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Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiement : SHA-256 in Action – Cryptographic Hashing

Objective/Aim:

To understand the working of SHA-256 cryptographic hash function by observing how even small changes in input data result in significantly different hashes, demonstrating **hash sensitivity**, **one-wayness**, and **data integrity**.

Apparatus/Software Used:

- Web Browser
- SHA-256 Demo: https://andersbrownworth.com/blockchain/hash
- Alternatively: Online SHA-256 tools like https://emn178.github.io/online-tools/sha256.html

Theory/Concept:

SHA-256 (Secure Hash Algorithm 256-bit) is a cryptographic hash function that generates a fixed-length (256-bit) output from any input. It is used in blockchain to ensure:

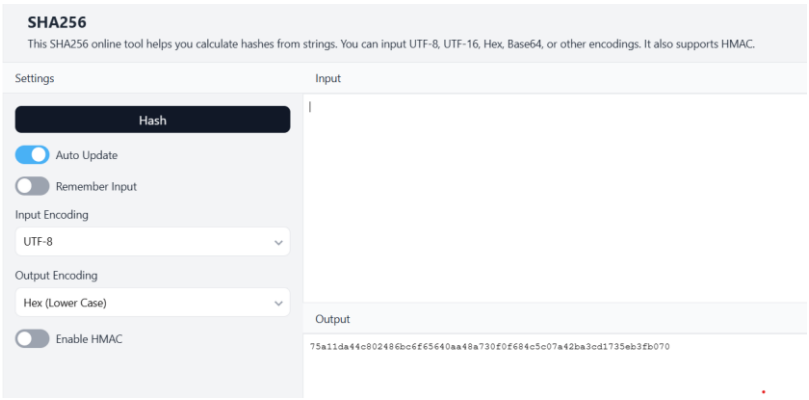
- Immutability of transactions
- Data integrity
- Proof-of-Work in mining

Key Properties of SHA-256:

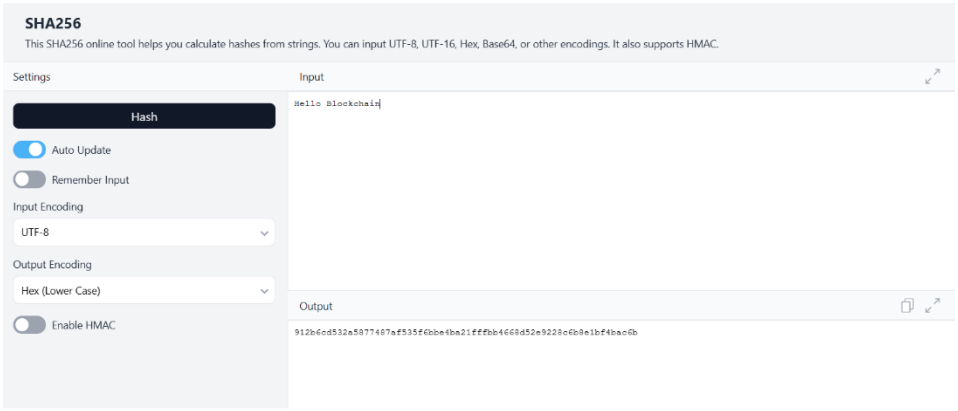
- Deterministic: Same input → same output
- Irreversible: Cannot reverse-engineer input from hash
- Collision-resistant: No two different inputs produce same hash
- Avalanche effect: A small change in input → large change in output

Procedure:

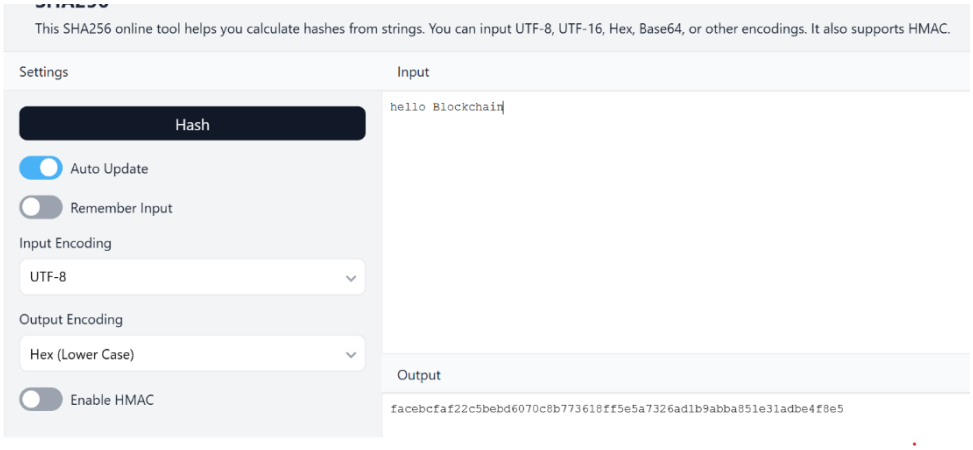
- Open the demo at: https://andersbrownworth.com/blockchain/hash



- In the **input box**, type a simple string, e.g., Hello Blockchain
- Observe the SHA-256 hash output instantly generated below the input field.



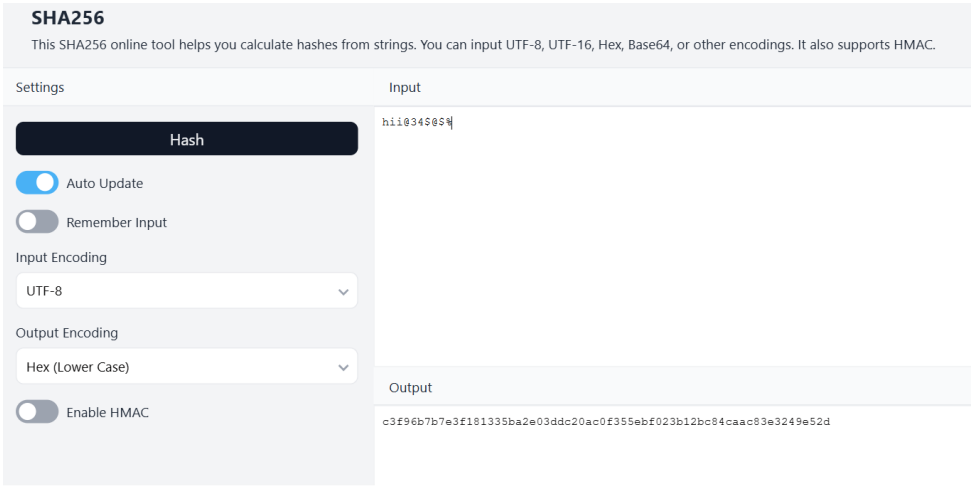
- Now change a single character, for example:



(Note the lowercase 'h').

- Compare the hash outputs. Despite only one letter changing, the resulting hash is **completely different**.

- Try hashing various other data types like numbers, symbols, or long paragraphs.



- Optional: Use an online SHA-256 calculator to cross-verify hashes or inspect byte-level hash values.

Observation Table:

Input	SHA-256 Hash (First 16 Chars)
Hello Blockchain	b79e7d...
hello Blockchain	5ae5a4...
Hello Blockchain!	e9152c...
12345	59944b...

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student:
Name :
Regn. No. :

Signature of the Faculty: