



Develop Technical Recall Skills: Spaced Repetition with Anki

Joshua Wright | Wednesday, June 10 2020*

Senior Instructor and Author

* Or something. Honestly, I lost track of days a while back.

This all
happens
before 10 AM.

It turns out, I'm
not the only that
struggles with this.

scripting - awk w x tom liston - Goo x custom pillowcas x itching powder - x +

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```
awk '{sum+=$3}; END {printf "%f",sum/NR}' ${file}_${f}_v1.xls >> to-plot-p.xls
```

print will insert a newline by default. You dont want that to happen, hence use printf instead.

share edit follow

answered Jan 7 '10 at 16:56

 **CodeRain**
4,932 4 23 32

I will forget this in 15 minutes.

printf "%s", whatever You forgot the comma. You can also extend with more variables and generate them with a comma. [Hjalke Walinge](#) Aug 7 '18 at 11:27

Why We Invest Time and Energy in Skill Development

What are your goals for developing technical skill?

- I want to pass a certification exam
- I want to build recall to draw on this knowledge when needed
- I want to continue to build my skills in other advanced areas
- I want to be the SME that other people turn to when they need help
- I want to use what I've learned to meet my career goals
- I want to run screaming from this and choose a different career

There are no wrong answers. It is up to you to decide what you want to do with the knowledge you're gaining. Let's examine some opportunities to maximize the time you have to spend on meeting your goals.

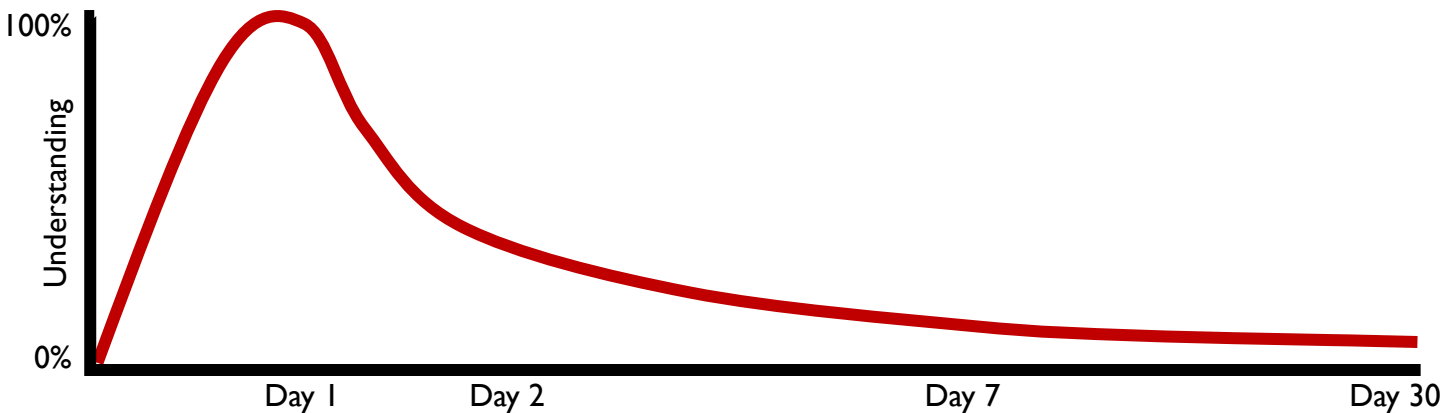
The Problem of Focused Technical Training

- Focused technical training (such as SANS classes) gives you access to expertise that requires many years to develop
 - Delivered in a short period of time
- SANS authors develop the content to suit different learning styles
- This exposure gives you an accelerated jump start to mastery of the subject area

These are the good points about short-term focused training. The hard part is building retention after the class is over.

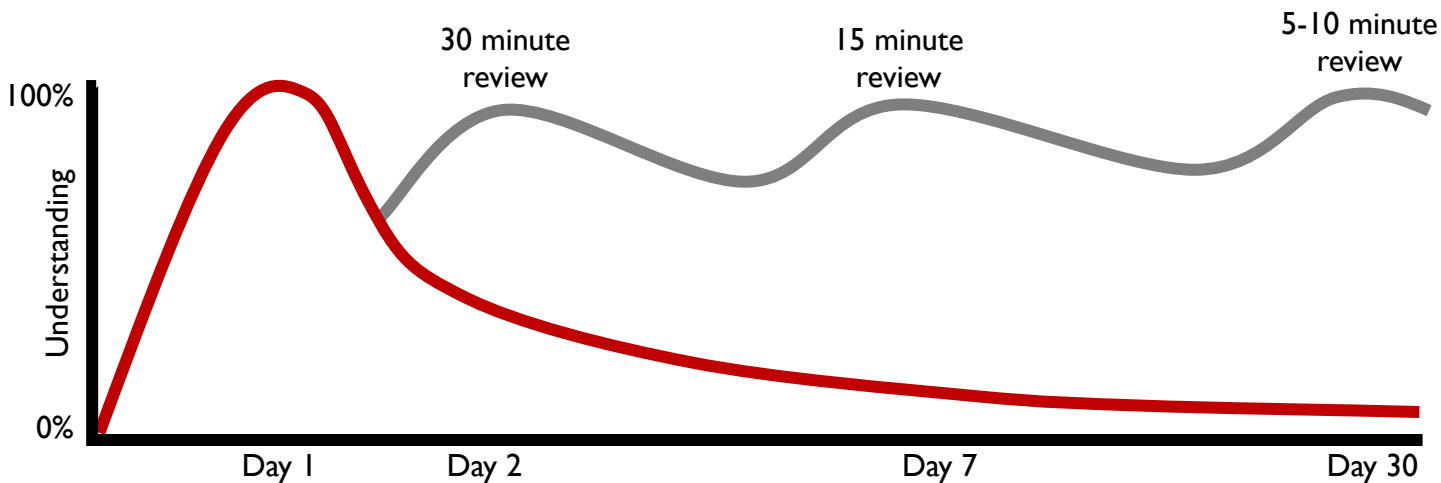
The Forgetting Curve

- Herman Ebbinghaus, 1885: 50-80% of what you learned 24 hours prior is forgotten (by day 30, only 2-3% is retained)
- This is the Forgetting Curve, and it's kind of depressing

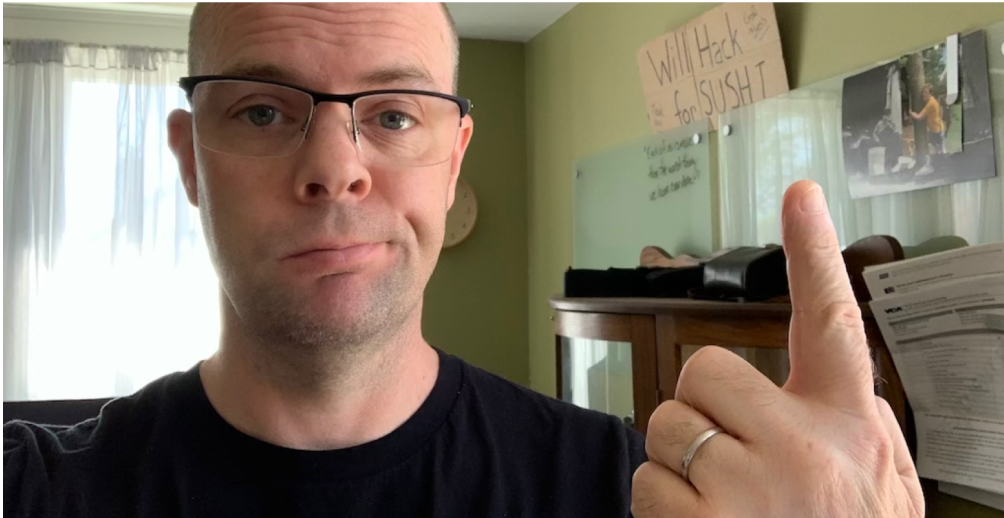


Spaced Repetition

- Within 24 hours, review the material again for 30 minutes
 - This resets your retention curve to 100% again
- 48 hours later, review again for 25 minutes (back to 100%)
 - Each subsequent review requires less time than the prior review, and builds retention



"Good morning class. Today we're going to review Chapter 4 and our study on early Republican Rome. Then we'll continue to examine Imperial Rome with the introduction of the first Roman Emperor: Augustus."



This style of teaching should be familiar to you. It's what is employed in schools worldwide when there is a long period of study available.

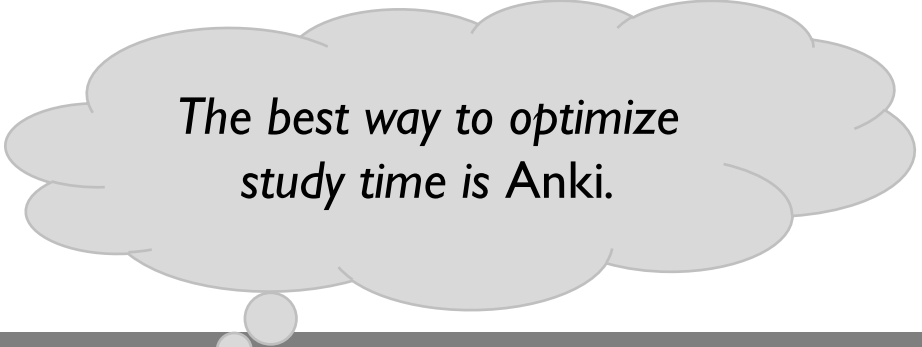
Optimizing Review Intervals

Optimal interval for review is based on two non-intuitive ideas

1. Longer review intervals lead to stronger recall skills

2. Review intervals need to be short enough to recall concepts with minimal review time

- I asked friends who work in fields where they have to memorize a lot of facts what they do
 - Medical students, polyglots, applied math graduates

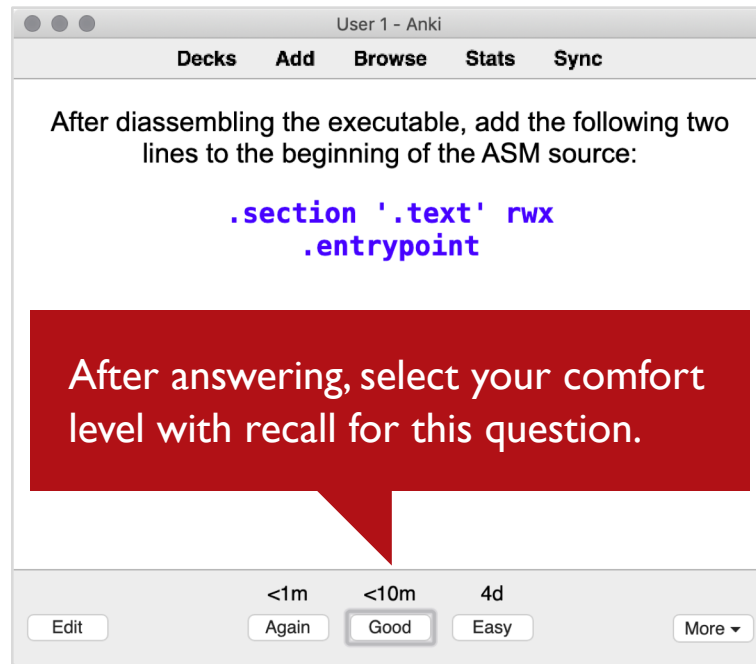


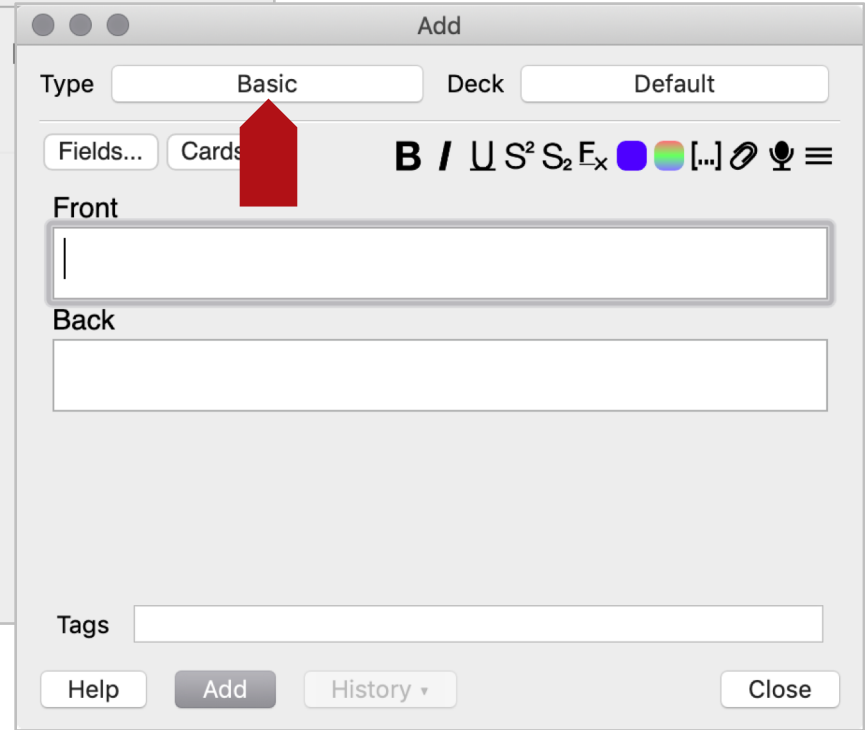
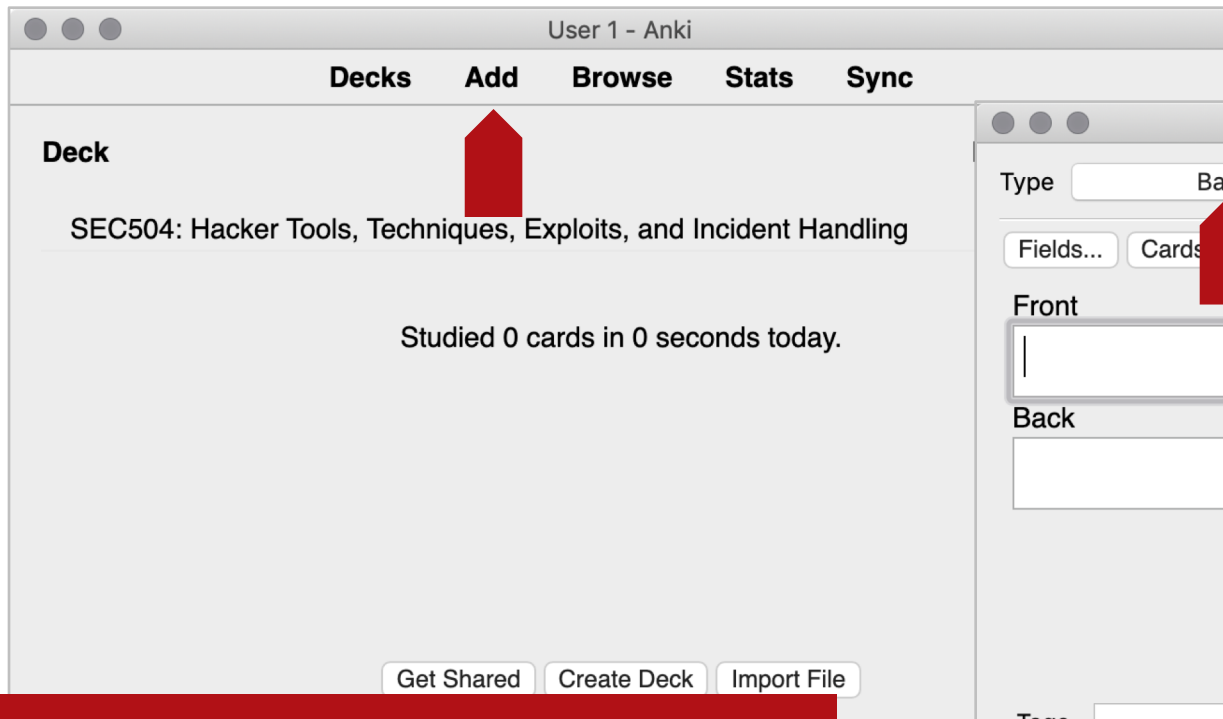
The best way to optimize study time is Anki.

Anki

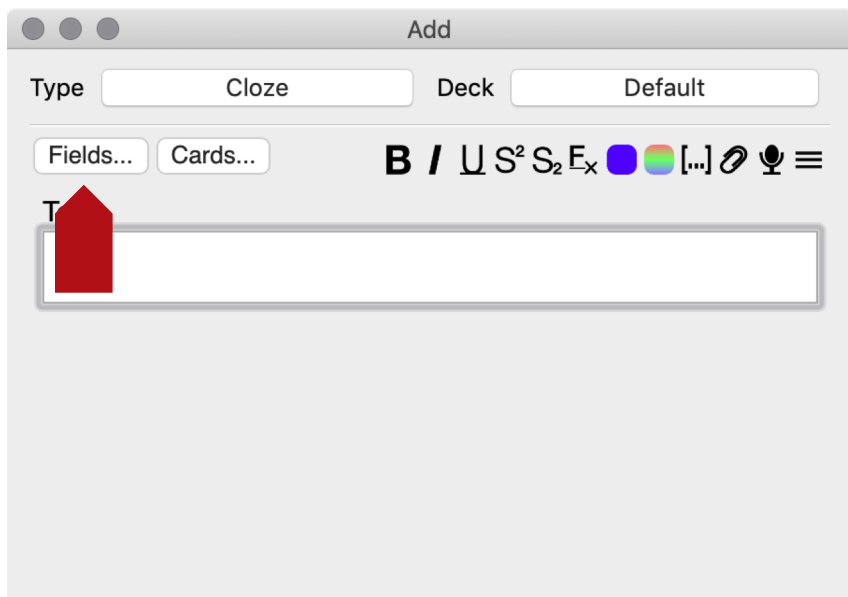
- Anki is a free flash card app that integrates spaced repetition training
- Anki uses your input of *Again*, *Good*, or *Easy* after answering a question to reschedule the card for retraining
 - If you indicate *Easy*, Anki *increases* time before showing this card again
 - If you indicate *Again*, Anki *decreases* time before showing this card again

<https://apps.ankiweb.net>

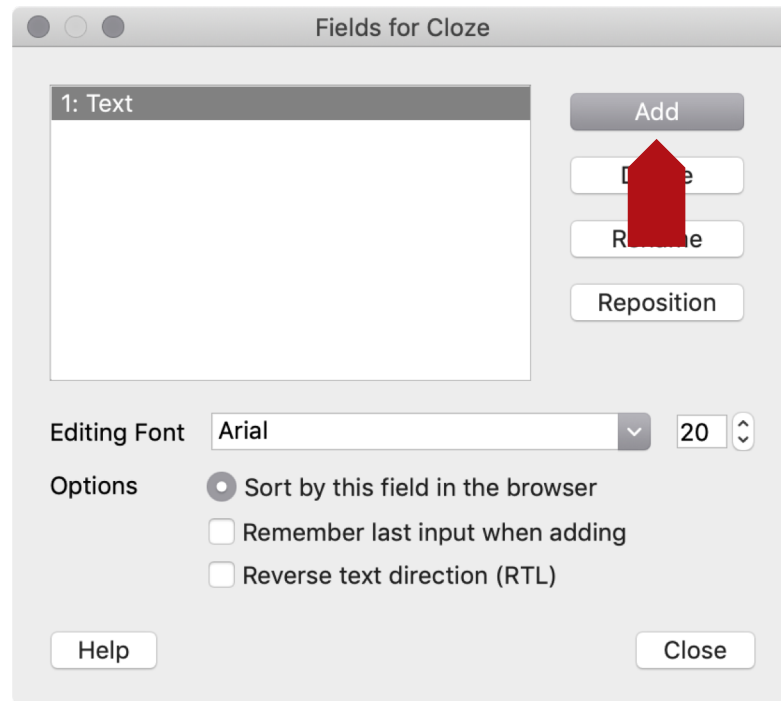




Start Anki, and create a deck of study cards. Add your first card. Change the card type from Basic to Cloze.



I like to customize the Cloze type to include a graphic element. You only have to do this once. Click Fields, then click Add.



Fields for Cloze

Field name:

Visual

Cancel OK

Reposition

Editing Font: Arial 20

Options:

- ☒ Sort by this field in the browser
- ☐ Remember last input when adding
- ☐ Reverse text direction (RTL)

Create a new field called Visual (or Graphic, or Screenshot, or whatever). Click OK.

Next, click Tools | Manage Note Types.

Study Deck... /

Create Filtered Deck... F

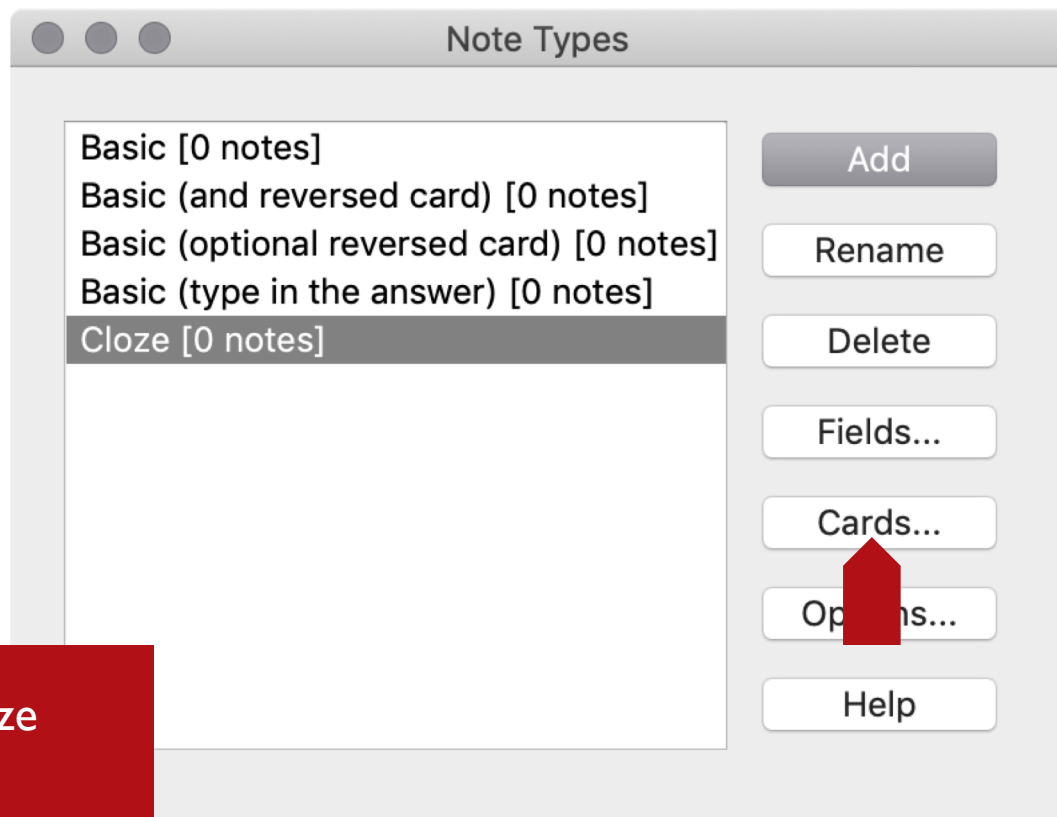
Check Database

Check Media...

Empty Cards...

Add-ons ⬆ ⌘ A

Manage Note Types ⬆ ⌘ N



Click Cards to customize the Cloze card type.

Card Types for Cloze

Card Type: Cloze: Text -> Text+Visual Options

Changes below will affect the 3 notes that use this card type.

Front Template

{{cloze:Text}}

Styling (shared between cards)

.card {font-family: arial;font-size: 20px;text-align: center;color: black;

Back Template

{{cloze:Text}}

{{Visual}}

Front Preview (1 of 1)

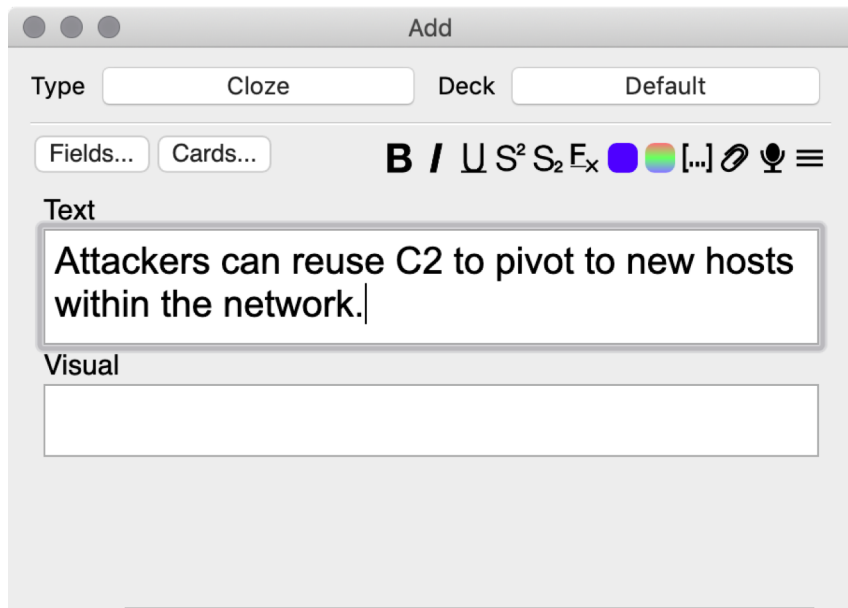
This is a [...] cloze deletion.

Back Preview (1 of 1)

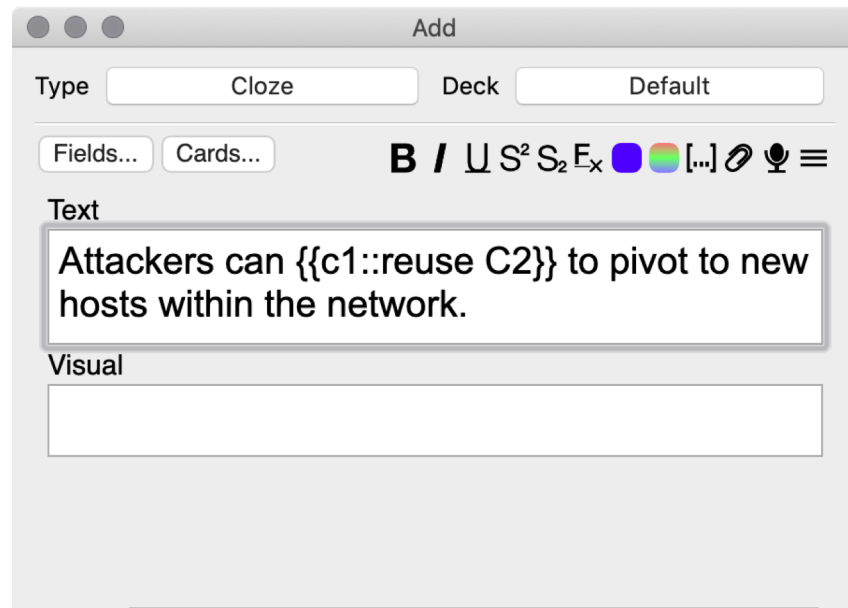
This is a sample cloze deletion. (Visual)

In the Back Template section, underneath {{cloze:Text}} add {{Visual}} (with the curly brackets). Then click Close.

