Blockchain

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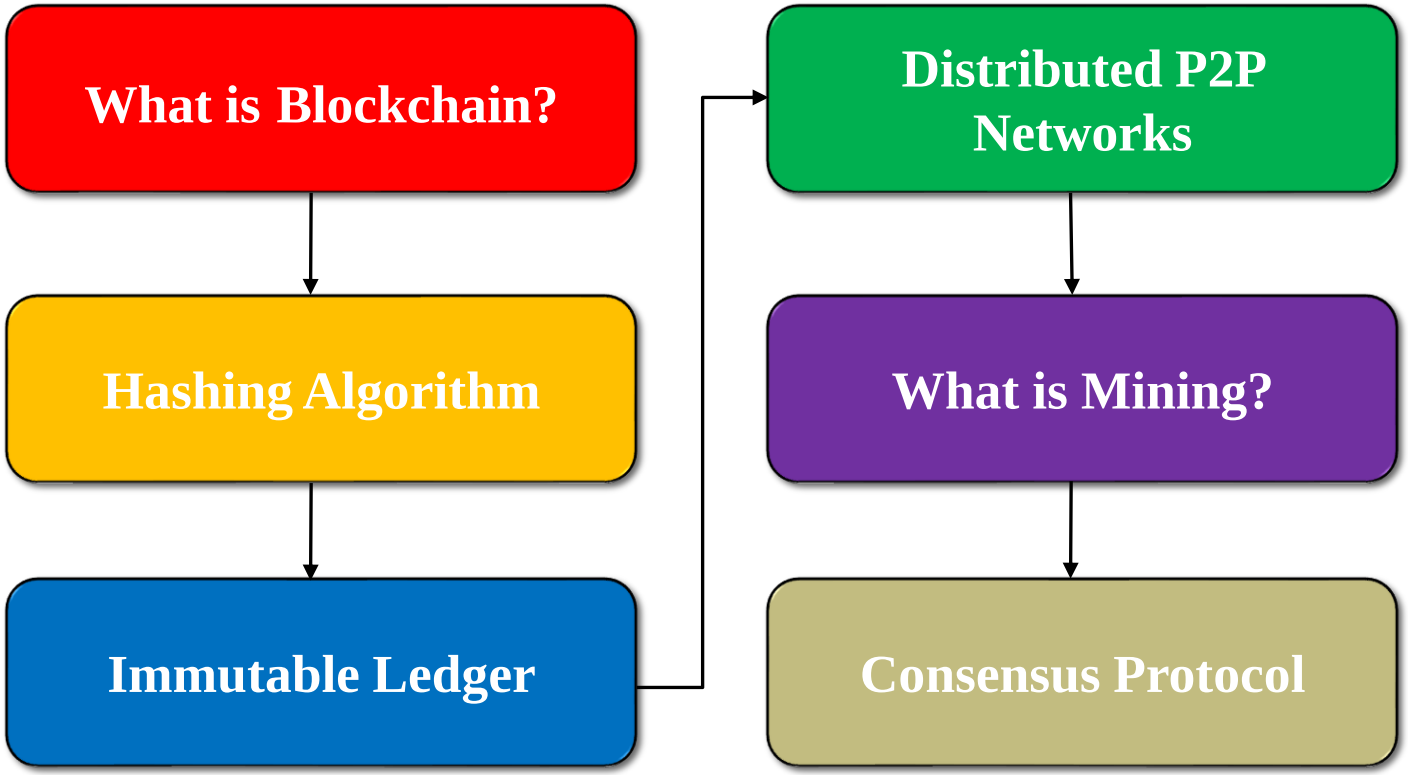
Contents – Module A



Blockchain Mining

Blockchain Mining

- This process of blockchain mining is performed by miners operating specialized hardware and running a dedicated blockchain mining software.

