Variant Sudoku as a Vehicle for General Education Mathematics

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Coals to Newcastle

Many people in the general populace are terrified of, and traumatized by, math

As adults, these individuals may transmit this opinion to young people in their lives

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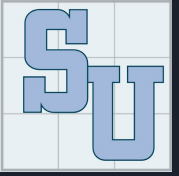
As adults, these individuals may transmit this opinion to young people in their lives

General education math may be the last chance to change their minds



Our Approach *(Big Surprise)*

Puzzles!

General Education Mathematics

“Students will demonstrate mathematical literacy through interpretation of mathematical forms and performing calculations.”

(Clemson’s learning outcome)

University Response *(Actual Big Surprise)*

OKAY!

MATH 1230 Math Reasoning Through Puzzles

Two sections offered in Fall 2025 with 38 students

University Response *(Bigger Surprise)*

Approved assessment structure:

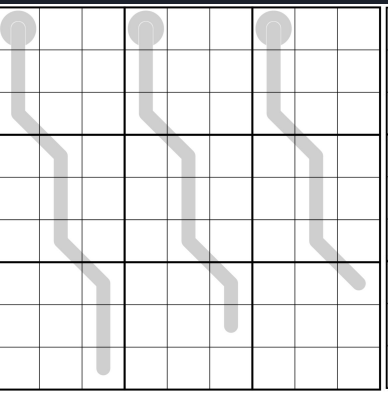
- Homework and reflections (20%)
- 3 portfolios (50% total)
- 2 midterms and a final (30% total)

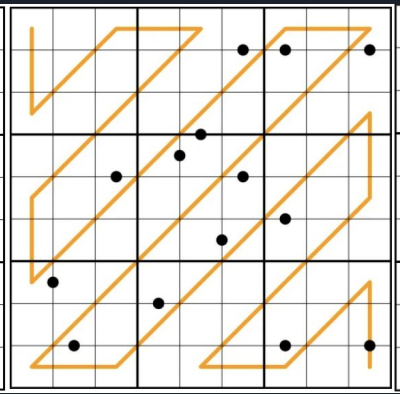
What sort of puzzles?

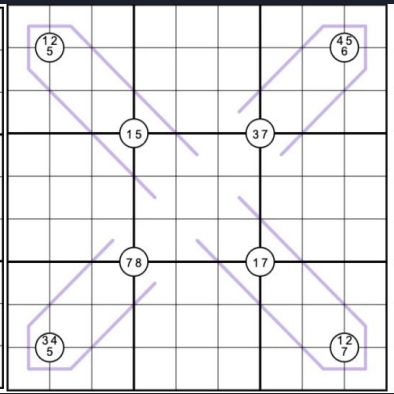
- Easy entry point
- Consistent underlying structure
- Scalable difficulty
- Variety of mathematical reasoning embedded in puzzles
- Students can construct puzzles

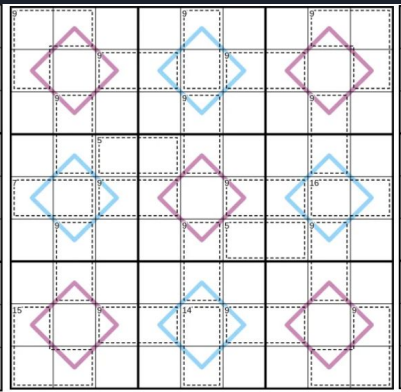
Our Answer: Variant Sudoku

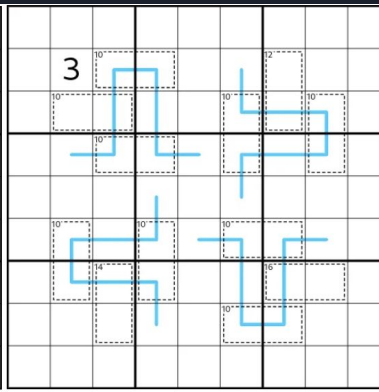
- Easy entry point
- Consistent underlying structure
- Scalable difficulty
- Variety of mathematical reasoning embedded in puzzles
- Students can construct puzzles





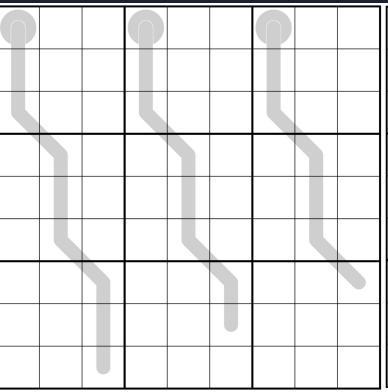
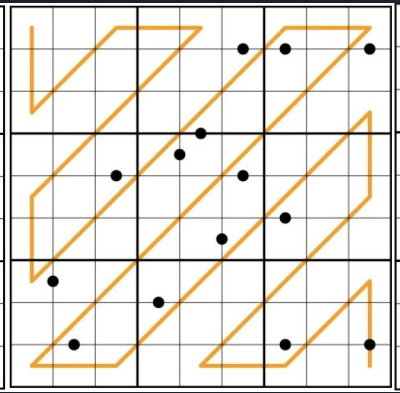
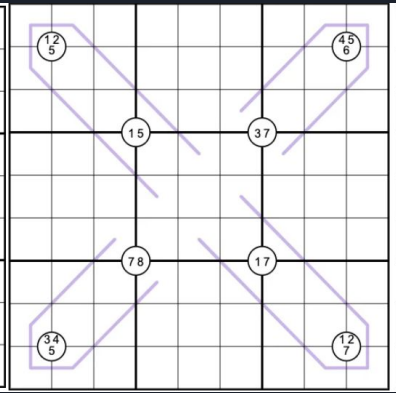


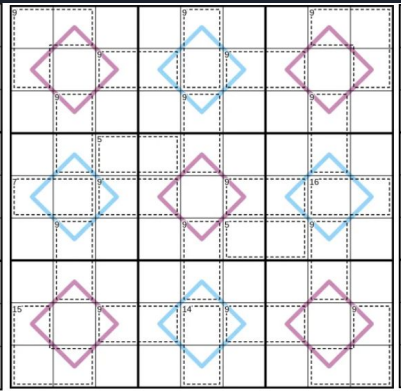
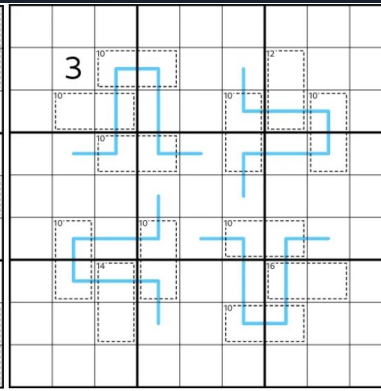




BONUS!

- Robust, free online solving platform (with data collection!)
- Robust, free online setting platform
- Vibrant international community
- Easily accessible puzzle construction tools
- Puzzles can be themed and visually appealing

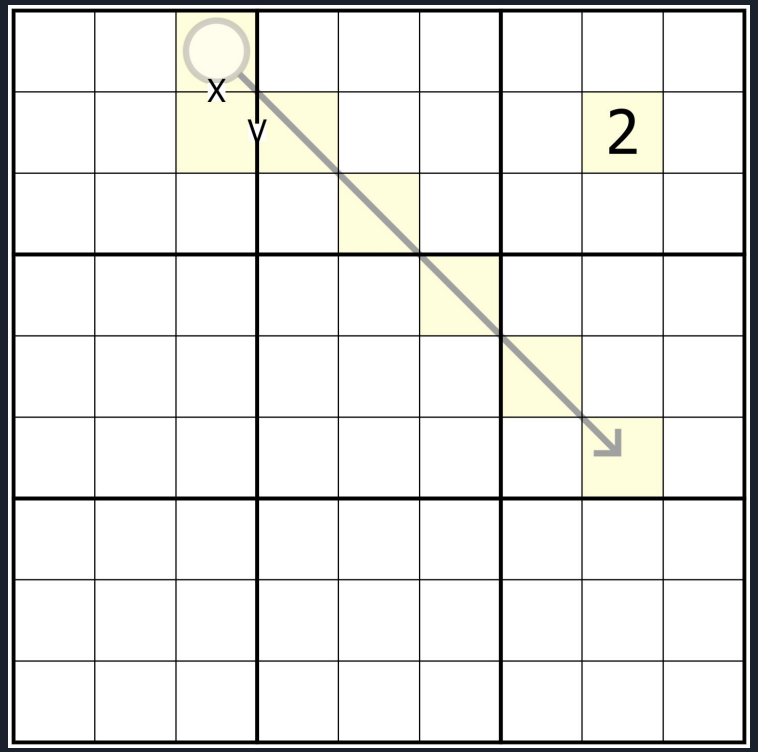



TOO MUCH TALKING!

NOT ENOUGH MATH!

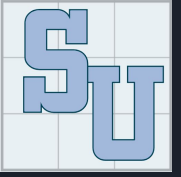
Sudoku **Problem**

place digits in the highlighted cells



- Only use the digits 1-9.
- Digits may not repeat in a row, column, or 3x3 box set off by darker lines.
- Digits separated by an X sum to 10.
- Digits separated by a V sum to 5.
- Digits along the shaft of an arrow sum to the number in the attached circle.

What types of mathematical reasoning did you use to solve the problem?

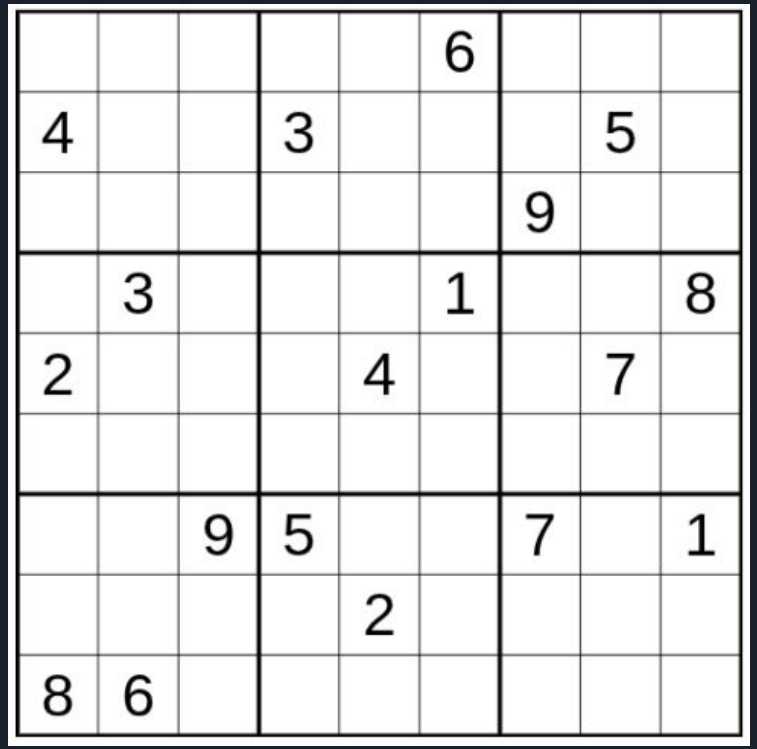


First Unit: Solving

Asking Good Questions

First Unit: Solving

Asking Good Questions

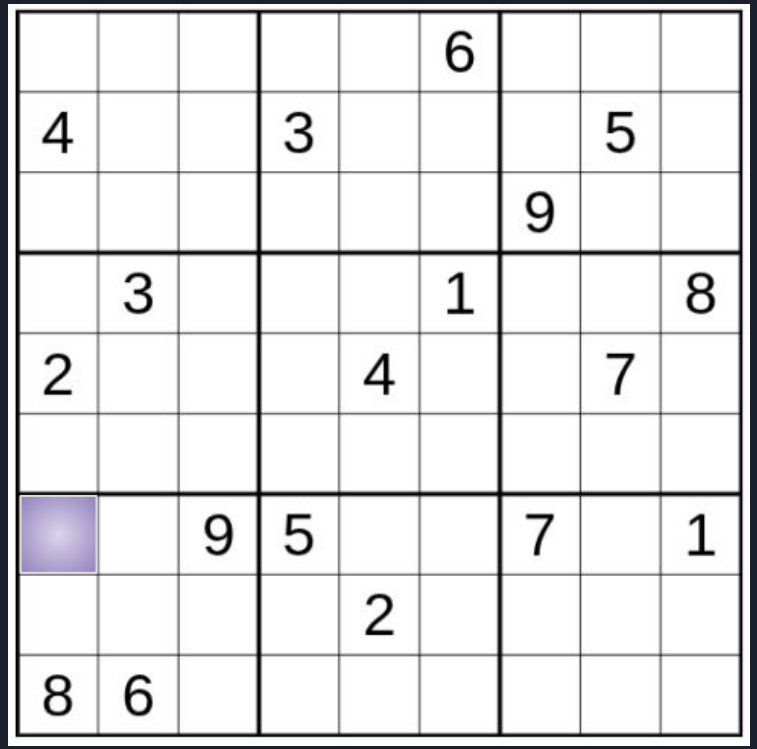


					6			
4			3				5	
						9		
	3				1			8
2				4			7	
		9	5			7		1
				2				
8	6							

What's a good question to ask for this grid?

First Unit: Solving

Asking Good Questions



					6			
4			3				5	
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What's a good question to ask for this grid?

What digit(s) can go in row 7, column 1?

First Unit: Solving

Asking Good Questions

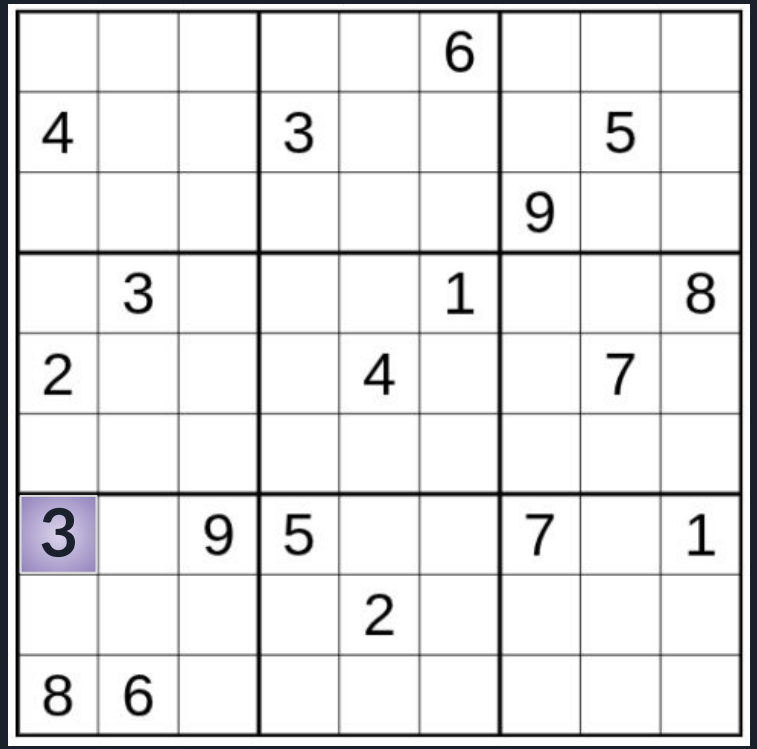
					6			
4			3				5	
						9		
	3				1			8
2				4			7	
3		9	5			7		1
				2				
8	6							

What digit(s) can go in row 7, column 1?

Row 7, Column 1 is a NAKED SINGLE. It sees 8 of the 9 digits in either row, column, or box so r7c1 can only contain the digit 3

First Unit: Solving

Asking Good Questions



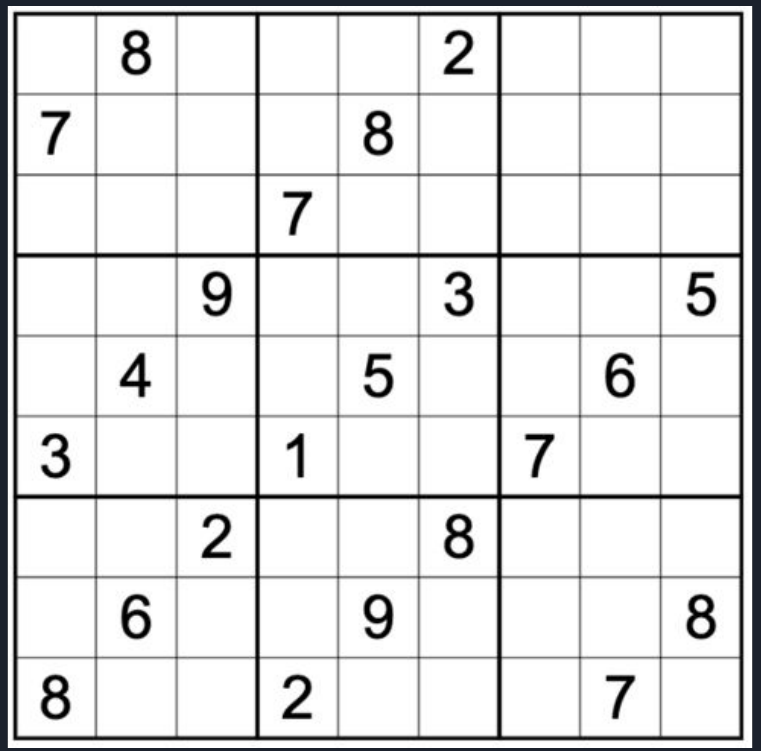
					6			
4			3				5	
						9		
	3				1			8
2				4			7	
3		9	5			7		1
				2				
8	6							

Sneaking in the vegetables:

- Pigeonhole Principle
- Coordinate Pairs
- Notation
- Terminology and definitions

