Outline:

Use selected on-line articles to explore current issues related to crypto currencies such as BitCoin. A focus for learning is: the underlying technologies, impacts on society, and impacts on the environment.

Objectives:

* C1.4 describe how electronic access to information influences our everyday lives.
* C2.1 describe the negative effects of computers and computer use on the environment.
* C3.1 describe legal and ethical issues related to the use of computers.

**BitCoin & Crypto currencies**

Use the following resource to answer the questions below:

* <https://www.investopedia.com/tech/most-important-cryptocurrencies-other-than-bitcoin/>

1. What is a “crypto currency” and how are “crypto currencies” different from traditional currencies (money)?

The “crypto” in cryptocurrencies refers to complicated cryptography which allows for the creation and processing of digital currencies and their transactions across decentralized systems. Alongside this important “crypto” feature of these currencies is a common commitment to decentralization; cryptocurrencies are typically developed as code by teams who build in mechanisms for issuance (often, although not always, through a process called “mining”) and other controls.

1. BitCoin is the leading crypto currency that most people know. What are some other crypto currencies and what are their unique features?

The first bitcoin alternative on our list, [Ethereum](https://www.investopedia.com/terms/e/ethereum.asp) is a decentralized software platform that enables [Smart Contracts](https://www.investopedia.com/terms/s/smart-contracts.asp) and Decentralized Applications (DApps) to be built and run without any downtime, fraud, control, or interference from a third party. The applications on Ethereum are run on its platform-specific cryptographic token, ether. Ether is like a vehicle for moving around on the Ethereum platform and is sought by mostly developers looking to develop and run applications inside Ethereum, or now by investors looking to make purchases of other digital currencies using ether.﻿ Ether, launched in 2015, is currently the second-largest digital currency by market cap after bitcoin, although it lags behind the dominant cryptocurrency by a significant margin. As of January 2020, ether's market cap is roughly 1/10 the size of bitcoins.

During 2014, Ethereum launched a pre-sale for ether which received an overwhelming response; this helped to usher in the age of the [initial coin offering (ICO)](https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp). According to Ethereum, it can be used to “codify, decentralize, secure and trade just about anything.”﻿ Following the attack on the DAO in 2016, Ethereum was split into Ethereum (ETH) and Ethereum Classic (ETC).﻿ As of Jan. 8, 2020, Ethereum (ETH) had a market cap of $15.6 billion and a per-token value of $142.54.

## 2. Ripple (XRP)

[Ripple](https://www.investopedia.com/terms/r/ripple.asp) is a real-time global settlement network that offers instant, certain and low-cost international payments. Launched in 2012, Ripple “enables banks to settle cross-border payments in real-time, with end-to-end transparency, and at lower costs.” Ripple’s consensus ledger (its method of conformation) is unique in that it doesn’t require mining. Indeed, all of Ripple's XRP tokens were "pre-mined" before launch, meaning that there is no "creation" of XRP over time, only the introduction and removal of XRP from the market supply according to the network's guidelines. In this way, Ripple sets itself apart from bitcoin and many other altcoins. Since Ripple’s structure doesn't require mining, it reduces the usage of computing power and minimizes network latency.

So far, Ripple has seen success with its current business model; it remains one of the most enticing digital currencies among traditional financial institutions looking for ways to revolutionize cross-border payments. It is also currently the third-largest cryptocurrency in the world by overall market cap. As of Jan. 8, 2020, Ripple had a market cap of $9.2 billion and a per-token value of $0.21. ﻿

## 3. Litecoin (LTC)

[Litecoin](https://www.investopedia.com/terms/l/litecoin.asp), launched in 2011, was among the first cryptocurrencies to follow in the footsteps of bitcoin and has often been referred to as “silver to [bitcoin](https://www.investopedia.com/terms/b/bitcoin.asp)’s gold.” It was created by Charlie Lee, an MIT graduate and former Google engineer. Litecoin is based on an open-source global payment network that is not controlled by any central authority and uses "scrypt" as a proof of work, which can be decoded with the help of CPUs of consumer-grade. Although Litecoin is like bitcoin in many ways, it has a faster block generation rate and hence offers a faster transaction confirmation time. ﻿ Other than developers, there are a growing number of merchants who accept Litecoin. As of Jan. 8, 2020, Litecoin had a market cap of $3.0 billion and a per-token value of $46.92, making it the sixth-largest cryptocurrency in the world. ﻿

## 4. Tether (USDT)

Tether was one of the first and most popular of a group of so-called [stablecoins](https://www.investopedia.com/terms/s/stablecoin.asp), cryptocurrencies which aim to peg their market value to a currency or other external reference point so as to reduce volatility. Because most digital currencies, even major ones like bitcoin, have experienced frequent periods of dramatic volatility, Tether and other stablecoins attempt to smooth out price fluctuations in order to attract users who may otherwise be cautious.