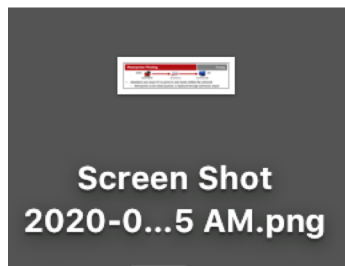
Close



Add a statement that you want to commit to long-term memory.



Highlight the part of the statement and press CTRL+Shift+C to create a Cloze block.



Drag and drop a screenshot in the
Visual block, then click Add.

Add

Type

Fields... Cards...

B / U ^S ² _S ₂ _E _x [Color icons] [More icons]

Text

Attackers can {{c1::reuse C2}} to pivot to new hosts within the network.

Visual

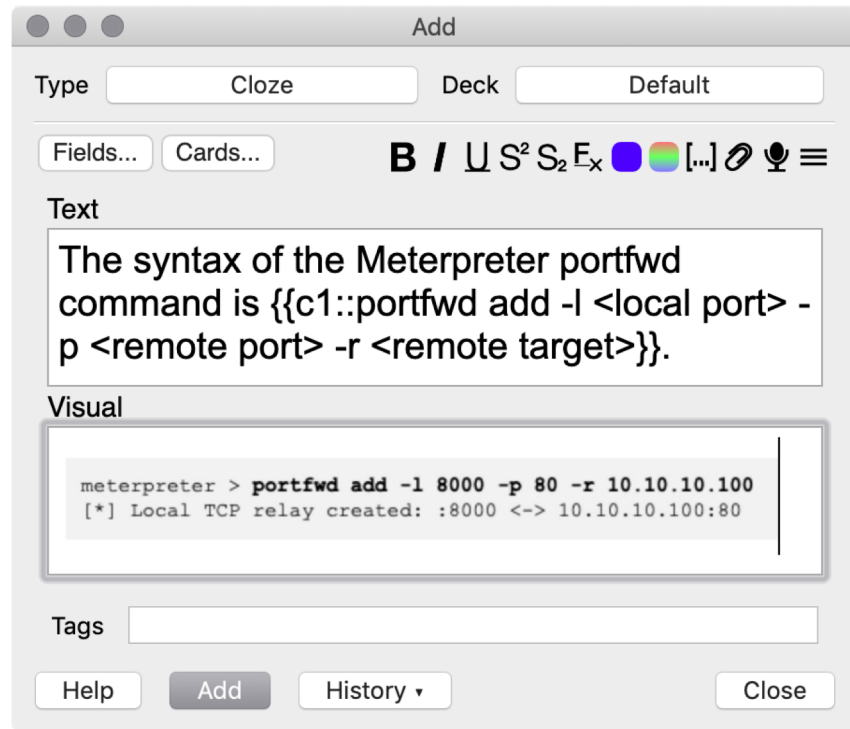
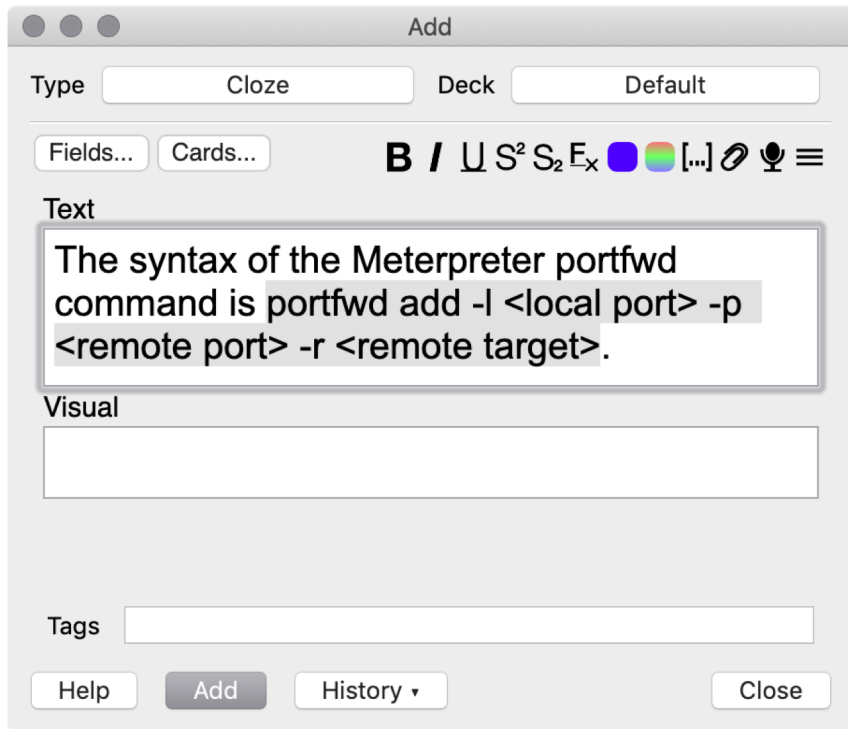
Meterpreter Pivoting Pivoting

:8000 96.97.98.99 → pivot 10.10.10.11 → 10.10.10.100 :80

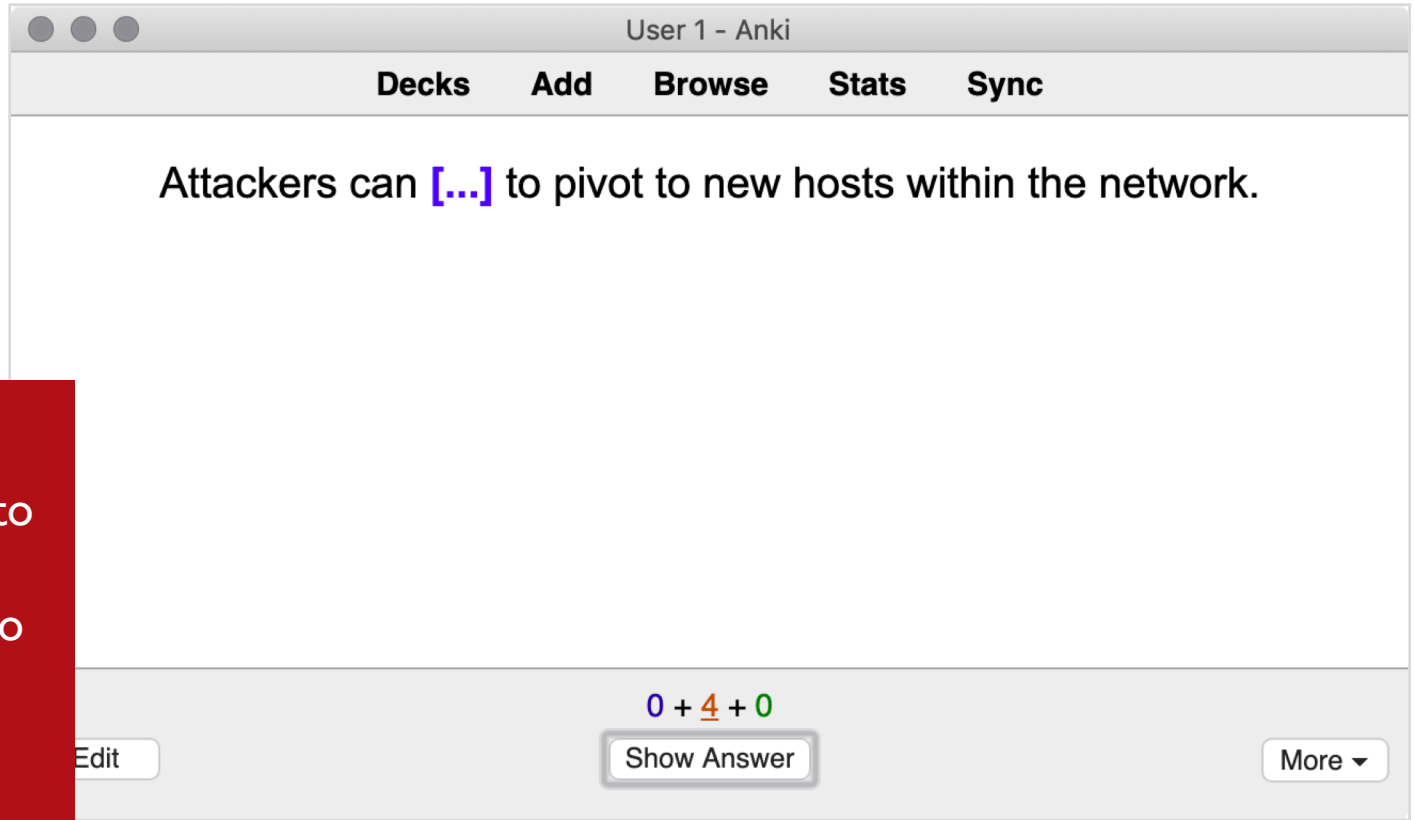
- Attackers can reuse C2 to pivot to new hosts within the network
 - Meterpreter as the initial payload, or deployed through msfvenom output

Tags

Help Add History ▾ Close



Another example, highlighting the command syntax as the Cloze block.



