to Career and Technical Education Employability Skills, Adopted 2025) as an integral part of this course.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: at least one credit in a course from the Information Technology Career Cluster. Recommended prerequisites: Principles of Information Technology and Computer Maintenance/Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

- (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

Information Technology Troubleshooting (IMRA26) (03/03/2026)

- (2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry-level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services. This career cluster includes occupations ranging from software developer and programmer to cybersecurity specialist and network analyst.
- (3) The Informational Technology Troubleshooting course is about applying logic over technical components to identify and resolve problems. The course focuses on developing a methodical approach in IT troubleshooting and leveraging those skills in a workplace environment. In this course, students learn and use proven troubleshooting methods and apply those in a collaborative workplace setting. Students develop personal success skills, including time management and personal accountability measures, strategies for collaboration and teamwork, and effective written and verbal communication skills. The knowledge and skills acquired in the course enables students to use IT resources and data safely, ethically, and within legal guidelines. Students work within a service level model that helps them to interpret, clarify, and diagnose issues with hardware, software, and networking.
- (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.
- (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and Skills Statements

(0) Employability skills--Levels 3 and 4. In a CTE course identified as a Level 3 or Level 4 course in a CTE program of study, the student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

- (A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site
 - (i) demonstrate dressing appropriately for the profession
 - (ii) demonstrate speaking politely for the profession
 - (iii) demonstrate conducting oneself in a manner appropriate for the profession
 - (iv) demonstrate dressing appropriately for the work site
 - (v) demonstrate speaking politely for the work site
 - (vi) demonstrate conducting oneself in a manner appropriate for the work site
- (B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;
 - (i) analyze how teams can produce better outcomes through cooperation from members of the team
 - (ii) analyze how teams can produce better outcomes through contribution from members of the team
 - (iii) analyze how teams can produce better outcomes through collaboration from members of the team
- (C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions;
 - (i) present written technical communication in a clear manner for a variety of purposes, including explaining decisions

- (ii) present written technical communication in a concise manner for a variety of purposes, including explaining decisions
- (iii) present written technical communication in a[n] effective manner for a variety of purposes, including explaining decisions
- (iv) present written technical communication in a clear manner for a variety of audiences, including explaining decisions
- (v) present written technical communication in a concise manner for a variety of audiences, including explaining decisions
- (vi) present written technical communication in a[n] effective manner for a variety of audiences, including explaining decisions
- (vii) present written technical communication in a clear manner for a variety of purposes, including justifying decisions
- (viii) present written technical communication in a concise manner for a variety of purposes, including justifying decisions
- (ix) present written technical communication in a[n] effective manner for a variety of purposes, including justifying decisions
- (x) present written technical communication in a clear manner for a variety of audiences, including justifying decisions
- (xi) present written technical communication in a concise manner for a variety of audiences, including justifying decisions
- (xii) present written technical communication in a[n] effective manner for a variety of audiences, including justifying decisions
- (xiii) present written oral communication in a clear manner for a variety of purposes, including explaining decisions
- (xiv) present written oral communication in a concise manner for a variety of purposes, including explaining decisions
- (xv) present written oral communication in a[n] effective manner for a variety of purposes, including explaining decisions
- (xvi) present written oral communication in a clear manner for a variety of audiences, including explaining decisions
- (xvii) present written oral communication in a concise manner for a variety of audiences, including explaining decisions
- (xviii) present written oral communication in a[n] effective manner for a variety of audiences, including explaining decisions
- (xix) present written oral communication in a clear manner for a variety of purposes, including justifying decisions
- (xx) present written oral communication in a concise manner for a variety of purposes, including justifying decisions

