

CoLAB IT Pathways			
Cross-Cutting KSAs for Curriculum Alignment			
KSA Description	Knowledge, Skill, or Ability?	Bloom's Taxonomy Level?	Cross-Cutting
Differentiate common data typologies, including structured vs. unstructured, numeric vs. text, root vs. derived.	Knowledge	3	Generalist 1b, Data Analytics 1d
Explain and demonstrate how differences in data and desired outcomes impact the appropriateness of data analysis techniques (e.g., descriptive vs. diagnostic vs. predictive vs. statistical).	Knowledge	2	Generalist 1e, Data Analytics 5c, Machine Learning 1b
Demonstrate knowledge of probability and standard statistical distributions.	Knowledge	1	Generalist 2a, Data Analytics 5a
Demonstrate and explain the role and importance of model validation and accuracy metrics in analytics projects, hypothesis testing, and information retrieval.	Knowledge	2	Generalist 2c, Data Analytics 5d
Perform data manipulation using appropriate tools and software.	Skill	3	Generalist 3a, Data Analytics 4c, Machine Learning 4f
Create and edit simple data structures and storage.	Skill	2	Generalist 3b, Data Analytics 4d
Explain the role of data visualization in discovery, communication, and decision-making.	Knowledge	3	Generalist 4a, Data Analytics 6a, Machine Learning 3a
Evaluate data visualization options for proper application in various situations.	Ability	4	Generalist 4b, Data Analytics 6c, Machine Learning 3b
Create effective static and interactive data visualizations or storytelling that employ analytics and visualization software and strategies for various audiences.	Skill	3	Generalist 4c, Data Analytics 6e, Machine Learning 3c
Visualize data using various types of displays including tables, dashboards, graphs, maps, and trees.	Skill	3	Generalist 4d, Data Analytics 6d, Machine Learning 3d
Distinguish between advanced visualizations and explain the advantages of each.	Knowledge	3	Generalist 4e, Machine Learning 3e
Discuss techniques for creating advanced data visualizations.	Knowledge	3	Generalist 4f, Machine Learning 3f
Apply the principles of color, composition, and hierarchy to design.	Skill	3	Generalist 4g, Machine Learning 3g
Properly define a problem in context, use appropriate data, and deliver a compelling visualization to explain or answer a question.	Ability	3	Generalist 4h, Data Analytics 6f, Machine learning 3h
Understanding of ADA/508 compliance for accessibility.	Knowledge	1	Generalist 4i, Machine Learning 3i
Identify how global legal, policy and/or ethical constraints might impact data analyses.	Knowledge	2	Generalist 5a, Data Analytics 8a, Machine Learning 5a
Identify the established legal, ethical and privacy issues in cybersecurity facing organizations.	Knowledge	2	Generalist 5b, Data Analytics 8b, Machine Learning 5b, Cybersecurity Specialist 4b, Cybersecurity Technologist 9b, Data Management 3e
Explain how ethical, compliance, and legal issues should/must be considered in data driven decision making.	Knowledge	1	Generalist 5c, Data Analytics 8c, Machine Learning 5c
Explain the importance of personal privacy issues related to the collection and usage of data.	Knowledge	2	Generalist 5d, Data Analytics 8i, Machine Learning 5g
Explain the important issues around data governance.	Knowledge	2	Generalist 5e, Data Analytics 1b
Explain individual and data bias and the implications each has in data analysis.	Knowledge	3	Data Analytics 5f, Machine Learning 5k, Data Management 3j
Describe the implications of data architecture on data processing.	Knowledge	2	Data Analytics 2d, Data Management 1n
Explain core statistical inference concepts (for example, deriving relevant hypotheses, evaluating the hypotheses, and prediction with uncertainty).	Knowledge	2	Data Analytics 5b, Machine Learning 1a

Explain core probability concepts (e.g., random variables, key distributions, conditional probability, Bayes theorem).	Knowledge	2	Data Analytics 5e, Machine Learning 1c
Leverage the appropriate sampling methodologies.	Skill	4	Data Analytics 5j, Machine Learning 4g
Discuss the importance of provenance, transparency, and explainability in data analysis and the ability to build trust.	Knowledge	2	Data Analytics 8d, Machine Learning 5f
Explain the limitations and potential unintended effects of data analysis when such algorithms encounter new scenarios.	Knowledge	2	Data Analytics 8j, Machine Learning 5i
Recognize potential societal impacts of using machine learning.	Knowledge	2	Machine Learning 5j, Cybersecurity Technologist 9j
Explain DNS traffic.	Knowledge	2	Cybersecurity Specialist 10a, Cybersecurity Technologist 10a, Networking 3a
Understand OSI model and how it applies to an example.	Knowledge	2	Cybersecurity Specialist 10b, Cybersecurity Technologist 10b, Networking 3b
Identify the layers of the OSI Model.	Knowledge	2	Cybersecurity Specialist 10c, Cybersecurity Technologist 10c, Networking 3c
Summarize the responsibilities of each layer of the OSI Model.	Knowledge	2	Cybersecurity Specialist 10d, Cybersecurity Technologist 10d, Networking 3d
Explain how the OSI Model is applied to Networking.	Knowledge	3	Cybersecurity Specialist 10e, Cybersecurity Technologist 10e, Networking 3e
Configure IPv4 classful subnets.	Skill	1	Cybersecurity Specialist 10f, Cybersecurity Technologist 10f, Networking 3f
Compare public IP addresses and Private IP addresses.	Knowledge	2	Cybersecurity Specialist 10g, Cybersecurity Technologist 10g, Networking 3g
Identify IPv4 address network ID (Class A, Class B, Class C).	Knowledge	2	Cybersecurity Specialist 10h, Cybersecurity Technologist 10h, Networking 3h
Interpret classless network ID (CIDR block notation).	Knowledge	2	Cybersecurity Specialist 10i, Cybersecurity Technologist 10i, Networking 3i
Explain domain naming conventions (UNC path, FQDN, host name).	Knowledge	3	Cybersecurity Specialist 10j, Cybersecurity Technologist 10j, Networking 3j
Compare Network Address Translation and Port Address Translation (NAT vs PAT).	Knowledge	2	Cybersecurity Specialist 10k, Cybersecurity Technologist 10k, Networking 3k
Draw network diagram.	Skill	3	Cybersecurity Specialist 10l, Cybersecurity Technologist 10l, Networking 3l
Analyze the output from networking utilities (e.g. Netstat, Tracert, Traceroute, Ping IPConfig, IFConfig).	Ability	3	Cybersecurity Specialist 10m, Cybersecurity Technologist 10m, Networking 3m
Discuss network software integration (client software (e.g. Windows 10 or Ubuntu) and server software).	Ability	3	Cybersecurity Specialist 10n, Cybersecurity Technologist 10n, Networking 3n
Discuss network hardware integration (workstations, desktop, mobile devices).	Knowledge	2	Cybersecurity Specialist 10o, Cybersecurity Technologist 10o, Networking 3o
Communicate best practices for troubleshooting networking issues (layers 1-2 at HS level) (7-step model).	Knowledge	3	Cybersecurity Specialist 10p, Cybersecurity Technologist 10p, Networking 3p
Install and maintain operating systems (OSs).	Ability	2	Cybersecurity Specialist 1a, Cybersecurity Technologist 1a
Understand how to manage systems at an enterprise level.	Knowledge	2	Cybersecurity Specialist 1b, Cybersecurity Technologist 1d
Ability to install and configure software.	Ability	3	Cybersecurity Specialist 1c, Cybersecurity Technologist 1e
Install and configure hardware.	Ability	3	Cybersecurity Specialist 1d, Cybersecurity Technologist 1f

Identify and describe basic file types and demonstrate fundamental file management.	Skill	2	Cybersecurity Specialist 1e, Cybersecurity Technologist 1g
Apply networking fundamentals to infrastructure systems.	Skill	3	Cybersecurity Specialist 1f, Cybersecurity Technologist 6a