When you study, Anki will ask you to answer the Cloze block in [...]. Try to remember the answer, then click Show Answer.

How hard or easy was the question?

Click *Again* (it was HARD), *Good* (I sort of knew the answer) or *Easy* (I knew the answer).

User 1 - Anki

Decks Add Browse Stats Sync

Attackers can **reuse C2** to pivot to new hosts within the network.

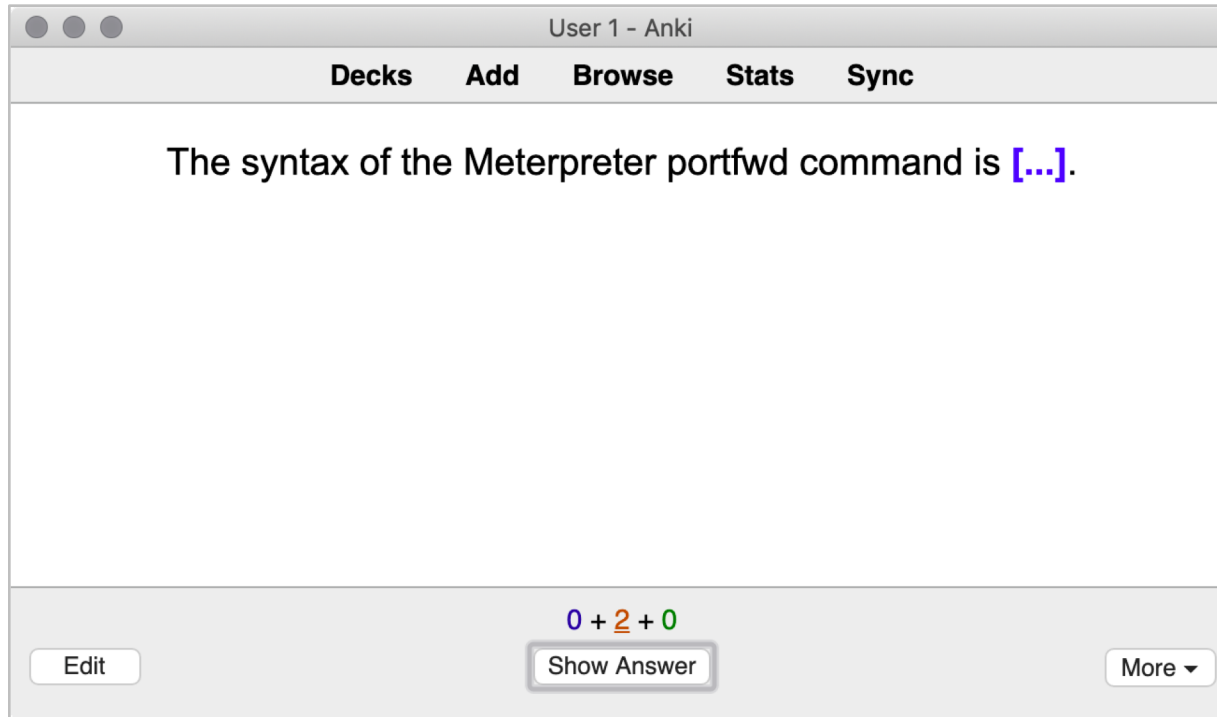
Meterpreter Pivoting Pivoting

:8000 96.97.98.99 → pivot 10.10.10.11 → :80 10.10.10.100

- Attackers can reuse C2 to pivot to new hosts within the network
 - Meterpreter as the initial payload, or deployed through msfvenom output

<1m <10m 4d

Edit Again Good Easy More ▾



User 1 - Anki

Decks Add Browse Stats Sync

The syntax of the Meterpreter portfwd command is **portfwd add -l <local port> -p <remote port> -r <remote target>**.

