SER 334 A Session

SI Session

Monday, February 19th 2024

7:00 pm - 8:00 pm MST

Agenda

- Review CPU Scheduling
- Review Paging & Virtual Memory
- Disk Scheduling
- RAID

SI Session Expectations

Thanks for coming to the **SER 334** SI session. We have a packed agenda and we are going to try to get through as many of our planned example problems as possible. This session will be recorded and shared with others.

- If after this you want to see additional examples, please visit the drop-in tutoring center.
- We will post the link in the chat now and at the end of the session.
    - tutoring.asu.edu
- Please keep in mind we are recording this session and it will be made available for you to review 24-48 hours after this session concludes.
- Finally, please be respectful to each other during the session.

Interact with us:

Zoom Features

Zoom Chat

- Use the chat feature to interact with the presenter and respond to presenter's questions.
- Annotations are encouraged

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Scheduling Algorithms

$T_n = 15$

Shortest Job First LIVE

$$T_{n+1} = a(\boxed{t_n}) + (1 - a)\boxed{T_n}$$

$\boxed{t_n}$ = actual burst, $\boxed{T_n}$ = CPU guess, a = weight (usually 0.5)

3 P0, 20

1 P1, 8

0 P2, 7

2 P3, 13

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Scheduling Algorithms

$T_n = 15$

Shortest Job First LIVE

$$T_{n+1} = a(t_n) + (1 - a)T_n$$

t_n = actual burst, T_n = CPU guess, a = weight (usually 0.5)

3 P0, 20

1 P1, 8

0 P2, 7

2 P3, 13

n=0

$$T_{n+1} = a(t_n) + (1 - a)T_n$$

$$T_1 = (0.5)(7) + (0.5)15$$

$$T_1 = 11$$

Shortest Job First LIVE

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Scheduling Algorithms

$T_n = 15$

$$T_{n+1} = a(\boxed{t_n}) + (1 - a)\boxed{T_n}$$

$\boxed{t_n}$ = actual burst, $\boxed{T_n}$ = CPU guess, a = weight (usually 0.5)

3 P0, 20

1 P1, $\boxed{8}$

0 P2, 7

2 P3, 13

n=0

$$T_{n+1} = a(t_n) + (1 - a)T_n$$

$$T_1 = (0.5)(7) + (0.5)15$$

$$T_1 = \boxed{11}$$

n=1

$$T_{n+1} = a(t_n) + (1 - a)T_n$$

$$T_1 = (0.5)(8) + (0.5)11$$

$$T_1 = 9.5$$

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Scheduling Algorithms

Shortest Job First LIVE

$T_n = 15$

$$T_{n+1} = a\boxed{(t_n)} + (1 - a)\boxed{T_n}$$

$\boxed{t_n}$ = actual burst, $\boxed{T_n}$ = CPU guess, a = weight (usually 0.5)

3 P0, 20

1 P1, 8

0 P2, 7

2 P3, $\boxed{13}$

n=0

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(7) + (0.5)15$

$T_1 = 11$

n=1

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(8) + (0.5)11$

$T_1 = \boxed{9.5}$

n=2

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(13) + (0.5)9.5$

$T_1 = 8.875$

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Scheduling Algorithms

$T_n = 15$

Shortest Job First LIVE

$$T_{n+1} = a(\boxed{t_n}) + (1 - a)\boxed{T_n}$$

$\boxed{t_n}$ = actual burst, $\boxed{T_n}$ = CPU guess, a = weight (usually 0.5)

3 P0, $\boxed{20}$

1 P1, 8

0 P2, 7

2 P3, 13

n=0

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(7) + (0.5)15$

$T_1 = 11$

n=1

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(8) + (0.5)11$

$T_1 = 9.5$

n=2

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(13) + (0.5)9.5$

$T_1 = \boxed{8.875}$

n=3

$T_{n+1} = a(t_n) + (1 - a)T_n$

$T_1 = (0.5)(20) + (0.5)8.875$

$T_1 = 11$

Shortest Job First LIVE

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Scheduling Algorithms

$T_n = 15$

$T_{n+1} = a(t_n) + (1 - a)T_n$

t_n = actual burst, T_n = CPU guess, a = weight (usually 0.5)

