

**Key:** SA = short answer, CR = code reading, FR = free response, CW = code writing

*Note 1:* any topic listed at CW or FR rank may be tested at all ranks.

*Note 2:* any topic listed at the CR rank may also be tested at the SA rank.

*Note 3:* **all topics** from Exam1 and Exam2 are also fair game.

- **SA:** Define **Moore's Law** and explain its effect on computing
- **SA:** Define and understand the difference between the following types of concurrency: **circuit-level concurrency, multitasking, multiprocessing, and distributed computing**
- **FR:** Create **concurrency trees** to increase the efficiency of complex operations by executing sub-operations at the same time
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- **SA:** Recognize certain problems that arise while multiprocessing, such as **difficulty of design, deadlock, and message passing**
- **FR:** Create **pipelines** to increase the efficiency of repeated operations by executing sub-steps at the same time
- **CW:** Use the **MapReduce pattern** to design and code **parallelized algorithms** for distributed computing
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- **SA:** Define core terms related to the internet, including: **browsers, routers, ISPs, IP addresses, DNS servers, protocols, packets, cloud**
- **SA:** Understand at a high level the **internet communication process** that happens when you click on a link to a website in your browser.
- **SA:** Understand at a high level that the internet is **fault tolerant** due to being distributed
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- **SA:** Define the following terms: **data privacy, data security, authentication, and encryption**
- **SA:** Recognize the traits of the internet that make it more prone to **security attacks**, and recognize common security attacks (**DDOS** and **man-in-the-middle**).
- **CR:** Trace common **encryption** algorithms, such as the **Caesar Cipher** and **RSA**
- **SA:** Evaluate the efficiency of **performing** encryption algorithms and **breaking** encryption algorithms.
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- **CR:** Read and write data from **files**
- **SA:** Interpret data according to different **protocols**: plaintext, CSV, and JSON
- **CW:** **Reformat** data to add, remove, or reinterpret pre-existing data
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- **SA:** Represent the state of a system in a **model** by identifying **components** and **rules**
- **CR:** **Visualize** a model using graphics
- **CR:** Update a model over **time** based on **rules**
- **CR:** Update a model based on **events** (mouse-based and keyboard-based)
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- **SA:** Given a dataset, identify **features** which may help predict information about the data
- **SA:** Identify **common types** of machine learning algorithms
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- **CW:** Perform basic **analyses** on data to answer simple questions
- **SA:** Identify which **visualization** is appropriate based on the **type of data**
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- **CW:** Use **randomization** and **Monte Carlo methods** to solve problems
- **SA:** Organize **animated simulations** to observe how systems evolve over time
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- **SA:** Identify how **training data**, **validation data**, and **testing data** is used in machine learning
- **SA:** Define the following keywords: **artificial intelligence** and **heuristics**
- **SA:** Recognize how AIs reach **goals** by using a **perception, reason, and action cycle**.
- **FR:** Interpret **game decision trees** to see what an AI would decide to do.
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- **SA:** CS History takeaways (see slides)
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- **SA:** Recognize the three core rules of code maintenance, and what the possible repercussions of badly-maintained code are
- **SA:** Understand the current extent of data collection on the internet and its possible repercussions.
- **SA:** Identify the societal impact of machine learning in terms of bias in data and responsibility for decisions made by AIs.
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- **SA:** Define key future computing buzzwords, including: **cryptocurrency**, **deepfake**, **5G**, and **quantum computing**.
- **SA:** Identify occupations that may be at risk due to **automation**
- **SA:** Describe how the **Turing test** works, and what its purpose is