L03: Bitcoin Deep Dive

BSc Blockchain Course

Digital Finance

2026

Learning Objectives

By the end of this lesson, you will be able to:

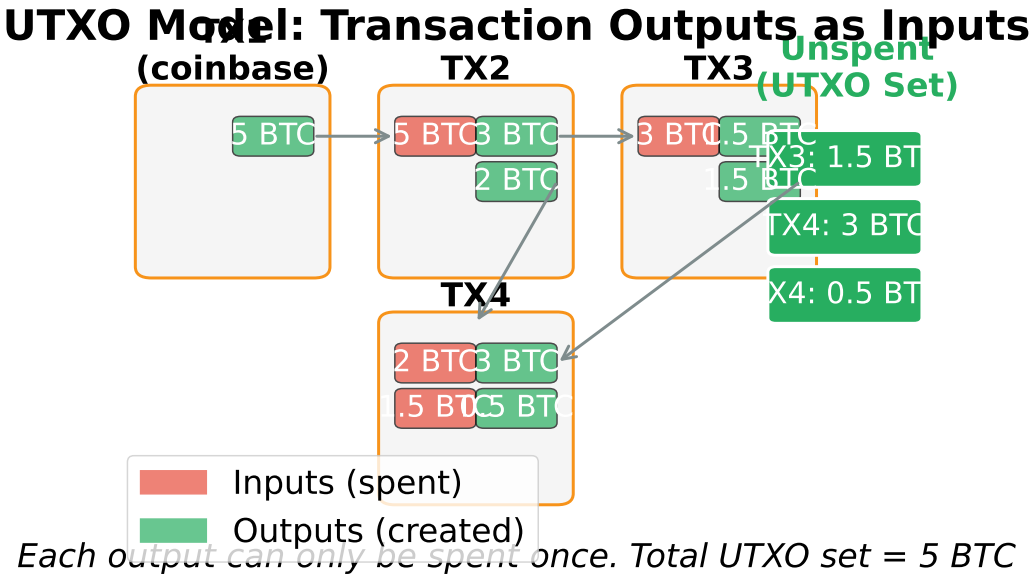
1. Explain the UTXO model and transaction structure
2. Describe Bitcoin block structure and mining process
3. Understand difficulty adjustment and reward schedule
4. Analyze the fee market and mempool dynamics
5. Explain chain selection rules (longest chain)

Building on cryptography fundamentals from L02.

UTXO Model

Unspent Transaction Output

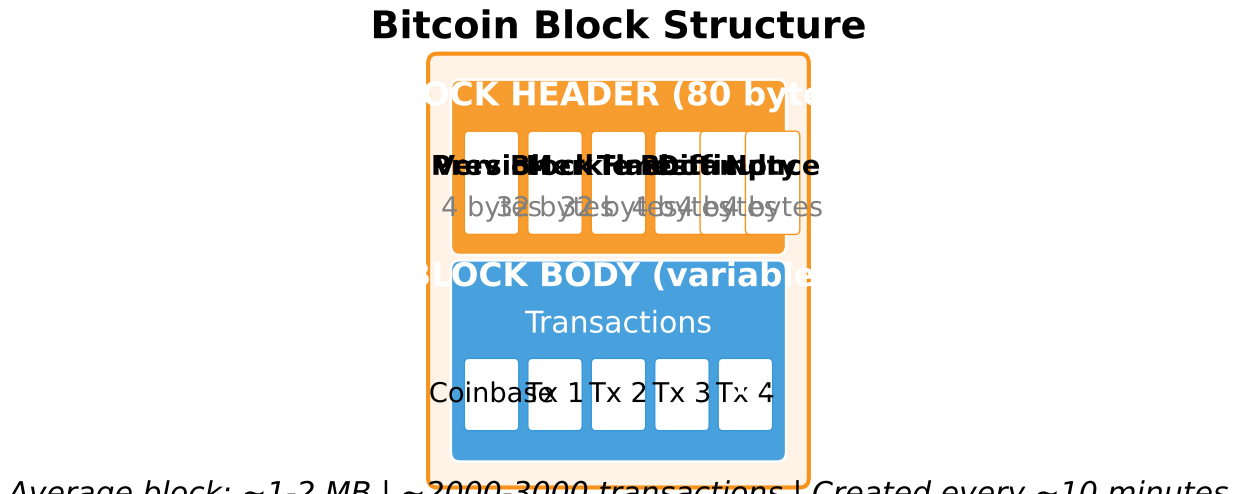
- Transactions consume UTXOs and create new ones
- Each UTXO can only be spent once
- Balance = sum of all UTXOs you can unlock