3 P0, 20	1 P1, 8	0 P2, 7	2 P3, 13
$T_1 = 11$	$T_1 = 9.5$	$T_1 = 8.875$	$T_1 = 11$

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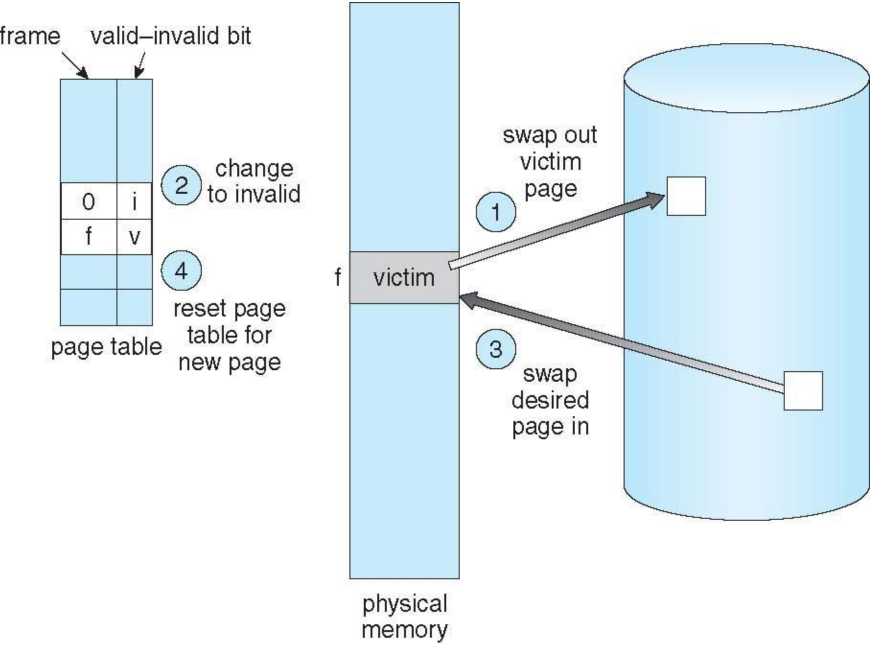
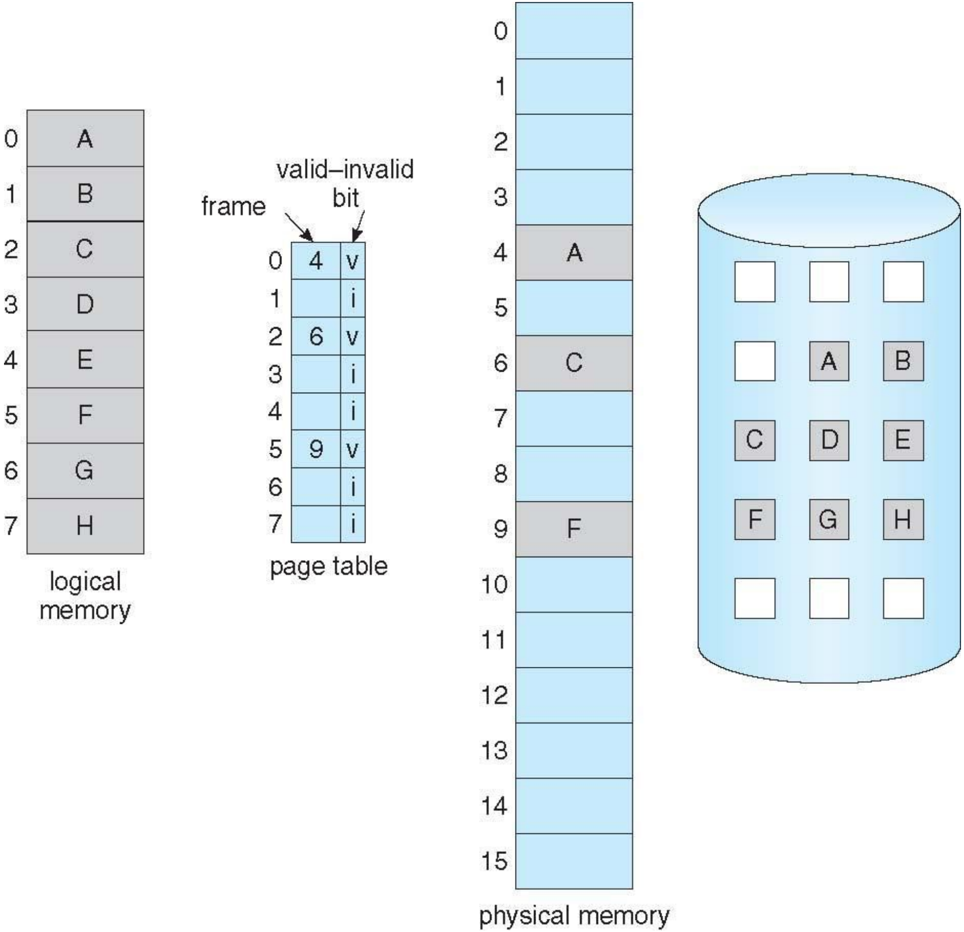
Paging Refresher





0	A
1	B
2	C
3	D
4	E
5	F
6	G
7	H

logical memory

	frame	valid–invalid bit
0	4	v
1		i
2	6	v
3		i
4		i
5	9	v
6		i
7		i

page table

0	
1	
2	
3	
4	A
5	
6	C
7	
8	
9	F
10	
11	
12	
13	
14	
15	

physical memory

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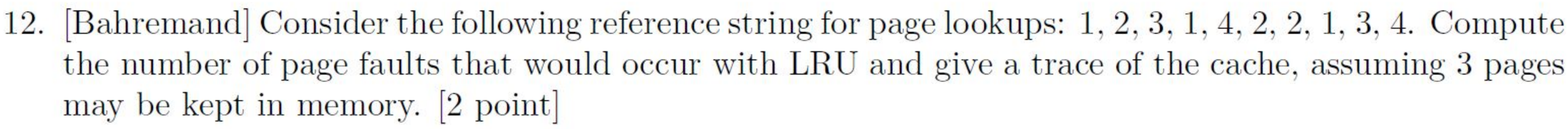
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

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Practice Problems

12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1									

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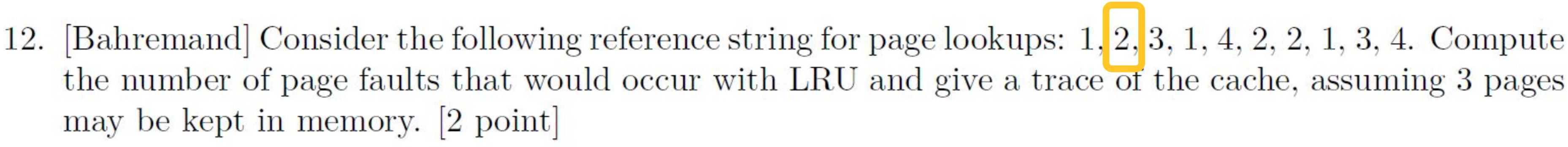
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2								
1	1								
x									

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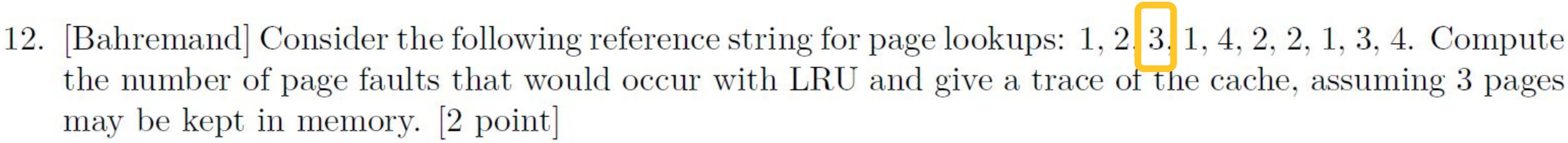
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1 2 3