- (xxi) present written oral communication in a[n] effective manner for a variety of purposes, including justifying decisions
 - (xxii) present written oral communication in a clear manner for a variety of audiences, including justifying decisions
 - (xxiii) present written oral communication in a concise manner for a variety of audiences, including justifying decisions
 - (xxiv) present written oral communication in a[n] effective manner for a variety of audiences, including justifying decisions
- (D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;
- (i) use time-management skills independently to prioritize tasks in a way that optimizes efficiency
 - (ii) use time-management skills independently to prioritize tasks in a way that optimizes results
 - (iii) use time-management skills independently to follow schedules in a way that optimizes efficiency
 - (iv) use time-management skills independently to follow schedules in a way that optimizes results
 - (v) use time-management skills independently tend to goal-relevant activities in a way that optimizes efficiency
 - (vi) use time-management skills independently tend to goal-relevant activities in a way that optimizes results
 - (vii) use time-management skills in groups to prioritize tasks in a way that optimizes efficiency
 - (viii) use time-management skills in groups to prioritize tasks in a way that optimizes results
 - (ix) use time-management skills in groups to follow schedules in a way that optimizes efficiency
 - (x) use time-management skills in groups to follow schedules in a way that optimizes results
 - (xi) use time-management skills in groups tend to goal-relevant activities in a way that optimizes efficiency
 - (xii) use time-management skills in groups tend to goal-relevant activities in a way that optimizes results
- (E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;
- (i) describe the importance of punctuality in reporting for duty
 - (ii) describe the importance of dependability in reporting for duty
 - (iii) describe the importance of reliability in reporting for duty
 - (iv) describe the importance of responsibility in reporting for duty
 - (v) describe the importance of punctuality in performing assigned tasks as directed
 - (vi) describe the importance of dependability in performing assigned tasks as directed
 - (vii) describe the importance of reliability in performing assigned tasks as directed
 - (viii) describe the importance of responsibility in performing assigned tasks as directed
- (F) demonstrate respect for differences in the workplace;

- (i) demonstrate respect for differences in the workplace
- (G) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;
 - (i) identify the importance of meritocracy in the workplace
 - (ii) identify the importance of a hard work ethic in the workplace
 - (iii) identify the importance of equal opportunity in the workplace
 - (iv) identify the benefits of meritocracy in the workplace
 - (v) identify the benefits of a hard work ethic in the workplace
 - (vi) identify the benefits of equal opportunity in the workplace
- (H) identify consequences relating to discrimination and harassment;
 - (i) identify consequences relating to discrimination
 - (ii) identify consequences relating to harassment
- (I) demonstrate knowledge of personal and occupational health and safety, applicable regulations, and first aid in the workplace and discuss why it is critical for employees and employers to maintain a safe work environment;
 - (i) demonstrate knowledge of personal health in the workplace
 - (ii) demonstrate knowledge of personal safety in the workplace
 - (iii) demonstrate knowledge of occupational health in the workplace
 - (iv) demonstrate knowledge of occupational safety in the workplace
 - (v) demonstrate knowledge of applicable regulations in the workplace
 - (vi) demonstrate knowledge of first aid in the workplace
 - (vii) discuss why it is critical for employees to maintain a safe work environment
 - (viii) discuss why it is critical for employers to maintain a safe work environment
- (J) compare skills and characteristics of managers and leaders in the workplace; and
 - (i) compare skills and characteristics of managers in the workplace
 - (ii) compare skills and characteristics of leaders in the workplace
- (K) identify career development opportunities in the field: (i) education and training; (ii) credentialing; (iii) internships and apprenticeships; and (iv) entrepreneurship opportunities;
 - (i) identify career development opportunities in the field: education
 - (ii) identify career development opportunities in the field: training
 - (iii) identify career development opportunities in the field: credentialing
 - (iv) identify career development opportunities in the field: internships
 - (v) identify career development opportunities in the field: apprenticeships
 - (vi) identify career development opportunities in the field: entrepreneurship opportunities

(L) demonstrate an understanding of legal and ethical responsibilities in relation to the field.

