**Information Technology Metrics**

**IT. 1. Carry out trouble-shooting strategies for resolving an identified end-user IT problem.**

Emerging Standard  
Lists appropriate methods or techniques to identify and resolve end-user IT problems.  
Developed Standard  
Investigates a given problem using appropriate methods or techniques, including communication and technical strategies.  
Highly Developed Standard  
Analyzes an end-user IT problem to successful resolution.

**IT. 2. Differentiate among various operating systems.**

Emerging Standard  
Describes a few commonly used operating systems.  
Developed Standard  
Summarizes several operating systems and differentiates among those systems.  
Highly Developed Standard  
Compares several operating systems on the basis of computing platforms and usability.

**IT. 3. Explain the process of authentication and authorization between end-user devices and computing network resources.**

Emerging Standard  
Identifies the processes of authentication and authorization across network resources.  
Developed Standard  
Summarizes the processes of user authentication and authorization across networks resources.  
Highly Developed Standard  
Compares several implementations of user authentication and authorization across network resources.

**IT. 4. Identify a variety of assistive or adaptive technologies and universal design considerations.**

Emerging Standard  
Lists a few assistive or adaptive technologies and universal design considerations.  
Developed Standard
Describes a variety of assistive or adaptive technologies and universal design considerations.
Highly Developed Standard
Discusses universal design and accessibility principles, and classifies assistive or adaptive technologies appropriate to their applications.

**IT. 5. Identify basic components of an end-user IT system.**

Emerging Standard
Lists some but not all components of an end-user IT system or incorrectly lists those components.
Developed Standard
Describes the basic components of an end-user IT system.
Highly Developed Standard
Diagrams the basic components of an end-user IT system.

**IT. 6. Implement a hardware and software configuration responsive to an identified scenario.**

Emerging Standard
Identifies hardware and software components for a given scenario.
Developed Standard
Implements an appropriate hardware and software configuration for a given scenario, such as configuring assistive technology on a desktop for an ADA accommodation.
Highly Developed Standard
Compares several hardware and software configurations for a given scenario and recommends the best solution.

**IT. 7. Summarize life-cycle strategies for replacement, reuse, recycling IT technology and resources.**

Emerging Standard
Lists a few strategies for replacing, reusing, and recycling IT resources.
Developed Standard
Summarizes principles of sustainable computing and lifecycle strategies for replacing, reusing, and recycling IT resources.
Highly Developed Standard
Outlines a sustainable computing and IT lifecycle plan for a given scenario.

**IT. 8. Summarize strategies to support or train users with their IT resources.**

Emerging Standard
Lists a few strategies for supporting or training end-users and their IT resources.
Developed Standard
Summarizes strategies and best practices for supporting or training end-users and their IT resources.
Highly Developed Standard
Categorizes strategies and best practices for supporting or training end-users and their IT resources for a given scenario.
IT. 9. Use a variety of practices for making end-user IT systems secure.

Emerging Standard
Summarizes a variety of practices for securing an end-user system.
Developed Standard
Uses a variety of practices to successfully secure an end-user system for a given scenario, such as strong passwords, anti-malware programs, and software firewalls.
Highly Developed Standard
Compares a variety of practices for securing end-user IT systems for a given scenario.

IT. 10. Describe the data management activities associated with the data lifecycle.

Emerging Standard
Lists some data management activities associated with the data lifecycle.
Developed Standard
Describes the relevant data management activities associated with the data lifecycle for a given scenario.
Highly Developed Standard
Explains in detail the relevant data management activities associated with the data lifecycle for a given scenario.

IT. 11. Diagram a database design based on an identified scenario.

Emerging Standard
Discuss a database design which reflects the business requirements for an identified scenario.
Developed Standard
Diagrams a database design which clearly reflects business requirements for an identified scenario.
Highly Developed Standard
Diagram a database design which clearly and logically reflects business requirements for an identified scenario and incorporates principles of good data organization.

IT. 12. Differentiate between public and private data.

Emerging Standard
Identifies public versus private data.
Developed Standard
Differentiates between public and private data, supported by examples.
Highly Developed Standard
Differentiates between public and private data, supported by examples, and discusses proper handling of each.

IT. 13. Discuss applications of data analytics.

