

FBLA HS Data Science and AI*

Probability and Statistics Foundations (15 test items)

1. Calculate the mean, median, mode, and range of a dataset
2. Discuss the use of measures of statistical variance (e.g., standard deviation, variance, covariance)
3. Discuss the characteristics and importance of Gaussian (normal) distribution
4. Calculate the expected value of a random variable
5. Differentiate between types of variables (e.g., continuous, discrete)

Data Analysis and Statistics for AI (15 test items)

1. Select the most appropriate visual medium to display a dataset
2. Describe different types of diagrams (e.g., boxplots, histograms, scatterplots)
3. Discuss techniques for working with multivariate data (e.g., dependence and interdependence methods, multiple linear and logistic regression)
4. Discuss the importance of cleaning data
5. Identify factors that may affect data quality (e.g., duplicates, low quality sources, incomplete datasets)
6. Describe how data science algorithms are applied to real-world problems (e.g., linear regression, decision trees, k-means)

* Sources: These learning outcomes are based on content from the Youcubed DS Learning Objectives and Standards, ACM Computing Competencies for Undergraduate Data Science Curricula, CodeHS Intro to AI Syllabus, AI4K12 Grade Band Progression Charts, IBM Data Science Professional Certificate, and Harvard's Data Science Principles course.

Tools for Data and AI (10 test items)

1. Write queries in SQL
2. Describe common packages and libraries for working with data and AI (e.g., Pandas, NumPy, PyTorch)
3. Discuss the use of Python for cleaning and wrangling datasets
4. Discuss the use of R for data science
5. Describe characteristics of relational databases

AI Basics (10 test items)

1. Discuss the nature of generative AI
2. Discuss capabilities and limitations of generative AI
3. List uses of generative AI (e.g., healthcare, research, digital art)
4. Describe AI subfields (e.g., computer vision, NLP, human interaction, robotics)
5. Define large language models (LLMs)
6. Discuss the capabilities of large language models (LLMs)

Machine Learning (10 test items)

1. Discuss the nature of machine learning
2. Describe the use of training, test, and validation datasets
3. Describe how machine learning algorithms behave (e.g., neural networks, decision trees, learning functions)
4. Characterize unsupervised, supervised, and reinforcement learning algorithms
5. Select an appropriate machine learning algorithm to solve a reasoning problem (e.g., supervised, unsupervised, reinforcement)
6. Explain the concept of deep learning

Perception, Representation, and Reasoning (10 test items)

1. Explain how predicate logic is used in AI models
2. Give examples of predicate logic
3. Discuss differences between logic-based and probability-based reasoning
4. Describe Bayesian networks and their components (e.g., nodes, edges, Directed Acyclic Graphs)
5. Discuss the nature of knowledge representation and reasoning for AI

Privacy and Ethics (10 test items)

1. Discuss dilemmas that arise from AI systems (e.g., self-driving vehicles, generative AI, surveillance)
2. Describe how AI inherits bias (e.g., algorithmic bias)
3. Discuss security and privacy risks associated with LLMs
4. Discuss credibility concerns of LLMs (e.g., hallucinations, misinformation)

Data Literacy and Foundations (20 test items)

1. Discuss the nature of data science
2. Describe differences between structured and unstructured data
3. Identify numeric and categorical data points
4. Convert among common data representations (e.g., binary, hexadecimal, decimal)
5. Describe the types of data that could be gathered from various sources
6. Describe the importance of data wrangling and transformation
7. Describe the stages of the data science process

References

- AI4K12. *Grade Band Progression Charts*. <https://ai4k12.org/gradeband-progression-charts/>
- Association for Computing Machinery. *Computing Competencies for Undergraduate Data Science Curricula*. https://www.acm.org/binaries/content/assets/education/curricula-recommendations/dstf_ccdsc2021.pdf
- CodeHS. *Intro to AI Syllabus*. <https://codehs.com/uploads/224a0c7cb8de30b494ec9c2286a73a28>
- Google Cloud. *What is artificial intelligence (AI)*. <https://cloud.google.com/learn/what-is-artificial-intelligence>
- Harvard. *Data Science Principles*. <https://www.harvardonline.harvard.edu/course/data-science-principles>
- IBM. *IBM Data Science Professional Certificate*. <https://www.coursera.org/professional-certificates/ibm-data-science/>
- Youcubed. *DS Learning Objectives and Standards by Unit*. <https://hsdatascience.youcubed.org/resources-standards-and-course-approval/>