(i) demonstrate an understanding of legal responsibilities in relation to the field

(ii) demonstrate an understanding of ethical responsibilities in relation to the field

(1) The student develops and models customer-service skills. The student is expected to:

(A) identify and model the characteristics of excellent customer service

(i) identify the characteristics of excellent customer service

(ii) model the characteristics of excellent customer service

(B) list and demonstrate the steps for opening and greeting a contact

(i) list the steps for opening a contact

(ii) list the steps for greeting a contact

(iii) demonstrate the steps for opening a contact

(iv) demonstrate the steps for greeting a contact

(C) explain the benefits of using a client's name

(i) explain the benefits of using a client's name

(D) identify habits and situations to avoid when interacting with a client

(i) identify habits to avoid when interacting with a client

(ii) identify situations to avoid when interacting with a client

(E) explain the importance of keeping clients informed of status changes

(i) explain the importance of keeping clients informed of status changes

(F) list and demonstrate the steps for putting a client on hold or transferring a call

(i) list the steps for putting a client on hold or transferring a call

(ii) demonstrate the steps for putting a client on hold or transferring a call

(G) identify and demonstrate techniques and strategies for handling difficult calls and situations

(i) identify techniques for handling difficult calls

(ii) identify techniques for handling difficult situations

(iii) identify strategies for handling difficult calls

(iv) identify strategies for handling difficult situations

(v) demonstrate techniques for handling difficult calls

(vi) demonstrate techniques for handling difficult situations

(vii) demonstrate strategies for handling difficult calls

(viii) demonstrate strategies for handling difficult situations

(H) document all client communications and outcomes clearly and appropriately

- (i) document all client communications clearly
- (ii) document all client communications appropriately
- (iii) document all client outcomes clearly
- (iv) document all client outcomes appropriately

(2) The student applies procedures for various support interaction types. The student is expected to:

- (A) describe the primary responsibilities and skills of an IT support specialist and how to deliver consistent, quality service
 - (i) describe the primary responsibilities of an IT support specialist
 - (ii) describe the skills of an IT support specialist
 - (iii) describe how to deliver consistent service
 - (iv) describe how to deliver quality service
- (B) explain and demonstrate safety procedures for unpacking, handling, and repacking replacement parts
 - (i) explain safety procedures for unpacking replacement parts
 - (ii) explain safety procedures for handling replacement parts
 - (iii) explain safety procedures for repacking replacement parts
 - (iv) demonstrate safety procedures for unpacking replacement parts
 - (v) demonstrate safety procedures for handling replacement parts
 - (vi) demonstrate safety procedures for repacking replacement parts
- (C) describe when to use various support delivery methods and technologies such as in-person, email, phone, web, and remote access
 - (i) describe when to use various support delivery methods
 - (ii) describe when to use various support delivery technologies
- (D) demonstrate the use of various support delivery models, including in-person, email, phone, web, and remote access technologies, to troubleshoot an issue
 - (i) demonstrate the use of various support delivery models, including in-person technologies, to troubleshoot an issue
 - (ii) demonstrate the use of various support delivery models, including email technologies, to troubleshoot an issue
 - (iii) demonstrate the use of various support delivery models, including phone technologies, to troubleshoot an issue
 - (iv) demonstrate the use of various support delivery models, including web technologies, to troubleshoot an issue
 - (v) demonstrate the use of various support delivery models, including remote access technologies, to troubleshoot an issue