1	1	1							
	2	2							
x	x								

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Practice Problems

12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1						
1	1	1	1						
	2	2	2						
		3	3						
x	x	x							

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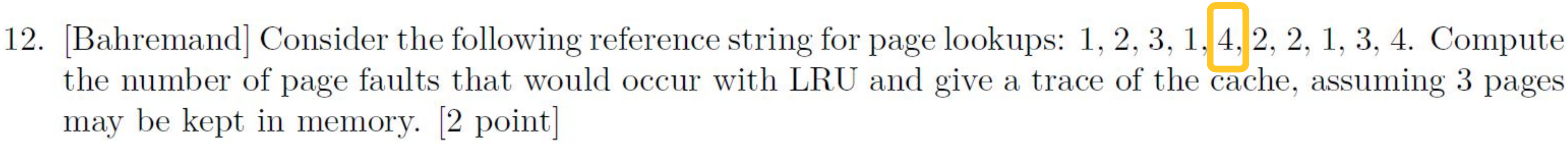
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1	4					
1	1	1	1	1					
	2	2	2	2					
		3	3	3					
x	x	x	✔						

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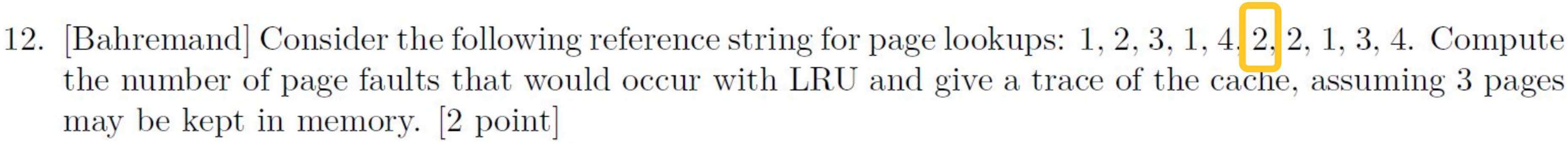
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1	4	2				
1	1	1	1	1	1				
	2	2	2	4	4				
		3	3	3	3				
x	x	x	✔	x					

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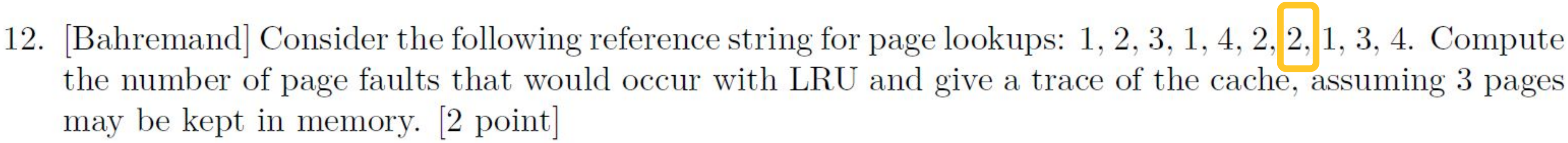
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1	4	2	2			
1	1	1	1	1	1	1			
	2	2	2	4	4	4			
		3	3	3	2	2			
x	x	x	✔	x	x				

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Practice Problems

12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1	4	2	2	1		
1	1	1	1	1	1	1	1		
	2	2	2	4	4	4	4		
		3	3	3	2	2	2		
x	x	x	✔	x	x	✔			

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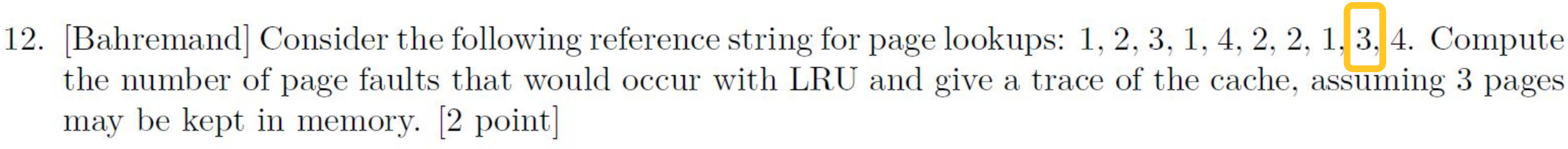
Practice Problems



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1	2	3	1	4	2	2	1	3	
1	1	1	1	1	1	1	1	1	
	2	2	2	4	4	4	4	4	
		3	3	3	2	2	2	2	
x	x	x	✔	x	x	✔	✔		

Module 11 Sample

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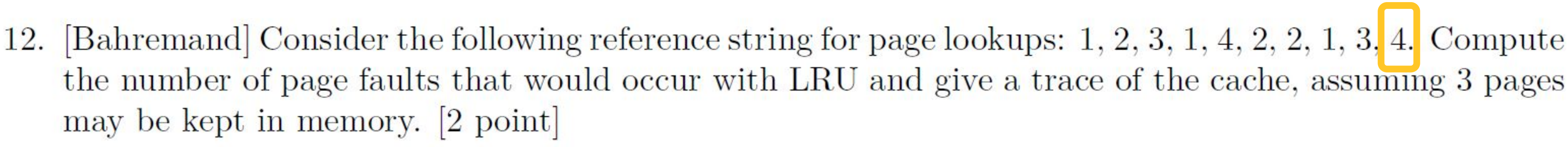
Practice Problems



12. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with LRU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

1	2	3	1	4	2	2	1	3	4
1	1	1	1	1	1	1	1	1	1
	2	2	2	4	4	4	4	3	3
		3	3	3	2	2	2	2	2
x	x	x	✔	x	x	✔	✔	x	

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Practice Problems

13. [Bahremand] Consider the following reference string for page lookups: 1, 2, 3, 1, 4, 2, 2, 1, 3, 4. Compute the number of page faults that would occur with MFU and give a trace of the cache, assuming 3 pages may be kept in memory. [2 point]

Types of Disk Scheduling?

First Come First Served	In order of request arrival
Shortest SEEK TIME First	Closest request is processed next
SCAN	Closest requests to the left, then closest requests to the right
C-SCAN	Closest requests to the right, then snap back to left edge
LOOK	C-SCAN but stops at last request and does not hit the edge

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Sample Problems

4. [Acuña] Consider using the SSTF disk scheduling algorithm on the cylinder blocks 18, 43, 70, 55, 27, 33, 58, 44. What cylinder order would be produced, and how far would the disk head need to travel? Assume the disk head is initially at 25, and that the disk has cylinders 1 to 100. [2 points]

Total:	

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Sample Problems

5. [Lisonbee] Consider using the FCFS disk scheduling algorithm on the cylinder blocks 54, 23, 12, 128, 9, 66, 47, 18. What cylinder order would be produced, and how far would the disk head need to travel? Assume the disk head is initially at 43, and that the disk has cylinders 1 to 150. [2 points]

Total:	

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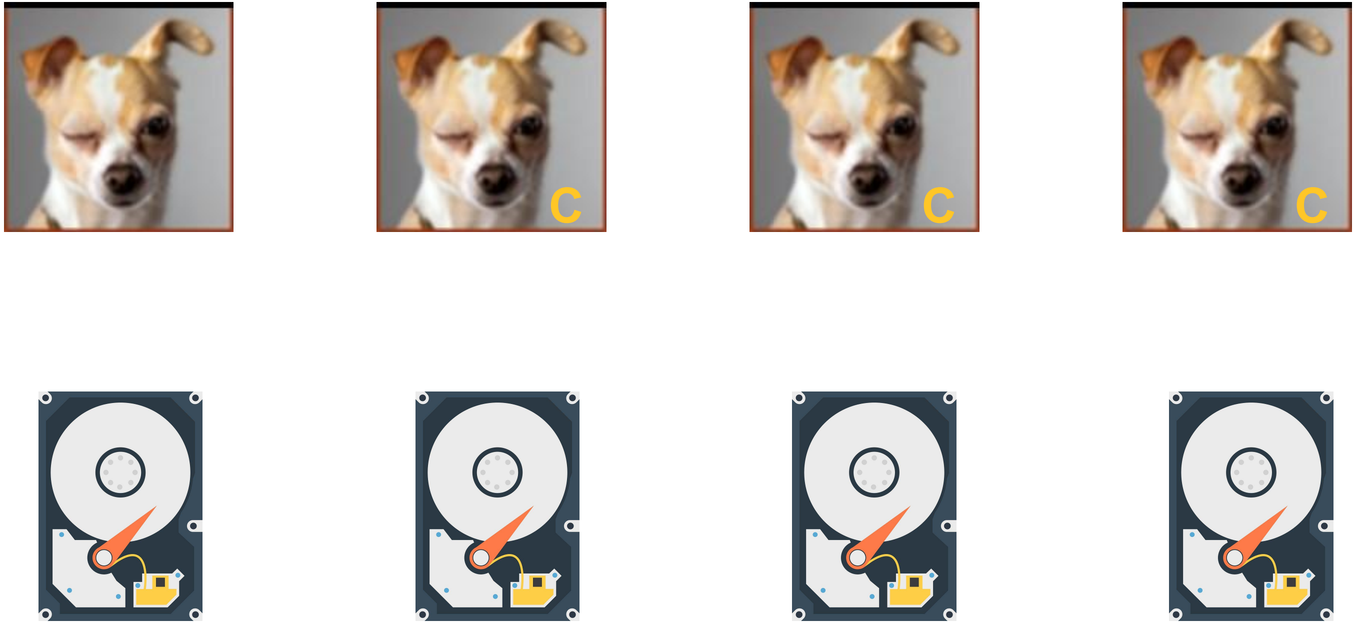
RAID

“Redundant Arrays of Independent Disks”

Think:
Combining the Disks!

RAID 1

Mirroring



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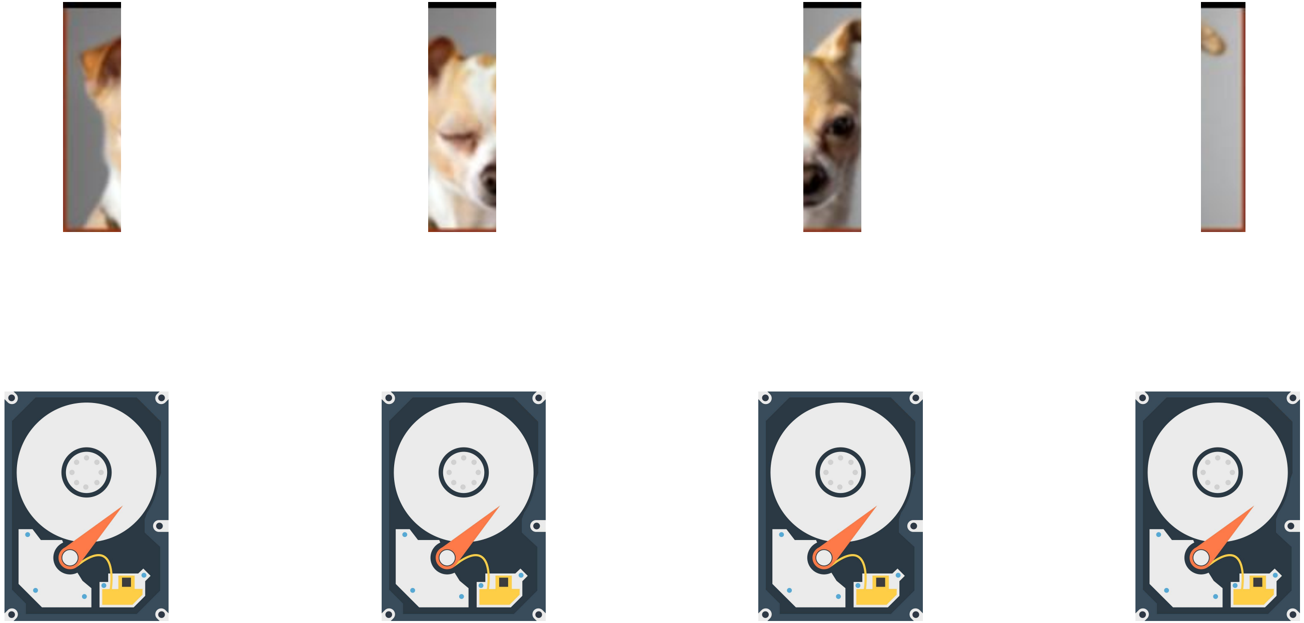
RAID

"Redundant Arrays of Independent Disks"

Think:
Combining the Disks!

RAID 0

Striping



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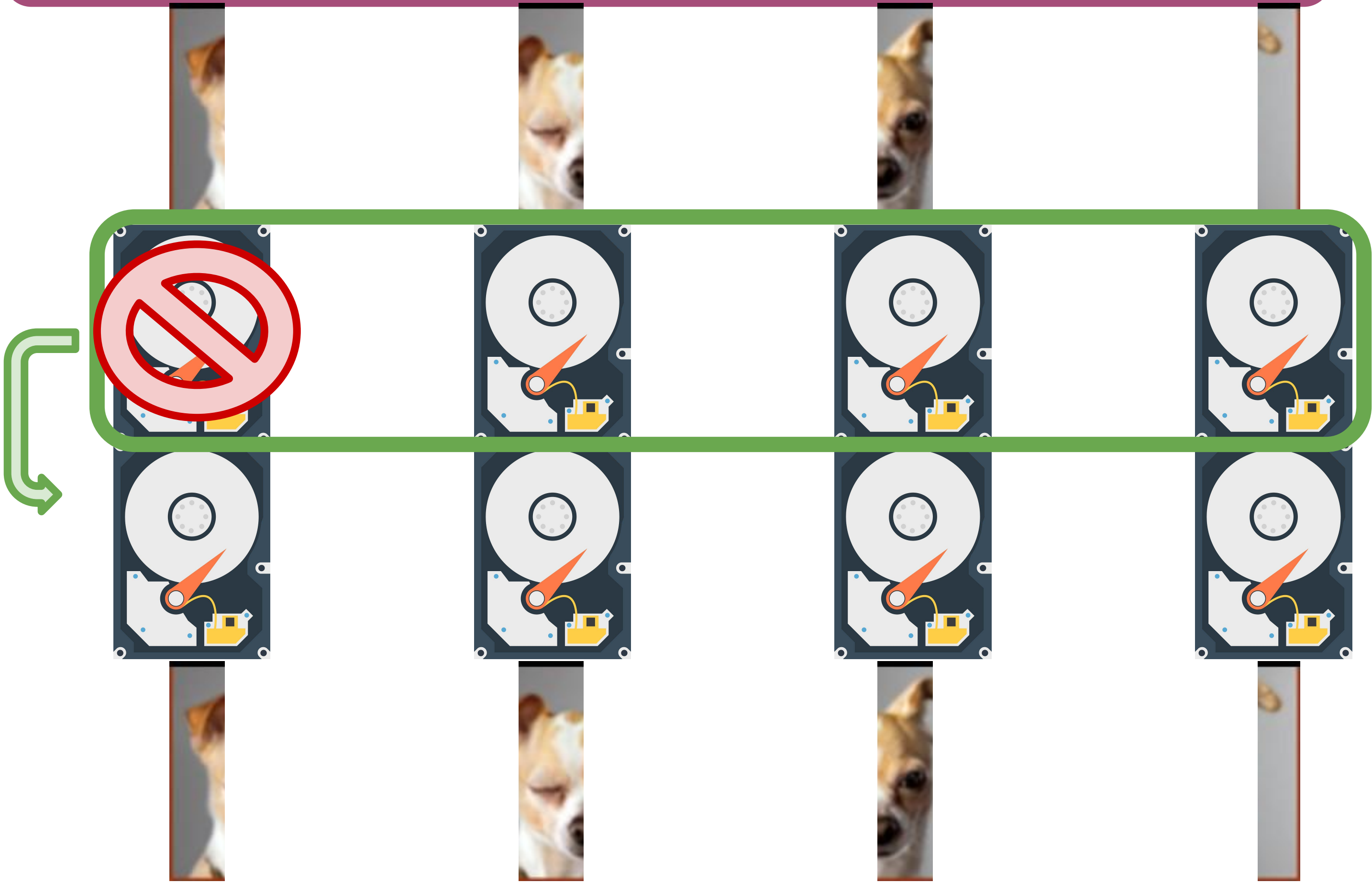
RAID

"Redundant Arrays of Independent Disks"

Think:
Combining the Disks!