Launched in 2014, Tether describes itself as "a blockchain-enabled platform designed to facilitate the use of fiat currencies in a digital manner." Effectively, this cryptocurrency allows individuals to utilize a blockchain network and related technologies to transact in traditional currencies while minimizing the volatility and complexity often associated with digital currencies. On Jan. 8, 2020, Tether was the fourth-largest cryptocurrency by market cap, with a total market cap of $4.6 billion and a per-token value of $1.00.

**Block Chains Explained**

Use the following resource to answer the questions below:

* <https://www.investopedia.com/terms/b/blockchain.asp>

1. “Block chains” are the basic technology behind crypto currencies and other emerging technologies. Explain block chains work with respect to:
   1. What they store

If you have been following banking, investing, or cryptocurrency over the last ten years, you may be familiar with “blockchain,” the record-keeping technology behind bitcoin. And there’s a good chance that it only makes so much sense. In trying to learn more about blockchain, you've probably encountered a definition like this: “blockchain is a distributed, decentralized, public ledger."

* 1. How they work

1. A transaction must occur. Let’s continue with the example of your impulsive Amazon purchase. After hastily clicking through multiple checkout prompt, you go against your better judgment and make a purchase.
2. That transaction must be verified. After making that purchase, your transaction must be verified. With other public records of information, like the Securities Exchange Commission, Wikipedia, or your local library, there’s someone in charge of vetting new data entries. With blockchain, however, that job is left up to a network of computers. When you make your purchase from Amazon, that network of computers rushes to check that your transaction happened in the way you said it did. That is, they confirm the details of the purchase, including the transaction’s time, dollar amount, and participants. (More on how this happens in a second.)
3. That transaction must be stored in a block. After your transaction has been verified as accurate, it gets the green light. The transaction’s dollar amount, your digital signature, and Amazon’s digital signature are all stored in a block. There, the transaction will likely join hundreds, or thousands, of others like it.
4. That block must be given a hash. Not unlike an angel earning its wings, once all of a block’s transactions have been verified, it must be given a unique, identifying code called a hash. The block is also given the hash of the most recent block added to the blockchain. Once hashed, the block can be added to the blockchain.
   1. How they are secure and private

Anyone can view the contents of the blockchain, but users can also opt to connect their computers to the blockchain network. In doing so, their computer receives a copy of the blockchain that is updated automatically whenever a new block is added, sort of like a Facebook News Feed that gives a live update whenever a new status is posted.

Each computer in the blockchain network has its own copy of the blockchain, which means that there are thousands, or in the case of Bitcoin, millions of copies of the same blockchain. Although each copy of the blockchain is identical, spreading that information across a network of computers makes the information more difficult to manipulate. With blockchain, there isn’t a single, definitive account of events that can be manipulated. Instead, a hacker would need to manipulate every copy of the blockchain on the network.

Looking over the Bitcoin blockchain, however, you will notice that you do not have access to identifying information about the users making transactions. Although transactions on the blockchain are not completely anonymous, personal information about users is limited to their digital signature or username.

This raises an important question: if you cannot know who is adding blocks to the blockchain, how can you trust blockchain or the network of computers upholding it?

Blockchain technology accounts for the issues of security and trust in several ways. First, new blocks are always stored linearly and chronologically. That is, they are always added to the “end” of the blockchain. If you take a look at Bitcoin’s blockchain, you’ll see that each block has a position on the chain, called a “height.” As of Feb. 2019, the block’s height had topped 562,000.

After a block has been added to the end of the blockchain, it is very difficult to go back and alter the contents of the block. That’s because each block contains its own hash, along with the hash of the block before it. Hash codes are created by a math function that turns digital information into a string of numbers and letters. If that information is edited in any way, the hash code changes as well.

Here’s why that’s important to security. Let’s say a hacker attempts to edit your transaction from Amazon so that you actually have to pay for your purchase twice. As soon as they edit the dollar amount of your transaction, the block’s hash will change. The next block in the chain will still contain the old hash, and the hacker would need to update that block in order to cover their tracks. However, doing so would change that block’s hash. And the next, and so on.

In order to change a single block, then, a hacker would need to change every single block after it on the blockchain. Recalculating all those hashes would take an enormous and improbable amount of computing power. In other words, once a block is added to the blockchain it becomes very difficult to edit and impossible to delete.

To address the issue of trust, blockchain networks have implemented tests for computers that want to join and add blocks to the chain. The tests, called “consensus models,” require users to “prove” themselves before they can participate in a blockchain network. One of the most common examples employed by Bitcoin is called “proof of work.”

* 1. How they use public and private encryption keys

Here’s the ELI5—“Explain it Like I’m 5”—version. You can think of a public key as a school locker and the private key as the locker combination. Teachers, students, and even your crush can insert letters and notes through the opening in your locker. However, the only person that can retrieve the contents of the mailbox is the one that has the unique key. It should be noted, however, that while school locker combinations are kept in the principal’s office, there is no central database that keeps track of a blockchain network’s private keys. If a user misplaces their private key, they will lose access to their Bitcoin wallet, as was the case with [this man](https://www.cnbc.com/2017/12/20/man-lost-127-million-worth-of-bitcoins-and-city-wont-let-him-look.html) who made national headlines in December of 2017.

### A Single Public Chain

In the Bitcoin network, the blockchain is not only shared and maintained by a public network of users—but it is also agreed upon. When users join the network, their connected computer receives a [copy of the blockchain](https://blockchain.info/) that is updated whenever a new block of transactions is added. But what if, through human error or the efforts of a hacker, one user’s copy of the blockchain manipulated to be different from every other copy of the blockchain?

The blockchain protocol discourages the existence of multiple blockchains through a process called “consensus.” In the presence of multiple, differing copies of the blockchain, the consensus protocol will adopt the longest chain available. More users on a blockchain mean that blocks can be added to the end of the chain quicker. By that logic, the blockchain of record will always be the one that most users trust. The consensus protocol is one of blockchain technology’s greatest strengths but also allows for one of its greatest weaknesses.

### Theoretically, Hacker-Proof

Theoretically, it is possible for a hacker to take advantage of the majority rule in what is referred to as a [51% attack](https://www.investopedia.com/terms/1/51-attack.asp). Here’s how it would happen. Let’s say that there are five million computers on the Bitcoin network, a gross understatement for sure but an easy enough number to divide. In order to achieve a majority on the network, a hacker would need to control at least 2.5 million and one of those computers. In doing so, an attacker or group of attackers could interfere with the process of recording new transactions. They could send a transaction—and then reverse it, making it appear as though they still had the coin they just spent. This vulnerability, known as [double-spending](https://www.investopedia.com/terms/d/doublespending.asp), is the digital equivalent of a perfect counterfeit and would enable users to spend their Bitcoins twice.

Such an attack is extremely difficult to execute for a blockchain of Bitcoin’s scale, as it would require an attacker to gain control of millions of computers. When Bitcoin was first founded in 2009 and its users numbered in the dozens, it would have been easier for an attacker to control most of the computational power in the network. This defining characteristic of blockchain has been flagged as one weakness for fledgling cryptocurrencies.

User fear of 51% attacks can actually limit monopolies from forming on the blockchain. In “Digital Gold: Bitcoin and the Inside Story of the Misfits and Millionaires Trying to Reinvent Money,” New York Times journalist Nathaniel Popper writes of how a group of users, called “[Bitfury](https://bitfury.com/" \t "_blank),” pooled thousands of high-powered computers together to gain a competitive edge on the blockchain. Their goal was to mine as many blocks as possible and earn bitcoin, which at the time were valued at approximately $700 each.

### Harnessing Bitfury

By March 2014, however, Bitfury was positioned to exceed 50% of the blockchain network’s total computational power. Instead of continuing to increase its hold over the network, the group elected to self-regulate itself and vowed never to go above 40%. Bitfury knew that if they chose to continue increasing their control over the network, bitcoin’s value would fall as users sold off their coins in preparation for the possibility of a 51% attack. In other words, if users lose their faith in the blockchain network, the information on that network risks becoming completely worthless. Blockchain users, then, can only increase their computational power to a point before they begin to lose money.

## Blockchain's Practical Application

Blocks on the blockchain store data about monetary transactions—we’ve got that out of the way. But it turns out that blockchain is actually a pretty reliable way of storing data about other types of transactions, as well. In fact, blockchain technology can be used to store data about property exchanges, stops in a supply chain, and even votes for a candidate.

Professional services network Deloitte recently surveyed 1,000 companies across seven countries about integrating blockchain into their business operations. Their [survey](https://www2.deloitte.com/insights/us/en/topics/understanding-blockchain-potential/global-blockchain-survey.html) found that 34% already had a blockchain system in production today, while another 41% expected to deploy a blockchain application within the next 12 months. In addition, nearly 40% of the surveyed companies reported they would invest $5 million or more in blockchain in the coming year. Here are some of the most popular applications of blockchain being explored today.

### Bank Use

Perhaps no industry stands to benefit from integrating blockchain into its business operations more than banking. Financial institutions only operate during business hours, five days a week. That means if you try to deposit a check on Friday at 6 p.m., you likely will have to wait until Monday morning to see that money hit your account. Even if you do make your deposit during business hours, the transaction can still take one to three days to verify due to the sheer volume of transactions that banks need to settle. Blockchain, on the other hand, never sleeps.

By integrating blockchain into banks, consumers can see their transactions processed in as little as 10 minutes, basically the time it takes to add a block to the blockchain, regardless of the time or day of the week. With blockchain, banks also have the opportunity to exchange funds between institutions more quickly and securely. In the stock trading business, for example, the settlement and clearing process can take up to three days (or longer, if banks are trading internationally), meaning that the money and shares are frozen for that time.