Each output can only be spent once. Total UTXO set = 5 BTC

Unlike account balances, UTXOs are discrete units of value.

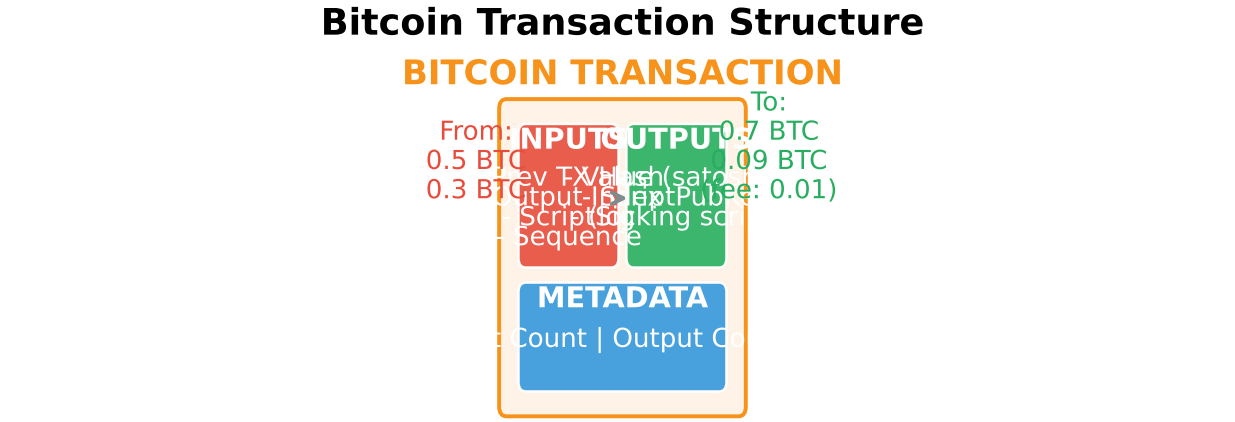
Block Structure



Average block: ~1-2 MB | ~2000-3000 transactions | Created every ~10 minutes

Header is 80 bytes; body contains 1000-3000 transactions.

