

This is CS50

GETTING AN EVACUATION
FROM THE
IS LIFE IN THINGS
GET A SPRINKLER
FROM A
FIRE HOSE...



learn how to program in C

learn how to program in Python

learn how to program in SQL

learn how to program in **JavaScript**

learn how to program

learn how to solve problems

what ultimately matters in this course is not so much where you end up relative to your classmates but where you end up relative to yourself when you began

hacks.mit.edu/Hacks/by_year/1991/fire_hydrant/







bbd CS50

to malan ▾

Hii David,

It's your friend, bbd! I hope you're well and not too worried after I left so abruptly yesterday night! After such a successful Hackathon and semester so far, I just needed to unwind a bit and take a trip to new places and fresh air! Don't worry tho! I will return safe, sound and healthy home once I am more relaxed :D as of right now I'm just spending some few days with our tech friends up Massachusetts Avenue, they gave me a hand on moving tonight (for some reason I could never find my feet 😞) and they've been amazing hosts! I will see you soon and will miss you and Harvard and specially our students!!

Sincerely yours,
CS50 bbd

Fri, Dec 2, 2022, 6:52AM



This is 6.100A/B

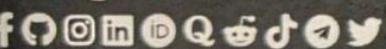
6.100A/B's Introduction to
Computer Science

OpenCourseWare

Donate 

David J. Malan

malan@harvard.edu



 Tech Interviews

 Zoom Meetings New

 6.100A/B Movie Night 20...

 6.100A/B Puzzle Day 2022

Hundredville

Write a Python program to solve a mystery.

A Mystery in Hundredville

The CS50 Duck has been stolen! The town of Hundredville has called upon you to solve the mystery of the theft. Authorities believe that the thief stole the duck and then, shortly afterwards, took a walk out of town with an accomplice. Your goal is to identify:

- Who the thief is,
- What school the thief escaped to, and
- Who the thief's accomplice is who helped them escape

All you know is that the theft **took place on December 2, 2022** and that it **took place at the CS50 Hackathon**.

How will you go about solving this mystery? The Hundredville authorities have taken some of the town's records from the time of the theft and prepared the file for you, `hundredville.csv`, which contains tables of data from the town's records. Using just the information in the database, your task is to solve the mystery.

Getting Started



This is 6.100A/B.