Given the size of the sums involved, even the few days that the money is in transit can carry significant costs and risks for banks. Santander, a European bank, put the potential savings at [$20 billion a year](http://www.coindesk.com/santander-blockchain-tech-can-save-banks-20-billion-a-year/). Capgemini, a French consultancy, estimates that consumers could save up to [$16 billion](https://www.capgemini.com/news/consumers-set-to-save-up-to-sixteen-billion-dollars-on-banking-and-insurance-fees-thanks-to) in banking and insurance fees each year through blockchain-based applications.

### Use in Cryptocurrency

Blockchain forms the bedrock for cryptocurrencies like Bitcoin. As we explored earlier, currencies like the U.S. dollar are regulated and verified by a central authority, usually a bank or government. Under the central authority system, a user’s data and currency are technically at the whim of their bank or government. If a user’s bank collapses or they live in a country with an unstable government, the value of their currency may be at risk. These are the worries out of which Bitcoin was borne.

By spreading its operations across a network of computers, blockchain allows Bitcoin and other cryptocurrencies to operate without the need for a central authority. This not only reduces risk but also eliminates many of the processing and transaction fees. It also gives those in countries with unstable currencies a more stable currency with more applications and a wider network of individuals and institutions they can do business with, both domestically and internationally (at least, this is the goal.)

### Healthcare Uses

Health care providers can leverage blockchain to securely store their patients’ medical records. When a medical record is generated and signed, it can be written into the blockchain, which provides patients with the proof and confidence that the record cannot be changed. These personal health records could be encoded and stored on the blockchain with a private key, so that they are only accessible by certain individuals, thereby ensuring privacy

### Property Records Use

If you have ever spent time in your local Recorder’s Office, you will know that the process of recording property rights is both burdensome and inefficient. Today, a physical deed must be delivered to a government employee at the local recording office, where is it manually entered into the county’s central database and public index. In the case of a property dispute, claims to the property must be reconciled with the public index.

This process is not just costly and time-consuming—it is also riddled with human error, where each inaccuracy makes tracking property ownership less efficient. Blockchain has the potential to eliminate the need for scanning documents and tracking down physical files in a local recording office. If property ownership is stored and verified on the blockchain, owners can trust that their deed is accurate and permanent.

### Use in Smart Contracts

A [smart contract](https://www.investopedia.com/terms/s/smart-contracts.asp) is a computer code that can be built into the blockchain to facilitate, verify, or negotiate a contract agreement. Smart contracts operate under a set of conditions that users agree to. When those conditions are met, the terms of the agreement are automatically carried out.

Say, for example, I’m renting you my apartment using a smart contract. I agree to give you the door code to the apartment as soon as you pay me your security deposit. Both of us would send our portion of the deal to the smart contract, which would hold onto and automatically exchange my door code for your security deposit on the date of the rental. If I don’t supply the door code by the rental date, the smart contract refunds your security deposit. This eliminates the fees that typically accompany using a notary or third-party mediator.

### Supply Chain Use

Suppliers can use blockchain to record the origins of materials that they have purchased. This would allow companies to verify the authenticity of their products, along with health and ethics labels like “Organic,” “Local,” and “Fair Trade.”

As reported by Forbes the [food industry is moving into the use](https://www.forbes.com/sites/samantharadocchia/2018/04/26/3-innovative-ways-blockchain-will-build-trust-in-the-food-industry/#10a5ebc42afc) of blockchain to increasingly track the path and safety of food throughout the farm-to-user journey.

### Uses in Voting

Voting with blockchain carries the potential to eliminate election fraud and boost voter turnout, as was [tested](https://www.technologyreview.com/s/611850/why-security-experts-hate-that-blockchain-voting-will-be-used-in-the-midterm-elections/) in the Nov. 2018 midterm elections in West Virginia. Each vote would be stored as a block on the blockchain, making them nearly impossible to tamper with. The blockchain protocol would also maintain transparency in the electoral process, reducing the personnel needed to conduct an election and provide officials with instant results.

1. How does BitCoin use block chains?

The goal of blockchain is to allow digital information to be recorded and distributed, but not edited. That concept can be difficult to wrap our heads around without seeing the technology in action, so let’s take a look at how the earliest application of blockchain technology actually works.

Blockchain technology was first outlined in 1991 by Stuart Haber and W. Scott Stornetta, two researchers who wanted to implement a system where document timestamps could not be tampered with. But it wasn’t until almost two decades later, with the launch of Bitcoin in January 2009, that blockchain had its first real-world application.

The Bitcoin protocol is built on the blockchain. In a research paper introducing the digital currency, Bitcoin’s pseudonymous creator Satoshi Nakamoto referred to it as “a new electronic cash system that’s fully peer-to-peer, with no trusted third party.”

Here’s how it works.