RAID 0+1

Stripe then Mirror

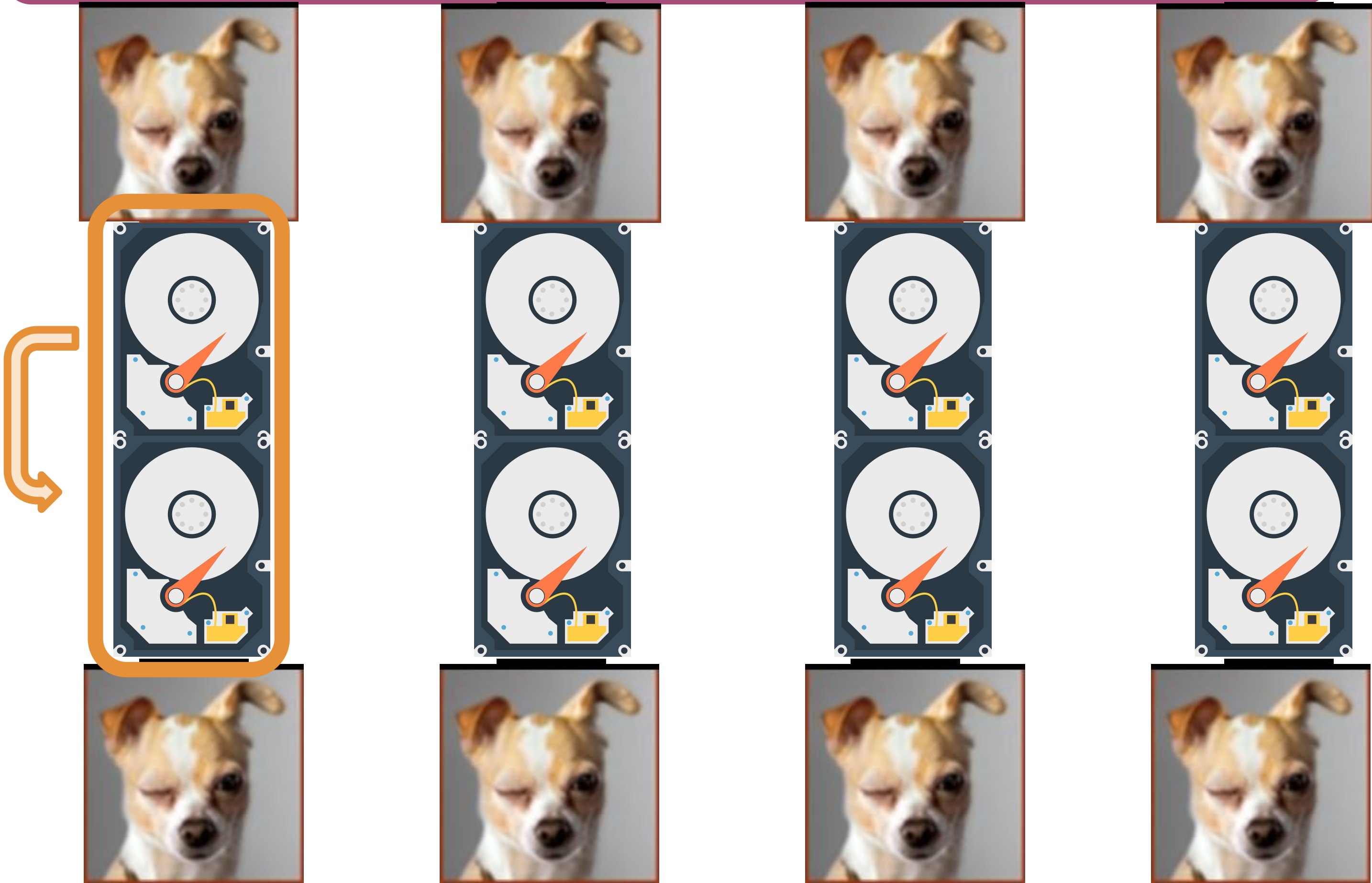


“Redundant Arrays of Independent Disks”

SER 334

RAID

Think:
Combining the Disks!



RAID 1+0

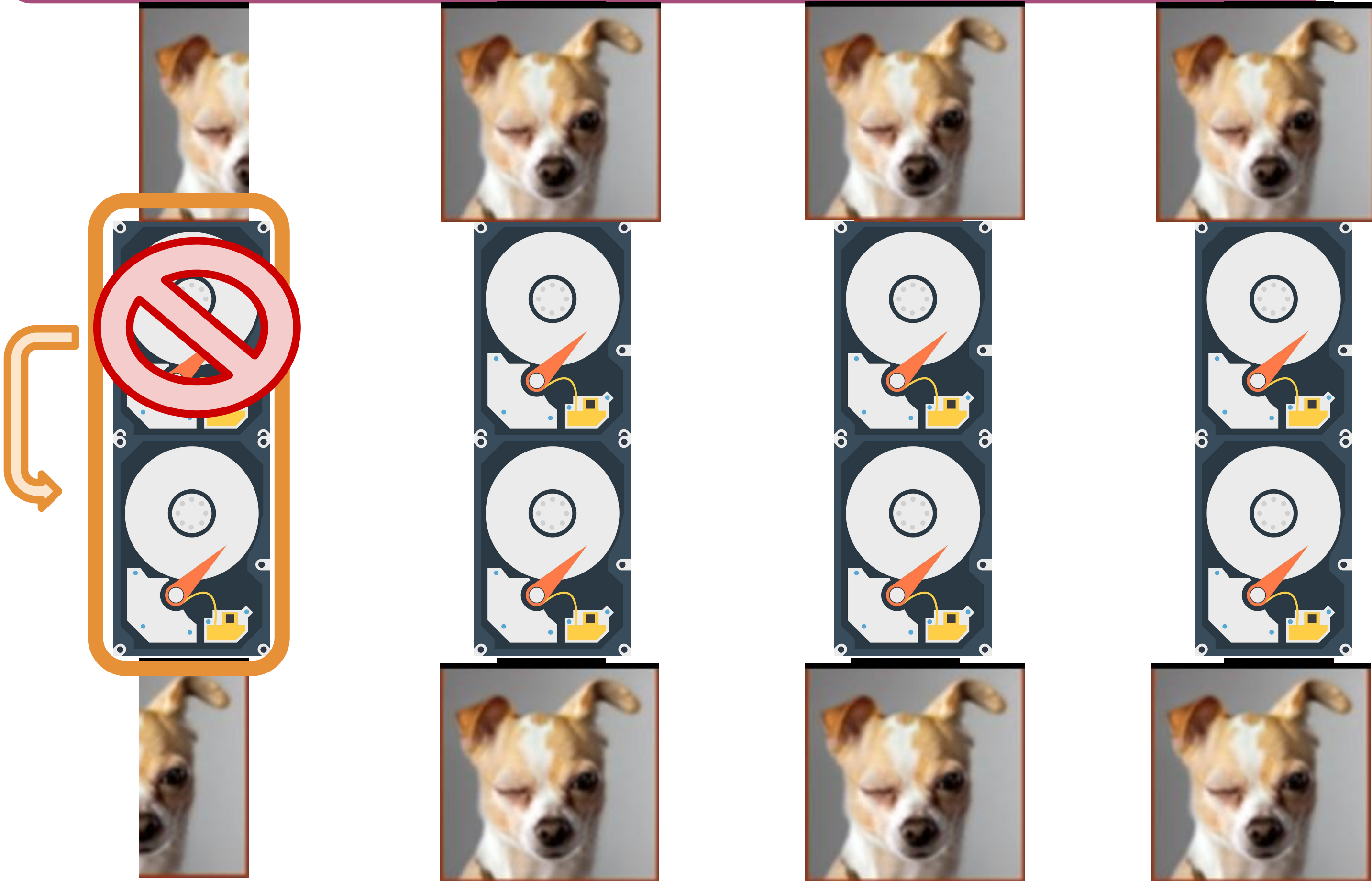
Mirror then Stripe

SER 334

RAID

"Redundant Arrays of Independent Disks"

Think:
Combining the Disks!