6.100A/B

**RED LINE
INBOUND
NEXT TRAIN**

TRACK 1

EXIT

ELEVAT

EXIT







Greetings from

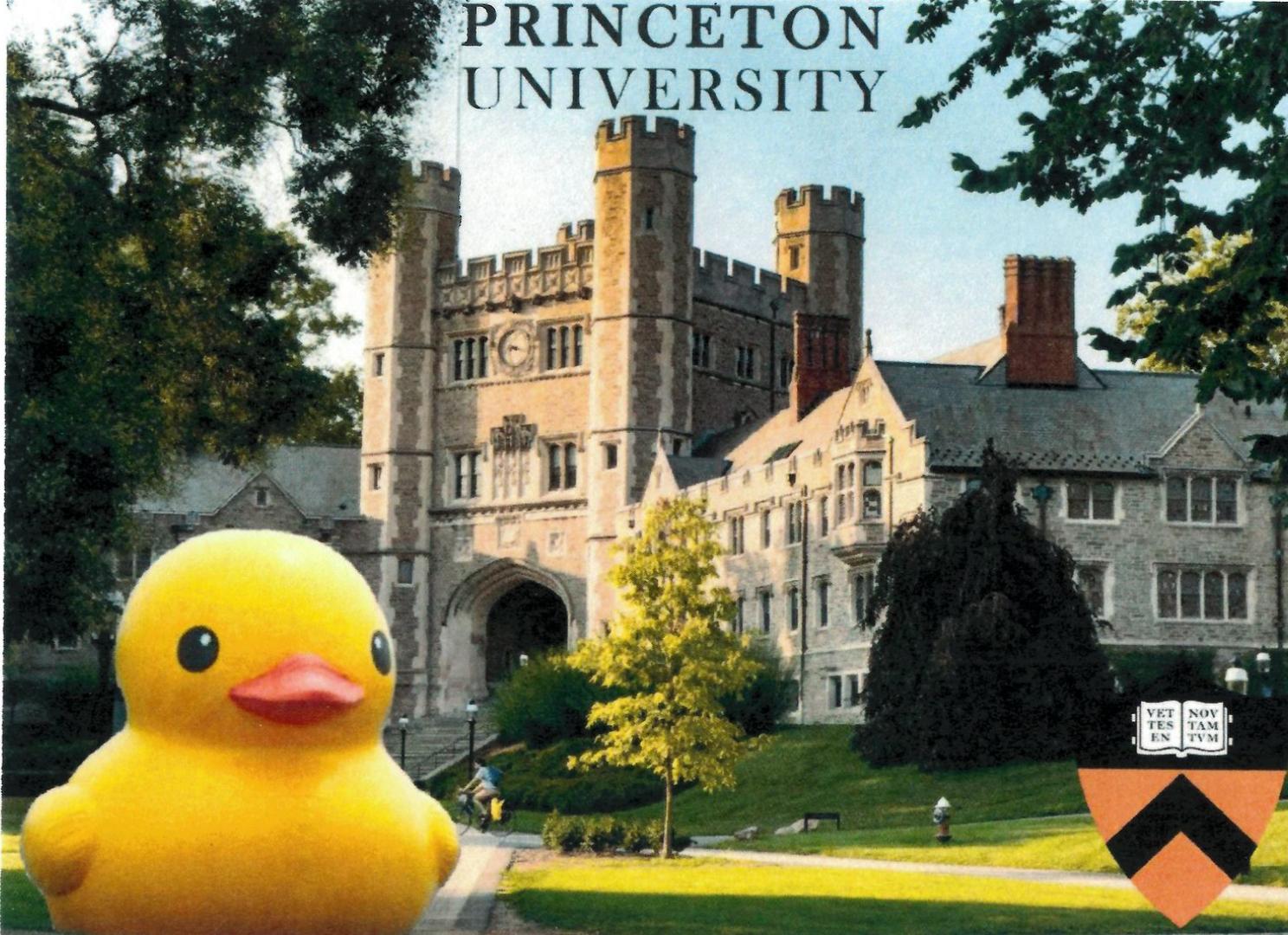
YALE



LUX ET VERITAS



PRINCETON UNIVERSITY



VET
TES
EN
NOV
TAM
TVM



Greetings from
Stanford
University









bbd CS50

to David ▾

Mon, Dec 5, 2022, 12:38AM



Hi David!

... I intend to arrive for the fair between 8:37am and 9:47am. It would be easier for my MIT hacker friends to bring me to the right location if there is someone waiting there with a sign that says “DUCK.”

Sincerely yours,
CS50 bbd



hacks.mit.edu/Hacks/by_year/2022/cs50_duck/

CS50 Hackathon





THIS IS CS50

P

shuttle.harvard.edu

connecting HARVARD

HARVARD
SHUTTLE

CS50

36442



CS50 Fair







I took CS50.

I took CS50.
I took CS50.

I took CS50.
I took CS50.
I took CS50.
I took CS50.

I took CS50.

I took CS50.
I took CS50

Install command-line tools

<https://developer.apple.com/xcode/>

<https://learn.microsoft.com/en-us/windows/wsl/about>

...

Learn Git

https://youtu.be/MJUJ4wbFm_A

...

Download VS Code

<https://code.visualstudio.com/>

<https://cs50.readthedocs.io/cs50.dev/>

Host a web site

<https://pages.github.com/>

<https://www.netlify.com/>

...

Host a web app

<https://aws.amazon.com/education/awseducate/>

<https://azure.microsoft.com/en-us/free/students/>

<https://cloud.google.com/edu/students>

<https://education.github.com/pack>

<https://www.heroku.com/>

<https://vercel.com/>

...

Ask questions

<https://www.reddit.com/r/learnprogramming/>

<https://www.reddit.com/r/programming/>

<https://stackoverflow.com/>

<https://serverfault.com/>

<https://techcrunch.com/>

<https://news.ycombinator.com/>

...

Ask questions

<https://chat.openai.com/>

<https://github.com/features/copilot>

...

Take classes

<https://cs50.edx.org/python>

<https://cs50.edx.org/sql>

<https://cs50.edx.org/web>

<https://cs50.edx.org/ai>

<https://cs50.edx.org/games>

<https://cs50.edx.org/cybersecurity>

<https://cs50.edx.org/business>

<https://cs50.edx.org/law>

<https://cs50.edx.org/technology>

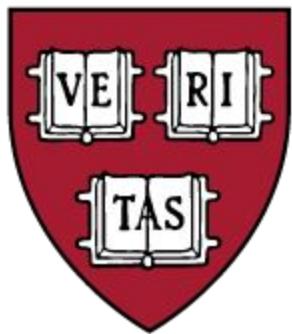
Stay in touch

cs50.harvard.edu/communities

Thank you



Office for the Arts at Harvard
Memorial Hall / Lowell Hall Complex



Education Support Services

Faculty of Arts and Sciences

Harvard University

A large, solid red circle is positioned on the left side of the frame, partially overlapping the text area.

THE RESTAURANT
CHANGSHO

CS50



truse

Helen Cho

Jonny Zhang



Abel



Sophie Edouard



Moni Radev



Mehreteab



Joshua Ng



Montague Mawere

cybersecurity

passwords

1. 123456
2. admin
3. 12345678
4. 123456789
5. 1234
6. 12345
7. password
8. 123
9. Aa123456
10. 1234567890

- iloveyou
- qwertyuiop
- P@ssw0rd
- *****

brute-force attacks

4-digit passcode

4-digit passcode

$10 \times 10 \times 10 \times 10$

10,000

4-letter passcode

$52 \times 52 \times 52 \times 52$

7,311,616

4-character passcode

$94 \times 94 \times 94 \times 94$

78,074,896

8-character passcode

$94 \times 94 \times 94 \times 94 \times 94 \times 94 \times 94$

6,095,689,385,410,816





Sign in

to continue to Gmail

Email or phone

[Forgot email?](#)

Not your computer? Use Guest mode to sign in privately.