You have all these people, all over the world, who have Bitcoin. According to a 2017 [study](https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-cryptocurrency/#.W9iLkBNKiL5) by the Cambridge Centre for Alternative Finance, the number may be as many as 5.9 million. Let’s say one of those 5.9 million people wants to spend their Bitcoin on groceries. This is where the blockchain comes in.

When it comes to printed money, the use of printed currency is regulated and verified by a central authority, usually a bank or government—but [Bitcoin is not controlled by anyone](https://www.investopedia.com/terms/d/disruptive-technology.asp). Instead, transactions made in Bitcoin are verified by a network of computers.

When one person pays another for goods using Bitcoin, computers on the Bitcoin network race to verify the transaction. In order to do so, users run a program on their computers and try to solve a complex mathematical problem, called a “hash.” When a computer solves the problem by “hashing” a block, its algorithmic work will have also verified the block’s transactions. The completed transaction is publicly recorded and stored as a block on the blockchain, at which point it becomes unalterable. In the case of Bitcoin, and most other blockchains, computers that successfully verify blocks are rewarded for their labor with cryptocurrency.

Although transactions are [publicly recorded](https://www.blockchain.com/btc/blocks) on the blockchain, user data is not—or, at least not in full. In order to conduct transactions on the Bitcoin network, participants must run a program called a “wallet.” Each wallet consists of two unique and distinct cryptographic keys: a public key and a private key. The public key is the location where transactions are deposited to and withdrawn from. This is also the key that appears on the blockchain ledger as the user’s digital signature.

1. What are some advantages and disadvantages of block chains?

Blocks on the blockchain store data about monetary transactions—we’ve got that out of the way. But it turns out that blockchain is actually a pretty reliable way of storing data about other types of transactions, as well. In fact, blockchain technology can be used to store data about property exchanges, stops in a supply chain, and even votes for a candidate.

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By spreading its operations across a network of computers, blockchain allows Bitcoin and other cryptocurrencies to operate without the need for a central authority. This not only reduces risk but also eliminates many of the processing and transaction fees. It also gives those in countries with unstable currencies a more stable currency with more applications and a wider network of individuals and institutions they can do business with, both domestically and internationally (at least, this is the goal.)

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**Crypto-Games & Other Applications**

Use the following resource to answer the questions below:

* <https://egamers.io/beginners-guide-to-crypto-games/>

1. What are some interesting Crypto Games (i.e. games that use Block Chain technology) available for Android or iPhone?

The [Enjin mobile wallet](https://egamers.io/enj-wallet-airdrop/" \t "_blank) is essential for any gamer and especially for crypto games in the Enjin ecosystem. The Enjin wallet acts like any other cryptocurrency wallet but it also allows users to see items that are stored in their wallets. You will be able to store any ERC20,  ERC721 and ERC1155 tokens (items) in your Enjin wallet. Think of the Enjin Wallet as your inventory for various games, items earned from crypto games can be stored in there any games based on the Enjin ecosystem can be accessed using your Enjin Wallet. As the [world’s most secured cryptocurrency wallet](https://egamers.io/enjin-smart-wallet-update-proven-security-assets-melting/), its the safest choice to store your hard earned items.

Some of the hottest games are built using Enjin’s blockchain and many of them are part of the [Gaming Multiverse](https://egamers.io/gaming-multiverse/). An alliance of blockchain games where you can use a [single item in various Multiverse games](https://egamers.io/multiverse-items-list/). Isn’t that cool?

* [Check here the list of the Multiverse Games and start playing now.](https://egamers.io/multiverse-games-list-blockchain-gaming/)
* Download the [Enjin mobile wallet](http://%20https//enjinwallet.io/" \t "_blank).
* You can learn how to [set up the wallet here](https://support.enjin.com/hc/en-us/articles/360000080453-Creating-a-new-wallet).

Keep in mind the following: Enjin is a token based on the Ethereum blockchain. So your Ethereum wallet is also your Enjin Wallet. Confused? Keep reading below.

1. How are Crypto Games different from conventional games?

A game is fully decentralized when it’s built on top of the blockchain technology. This type of games follows blockchain principles meaning that most of the times, each move you do is irreversible and usually you have to send a transaction to the network where some fees occur. Most of the times they are playable using Metamask extension when it comes to Ethereum blockchain, TronLink for TRON games, Scatter for EOS Blockchain and so on. Most decentralized games are currently using sidechains for a better gaming experience. In sidechains, usually, the player doesn’t have to pay for fees each time an action is performed and it completes instantly unless otherwise stated.