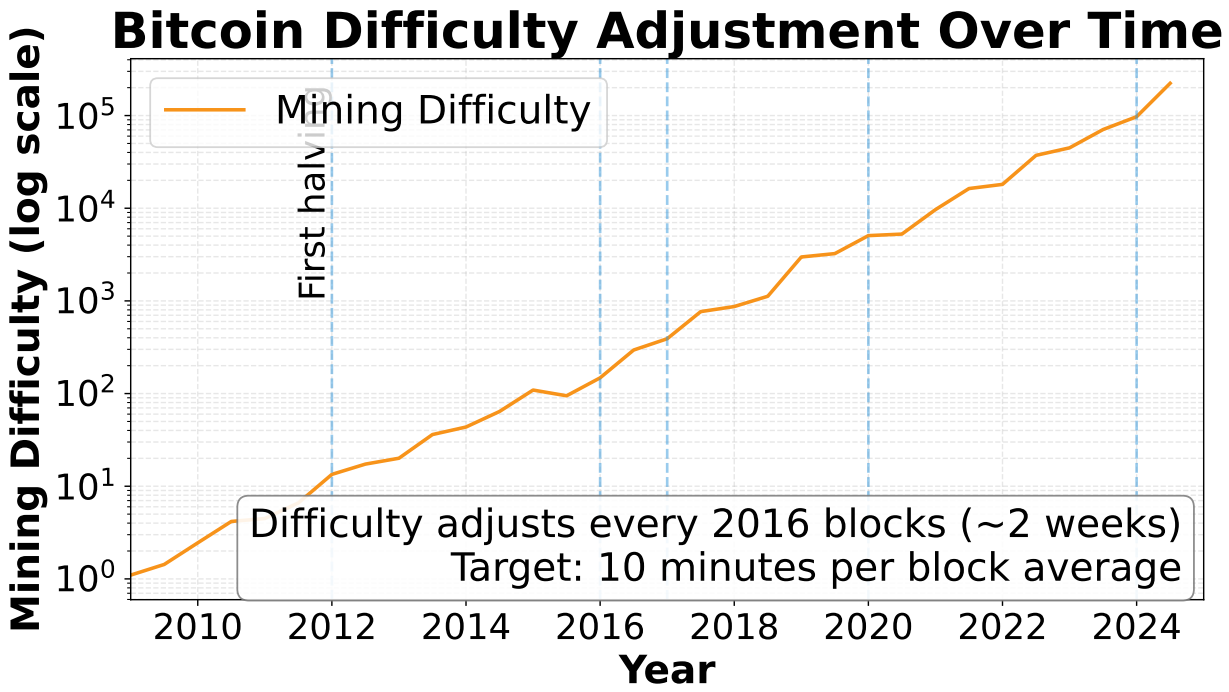
Transaction Anatomy



Inputs unlock funds | Outputs create new UTXOs | Fee = Sum(inputs) - Sum(outputs)

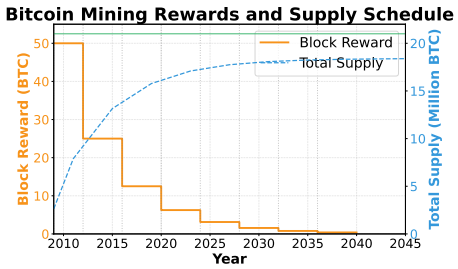
Fee = sum of inputs - sum of outputs.

Difficulty Adjustment



Adjusts every 2016 blocks to maintain 10-minute average.