Emerging Standard
Identifies some applications of data analytics.
Developed Standard
Discusses in detail applications of data analytics, such as informing decision making.
Highly Developed Standard
Analyzes a scenario and recommends applications of data analytics.

**IT. 14. Discuss issues relevant to dealing with very large data sets, both structured and unstructured.**

Emerging Standard
Recognizes some of the issues relevant to dealing with very large data sets.
Developed Standard
Discusses issues relevant to dealing with very large data sets, such as collection, transfer, and storage.
Highly Developed Standard
Analyzes issues relevant to dealing with very large data sets, both structured and unstructured.

**IT. 15. Identify database administration tasks.**

Emerging Standard
Identifies some of the tasks required to administer a database.
Developed Standard
Identifies most of the tasks required to administer a database, such as maintaining user accounts and performing backups.
Highly Developed Standard
Explains the tasks required to administer a database.

**IT. 16. Produce simple database queries.**

Emerging Standard
Produces a query which partially answers a question.
Developed Standard
Produces a query which provides the exact data needed to completely answer a question.
Highly Developed Standard
Produces an efficient query which provides the exact data needed to completely answer a question with professionally formatted results.

**IT. 17. Use data analytics to support decision making for a given scenario.**

Emerging Standard
Discusses how data analytics could be used to support decision making for a given scenario.
Developed Standard
Uses data analytics to identify meaningful options for decision making.
Highly Developed Standard
Uses data analytics efficiently and effectively to identify meaningful options for decision making.
IT. 18. Differentiate among a variety of technology-based sensory interactions.

Emerging Standard
Lists a variety of sensory-based input and output methods.

Developed Standard
Explains a variety of sensory-based input and output methods, such as touch screens, wearable computing, and voice interfaces.

Highly Developed Standard
Compares a variety of sensory-based input and output methods.

IT. 19. Differentiate among data types, data transfer protocols and file characteristics specific to the targeted use.

Emerging Standard
Lists data types, transfer protocols and file characteristics used in digital design.

Developed Standard
Classifies data types, transfer protocols and file characteristics according to the targeted use.

Highly Developed Standard
Uses data types, transfer protocols and file characteristics appropriate to the task.

IT. 20. Illustrate the activities of a digital media design process.

Emerging Standard
Lists the steps of a digital media design process.

Developed Standard
Illustrates the activities of a digital media design process.

Highly Developed Standard
Creates a digital design utilizing activities of a digital media design process.

IT. 21. Implement communication principles into digital media design.

Emerging Standard
Executes a digital design that partially communicates the intended message.

Developed Standard
Executes a digital design that communicates the intended message.

Highly Developed Standard
Executes a digital design that communicates the intended message and demonstrates standards appropriate to media.

IT. 22. Carry out basic computer network troubleshooting techniques.

Emerging Standard
Investigates a given networking problem without using appropriate methods or techniques.

Developed Standard
Investigates a given networking problem using appropriate methods or techniques.
Highly Developed Standard
Solves a given networking problem using appropriate methods and provides documentation.

**IT. 23. Describe the layers, protocols and components of the OSI model.**

Emerging Standard
Lists the layers, protocols or components of the OSI model inaccurately or insufficiently.
Developed Standard
Describes the layers, names the major protocols and describes the common components of the OSI model.
Highly Developed Standard
Explains the interaction of the OSI model layers in the encapsulation process.

**IT. 24. Diagram the components of an integrated IT system.**

Emerging Standard
Diagrams an integrated system insufficiently, or fails to explain the interactivity among subsystems.
Developed Standard
Diagrams an integrated system, labels subsystems and explains how they interact to achieve the objective.
Highly Developed Standard
Implements an integrated system and explains how subsystems interact.

**IT. 25. Differentiate among various computer networking models.**

Emerging Standard
Lists various network models.
Developed Standard
Differentiates among different network models, such as client-server, peer-to-peer, and cloud-based.
Highly Developed Standard
Differentiates among different network models, and identifies the model best suited for a given scenario.

**IT. 26. Differentiate among various techniques for making a computer network secure.**

Emerging Standard
Identifies a limited number of security methods.
Developed Standard
Explains methods of securing a network appropriate to various threat types, such as firewalls and access control lists.
Highly Developed Standard
Implements network security measures appropriate to threat type.