1. What are some other real-world applications of block chains besides games and crypto currencies?

MetaMask is a chrome extension that allows you to run web 3 applications (dapps). It’s the most popular and essential program needed to play Ethereum based games and it also serves as an Ethereum cryptocurrency wallet. Remember what we said above, Ethereum has a lot of other cryptocurrencies built upon it, so **all the ERC-20 tokens such as**[**ENJ**](https://egamers.io/mass-adoption-weapon-enjin-blockchain-sdk-will-take-over-the-gaming-industry/)**,**[**MANA**](https://egamers.io/decentraland-celebrates-3d-builder-with-a-creative-50000-contest/)**,**[**LOOM**](https://egamers.io/tag/loom/)**etc can be stored in an Ethereum address** (wallet).

**BitCoin & Society**

Read the following resources before answering the questions below:

* <https://www.cnet.com/how-to/what-is-bitcoin/>
* <https://www.independent.co.uk/life-style/gadgets-and-tech/news/bitcoin-price-fall-criminals-blockchain-anonymous-cryptocurrency-zcash-monero-dash-a8174716.html>
* <https://coincenter.org/link/why-ransomware-criminals-use-bitcoin-and-why-that-could-be-their-undoing>

1. How is BitCoin created and what is "BitCoin Mining"?

Bitcoin was invented in 2009 by a person (or group) who called himself Satoshi Nakamoto. His [stated goal](https://bitcoin.org/bitcoin.pdf) was to create "a new electronic cash system" that was "completely decentralized with no server or central authority." After cultivating the concept and technology, in 2011, Nakamoto turned over the source code and domains to others in the bitcoin community, and subsequently vanished. (Check out the [New Yorker's great profile](https://www.newyorker.com/magazine/2011/10/10/the-crypto-currency) of Nakamoto from 2011.)

A person (or group, or company) mines bitcoin by doing a combination of advanced math and record-keeping. Here's how it works. When someone sends a bitcoin to someone else, the network records that transaction, and all of the others made over a certain period of time, in a "block." Computers running special software -- the "miners" -- inscribe these transactions in a gigantic digital ledger. These blocks are known, collectively, as the "blockchain" -- [an eternal, openly accessible record](https://www.cnet.com/news/blockchain-explained-builds-trust-when-you-need-it-most/) of all the transactions that have ever been made.

1. Can you buy BitCoin and what does it cost?

Ultimately, the value of a bitcoin is determined by what people will pay for it. In this way, there's a similarity to how stocks are priced.

The protocol established by Satoshi Nakamoto dictates that only 21 million bitcoins can ever be mined -- about 12 million have been mined so far -- so there is a limited supply, like with gold and other precious metals, but no real intrinsic value. (There are [numerous mathematical and economic theories](https://bitcoin.stackexchange.com/questions/8439/why-was-21-million-picked-as-the-number-of-bitcoins-to-be-created) about why Nakamoto chose the number 21 million.) This makes bitcoin different from stocks, which usually have some relationship to a company's actual or potential earnings.

1. What can you use BitCoin for?

You can use bitcoin to buy a gift card and then shop at those retailers or another one of the 200-some that they work with, including giants like Nike, Target and Starbucks. Alternatively, you can also use a service like Shakepay to convert cryptocurrencies into USD or Euros for a fee.

1. What are the risks of using BitCoin?

Legal and regulatory hazards aside, as both an investment and currency, bitcoin is very risky. When you wake up in the morning, you know pretty precisely how much a dollar can buy. The financial value of a bitcoin, however, is highly volatile and may swing widely from day to day and even hour to hour. ([Exhibit A: December 2017.](https://www.cnet.com/news/bitcoin-crash-correction/))

Bitcoin transactions cannot be traced back individuals -- they are secured but also obscured through the use of [public and private encryption keys](https://www.cnet.com/news/how-well-save-encryption-from-the-crypto-apocalypse/). This anonymity can be appealing, especially with companies and marketers increasingly tracking our every purchase, but it also comes with drawbacks. You can never be certain who is selling you bitcoin or buying them from you.  Opportunities for money laundering abound; in 2016, [authorities in the Netherlands arrested 10 men](https://www.reuters.com/article/us-netherlands-crime-bitcoin/dutch-arrest-10-men-suspected-of-using-bitcoin-to-launder-money-idUSKCN0UY0V8) for just this.

Theft is also a risk. The [bitcoin subreddit](http://www.reddit.com/r/Bitcoin) is rife with individuals' stories and even established exchanges are targets. Mt. Gox, based in Japan, ["lost" 750,000 of its customers' bitcoins](https://www.cnet.com/news/bitcoin-losses-spur-mt-gox-to-bankruptcy-filing/) in 2014 and [hackers took $60 million from NiceHash](https://www.cnet.com/news/bitcoin-exchange-nicehash-loses-millions-to-hackers/) in December 2017. There are few avenues for pursuing refunds, challenging a transaction or recovering such losses. Once a transaction hits the blockchain, it's final.

1. How much of BitCoin business is related to criminal activity?

Last week's major ransomware attack put Bitcoin back into spotlight. With that comes questions about what Bitcoin is, how it works, and why it is apparently favored by ransomware hackers.