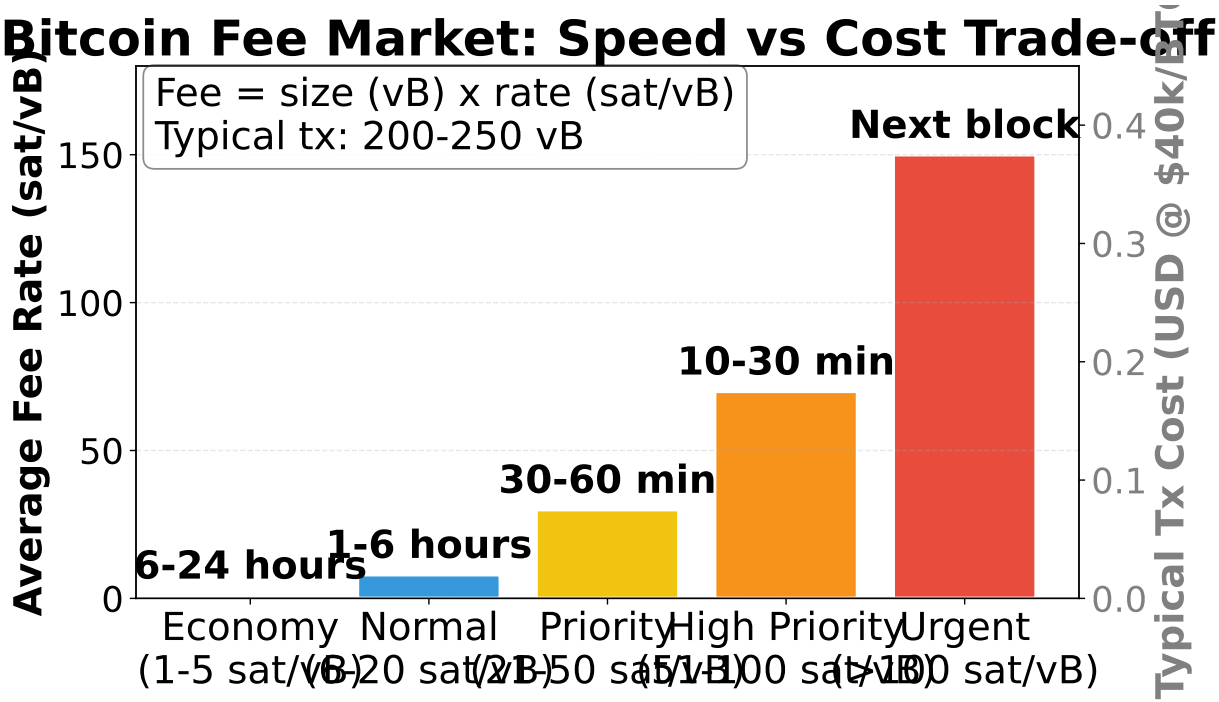
Mining Rewards



21M Cap

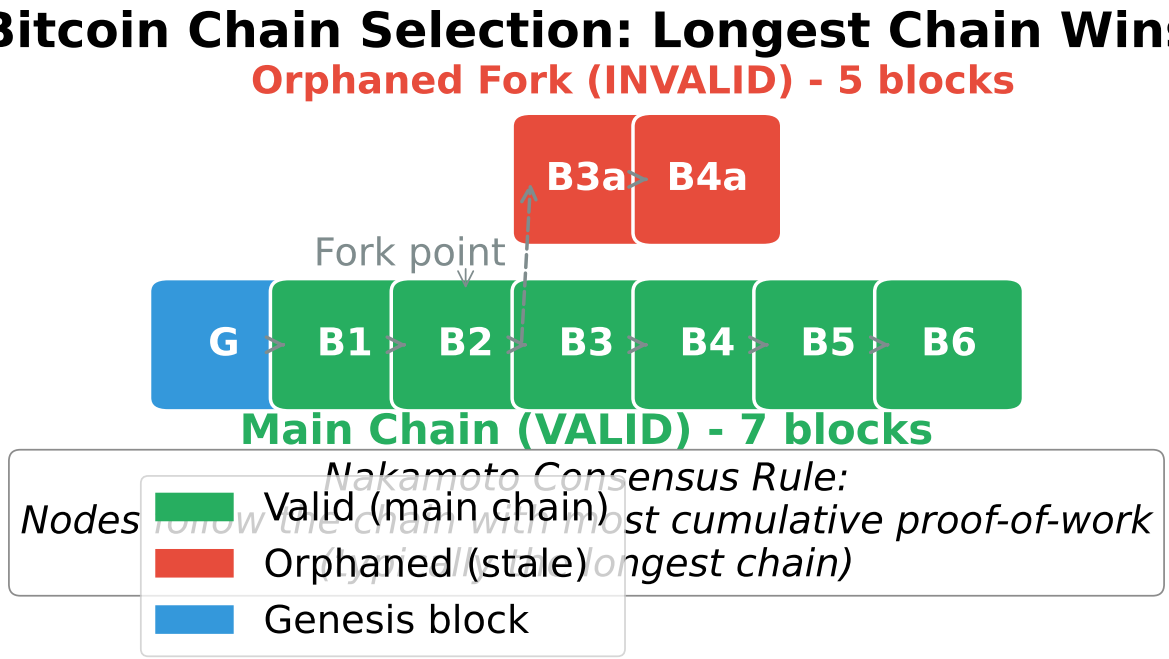
Halving every 210,000 blocks; 21M BTC maximum supply.

Fee Market



Miners prioritize transactions by fee rate (sat/vB).

Chain Selection



Nakamoto consensus: follow the chain with most proof-of-work.

Key Takeaways

Remember These Points

1. UTXO model tracks individual outputs, not account balances
2. Blocks contain header (80 bytes) + transactions (variable)
3. Difficulty adjusts to maintain 10-minute blocks
4. Supply capped at 21M BTC via halving schedule
5. Longest chain (most work) wins in case of forks

Next Lesson: Consensus Mechanisms – PoW, PoS, and alternatives.