HASHING IN BLOCKCHAIN

Blockchain Development

Time: 60 mins

Introduction

In this class, the student/s will be introduced to concepts of advanced encryption like hashing. They will learn to store and encrypt the information of blocks using the hash concept.

New Commands Introduced

● sha256()	Accepts the input string as a parameter and creates a hash object .
● import hashlib	Python provides a library called hashlib that provides hashing techniques.
● ord()	Returns the number representing the unicode code of a specified character
● hexdigest()	Digest is returned as a string object of double length, containing only hexadecimal digits.

Vocabulary

- **Hash:** An algorithm can be used to create and add new blocks with a unique digital fingerprint called a Hash.

Learning Objectives

Student/s should be able to:

- ***Recall*** how encryption and decryption is done on a text.
- ***Explain*** how the concept of hashing works.
- ***Demonstrate*** how the SHA encryption is done.

Activities

1. **Class Narrative:** *(2 mins)*
    - Brief the student/s that the hashing encryption is done to encrypt the date on the blocks.

2. **Concept Introduction Activity:** *(5 mins)*

- Let the student/s play the explore-activity to observe .
- Explain the need of hashing in blockchain and introduce Secure hashing for data.
- Using the slides, explain that the student/s will learn:
    - to generate hashcode of the data
    - to validate the data in the blocks

3. **Activity 1: Generate a Simple HashCode** *(14 mins)*

    Teacher Activity: *(7 mins)*

- Explain how we hash the data using ASCII values.
- Explain how to get the ASCII value of every character and concatenate them.

    Student Activity: *(7 mins)*

- Guide the student/s to perform simple hashing using ASCII code.

4. **Activity 2: Generate HashCode** *(12 mins)*

    Teacher Activity: *(3 mins)* .

- Let the student/s play the explore-activity to observe hashing on the SHA 256 Algorithm.
- Ask the student/s about their observations.
- Explain how to import hashing libraries and how to perform SHA encryption of data.
- Explain how to create a hashing object and get the hexadecimal value of hash.

    Student Activity: *(9 mins)*

- Guide the student/s to perform securing hashing of the message or text and return its hash value.

5. **Activity 3: Validate Data Received** *(12 mins)*

    Teacher Activity: *(6 mins)*

- Explain the concept of data validation and its importance in the activity.
- Explain how the validation of data happens and how validation is performed of hashed data.

    Student Activity: *(6 mins)*

- Guide the students to perform validation of hash data .

6. **Introduce the Post class project:** *(2 min)*
    - Load the project and demonstrate how password validation is done for signin.

7. **Test and Summarize the class learnings:** *(5 mins)*
    - Check for understanding through quizzes and summarize learning after respective missions.
    - Summarize the overall class learning towards the end of the class.
8. **Additional activities:**
    - Encourage the student/s to debug the ascii hashing for every character of string.
    - Encourage the student/s to generate hash values of fixed length.

9. **State the Next Class Objective:** *(1 min)*
    - In the next class, student/s will learn to use the blockchain technology to verify and trace the transactions.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Hashing in Blockchain	https://s3-whjr-curriculum-uploads.whjr.online/27fcf912-447d-40c8-a58c-51f30751cc6f.html
Explore Activity	Hash Validation	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Student Activity 1	Generate a HashValue using ASCII values	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS-BP
Teacher Reference: Student Activity 1 Solution	Generate a HashValue using ASCII values	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Explore Activtiy	Hash Algorithm	https://emn178.github.io/online-tools/sha256.html
Student Activity 2	Generate a Hash value using Algotihtm	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS-BP

Teacher Reference: Student Activity 2 Solution	Generate a Hash value using Algotihtm	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Teacher Activity 3	Validate the Recieved Data	https://github.com/Tynker-Blockchain/TNK-M11-C84-TAS-BP
Teacher Reference: Teacher Activity 3 Solution	Validate the Recieved Data	https://github.com/Tynker-Blockchain/TNK-M11-C84-TAS
Student Activity 3	Validate the Recieved Data	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS-BP
Teacher Reference: Student Activity 3 Solution	Validate the Recieved Data	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Student's Additional Activity 1	Debug the generateHash() function	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Debug the generateHash() function	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Student's Additional Activity 2	Find the Prime Numbers for Given Range	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS-BP
Teacher Reference: Student's Additional Activity 2 Solution	Find the Prime Numbers for Given Range	https://github.com/Tynker-Blockchain/TNK-M11-C84-SAS
Post Class Project	Hash the Password	https://github.com/Tynker-Blockchain/TNK-M11-C84-PCP-BP
Teacher Reference: Post Class Project Solution	Hash the Password	https://github.com/Tynker-Blockchain/TNK-M11-C84-PCP