[Learn more](#)

[Create account](#)

[Next](#)

password managers

- Apple iCloud Keychain
- Google Password Manager
- Microsoft Credential Manager
- ...

two-factor authentication

one-time passwords



2-step Verification

Use your device to sign in to your Google Account.



Enter verification code

Get a verification code from the "Google Authenticator" app

Enter the 6-digit code

Done

Don't ask again on this computer



Welcome

Enter your password

Show password

[Forgot password?](#)

Next



Welcome

Enter your password

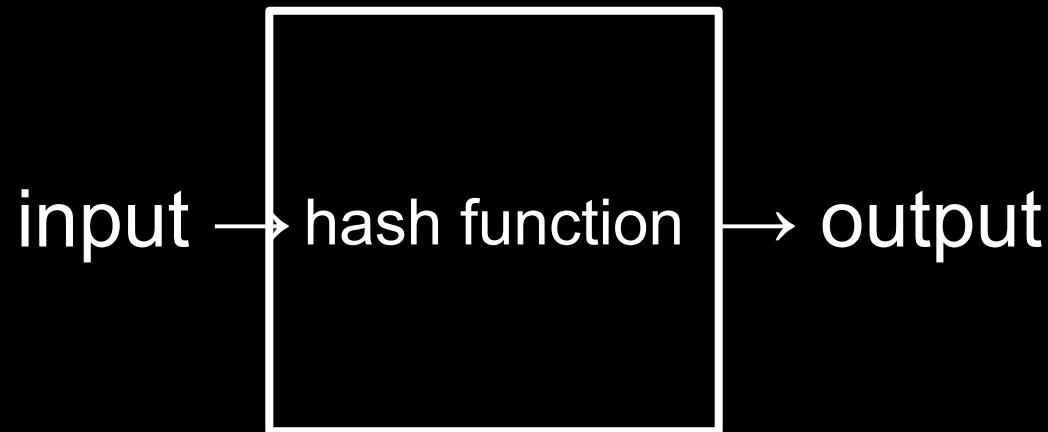
Show password

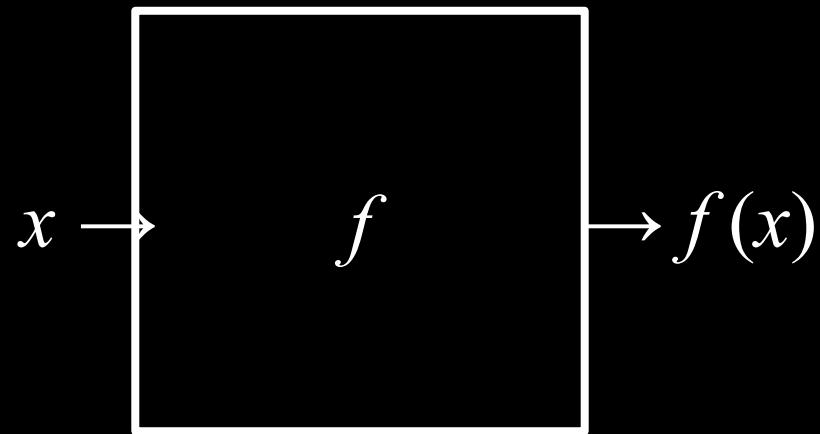
[Forgot password?](#)

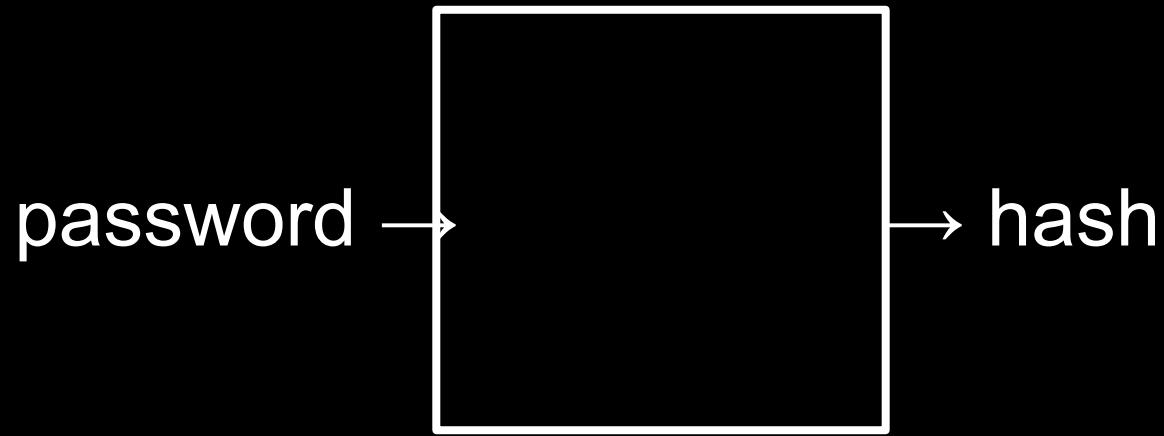
Next

hashing

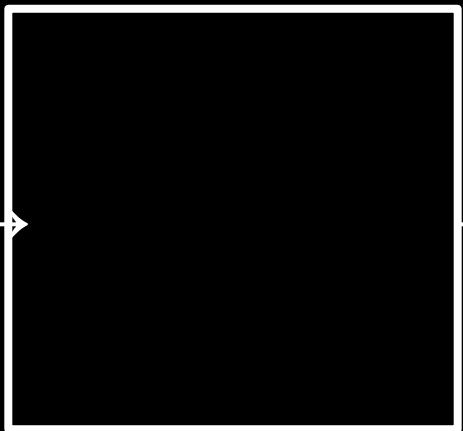
alice:apple
bob:banana
...



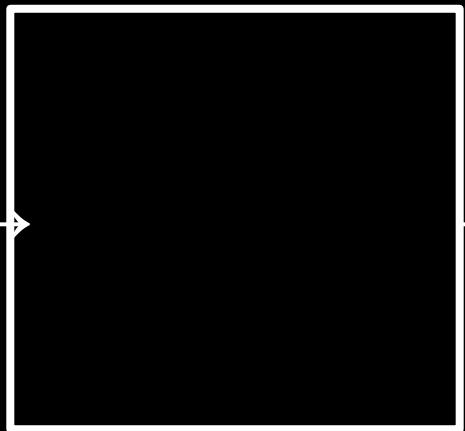




apple → 1

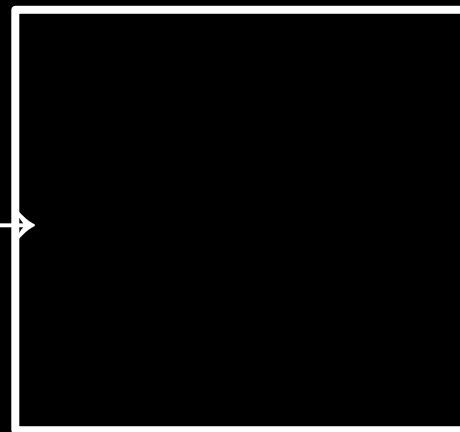


apple →



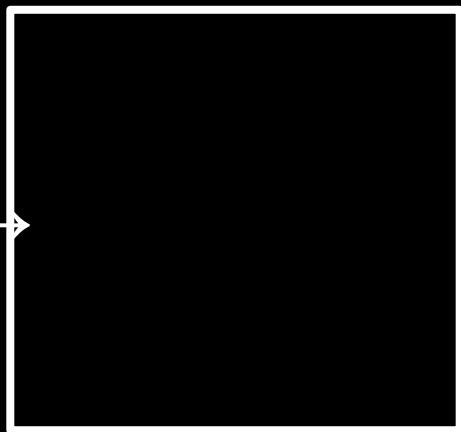
→ ...ekWXa83dhiA

banana →



→ 2

banana



→ ...ZS4zkCo/P7E

alice:apple
bob:banana
...

alice:..ekWXa83dhiA

bob:..ZS4zkCo/P7E

...

alice:\$y\$j9T\$DIXfskUxbz6we5RbfdPCz0\$zFd93JMuTyEJHrdIf.6bZ8Rbw4otHvybd0uLn.eD.s3
bob:\$y\$j9T\$ty3B9GwDhm4f6zQIgm9uL.\$SbFq.iSFt48A5iQlue8DtUd.57KaBN1tIEdLPmtEjwC

...

rainbow table

password

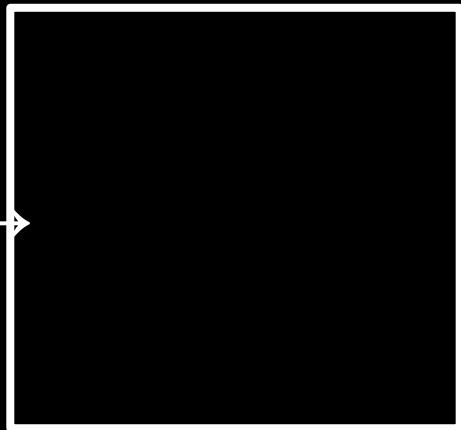
hash

```
alice:apple  
bob:banana  
carol:cherry  
charlie:cherry  
...
```

```
alice:...ekWXa83dhiA  
bob:..ZS4zkCo/P7E  
carol:..rj98gxDTYfM  
charlie:..rj98gxDTYfM  
...
```

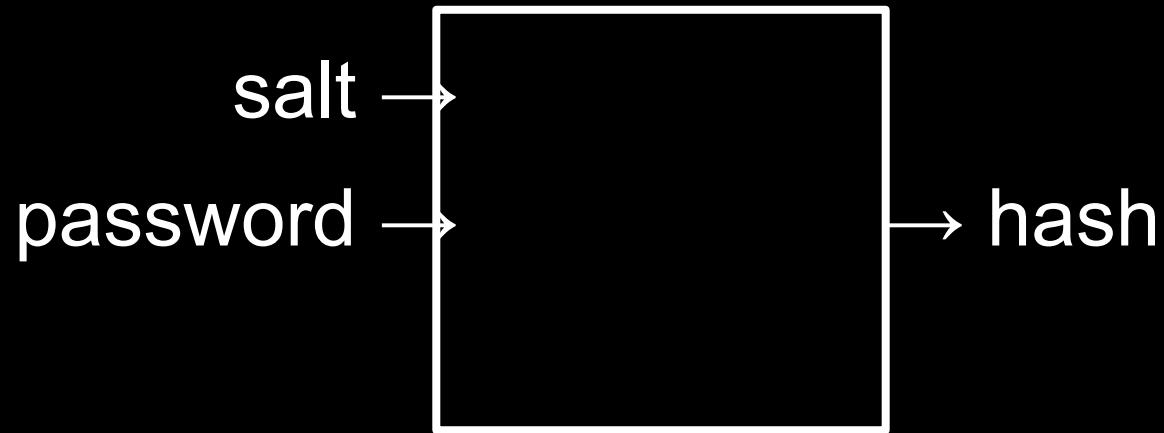
```
alice:..ekWXa83dhiA  
bob:..ZS4zkCo/P7E  
carol:..rj98gxDTYfM  
charlie:..rj98gxDTYfM  
...  
...
```