**IT. 27. Summarize the flow of data through a computer network scenario.**

Emerging Standard
Summarizes the progression of data through a typical network insufficiently or without adequate explanation. 
Developed Standard
Summarizes the progression of data through a typical network, explaining the function of each networking device in turn.
Highly Developed Standard
Summarizes the progression of data through a typical network, explaining the function of each networking device in turn, and implements a working model.

**IT. 28. Demonstrate best practices for designing end-user computing interfaces.**

Emerging Standard
Identifies best practices for designing end-user interfaces without adequate demonstration.
Developed Standard
Demonstrates best practices for designing end-user interfaces, such as Schneiderman's 8 Golden Rules of Interface Design.
Highly Developed Standard
Implements best practices when designing end-user interfaces.

**IT. 29. Demonstrate the techniques of defensive programming and secure coding.**

Emerging Standard
Lists strategies for creating secure code.
Developed Standard
Explains the techniques of defensive programming and secure code, such as input validation and avoiding buffer overflows.
Highly Developed Standard
Implements programming solutions using defensive programming and secure coding techniques.

**IT. 30. Diagram the phases of the Secure Software Development Lifecycle.**

Emerging Standard
Illustrates some, but not all the phases of the Secure Development Lifecycle accurately.
Developed Standard
Illustrates each phase of the Secure Software Development Lifecycle.
Highly Developed Standard
Outlines in detail each phase of the Secure Software Development Lifecycle.

**IT. 31. Discuss software development methodologies.**

Emerging Standard
Describes basic software development methodology terms.
Developed Standard
Explains several software development methodologies and frameworks, such as SDLC and RAD.
Highly Developed Standard
Compares software development methodologies and frameworks.

**IT. 32. Summarize the differences among various programming languages.**

Emerging Standard
Identifies a few programming languages.
Developed Standard
Explains the differences among several programming languages and categories of languages.
Highly Developed Standard
Compares strengths and weaknesses of several programming languages and categories of languages.

**IT. 33. Use a programming or a scripting language to share data across an integrated IT system.**

Emerging Standard
Summarizes how programs access and modify data across an integrated IT system.
Developed Standard
Implements programming or scripting code to access and modify data across an integrated IT system.
Highly Developed Standard
Implements a programming solution which efficiently and securely accesses and modifies data across an integrated IT system.

**IT. 34. Use a programming or a scripting language to solve a problem.**

Emerging Standard
Summarizes a solution to the problem, but fails to implement a working solution in a programming or scripting language.
Developed Standard
Implements a solution, written in a programming or scripting language to a given problem.
Highly Developed Standard
Structures the programming code in an optimal solution.

**IT. 35. Differentiate among strategies for business continuity provisioning of IT resources at the enterprise level.**

Emerging Standard
Lists some strategies for business continuity provisioning at the enterprise level.
Developed Standard
Differentiates among strategies for business continuity provisioning at the enterprise level, such as cloud-based resources and off-site backup and archiving.
Highly Developed Standard
Differentiates among strategies for business continuity provisioning at the enterprise level and attributes them to various scenarios.
IT. 36. Discuss data governance and its implications for users as well as IT professionals.

Emerging Standard
Identifies elements of data governance.
Developed Standard
Explains key elements of data governance and discusses their implications for users and IT professionals.
Highly Developed Standard
Explains key elements of data governance and differentiates among implications of different policies and practices for users and IT professionals.

IT. 37. Identify a variety of enterprise-level digital storage technologies.

Emerging Standard
Lists some enterprise-level storage technologies.
Developed Standard
Identifies a variety of enterprise-level storage technologies, such as SAN and RAID.
Highly Developed Standard
Differentiates among various enterprise-level storage technologies.

IT. 38. Implement an application of virtualization.

Emerging Standard
Discusses how virtualization could be used in a given scenario.
Developed Standard
Implements a solution using virtualization for a given scenario.
Highly Developed Standard
Implements a secure and efficient solution using virtualization for a given scenario.

IT. 39. Modify a system to improve data confidentiality or regulatory compliance.