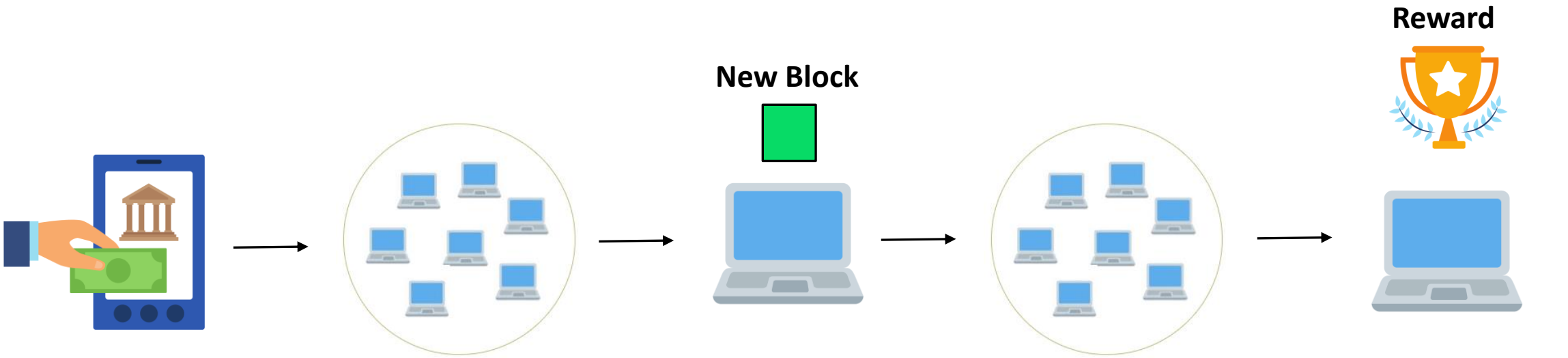
Blockchain Mining

- Transactions occur in a blockchain when a user initiates an action that involves transferring digital assets (cryptocurrency, tokens, or other digital items) from one account or address to another.
- These transactions are saved in a Mempool
- Miners pick these transactions from a Mempool and add them to a block
- Miners solve a mathematical problem.
- A block is created for those miners, which solves the problem quickly

Blockchain Mining

- The Miner communicates across the network that a block is created
- Other Miners verify if the block is valid or not.
- If the block is valid then it will be added to a Blockchain
- The miners will be rewarded for mining the new block. (This will be covered in detail in the coming lectures)

Blockchain Mining



Blockchain Mining

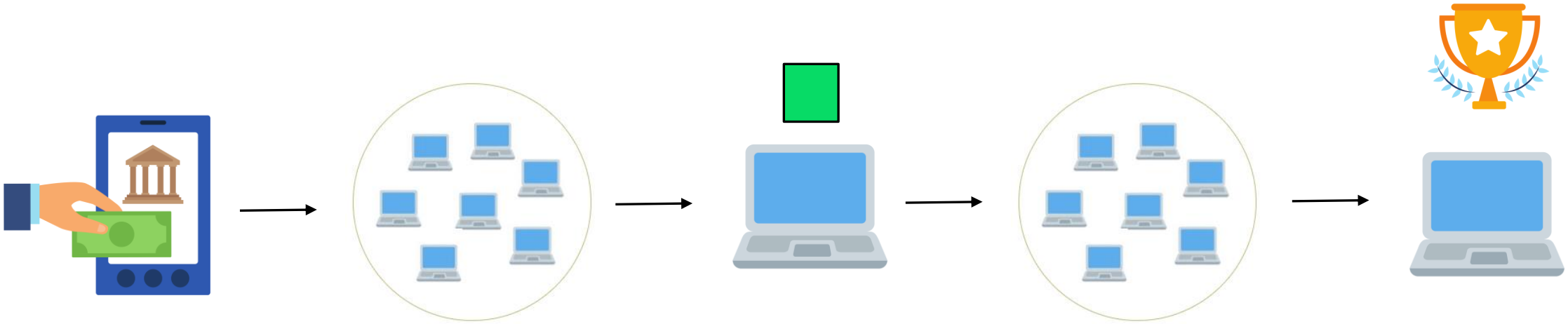
Why Mining is important?

- The main importance of mining is to secure the network
- There is not central authority, so this way transaction is verified
- Miners are rewarded for adding blocks to existing Blockchain

- So, through mining trust and security is created across the network
  - Trust
  - Security

How Mining works: The Nonce

Blockchain Mining



Transaction

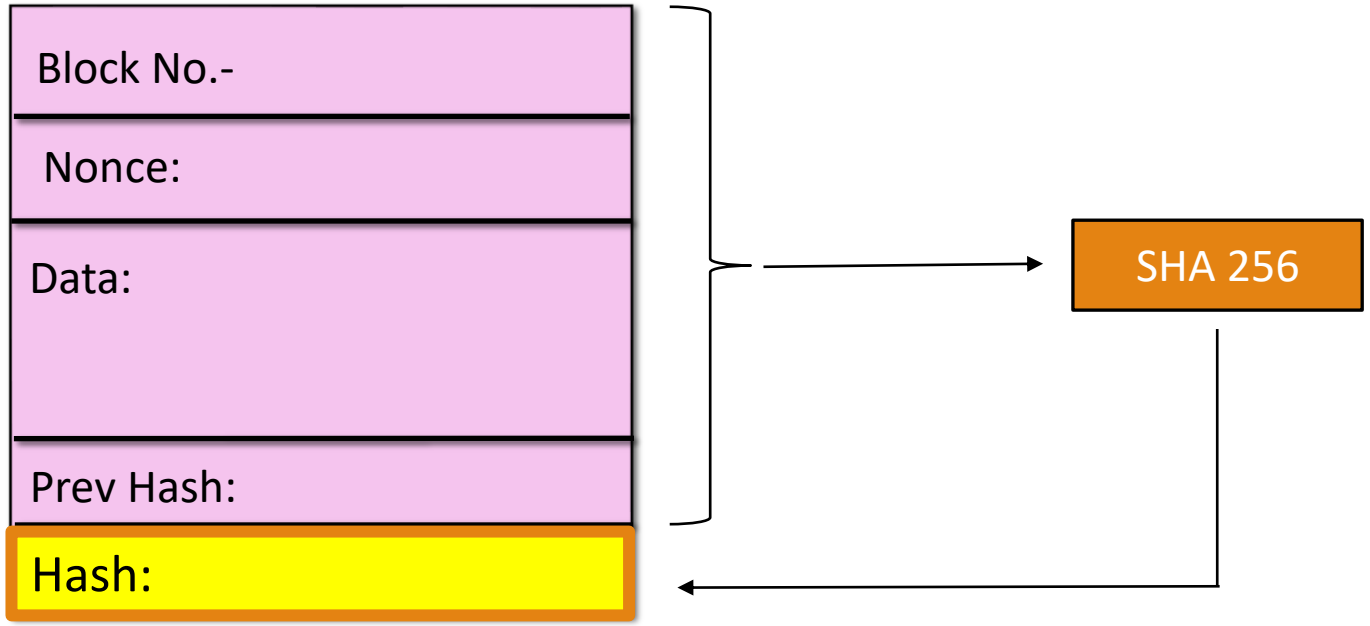
Solve Mathematical Problem

Miner Solved Problem First

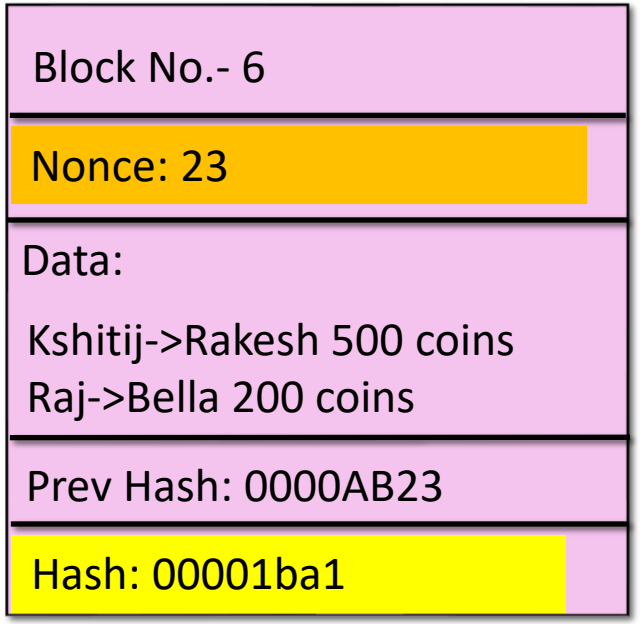
Miners Verify the Validity

Block is added

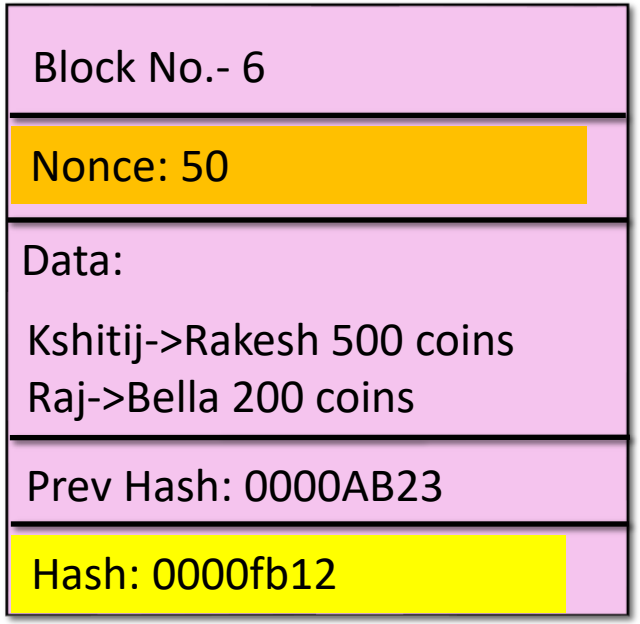
The Nonce



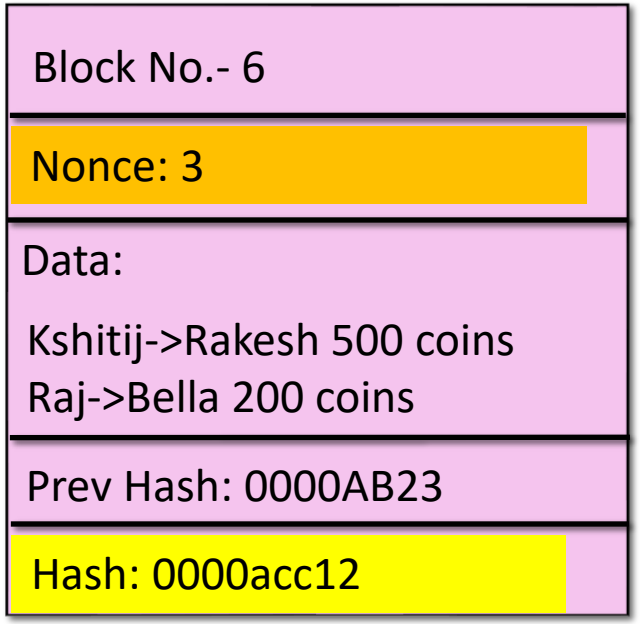
The Nonce


Block No.- 6
Nonce: 23
Data:
Kshitij->Rakesh 500 coins
Raj->Bella 200 coins
Prev Hash: 0000AB23
Hash: 00001ba1