RAID 1+0

Mirror then Stripe

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Scratch Space

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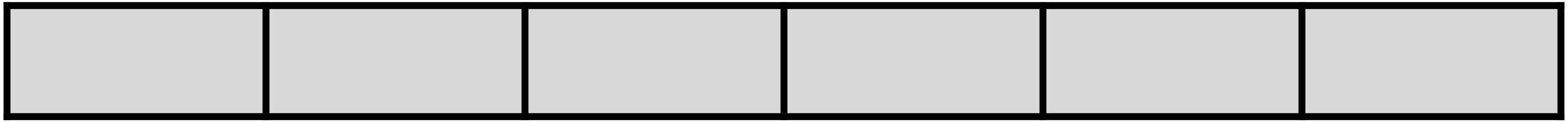
Scratch Space



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Scratch Space

Upcoming Events

SI Sessions:

- Sunday, February 25th at 7:00 pm MST - Q&A Session before Exam 3

Review Sessions:

- Exam 3 Review: Thursday, February 22nd at 7:00 pm MST

Questions?

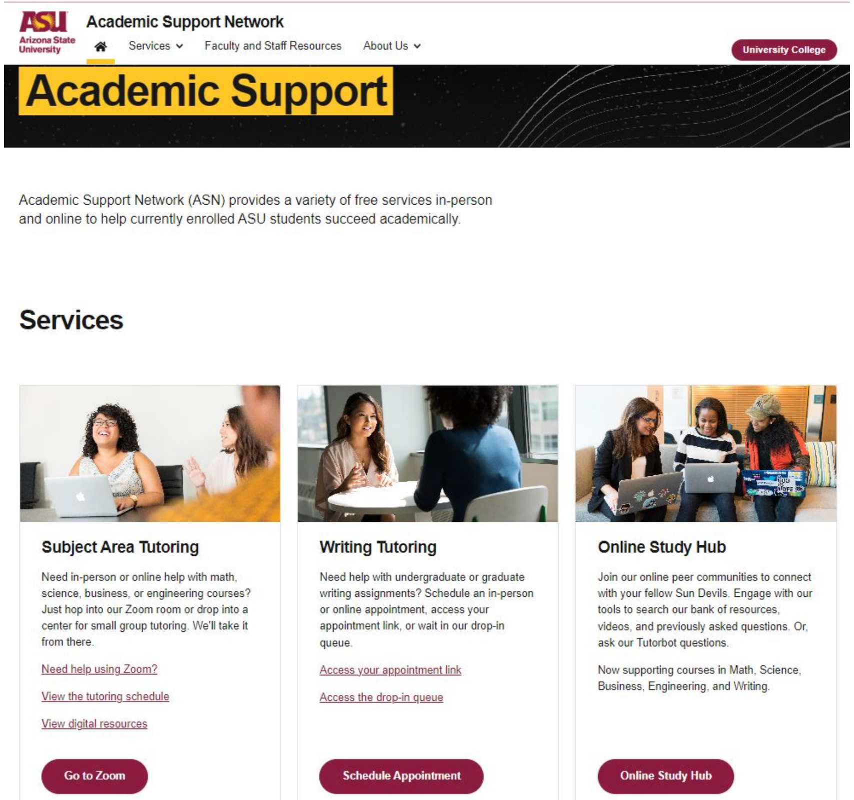
Survey:

http://bit.ly/ASN2324

More Questions?

Check out our other resources!

tutoring.asu.edu



ASU Arizona State University

Academic Support Network

Academic Support

Academic Support Network (ASN) provides a variety of free services in-person and online to help currently enrolled ASU students succeed academically.

Services

Subject Area Tutoring

Need in-person or online help with math, science, business, or engineering courses? Just hop into our Zoom room or drop into a center for small group tutoring. We'll take it from there.

Need help using Zoom?

View the tutoring schedule

View digital resources

Go to Zoom

Writing Tutoring

Need help with undergraduate or graduate writing assignments? Schedule an in-person or online appointment, access your appointment link, or wait in our drop-in queue.

Access your appointment link

Access the drop-in queue

Schedule Appointment

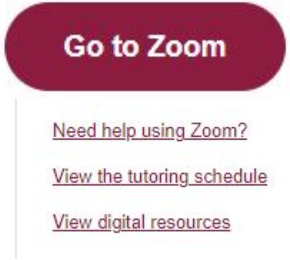
Online Study Hub

Join our online peer communities to connect with your fellow Sun Devils. Engage with our tools to search our bank of resources, videos, and previously asked questions. Or, ask our Tutorbot questions.

Now supporting courses in Math, Science, Business, Engineering, and Writing.

Online Study Hub

1 –



Go to Zoom

2-

Need help using Zoom?