Emerging Standard
Discusses the modifications required to implement regulatory compliance or data confidentiality in a system.
Developed Standard
Modifies a system to improve data confidentiality or regulatory compliance.
Highly Developed Standard
Modifies a system to ensure data confidentiality and regulatory compliance while maintaining efficiency and usability.

IT. 40. Summarize the implications of various cloud computing models.

Emerging Standard
Lists various cloud computing models.
Developed Standard
Summarizes the implications of various cloud computing models, such as private, public and hybrid.

Highly Developed Standard
Summarizes the implications of various cloud computing models and classifies the models according to use.

**IT. 41. Summarize the security implications and risks for distributed IT systems.**

Emerging Standard
Recognizes some of the security issues and risks in a distributed IT system.

Developed Standard
Summarizes the security issues and risks in a distributed IT system, and discuss their implications.

Highly Developed Standard
Analyzes the security issues and risks in a distributed IT system, and discusses their implications and mitigation strategies.

**IT. 42. Use communication, negotiation, and collaboration skills as a member of a diverse team.**

Emerging Standard
Uses communication, negotiation, and collaboration skills at a subpar level within a diverse team.

Developed Standard
Uses communication, negotiation, and collaboration skills as a member of a diverse team.

Highly Developed Standard
Analyzes interpersonal interactions to improve collaboration within a diverse team.

**IT. 43. Describe the attitudes, knowledge and abilities associated with quality customer service.**

Emerging Standard
Lists some of the attitudes, knowledge and abilities associated with quality customer service.

Developed Standard
Describes the attitudes, knowledge and abilities associated with quality customer service.

Highly Developed Standard
Exemplifies the attitudes, knowledge and abilities associated with quality customer service.

**IT. 44. Produce technical documentation responsive to an identified computing scenario**

Emerging Standard
Produces incomplete documentation, or documentation that does not conform to the format and syntax required for the identified scenario.

Developed Standard
Produces complete documentation that conforms to the format and syntax required for the identified scenario.

Highly Developed Standard
Creates comprehensive documentation that conforms to the format and syntax required for the identified scenario and contributes to a collection of documentation.
IT. 45. Use documentation or a knowledge base to resolve a technical challenge in an identified computing scenario.

Emerging Standard
Locates information to resolve a technical challenge in the identified scenario.
Developed Standard
Uses documentation or information from a knowledge base to resolve a technical challenge in the identified scenario.
Highly Developed Standard
Edits to improve documentation or knowledge base information to resolve a technical challenge in the identified scenario.

IT. 46. Discuss significant trends and emerging technologies and their impact on global society.

Emerging Standard
Recognizes significant trends and emerging technologies.
Developed Standard
Discusses significant trends and emerging technologies and their impact on global society, such as diversity in the IT workplace, and the digital divide.
Highly Developed Standard
Analyzes significant trends and emerging technologies and their impact on global society.

IT. 47. Demonstrate professional behavior in response to an ethically-challenging scenario in computing.

Emerging Standard
Recognizes that choices in behavior exist in the face of ethical computing challenges.
Developed Standard
Demonstrates professional behavior in response to an ethically-challenging scenario in computing.
Highly Developed Standard
Uses professional behavior in ethically-challenging computing situations.

IT. 48. Summarize the tenets of ethics and professional behavior promoted by international computing societies.

Emerging Standard
Names some of the tenets of ethics and professional behavior promoted by international computing societies.
Developed Standard
Summarizes the tenets of ethics and professional behavior promoted by international computing societies, such as ACM, AITP, the British Computer Society, and the Chinese Computing Federation.
Highly Developed Standard
Analyzes the tenets of ethics and professional behavior promoted by international computing societies.
IT. 49. Describe IT procurement processes for goods and services.

Emerging Standard
Recalls limited aspects of IT procurement processes for goods and services.
Developed Standard
Describes IT procurement processes for goods and services, such as software licenses, maintenance contracts, product research and market analysis.
Highly Developed Standard
Illustrates IT procurement processes for goods and services.

IT. 50. Summarize the role of IT in supporting the mission and goals of an organization.

Emerging Standard
Recognizes the role of IT in supporting the mission and goals of an organization.
Developed Standard
Summarizes the role of IT in supporting the mission and goals of an organization.
Highly Developed Standard
Illustrates with examples the role of IT in supporting the mission and goals of an organization.