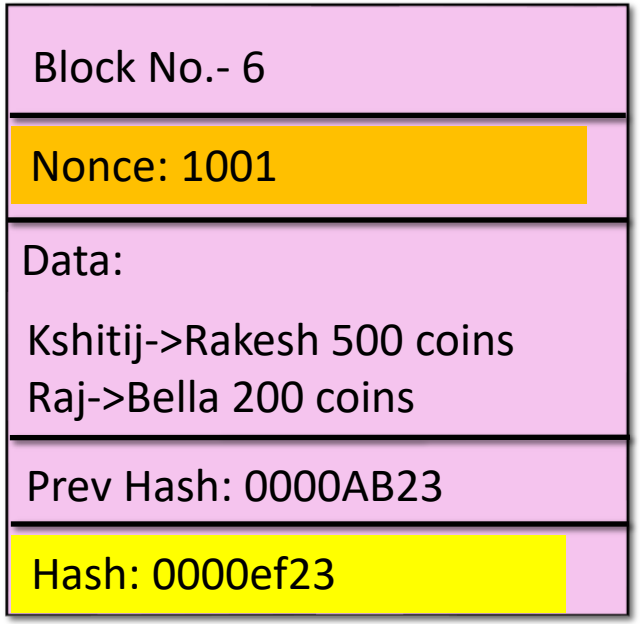
The Nonce


Block No.- 6
Nonce: 50
Data:
Kshitij->Rakesh 500 coins
Raj->Bella 200 coins
Prev Hash: 0000AB23
Hash: 0000fb12

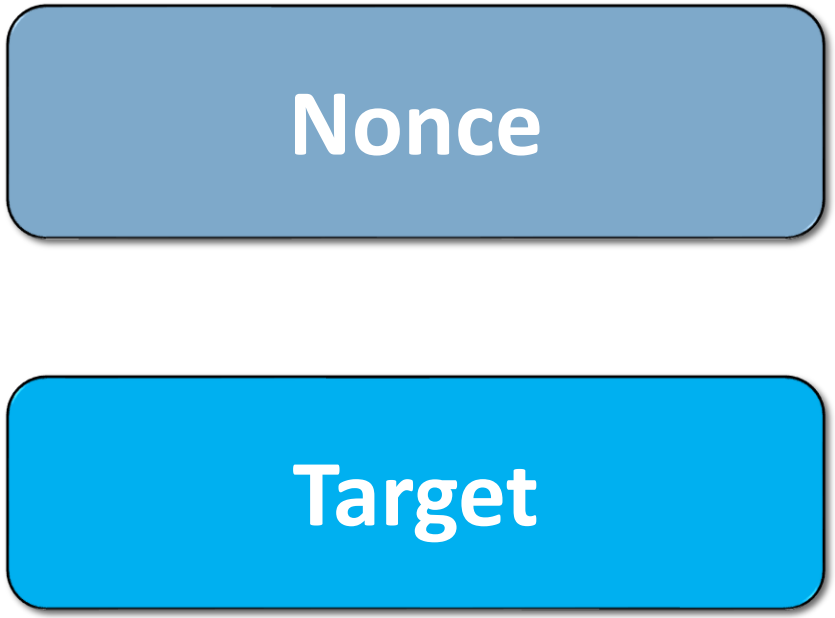
The Nonce


Block No.- 6
Nonce: 3
Data:
Kshitij->Rakesh 500 coins
Raj->Bella 200 coins
Prev Hash: 0000AB23
Hash: 0000acc12

The Nonce


Block No.- 6
Nonce: 1001
Data:
Kshitij->Rakesh 500 coins
Raj->Bella 200 coins
Prev Hash: 0000AB23
Hash: 0000ef23

How Mining Works ?



How Mining Works ?

Nonce:

- The nonce is the number that Blockchain miners are solving for.

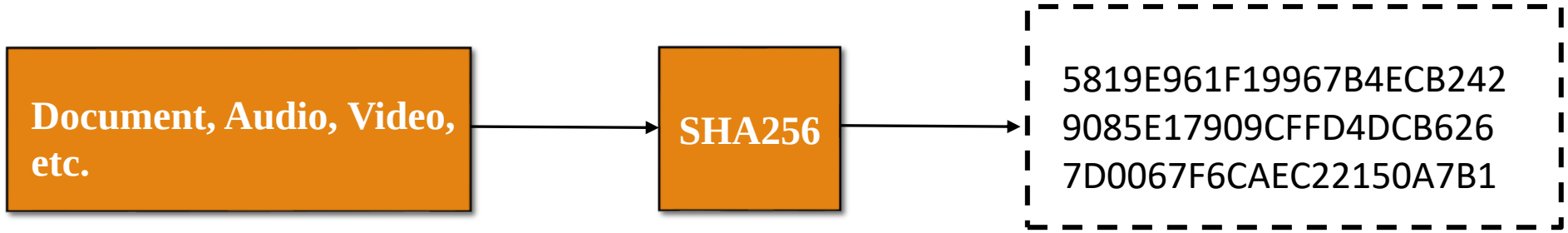
How Mining Works ?