- (E) describe the purpose and value of the security management process and the IT support specialist's role in that process
 - (i) describe the purpose of the security management process
 - (ii) describe the value of the security management process
 - (iii) describe IT support specialist's role in [the security management] process
- (3) The student implements proven troubleshooting methods and strategies within the context of a service level model. The student is expected to:
 - (A) implement and explain a troubleshooting process for diagnosing issues with hardware, software, and the network
 - (i) implement a troubleshooting process for diagnosing issues with hardware
 - (ii) implement a troubleshooting process for diagnosing issues with software
 - (iii) implement a troubleshooting process for diagnosing issues with the network
 - (iv) explain a troubleshooting process for diagnosing issues with hardware
 - (v) explain a troubleshooting process for diagnosing issues with software
 - (vi) explain a troubleshooting process for diagnosing issues with the network
 - (B) explain the importance of clearly documenting progress throughout the troubleshooting process
 - (i) explain the importance of clearly documenting progress throughout the troubleshooting process
 - (C) describe activities common to help desk service level model and incident management processes
 - (i) describe activities common to help desk service level model management processes
 - (ii) describe activities common to help desk incident management processes
 - (D) interpret and clarify different types of incidents, problems, and events submitted in the help desk service model or trouble ticketing system
 - (i) interpret different types of incidents submitted in the help desk service model or trouble ticketing system
 - (ii) interpret different types of problems submitted in the help desk service model or trouble ticketing system
 - (iii) interpret different types of events submitted in the help desk service model or trouble ticketing system
 - (iv) clarify different types of incidents submitted in the help desk service model or trouble ticketing system
 - (v) clarify different types of problems submitted in the help desk service model or trouble ticketing system
 - (vi) clarify different types of events submitted in the help desk service model or trouble ticketing system
 - (E) describe an operational level agreement (OLA) and the role of the IT support specialist in an OLA
 - (i) describe an operational level agreement (OLA)
 - (ii) describe the role of the IT support specialist in an OLA
 - (F) describe what is meant by escalation and the reasons an incident may be escalated
 - (i) describe what is meant by escalation
 - (ii) describe the reasons an incident may be escalated

- (G) identify and apply relevant system updates for supported devices
 - (i) identify relevant system updates for supported devices
 - (ii) apply relevant system updates for supported devices
 - (H) describe service and support center metrics, including a service level target and the IT support specialist's role in monitoring and reviewing data related to these metrics
 - (i) describe service center metrics, including a service level target
 - (ii) describe support center metrics, including a service level target
 - (iii) describe the IT support specialist's role in monitoring data related to these metrics
 - (iv) describe the IT support specialist's role in reviewing data related to these metrics
- (4) The student describes and applies best practices for the safe, ethical, and legal use of resources and information. The student is expected to:
- (A) demonstrate and describe positive digital citizenship and acceptable use policy when using digital resources
 - (i) demonstrate positive digital citizenship when using digital resources
 - (ii) demonstrate acceptable use policy when using digital resources
 - (iii) describe positive digital citizenship when using digital resources
 - (iv) describe acceptable use policy when using digital resources
 - (B) describe best practices for creating passwords such as increasing password length and password complexity, enforcing password blacklists, resetting passwords, limiting password entry attempts, and using multi-factor authentication
 - (i) describe best practices for creating passwords
 - (C) examine, describe, and demonstrate the use of guidelines for using media, information, and applications protected by copyright
 - (i) examine the use of guidelines for using media protected by copyright
 - (ii) examine the use of guidelines for using information protected by copyright
 - (iii) examine the use of guidelines for using applications protected by copyright
 - (iv) describe the use of guidelines for using media protected by copyright
 - (v) describe the use of guidelines for using information protected by copyright
 - (vi) describe the use of guidelines for using applications protected by copyright
 - (vii) demonstrate the use of guidelines for using media protected by copyright
 - (viii) demonstrate the use of guidelines for using information protected by copyright
 - (ix) demonstrate the use of guidelines for using applications protected by copyright
 - (D) compare and explain copyright, fair use, public domain, and Creative Commons licensing
 - (i) compare copyright, fair use, public domain, and Creative Commons licensing