```
meterpreter > portfwd add -l 8000 -p 80 -r 10.10.10.100
[*] Local TCP relay created: :8000 <-> 10.10.10.100:80
```

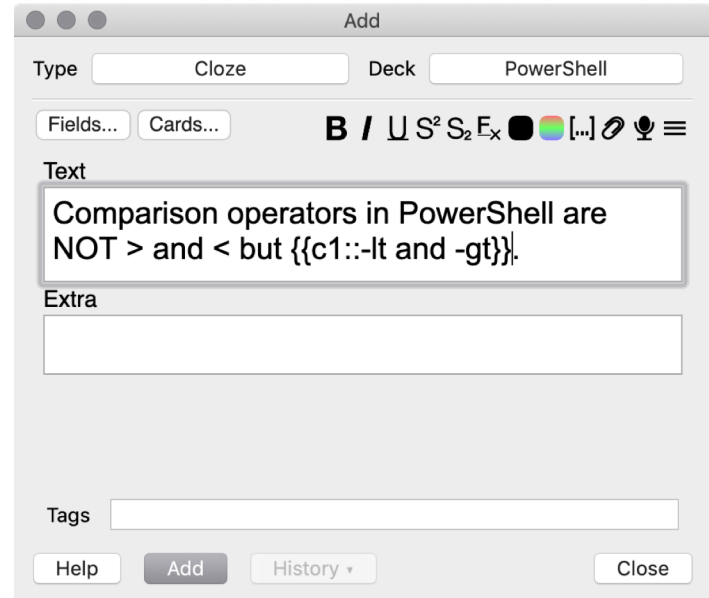
Edit <1m <10m 4d

Again **Good** Easy

Choosing Again/Good/Easy sets up Anki for spaced repetition practice, optimizing your study time to maximize retention.

Putting Anki in Practice

- After you take a focused-study class, review and create Anki cards for self-study and retention development
- While you are reading a technical book or taking a self-paced class, create Anki cards
- Keep Anki open throughout the day; add the tidbits you Google (read: SO answers) to an Anki deck
- Review your Anki cards every day for 15-30 minutes



There are two significant problems that Anki does not solve for you.

The Problem of Motivation

Retaining knowledge requires persistence, and persistence is self-motivated

Enjoyment: Finding enjoyment in your topic will help with motivation, and sustain you for long-term study.

Methods: A method (spaced repetition, Anki) gives you a task, and a clear completion target.

System: Habit development is necessary to continue a task through the long haul.

Patience: Frustration is a normal and *valuable* part of learning. Embrace it instead of being dissuaded by it.

The Problem of Time

Time is a precious commodity and we all have competing factors for our time

- Studying Anki every day may seem burdensome on your time
 - But 20-30 minutes/day decreasing to 10 minutes/day is much better than cramming for a week with little retention benefit
- Revisit your goals – are they worth the time you need to invest?
- What changes can you make in your life?
 - Waking up a little earlier, studying over breakfast, watching one fewer 30-minute TV show/YouTube video, multi-tasking while exercising, ...
- How important is retention to your employer?
 - Can you dedicate time at work to study? Negotiate for time at your next compensation review?

Why Do We Care?

- Your job matters. It really, really does.
- Consider the alternatives:
 - Important digital assets are lost
 - Organized crime wins
 - People lose their savings, retirement
 - Cities go dark. Lives are threatened.
- We're all in this together. Please support each other.

"Do the best you can until you know better. Then when you know better, do better." *Maya Angelou*

Free Anki Lab Exercise

<https://sansurl.com/504-lab-ankicards>

SEC504: Hacker Tools, Techniques, Exploits, and Incident Handling has gone through a major update:

- New emphasis on hands-on and practical incident response techniques
- New look at modern attack TTPs
- Integration with MITRE ATT&CK
- Double the number of hands-on exercises
- All new CTF
- Coming soon!

<https://www.sans.org/sec504>

Please reach out with your success stories, and your struggles. Thank you!
josh@willhackforsushi.com | [@joswr1ght](https://twitter.com/joswr1ght)