cherry



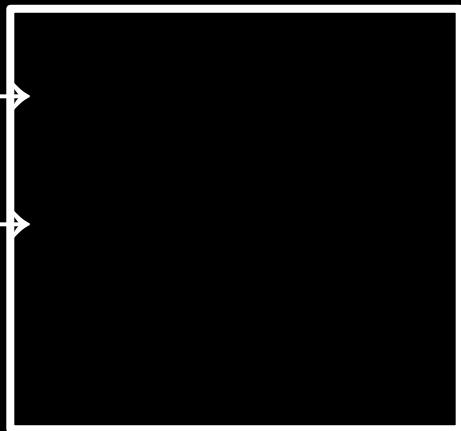
...rj98gxDTYfM

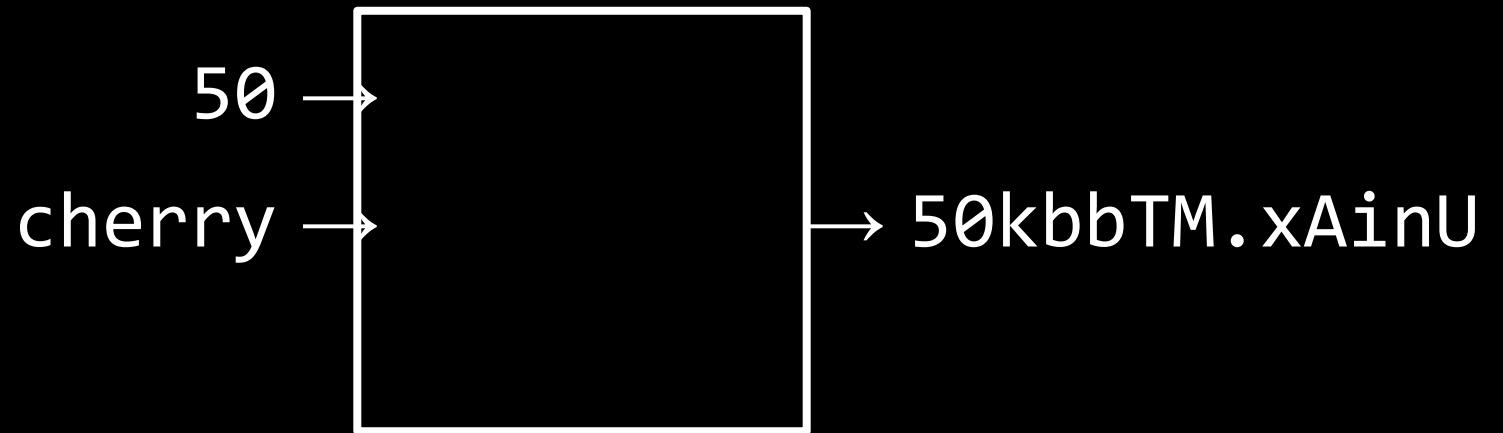
salting

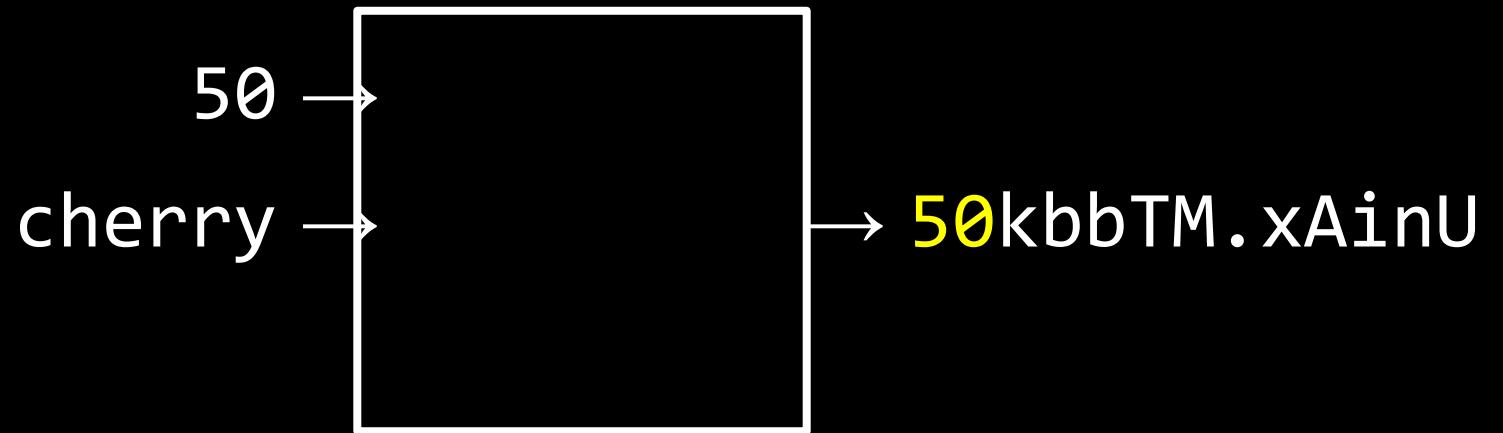


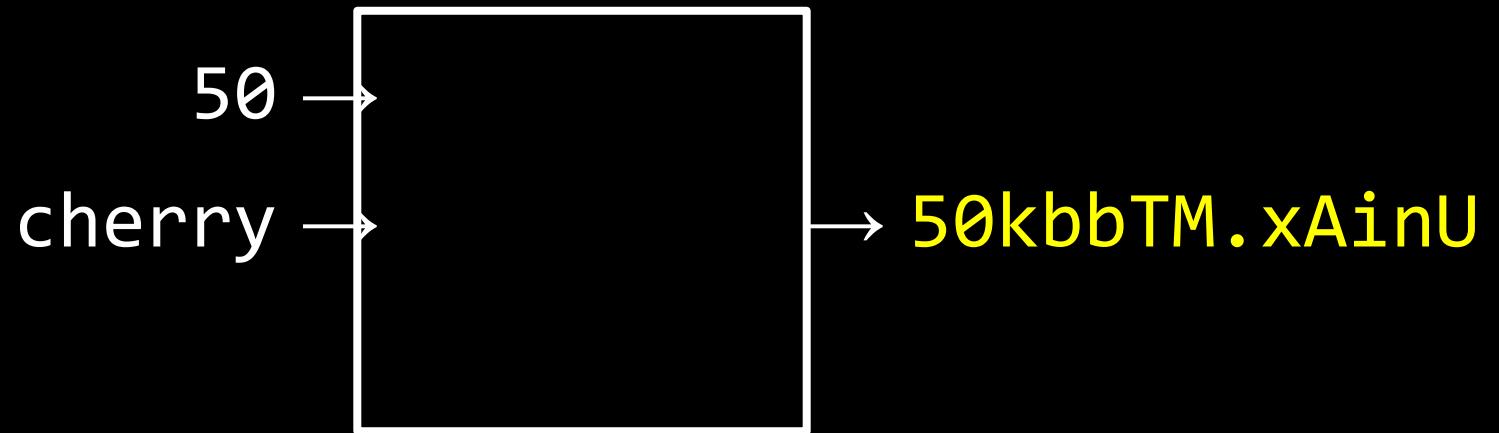
50

cherry



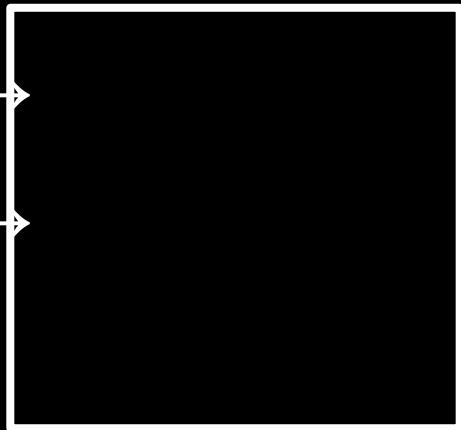






49

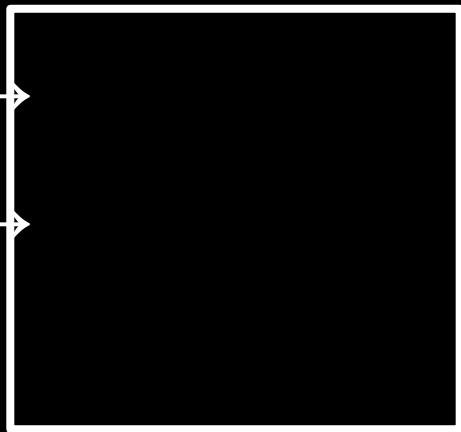
cherry



493vg4DKt4MKg

49

cherry

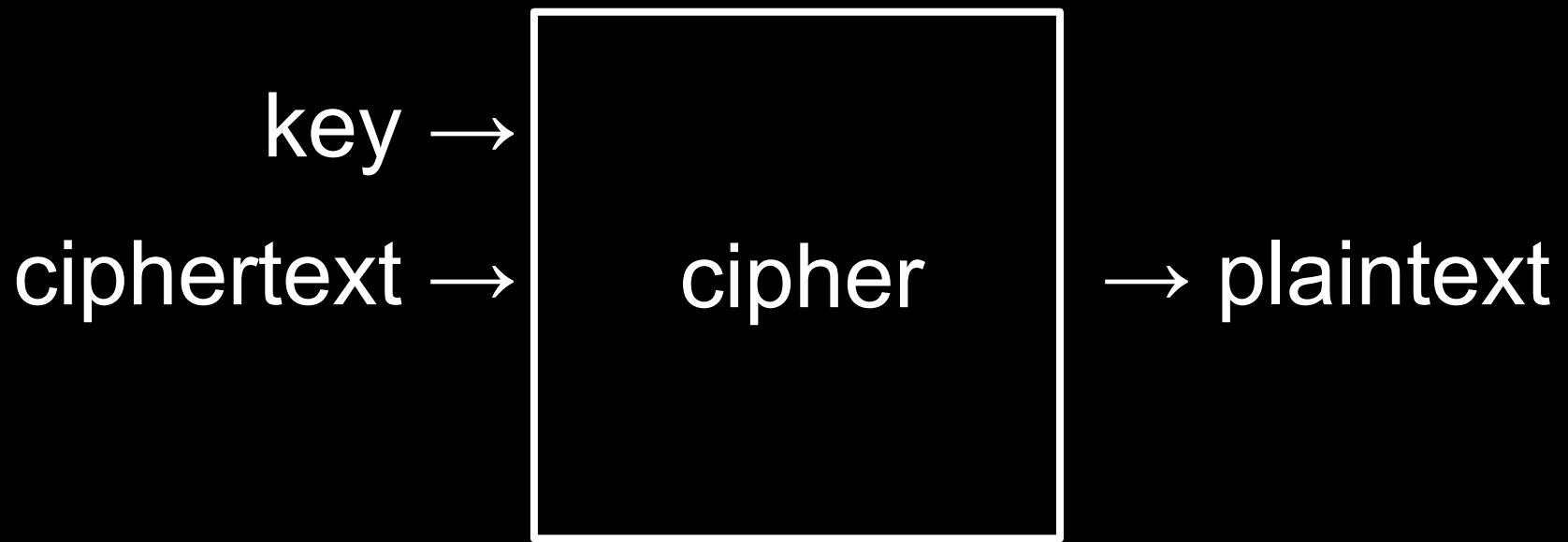


493vg4DKt4MKg

cryptography

key →

plaintext → cipher → ciphertext

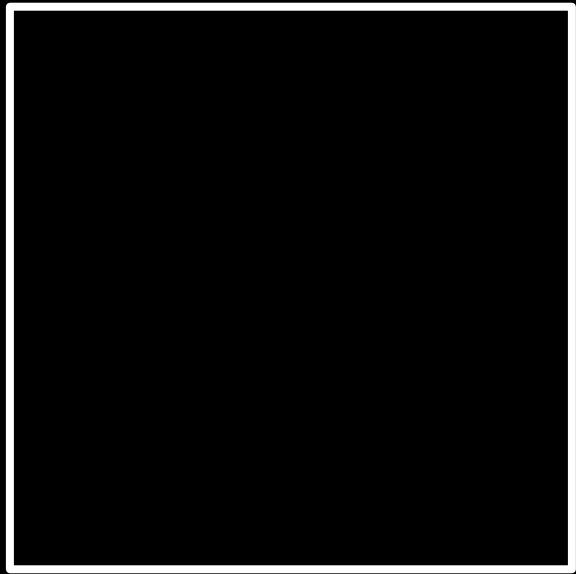


secret-key cryptography

symmetric cryptography

$1 \rightarrow$