Target

- Target is a number used in mining.
- It is a number that a block hash must be below for the block to be added to the Blockchain.
- The target is adjusted to try and ensure that blocks are mined on average in **a specified period**.
- Generally, the target is adjusted by the algorithm or protocol automatically

How Mining Works ?

Hashing Algorithm



This has 64 hexadecimal characters.
Each character is of 4 bits.
So in total it has 64* 4 bits i.e. 256 bits.

How Mining Works ?

Hexadecimal Numbers

Decimal	Hexadecimal
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A

Decimal	Hexadecimal
11	B
12	C
13	D
14	E
15	F

How Mining Works ?

Hashing Algorithm

- d2fd3930d274b202fe8e7cb431e38a8b64ec396e15f5717e60493234b0de210a
- 52d095795c1dc87ff2f6b4d9b005a1fe2cfed01103763c9443f6d4496df8e800
- 0000005432d9f64f6e05c019f9302162100163b6cdba06bd72eee35cd19aebf

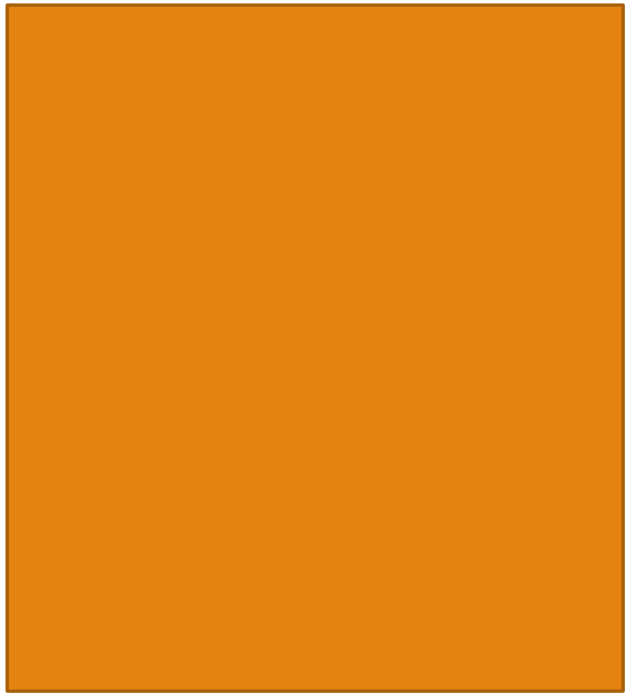
Smallest- 0000000.....0

Largest- fffffffffffff.....f

How Mining Works ?

Block No.-6
Nonce:
Data: Kshitij->Rakesh 500 coins Raj->Bella 200 coins
Prev Hash: 0000AB23
Hash:

All Possible Hashes



How Mining Works ?

Block No.-6

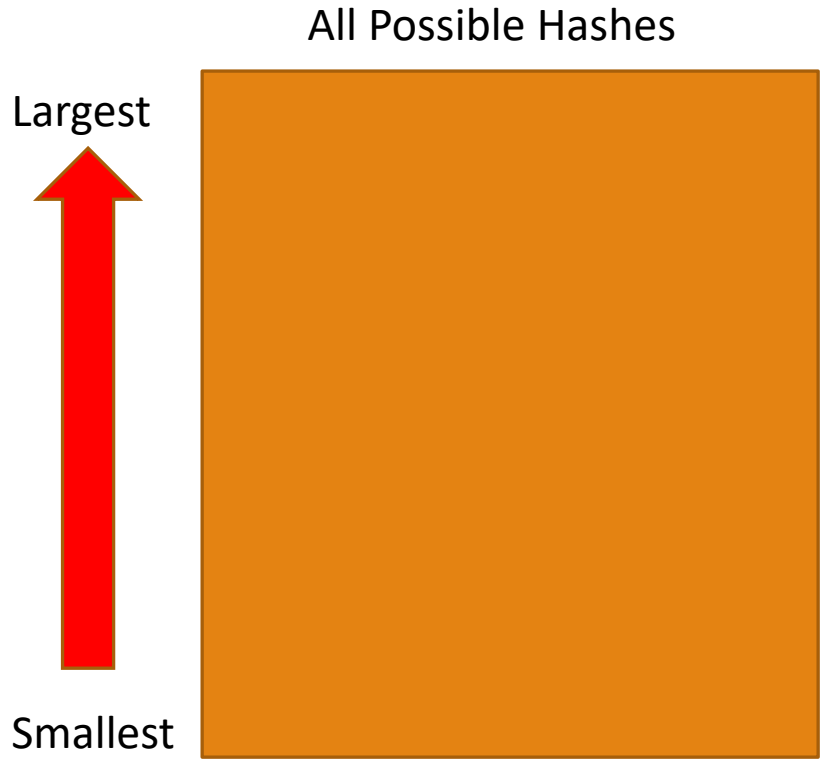
Nonce:

Data:

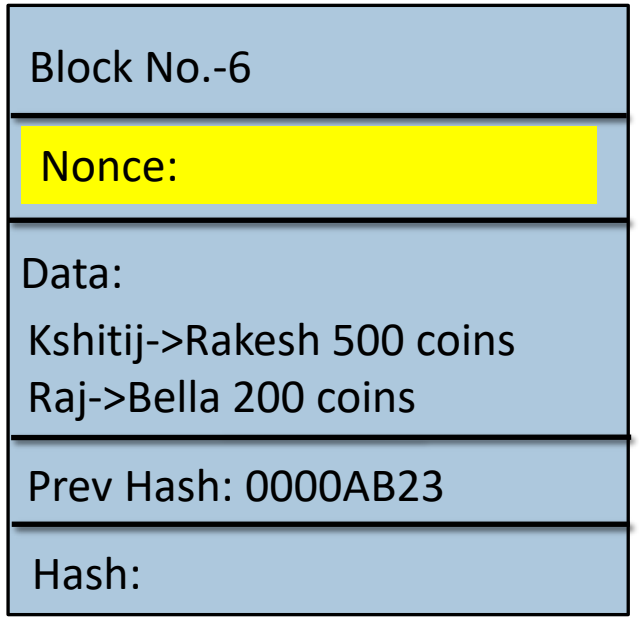
Kshitij->Rakesh 500 coins
Raj->Bella 200 coins

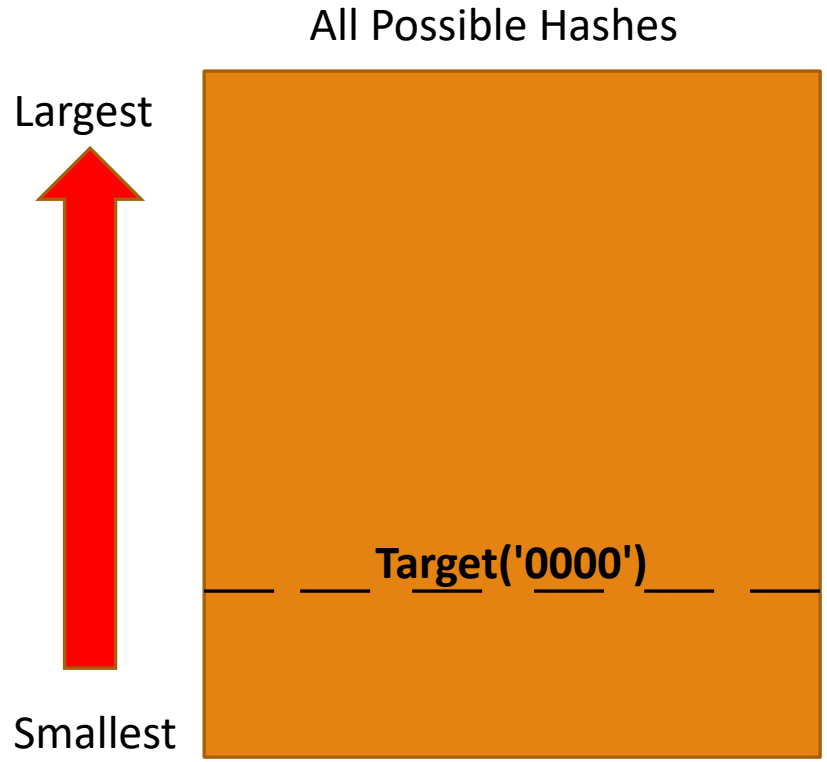
Prev Hash: 0000AB23

Hash:

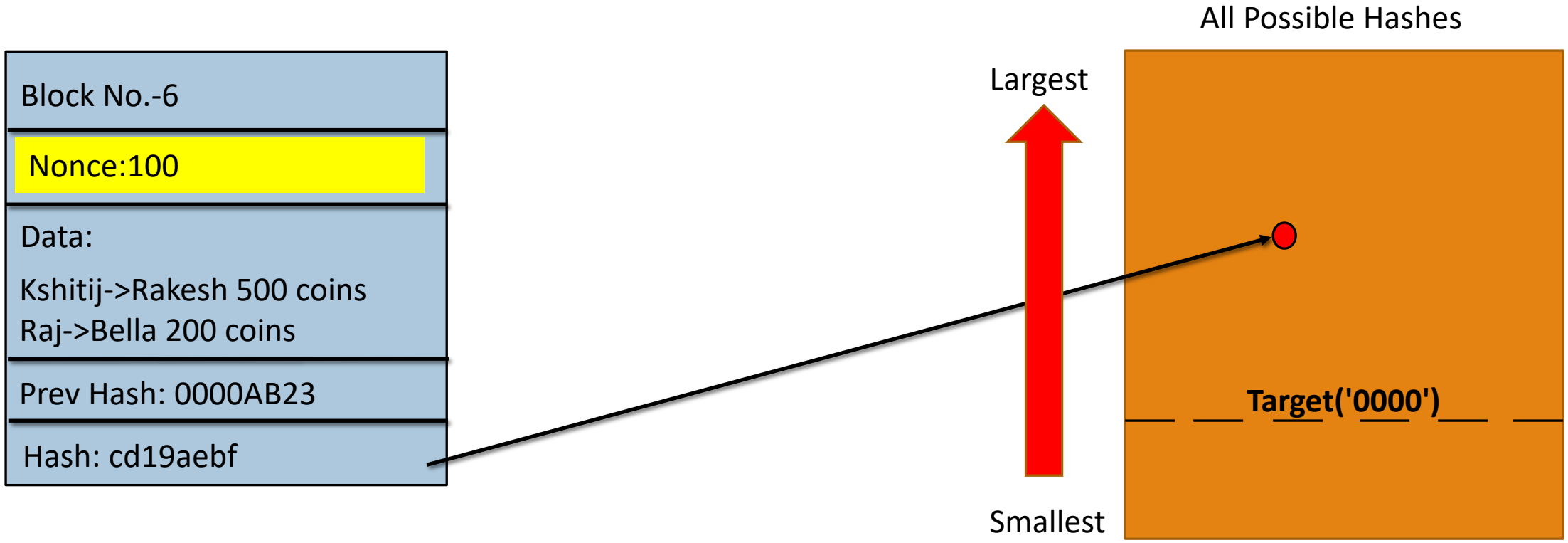


How Mining Works ?