- (ii) explain copyright
 - (iii) explain fair use
 - (iv) explain public domain
 - (v) explain Creative Commons licensing
- (E) identify and apply licensing guidelines for software, media, and other resources
- (i) identify licensing guidelines for software
 - (ii) identify licensing guidelines for media
 - (iii) identify licensing guidelines for other resources
 - (iv) apply licensing guidelines for software
 - (v) apply licensing guidelines for media
 - (vi) apply licensing guidelines for other resources
- (F) explain the importance and uses of encryption
- (i) explain the importance of encryption
 - (ii) explain the uses of encryption
- (G) describe and demonstrate best practices for handling confidential information
- (i) describe best practices for handling confidential information
 - (ii) demonstrate best practices for handling confidential information
- (H) analyze cyber threats and social engineering vulnerabilities and discuss ways to prevent them
- (i) analyze cyber threats
 - (ii) analyze social engineering vulnerabilities
 - (iii) discuss ways to prevent [cyber threats]
 - (iv) discuss ways to prevent [social engineering vulnerabilities]
- (I) describe various types of security policies and summarize the importance of physical security and logical security measures
- (i) describe various types of security policies
 - (ii) summarize the importance of physical security measures
 - (iii) summarize the importance of logical security measures
- (J) explain the importance of reporting security compromises such as addressing prohibited content and activity
- (i) explain the importance of reporting security compromises
- (K) identify and demonstrate appropriate data destruction and disposal methods relevant to a given scenario
- (i) identify appropriate data destruction methods relevant to a given scenario
 - (ii) identify appropriate data disposal methods relevant to a given scenario

- (iii) demonstrate appropriate data destruction methods relevant to a given scenario
 - (iv) demonstrate appropriate data disposal methods relevant to a given scenario
- (5) The student applies foundational knowledge and skills for the installation, configuration, operation, and maintenance of desktops and workstations. The student is expected to:
- (A) explain the procedure used to install and configure motherboards, central processing units (CPUs), and add-on cards relevant to a given scenario such as a custom personal computer configuration to meet customer specifications
 - (i) explain the procedure used to install motherboards relevant to a given scenario
 - (ii) explain the procedure used to install central processing units (CPUs) relevant to a given scenario
 - (iii) explain the procedure used to install add-on cards relevant to a given scenario
 - (iv) explain the procedure used to configure motherboards relevant to a given scenario
 - (v) explain the procedure used to configure central processing units (CPUs) relevant to a given scenario
 - (vi) explain the procedure used to configure add-on cards relevant to a given scenario
 - (B) describe how to implement security best practices to secure a workstation, including software-based computer protection tools such as software firewalls, antivirus software, and anti-spyware
 - (i) describe how to implement security best practices to secure a workstation, including software-based computer protection tools
 - (C) demonstrate how to identify symptoms or error codes, including no power, no POST, no BOOT, and no video, that indicate device issues and explain how to troubleshoot symptoms or error codes
 - (i) demonstrate how to identify symptoms or error codes, including no power, that indicate device issues
 - (ii) demonstrate how to identify symptoms or error codes, including no POST, that indicate device issues
 - (iii) demonstrate how to identify symptoms or error codes, including no BOOT, that indicate device issues
 - (iv) demonstrate how to identify symptoms or error codes, including no video, that indicate device issues
 - (v) explain how to troubleshoot symptoms or error codes
 - (D) describe the process used to install, troubleshoot, and replace random-access memory (RAM) types and data storage
 - (i) describe the process used to install random-access memory (RAM) types
 - (ii) describe the process used to install data storage
 - (iii) describe the process used to troubleshoot random-access memory (RAM) types
 - (iv) describe the process used to troubleshoot data storage
 - (v) describe the process used to replace random-access memory (RAM) types
 - (vi) describe the process used to replace data storage
 - (E) describe how to troubleshoot, clean, repair, or replace internal components, including heat sink units and thermal paste, exhaust vents and fans, power supply units, power adapters, batteries, wireless elements, and wireless wide area network (WWAN) components

- (i) describe how to troubleshoot, clean, repair, or replace internal components, including heat sink units
 - (ii) describe how to troubleshoot, clean, repair, or replace internal components, including thermal paste
 - (iii) describe how to troubleshoot, clean, repair, or replace internal components, including exhaust vents
 - (iv) describe how to troubleshoot, clean, repair, or replace internal components, including exhaust fans
 - (v) describe how to troubleshoot clean, repair, or replace internal components, including power supply units
 - (vi) describe how to troubleshoot, clean, repair, or replace internal components, including power adapters
 - (vii) describe how to troubleshoot, clean, repair, or replace internal components, including batteries
 - (viii) describe how to troubleshoot, clean, repair, or replace internal components, including wireless elements
 - (ix) describe how to troubleshoot, clean, repair, or replace internal components, including wireless wide area network (WWAN) components
- (F) explain the importance of conducting periodic maintenance, including both physical and electronic cleaning, disk checks, routine reboots, data dumps, and testing
- (i) explain the importance of conducting periodic maintenance, including physical cleaning
 - (ii) explain the importance of conducting periodic maintenance, including electronic cleaning
 - (iii) explain the importance of conducting periodic maintenance, including disk checks
 - (iv) explain the importance of conducting periodic maintenance, including routine reboots
 - (v) explain the importance of conducting periodic maintenance, including data dumps
 - (vi) explain the importance of conducting periodic maintenance, including testing
- (G) describe and demonstrate how to prevent, detect, and remove malware using appropriate tools and methods
- (i) describe how to prevent malware using appropriate tools
 - (ii) describe how to prevent malware using appropriate methods
 - (iii) describe how to detect malware using appropriate tools
 - (iv) describe how to detect malware using appropriate methods
 - (v) describe how to remove malware using appropriate tools
 - (vi) describe how to remove malware using appropriate methods
 - (vii) demonstrate how to prevent malware using appropriate tools
 - (viii) demonstrate how to prevent malware using appropriate methods
 - (ix) demonstrate how to detect malware using appropriate tools
 - (x) demonstrate how to detect malware using appropriate methods
 - (xi) demonstrate how to remove malware using appropriate tools
 - (xii) demonstrate how to remove malware using appropriate methods

(6) The student applies foundational knowledge and skills about the installation, configuration, operation, and maintenance of operating systems (OS) and software. The student is expected to:

- (A) describe and demonstrate the use of OS features and tools relevant to given scenarios
 - (i) describe the OS features and tools relevant to given scenarios
 - (ii) describe the OS tools relevant to given scenarios
 - (iii) demonstrate the use of OS features relevant to given scenarios
 - (iv) demonstrate the use of OS tools relevant to given scenarios
 - (B) describe and demonstrate the use of OS utilities relevant to given scenarios
 - (i) describe the OS utilities relevant to given scenarios
 - (ii) demonstrate the use of OS utilities relevant to given scenarios
 - (C) execute OS command-line tools such as ipconfig, netstat, dir, nbtstat
 - (i) execute OS command-line tools
 - (D) troubleshoot and document OS problems relevant to a given scenario
 - (i) troubleshoot OS problems relevant to a given scenario
 - (ii) document OS problems relevant to a given scenario
 - (E) demonstrate how to use features and tools of various operating systems properly
 - (i) demonstrate how to use features of various operating systems properly
 - (ii) demonstrate how to use tools of various operating systems properly
 - (F) troubleshoot and document problems in various operating systems
 - (i) troubleshoot problems in various operating systems
 - (ii) document problems in various operating systems
 - (G) explain database concepts and the purpose of a database
 - (i) explain database concepts
 - (ii) explain the purpose of a database
- (7) The student installs, configures, operates, maintains, and troubleshoots issues related to peripheral devices relevant to a given scenario. The student is expected to:
- (A) explain and demonstrate how to install, configure, maintain, and troubleshoot storage devices
 - (i) explain how to install storage devices
 - (ii) explain how to configure storage devices
 - (iii) explain how to maintain storage devices
 - (iv) explain how to troubleshoot storage devices
 - (v) demonstrate how to install storage devices
 - (vi) demonstrate how to configure storage devices
 - (vii) demonstrate how to maintain storage devices