Coin Center director of research Peter Van Valkenburgh was on the [Marketplace radio show yesterday](https://www.marketplace.org/2017/05/15/tech/hackers-may-wanna-cry-when-trying-cash-worldwide-cyberattack) to talk through these questions. On why hackers are using Bitcoin, he said:

"The efficiency of the network is what criminals are really using it for here. It's electronic cash, so it’s easy to write software that can automatically demand payment and automatically demand that payment has been made."

He goes into more detail on what that means in his blog post, "[Why Bitcoin is not the root cause of ransomware](https://coincenter.org/entry/why-bitcoin-is-not-the-root-cause-of-ransomware):"

"Bitcoin is particularly useful here because it’s fast, reliable, and verifiable. The hacker can simply watch the public blockchain to know if and when a victim has paid up; she can even make a unique payment address for each victim and automate the process of unlocking their files upon a confirmed bitcoin transaction to that unique address.

The truth is that criminals have, as usual, very strict design parameters for the tools they use because there’s no tech-support, contract, or legal recourse for a criminal whose tools fail to perform as they should. Criminals are using Bitcoin in this case because it’s a reliable system that just works. Ransomware hackers are rather like the proverbial rumrunners of prohibition: they like fast custom cars because almost everyone else is still driving a Model T."

Of course, as many have pointed out, there is an inherent problem with the choice to use cryptocurrency in this attack. The open, transparent, nature of bitcoin blockchain transactions means that the global community is closely watching the ransom money. This is going to make converting it into fiat currency pretty difficult to get away with. As Peter [told the International Business Times](http://www.rawstory.com/2017/05/wannacry-hackers-only-made-50000-worth-of-bitcoin-from-attack/):

"In the US, every major bitcoin exchange is regulated by FINCEN. Right now the $50,000 extorted from victims is just sitting on the bitcoin network...that [exchange into local currency] is where you're vulnerable to being identified."

We’ve detailed how [law enforcement can use the bitcoin blockchain](https://coincenter.org/entry/how-can-law-enforcement-leverage-the-blockchain-in-investigations) to track criminals before and have already seen [high profile cases](https://coincenter.org/entry/silk-road-corruption-case-shows-how-law-enforcement-uses-bitcoin) in which blockchain forensics exposed criminals. All they need to do is slip up once and a global community of professional and enthusiast cyber crime fighters will jump on them.

1. What are some of the reasons why criminals use BitCoin?

Contrary to popular opinion, it’s actually [quite easy to link Bitcoin transactions together](https://thenextweb.com/the-next-police/2018/08/07/police-drugs-online-darkweb/) in order to identify you. This should be obvious, considering public blockchains [are totally transparent and browsable](https://www.blockchain.com/explorer) by anyone.

Still, dumb criminals are [constantly caught for using Bitcoin](https://thenextweb.com/hardfork/2018/06/27/drug-bitcoin-anonymous/) in illicit activities.

This is because Bitcoin is not anonymous. In fact, there are barely any [cryptocurrencies on today’s market that are capable of masking identities](https://www.wired.com/story/monero-privacy/) when sending, receiving, and spending cryptocurrency.

So, ever wonder how these cyberbaddies are turning ill-gotten money, too sketchy for use in the real world, into clean cryptocurrency?

1. What are some of the disadvantages of BitCoin when used for criminal activity?

Taken together, the security risks around Bitcoin are the currency’s single greatest drawback, and are worthy of special consideration for anyone considering converting U.S. dollars into Bitcoin.

The fact that Bitcoin units are virtually impossible to duplicate does not mean that Bitcoin users are immune to theft or fraud. The Bitcoin system has some imperfections and weak points that can be exploited by sophisticated hackers looking to steal Bitcoin for their own use. The Mt. Gox incident, as well as a host of smaller, less publicized incidents, underscore that Bitcoin exchanges are particularly vulnerable to theft by hacking.

Two of Bitcoin’s perceived strengths – its political independence and strong anonymity protections – actually make it *more* attractive to thieves and fraudsters.

In many jurisdictions, Bitcoin occupies a legal gray area, meaning local law enforcement authorities view theft prevention as a relatively low priority. Moreover, it’s often difficult for the authorities to prosecute those responsible for Bitcoin heists, many of which originate in politically unstable or unfriendly nations and affect a global population of Bitcoin holders.

Those who use Bitcoin for illicit purposes face additional risks. Dark web marketplaces – online, international black markets whose users buy and sell illicit substances, stolen goods, and prohibited services – are frequent heist targets. Bitcoin users who participate in the dark web are likely already breaking the law, and thus have limited recourse in the event of a hack or theft. After all, they can’t very well contact local authorities and say that the funds they received for selling illegal drugs were stolen.