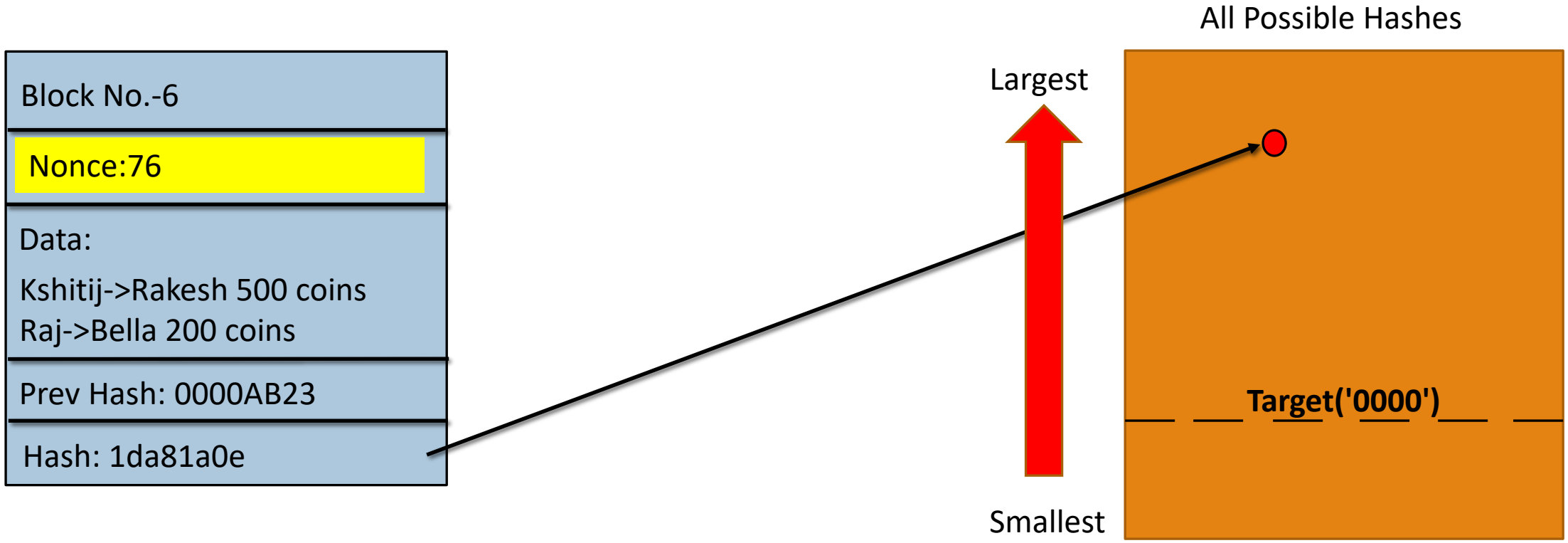




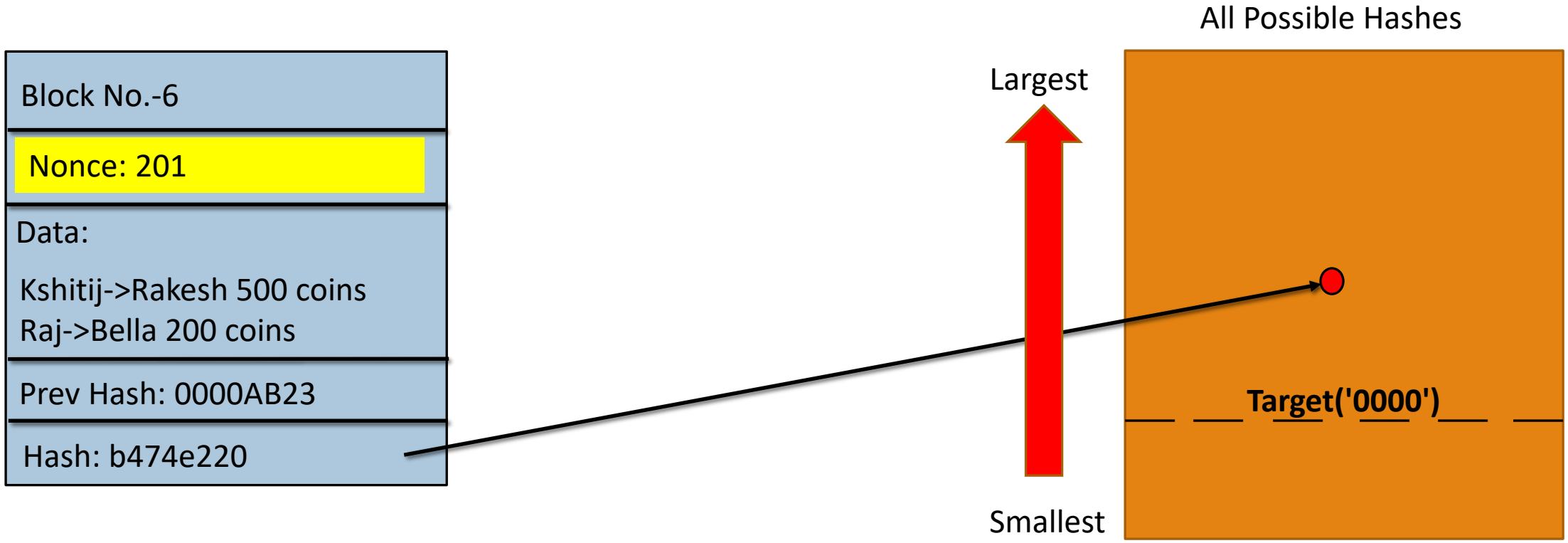
How Mining Works ?



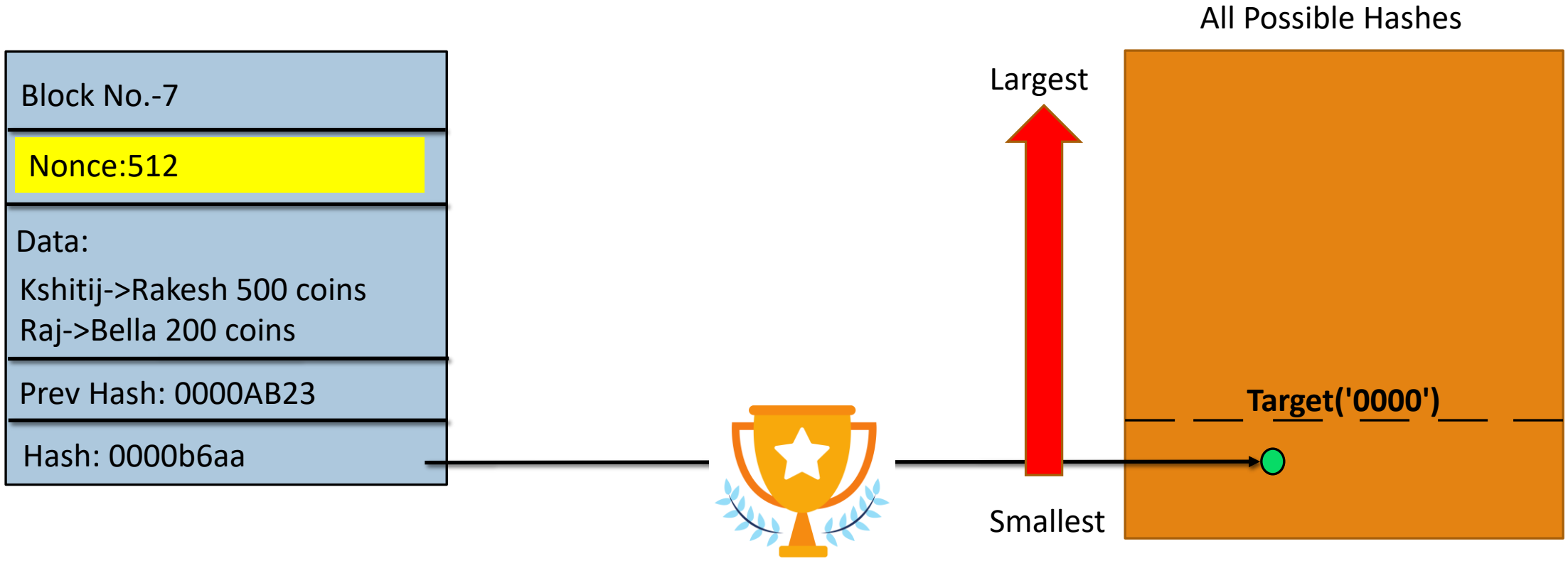
How Mining Works ?



How Mining Works ?



How Mining Works ?



Is Mining that easy?

Challenges faced by Miners

Time Taking

Electricity Bills

Mathematical problem-solving skill

Start All Over Again Attitude

Fast Computers

Hashing Algorithm Demo

Online demonstration (Nonse)

https://andersbrownworth.com/blockchain/

Running your Node Server

https://github.com/anders94/blockchain-demo/