Identify trending technologies, their fundamental architecture, and their value in the marketplace.	Knowledge	2	Cybersecurity Specialist 1g, Cybersecurity Technologist 1i
Explain the fundamentals of delivering information and applications using web architecture.	Knowledge	2	Cybersecurity Specialist 1h, Cybersecurity Technologist 1j
Explain and describe data encoding basics.	Knowledge	2	Cybersecurity Specialist 1i, Cybersecurity Technologist 1k
Examine and employ principles of cybersecurity.	Ability	2	Cybersecurity Specialist 2a, Cybersecurity Technologist 2a
Explain the need for confidentiality, integrity, and availability (CIA) of information.	Knowledge	1	Cybersecurity Specialist 2b, Cybersecurity Technologist 2b1
Explain data security in terms of authentication, authorization, access and auditing.	Knowledge	3	Cybersecurity Specialist 2c, Cybersecurity Technologist 2b3, Networking 4g, Software development 1l
Describe major threats to computer systems (e.g., insider threats, viruses, worms, spyware, ransomware, spoofing, hacking, social engineering, phishing).	Knowledge	2	Cybersecurity Specialist 2d, Cybersecurity Technologist 2b6
Describe the components of the physical environment (e.g., wiring closets, server rooms) and physical security systems.	Knowledge	2	Cybersecurity Specialist 2e, Cybersecurity Technologist 2b7
Describe the need for security in networking (e.g., firewall, access controls, encryption, demilitarized zone).	Knowledge	2	Cybersecurity Specialist 2f, Cybersecurity Technologist 2b8
Describe the need for security in application development.	Knowledge	2	Cybersecurity Specialist 2g, Cybersecurity Technologist 2b9
Mitigate threats by remaining abreast of industry information (CVE, CWE, threat intel feeds, ATT&CK Framework).	Skill	2	Cybersecurity Specialist 2h, Cybersecurity Technologist 2a5
Demonstrate and recognize common cyber-attack mechanisms.	Skill	3	Cybersecurity Specialist 2i, Cybersecurity Technologist 3e
Describe and understand Social Engineering attacks (e.g., Shoulder surfing, Dumpster diving, Tailgating, Impersonation, Hoaxes, Phishing, Spear Phishing, Whaling, Vishing, Principles, URL hijacking, Watering Hole).	Knowledge	2	Cybersecurity Specialist 2k, Cybersecurity Technologist 3h
Understand concepts and tools of penetration testing.	Knowledge	2	Cybersecurity Specialist 2l, Cybersecurity Technologist 3i
Describe the fundamental cloud components (e.g., shared or dedicated processing, storage, memory, networking, hypervisor).	Knowledge	2	Cybersecurity Specialist 3a, Cybersecurity Technologist 8a
Differentiate between public, private, and hybrid clouds.	Knowledge	2	Cybersecurity Specialist 3b, Cybersecurity Technologist 8b
Demonstrate an understanding of cloud architecture and the capabilities of services such as AWS, Azure, IBM, Oracle and Google.	Knowledge	2	Cybersecurity Specialist 3c, Cybersecurity Technologist 8g, Data Management 1p, Networking 4d, Software Development 1g
Instantiate a small computing environment in a cloud service.	Ability	3	Cybersecurity Specialist 3d, Cybersecurity Technologist 8d
Identify common breaches and threats in the cloud environment.	Knowledge	1	Cybersecurity Specialist 3e, Cybersecurity Technologist 8e
Understand how to set security configurations in a cloud environment.	Knowledge	2	Cybersecurity Specialist 3f, Cybersecurity Technologist 8f
Describe how global legal, ethical, and privacy constraints might impact cybersecurity.	Knowledge	2	Cybersecurity Specialist 4a, Cybersecurity Technologist 9a
Explain how ethical, legal, and privacy issues should/must be considered in securing systems and data.	Knowledge	2	Cybersecurity Specialist 4c, Cybersecurity Technologist 9c
Discuss the importance issues around privacy.	Knowledge	2	Cybersecurity Specialist 4d, Cybersecurity Technologist 9d