View the tutoring schedule

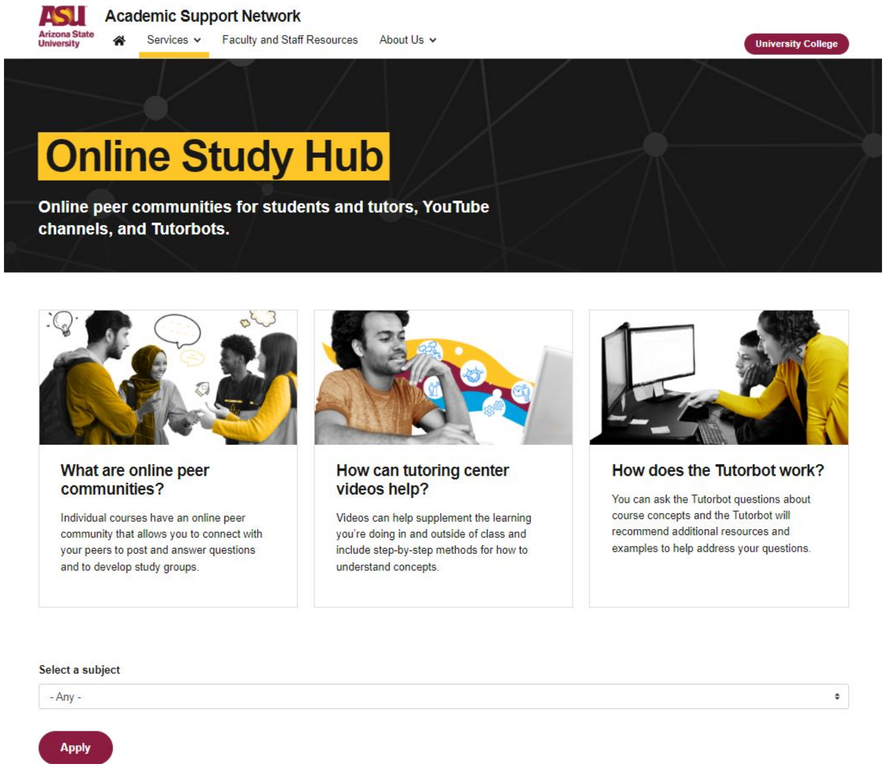
View digital resources

1. **Click on 'Go to Zoom' to log onto our Online Tutoring Center.**
2. **Click on 'View the tutoring schedule' to see when tutors are available for specific courses.**

More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



Online Study Hub

Online peer communities for students and tutors, YouTube channels, and Tutorbots.

What are online peer communities?

Individual courses have an online peer community that allows you to connect with your peers to post and answer questions and to develop study groups.

How can tutoring center videos help?

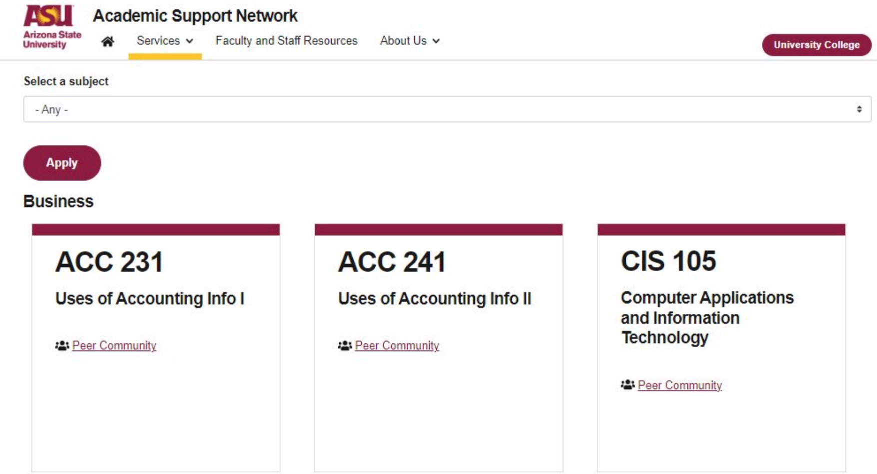
Videos can help supplement the learning you're doing in and outside of class and include step-by-step methods for how to understand concepts.

How does the Tutorbot work?

You can ask the Tutorbot questions about course concepts and the Tutorbot will recommend additional resources and examples to help address your questions.

Select a subject: - Any -

Apply



Select a subject: - Any -

Apply

Business

ACC 231
Uses of Accounting Info I
Peer Community

ACC 241
Uses of Accounting Info II
Peer Community

CIS 105
Computer Applications and Information Technology
Peer Community

Don't forget to check out the Online Study Hub for additional resources!

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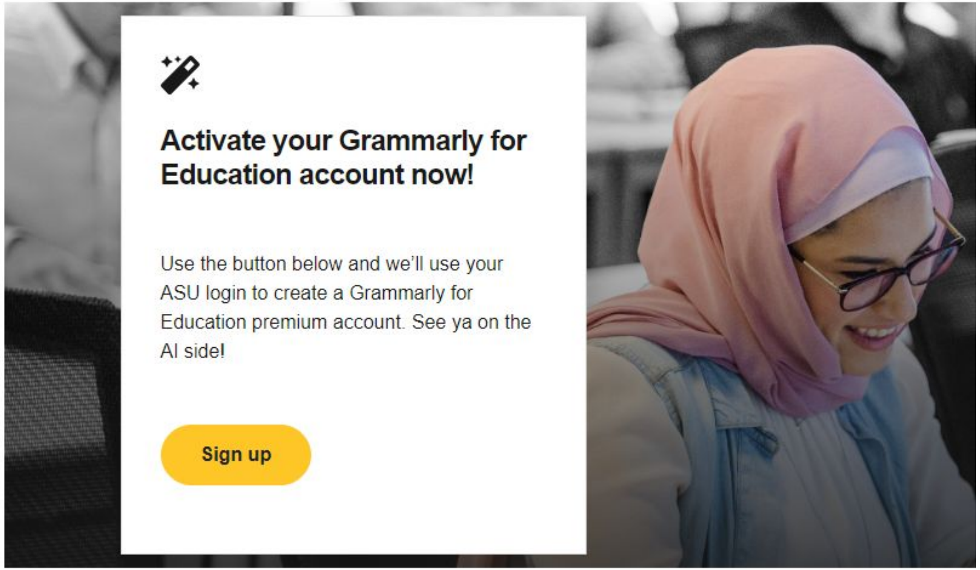

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Use the button below and we'll use your ASU login to create a Grammarly for Education premium account. See ya on the AI side!

tutoring.asu.edu/expanded-writing-support

*Available slots for this pilot are limited

Additional Resources

- Course Repo
- Course Discord
- BMP File Format (Wiki)
- Linux Kernel API
- Bootlin - Linux Cross Referencer
- Dining Philosophers Interactive
- Producer/Consumer Visual
- Dave’s Garage Memory Video