- (viii) demonstrate how to troubleshoot storage devices
- (B) explain and demonstrate how to install, configure, maintain, and troubleshoot printers, copiers, and scanners, including small office home office (SOHO) multifunction devices and printers
 - (i) explain how to install printers
 - (ii) explain how to configure printers
 - (iii) explain how to maintain printers
 - (iv) explain how to troubleshoot printers
 - (v) demonstrate how to install printers
 - (vi) demonstrate how to configure printers
 - (vii) demonstrate how to maintain printers
 - (viii) demonstrate how to troubleshoot printers
 - (ix) explain how to install copiers
 - (x) explain how to configure copiers
 - (xi) explain how to maintain copiers
 - (xii) explain how to troubleshoot copiers
 - (xiii) demonstrate how to install copiers
 - (xiv) demonstrate how to configure copiers
 - (xv) demonstrate how to maintain copiers
 - (xvi) demonstrate how to troubleshoot copiers
 - (xvii) explain how to install scanners
 - (xviii) explain how to configure scanners
 - (xix) explain how to maintain scanners
 - (xx) explain how to troubleshoot scanners
 - (xxi) demonstrate how to install scanners
 - (xxii) demonstrate how to configure scanners
 - (xxiii) demonstrate how to maintain scanners
 - (xxiv) demonstrate how to troubleshoot scanners
 - (xxv) explain how to install small office home office (SOHO) multifunction devices
 - (xxvi) explain how to configure small office home office (SOHO) multifunction devices
 - (xxvii) explain how to maintain small office home office (SOHO) multifunction devices
 - (xxviii) explain how to troubleshoot small office home office (SOHO) multifunction devices
 - (xxix) explain how to install small office home office (SOHO) multifunction printers

- (xxx) explain how to configure small office home office (SOHO) multifunction printers
 - (xxxi) explain how to maintain small office home office (SOHO) multifunction printers
 - (xxxii) explain how to troubleshoot small office home office (SOHO) multifunction printers
- (C) explain and demonstrate how to install, configure, maintain, and troubleshoot video projectors and video displays
- (i) explain how to install video projectors
 - (ii) explain how to configure video projectors
 - (iii) explain how to maintain video projectors
 - (iv) explain how to troubleshoot video projectors
 - (v) demonstrate how to install video projectors
 - (vi) demonstrate how to configure video projectors
 - (vii) demonstrate how to maintain video projectors
 - (viii) demonstrate how to troubleshoot video projectors
 - (ix) explain how to install video displays
 - (x) explain how to configure video displays
 - (xi) explain how to maintain video displays
 - (xii) explain how to troubleshoot video displays
 - (xiii) demonstrate how to install video displays
 - (xiv) demonstrate how to configure video displays
 - (xv) demonstrate how to maintain video displays
 - (xvi) demonstrate how to troubleshoot video displays
- (D) explain and demonstrate how to install, configure, maintain, and troubleshoot multimedia devices such as sound cards, speakers, microphones, and webcams
- (i) explain how to install multimedia devices
 - (ii) explain how to configure multimedia devices
 - (iii) explain how to maintain multimedia devices
 - (iv) explain how to troubleshoot multimedia devices
 - (v) demonstrate how to install multimedia devices
 - (vi) demonstrate how to configure multimedia devices
 - (vii) demonstrate how to maintain multimedia devices
 - (viii) demonstrate how to troubleshoot multimedia devices

(8) The student monitors current issues related to the installation, configuration, operation, and maintenance of laptops, tablets, and other mobile devices, including internet of things (IoT) devices. The student is expected to:

- (A) explain and demonstrate how to install and configure laptop and netbook hardware to meet customer specifications
 - (i) explain how to install laptop hardware to meet customer specifications
 - (ii) explain how to install netbook hardware to meet customer specifications
 - (iii) explain how to configure laptop hardware to meet customer specifications
 - (iv) explain how to configure netbook hardware to meet customer specifications
 - (v) demonstrate how to install laptop hardware to meet customer specifications
 - (vi) demonstrate how to install netbook hardware to meet customer specifications
 - (vii) demonstrate how to configure laptop hardware to meet customer specifications
 - (viii) demonstrate how to configure netbook hardware to meet customer specifications
- (B) explain and demonstrate how to install components within the display of a laptop
 - (i) explain how to install components within the display of a laptop
 - (ii) demonstrate how to install components within the display of a laptop
- (C) explain and demonstrate how to connect and configure accessories and ports of mobile devices
 - (i) explain how to connect accessories of mobile devices
 - (ii) explain how to connect ports of mobile devices
 - (iii) explain how to configure accessories of mobile devices
 - (iv) explain how to configure ports of mobile devices
 - (v) demonstrate how to connect accessories of mobile devices
 - (vi) demonstrate how to connect ports of mobile devices
 - (vii) demonstrate how to configure accessories of mobile devices
 - (viii) demonstrate how to configure ports of mobile devices
- (D) analyze and apply methods used to secure mobile devices
 - (i) analyze methods used to secure mobile devices
 - (ii) apply methods used to secure mobile devices
- (E) configure mobile device network connectivity and application support
 - (i) configure mobile device network connectivity
 - (ii) configure mobile device application support
- (F) demonstrate proper methods to perform mobile device synchronization such as synchronizing information to a laptop or desktop computer; and
 - (i) demonstrate proper methods to perform mobile device synchronization
- (G) explain and demonstrate how to troubleshoot issues relevant to mobile devices, OS, and applications

- (i) explain how to troubleshoot issues relevant to mobile devices
- (ii) explain how to troubleshoot issues relevant to OS [operating systems]
- (iii) explain how to troubleshoot issues relevant to applications
- (iv) demonstrate how to troubleshoot issues relevant to mobile devices
- (v) demonstrate how to troubleshoot issues relevant to OS [operating systems]
- (vi) demonstrate how to troubleshoot issues relevant to applications

(9) The student troubleshoots issues with wired and wireless networks and cloud computing resources. The student is expected to:

(A) explain and demonstrate how to install, configure, and secure a wired network

- (i) explain how to install a wired network
- (ii) explain how to configure a wired network
- (iii) explain how to secure a wired network
- (iv) demonstrate how to install a wired network
- (v) demonstrate how to configure a wired network
- (vi) demonstrate how to secure a wired network

(B) explain and demonstrate how to install, configure, and secure a wireless network

- (i) explain how to install a wireless network
- (ii) explain how to configure a wireless network
- (iii) explain how to secure a wireless network
- (iv) demonstrate how to install a wireless network
- (v) demonstrate how to configure a wireless network
- (vi) demonstrate how to secure a wireless network

(C) compare wireless security protocols and authentication methods

- (i) compare wireless security protocols
- (ii) compare wireless authentication methods

(D) analyze, describe, and troubleshoot wired and wireless network problems

- (i) analyze wired network problems
- (ii) describe wired network problems
- (iii) troubleshoot wired network problems
- (iv) analyze wireless network problems
- (v) describe wireless network problems
- (vi) troubleshoot wireless network problems

- (E) demonstrate the use of appropriate networking tools to fix network issues safely
 - (i) demonstrate the use of appropriate networking tools to fix network issues safely
- (F) explain how computing devices such as laptops and cell phones connect and share data
 - (i) explain how computing devices connect
 - (ii) explain how computing devices share data
- (G) describe the components of cloud-computing architectures and features of cloud-computing platforms
 - (i) describe the components of cloud-computing architectures
 - (ii) describe the features of cloud-computing platforms
- (H) analyze, describe, and troubleshoot cloud computing resources
 - (i) analyze cloud computing resources
 - (ii) describe cloud computing resources
 - (iii) troubleshoot cloud computing resources