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NOTES FOR TEACHERS

What Is Mining?

Students learn how bitcoin mining works as a guessing lottery: the winner adds the next page and earns new bitcoin, the network adjusts the difficulty to keep the pace, and the work protects the record at a real energy cost.

Grades 9–12

1:44 video

Economics Standard 4

Free to use, no sign-up

STEP 1

Before watching

If there's no boss, how could a group of strangers fairly decide who gets to write the next page of a shared notebook?

STEP 2

Watch the episode

Bitcoin Basics, 1:44: thesteadyblock.com/episodes/what-is-mining/ (also on YouTube, @TheSteadyBlock)

STEP 3

Discussion questions

1. Why does the episode compare mining to a lottery rather than to solving a hard math problem?
2. What happens to the difficulty when more miners join, and why does the network keep new pages coming about every 10 minutes?
3. Bitcoin mining uses about half a percent of the world's electricity. Critics call it waste; supporters say it's the price of a record no one controls. What would you need to know to decide whether that energy use is worth it?

STEP 4

Exit quiz

1. According to the episode, what are miners actually doing?

- A. Solving one very hard equation
- B. Digging up digital coins
- C. Making guess after guess until one code lands below a target
- D. Approving bank transfers

2. What does the winning miner get?

- A. Newly created bitcoin plus the fees in that page
- B. A share of every bank account
- C. Nothing; mining is volunteer work
- D. Ownership of the network

3. If more miners join and pages start coming too fast, what happens?

- A. The prize doubles
- B. Pages get bigger
- C. The network shuts down for a day
- D. The target drops, so winning gets harder

4. Why does mining make old pages hard to change?

- A. Old pages are locked with a password
- B. To rewrite one, you'd have to win all the later lotteries again, faster than everyone else combined
- C. Only the first miner can edit them
- D. Banks keep backup copies

5. About how much of the world's electricity does bitcoin mining use, according to the Cambridge estimate in the episode?

- A. About half a percent
- B. About 10 percent
- C. About a quarter
- D. Almost none

Key terms

Miner	A computer, and the person or company running it, competing to add the next page by guessing.
Target	The number a winning code must fall below; the lower the target, the harder it is to win.
Difficulty adjustment	The reset about every two weeks (2,016 blocks) that keeps new pages coming about every 10 minutes.
Block reward	The new bitcoin, plus fees, paid to the miner who adds a page.

National standard

MAIN STANDARD • ECONOMICS STANDARD 4

People usually respond predictably to positive and negative incentives.

ECONOMICS STANDARD 4, GRADE 8, BENCHMARK 2

Changes in incentives usually cause people to change their behavior in predictable ways.

ECONOMICS STANDARD 4, GRADE 12, BENCHMARK 1

Acting as consumers, producers, workers, savers, investors, and citizens, people respond to incentives in order to allocate their scarce resources in ways that provide them the highest possible net benefits.

Mining runs on incentives: the block reward draws miners in, and the difficulty reset changes the odds when more join. The episode fits an economics unit; the 2021 personal-finance standards have no benchmark on how a payment network adds records.

From the Voluntary National Content Standards in Economics (Council for Economic Education, 2nd edition, 2010), Standard 4, pp. 10-12.

Numbers in this episode

As of October 2026

- $\sim 10^{21}/s$: About 1.02×10^{21} guesses (hashes) per second across the network on October 11, 2026 (mempool.space); roughly a billion trillion.
- 1 in 5.7×10^{23} : The chance that one guess wins at today's difficulty (about 132.7 trillion), so a winner turns up about every 9 to 10 minutes on average. Some blocks take much longer, some much less.
- 3.125: New bitcoin paid to the winner of each block since the April 2024 halving, plus the block's fees: about 0.014 bitcoin per block on average over the last 144 blocks (October 11, 2026).

- 2,016: Blocks between difficulty resets, about two weeks. The next reset, at block 971,712, was estimated at about +4% on October 11, 2026 (mempool.space).
- ~0.5%: Bitcoin mining's estimated share of world electricity: about 138 TWh a year (Cambridge Centre for Alternative Finance, April 2025). The same study's survey of miners put renewables and nuclear at 52.4% of their power.

Where each number comes from is listed on the [episode page](#).

Further reading

For students or teachers who want to go deeper.

FOR STUDENTS **Tracking electricity consumption from U.S. cryptocurrency mining operations**

(<https://www.eia.gov/todayinenergy/detail.php?id=61364>)

US Energy Information Administration (February 2024)

A government statistics office's estimate of how much US electricity crypto mining uses, with ranges and the reasons the numbers are uncertain.

FOR STUDENTS **Cambridge Bitcoin Electricity Consumption Index** (<https://ccaf.io/cbnsi/cbeci>)

Cambridge Centre for Alternative Finance, University of Cambridge

A regularly updated estimate of bitcoin's electricity use, from the research centre behind the episode's "half a percent".

FOR TEACHERS **Bitcoin: A Peer-to-Peer Electronic Cash System** (<https://nakamotoinstitute.org/library/bitcoin/>)

[bitcoin/](https://nakamotoinstitute.org/library/bitcoin/)

Satoshi Nakamoto (2008), Satoshi Nakamoto Institute copy

Section 4 describes proof-of-work (the guessing lottery) and section 6 the incentive: new coins and fees paid to the winner.

Links checked October 2026.

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Answer key: What Is Mining?

1. **C. Making guess after guess until one code lands below a target**

Mining is repeated guessing: each guess turns the page into a code, and only a code below the target wins.

2. **A. Newly created bitcoin plus the fees in that page**

The prize is 3.125 new bitcoin (since the April 2024 halving) plus the fees in the page.

3. **D. The target drops, so winning gets harder**

About every 2 weeks (2,016 blocks), the network resets the target to keep the pace near 10 minutes.

4. **B. To rewrite one, you'd have to win all the later lotteries again, faster than everyone else combined**

Changing an old page means redoing the guessing for it and every page after it, faster than the rest of the network combined.

5. **A. About half a percent**

About 138 TWh a year, roughly half a percent of the world's electricity (Cambridge Centre for Alternative Finance, April 2025); estimates vary.

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Episode narration uses a synthetic voice.