$A \rightarrow$

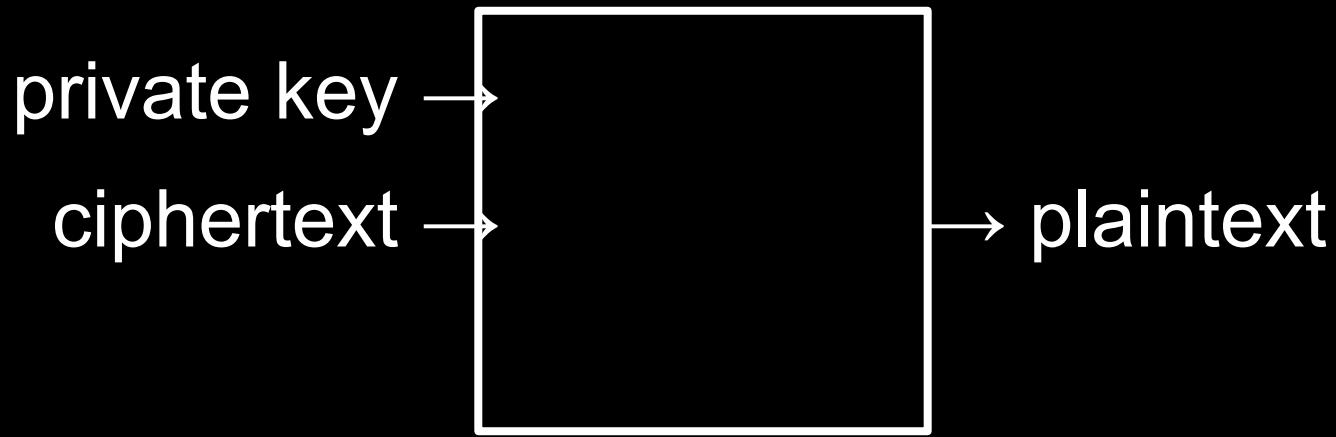


$\rightarrow B$

asymmetric cryptography

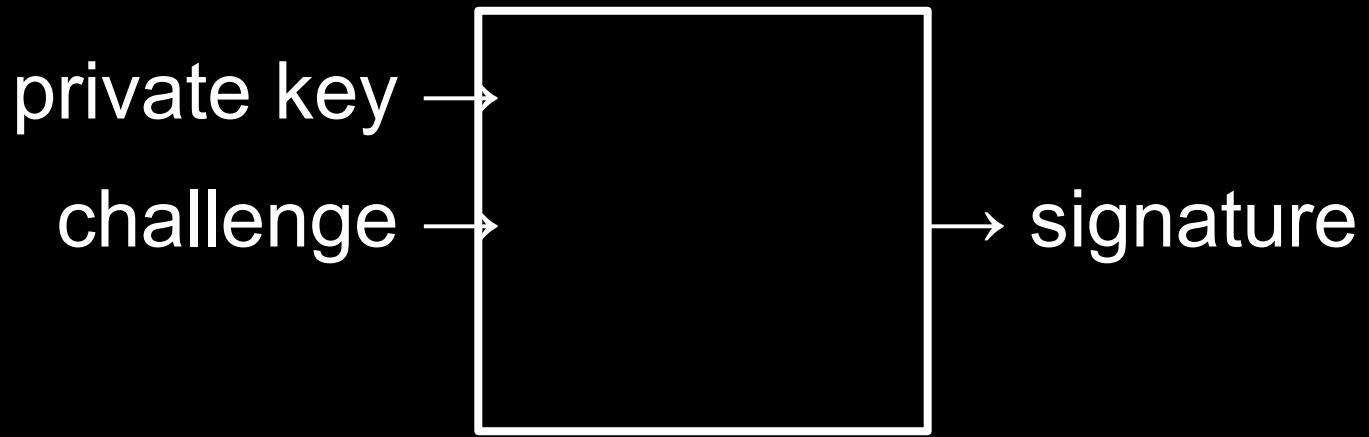
public-key cryptography

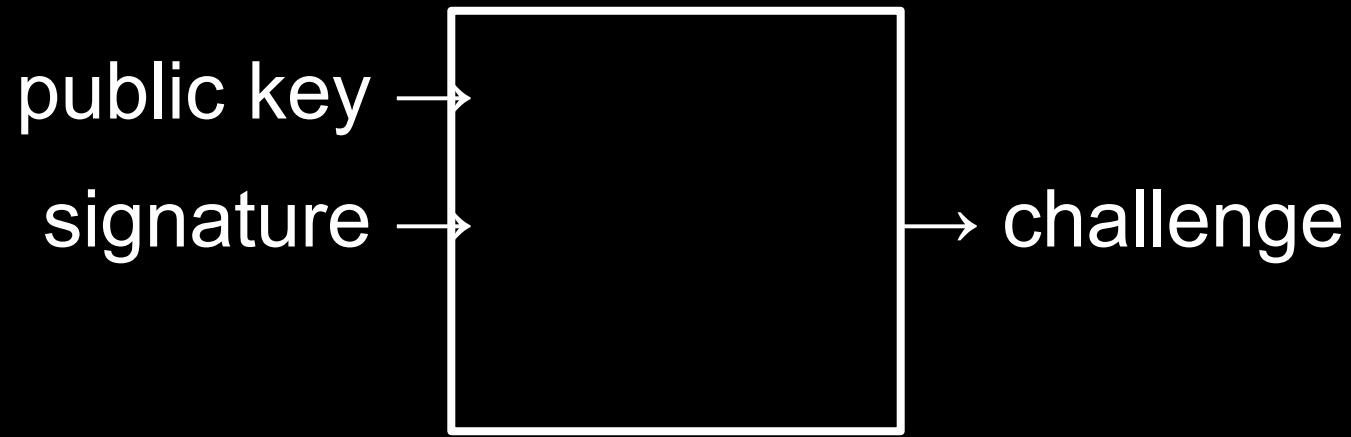




HTTPS

passkeys





end-to-end encryption





Schedule Meeting

Topic

Cybersecurity

Date & Time

11/20/2023

1:30 PM

to

4:15 PM

11/20/2023

Time Zone:

Eastern Time (US and Canada)

Recurring meeting

Attendees

Email or name

Security

Passcode

123456



Only users who have the invite link or passcode can join the meeting

Waiting Room

Only users admitted by the host can join the meeting

Only authenticated users can join: Sign in to Zoom

Encryption

Enhanced encryption

End-to-end encryption



Several features will be automatically disabled when using end-to-end encryption, including cloud recording and phone/SIP/H.323 dial-in.



[Learn more](#)

deletion

00001110101100000110110110110111110111000101000100111000011100010111010110100010101100001111010
1111101101001110011000101111000110000101010100011000011110001010010110111001111011100110001
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secure deletion

full-disk encryption

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111110110100111001100011000101111000110000101010100011000011110001010010110111001111011100110001
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0110111100100110010011011111001001101100000101100010010111000110011000100101110001001001011101

- BitLocker
- FileVault
- ...

ransomware

"Problem Set 10"

1. Start using a password manager or passkeys
2. Start using two-factor authentication
3. Start using (end-to-end) encryption

CS50 Quiz Show



This was CS50