**BitCoin & The Environment**

Read the following resources before answering the questions below:

* <https://www.cbc.ca/news/business/bitcoin-electricity-1.4668768>
* <https://www.cbc.ca/news/business/hut8-medicine-hat-bitcoin-mining-1.4834027>

1. What is a BitCoin “miner” and why are people concerned about BitCoin mining?

De Vries also estimates the industry's voracious appetite for juice has doubled in the past six months, possibly due to new interest in bitcoin — their price spiked to just under $20,000 each at the end of last year — but also because energy-consumption growth is baked in: the supply of undiscovered bitcoins is dwindling so it takes more work to find those left.

In the early days, it was comparatively easy to find a bitcoin, as there were fewer miners competing for the work. Mining could be done by hobbyists using personal computers. But as the digital currency's popularity — and value — has skyrocketed, the increased complexity of the blockchain requires more energy and computing power to solve equations, and now there are specialized computing farms mining for bitcoin.

1. Why does BitCoin mining use so much energy?

Bitcoin miners will guzzle more electricity this year than some countries do, according to new numbers from a leading researcher. And while some critics take issue with these figures, few disagree that the digital currency's energy use is a problem that's only getting bigger.

Economist Alex de Vries studies bitcoin and other cryptocurrencies, which were invented in 2008 by[an anonymous computer programmer](http://www.cbc.ca/news/technology/bitcoin-virtual-currency-hitting-the-mainstream-1.1312022). Bitcoin allows people to buy and sell things directly from each other without the use of intermediaries, like banks or currencies controlled and manipulated by governments.

1. Why has Hut-8 decided to locate its facility in Alberta when its head office is in Toronto? What does the city of Medicine Hat provide that is required for mining BitCoin?

On the day of the grand opening of the largest bitcoin mining project in the country, the weather was partly cloudy and 15 C. On a Friday afternoon like this one, the new facility uses as much electricity as all of Medicine Hat, Alta., a city of more than 60,000 people and home to several large industrial plants.

The vast amount of electricity needed for bitcoin mining is why the city of Medicine Hat has championed the economic benefits of the project, while environmentalists say they are wary of the significant energy use.

Toronto-based Hut 8 has spent more than $100 million to develop the 4½-hectare site on the northern edge of the city. It has 56 shipping containers, each filled with 180 computer servers that digitally mine for bitcoin around the clock.

1. What benefits does the city of Medicine Hat expect to see from this BitCoin facility?

The company said it has already mined more than 3,300 bitcoins in Alberta, including at its much smaller site in Drumheller. On average, the Medicine Hat facility mines about 20 bitcoins per day. The value of bitcoin can fluctuate daily but has sold recently for around $9,000.

The bitcoin mining facility is located right beside the city of Medicine Hat's new natural gas-fired power plant and four wind turbines are a short distance away. The bitcoin plant can consume more than 60 megawatts of power, more than 10 times more electricity used by any other facility in the city, according to the mayor.

1. What concern does the city of Medicine Hat have about from this Bitcoin facility?

That's why, in the event of a summer heat wave, the city has provisions in place to pull the plug on the electricity it provides to Hut 8, so there won't be any blackouts for residents, according to the mayor.

Still, some say the bitcoin mining industry wastes far too much energy.

"It's a huge magnitude when you talk about the carbon emissions," said Saeed Kaddoura, an analyst with the Pembina Institute, an environmental think-tank. "Moving forward, there needs to be some consideration on what the environmental impact of this is."

1. What concern do environmentalists have about the Medicine Hat facility and about BitCion mining in general? E.g. how does BitCoin mining harm the environment?

Environmental groups are concerned by the sheer amount of energy consumed by bitcoin mining, especially in places like Medicine Hat where most of the electricity is produced by fossil fuels.

The bitcoin system is designed, so only a limited number of the cryptocurrency can be mined everyday. Over time, as more miners compete for a decreasing number of available bitcoins, facilities will have to use more electricity compared to the amount of the cryptocurrency they collect.

"The way the bitcoin algorithm works is that it's designed to waste as much electricity as possible. And the more popular bitcoin becomes, the more electricity it wastes," said Keith Stewart, a spokesperson for Greenpeace.

1. If Hut-8 wanted to build a facility in Brampton, would be in favor of this proposal? Explain why and why not.

Medicine Hat owns its own natural gas and electricity generation and distribution businesses. The city leases the land to Hut 8 and the facility employs 40 full-time workers. Add up the economic benefits and the city of Medicine Hat will receive a significant financial boost from the new project, says Ted Clugston, the city's mayor.

Financial details of the city's deal with Hut 8 are not disclosed.

* [Bitcoin is an energy hog: New numbers suggest how big a problem it is](https://www.cbc.ca/news/business/bitcoin-electricity-1.4668768)

For more than a century, the city has attracted business by offering low-cost energy, and the mayor said this project is no different.

"They could have gone anywhere in the world and they chose Medicine Hat," said Clugston. "[Hut 8] is not here for renewable energy because it is not reliable. They need gas-fired generation and we have it in spades."