Understand the limitations of cybersecurity.	Knowledge	2	Cybersecurity Specialist 4e, Cybersecurity Technologist 9g

Demonstrate awareness of personal privacy issues and how cybersecurity can protect it.	Knowledge	3	Cybersecurity Specialist 4f, Cybersecurity Technologist 9h
Describe the tradeoffs between privacy and security.	Knowledge	2	Cybersecurity Specialist 4g, Cybersecurity Technologist 9i
Implement authorization control (e.g., least privilege, separation of duties, mandatory access, rule-based access control, role-based access control).	Skill	2	Cybersecurity Specialist 5i, Cybersecurity Technologist 4a
Understand authentication techniques (e.g., Tokens, Common access card, Smart card, Multifactor authentication, Single sign-on, Biometrics, Personal identification verification card, Username, Federation, Transitive trust/authentication).	Knowledge	2	Cybersecurity Specialist 5j, Cybersecurity Technologist 4c
Understand security implications of third party connectivity and access.	Knowledge	2	Cybersecurity Specialist 5k, Cybersecurity Technologist 4d
Apply secure network Protocols (e.g., IPSec, SNMP, SSH, DNS, TLS, SSL, TCP/IP, FTPS, HTTPS, SCP, ICMP).	Ability	2	Cybersecurity Specialist 6a, Cybersecurity Technologist 6c, Networking 2g
Understand the key cybersecurity principles in network defense (defense in depth, minimizing exposure, etc.).	Knowledge	2	Cybersecurity Specialist 6f, Cybersecurity Technologist 2b4
Demonstrate fundamental programming skills including the use of variables, loops, conditional branching, and program logic.	Skill	3	Cybersecurity Specialist 7a, Data Management 1m, Software Development 2c
Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures.	Skill	3	Cybersecurity Specialist 7b Software Development 2d
Write programs that use each of the following data structures: arrays, records/structs, strings, linked lists, stacks, queues, sets, and maps.	Skill	3	Cybersecurity Specialist 7e Software Development 3c
Compare alternative implementations of data structures with respect to performance.	Skill	4	Cybersecurity Specialist 7f Software Development 3e
Choose the appropriate data structure for modeling a given problem.	Skill	3	Cybersecurity Specialist 7g Software Development 3f
Implement a divide-and-conquer algorithm for solving a problem.	Skill	3	Cybersecurity Specialist 7h Software Development 5g
Implement a coherent abstract data type, with loose coupling between components and behaviors.	Skill	3	Cybersecurity Specialist 7i Software Development 5i
Apply the principles of least privilege, defensive programming, and fail-safe defaults.	Ability	3	Cybersecurity Specialist 7k Software Development 10d
Write code with logging capabilities.	Skill	2	Cybersecurity Specialist 7l Software Development 10f
Understand basics of securing web apps - SQL Injection and other input validation.	Knowledge	3	Cybersecurity Specialist 7n Software Development 10h
Implement end-to-end data security.	Skill	3	Cybersecurity Specialist 8d, Cybersecurity Technologist 5p
Ability to normalize a database through 3rd normal form.	Ability	3	Data Management 2j, Software Development 1a
Apply SQL data manipulation language such as Select (From), Insert, Update, Delete, JOIN (inner, outer, full, left, right), Where, Group By, Order By, etc.	Ability	3	Data Management 1l, Software Development 1d
Identify and apply Transmission Control Protocol and Internet Protocol (TCP/IP), Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6) applications and services (e.g., rlogin, Simple Mail Transfer Protocol [SMTP], Telecommunications Network [Telnet], File Transfer Protocol [FTP], Domain Name System [DNS], Network File System [NFS], Voice over Internet Protocol [VoIP], Internet Control Message Protocol [ICMP]).	Knowledge	2	Networking 2h, Software Development 1n