First Unit: Solving

Asking Good Questions

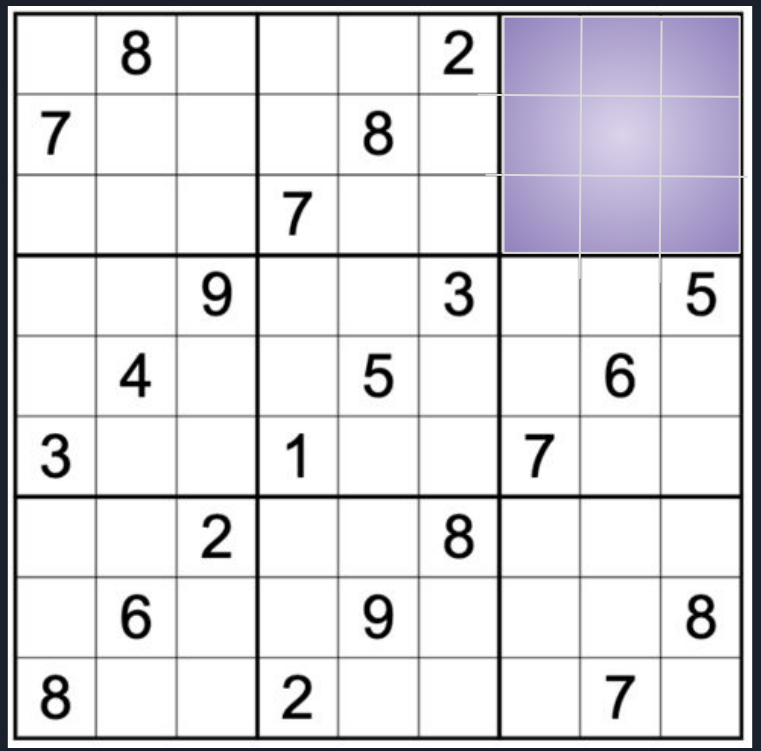


	8				2			
7				8				
			7					
		9			3			5
	4			5			6	
3			1			7		
		2			8			
	6			9				8
8			2				7	

What's a good question to ask for this grid?

First Unit: Solving

Asking Good Questions



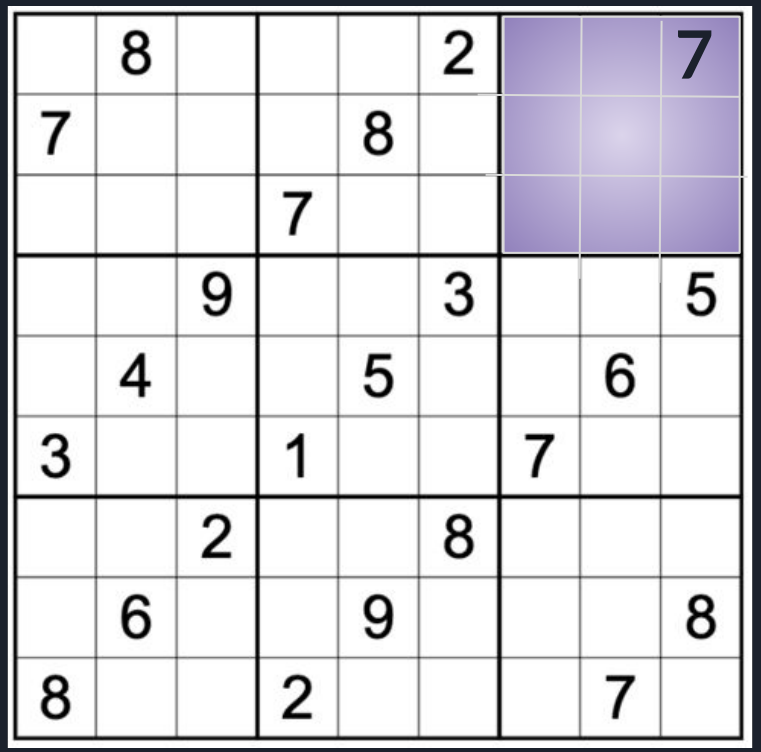
	8				2			
7				8				
			7					
		9			3			5
	4			5			6	
3			1			7		
		2			8			
	6			9				8
8			2				7	

What's a good question to ask for this grid?

Where can 7 go in box 3?

First Unit: Solving

Asking Good Questions



	8				2			7
7				8				
			7					
		9			3			5
	4			5			6	
3			1			7		
		2			8			
	6			9				8
8			2				7	

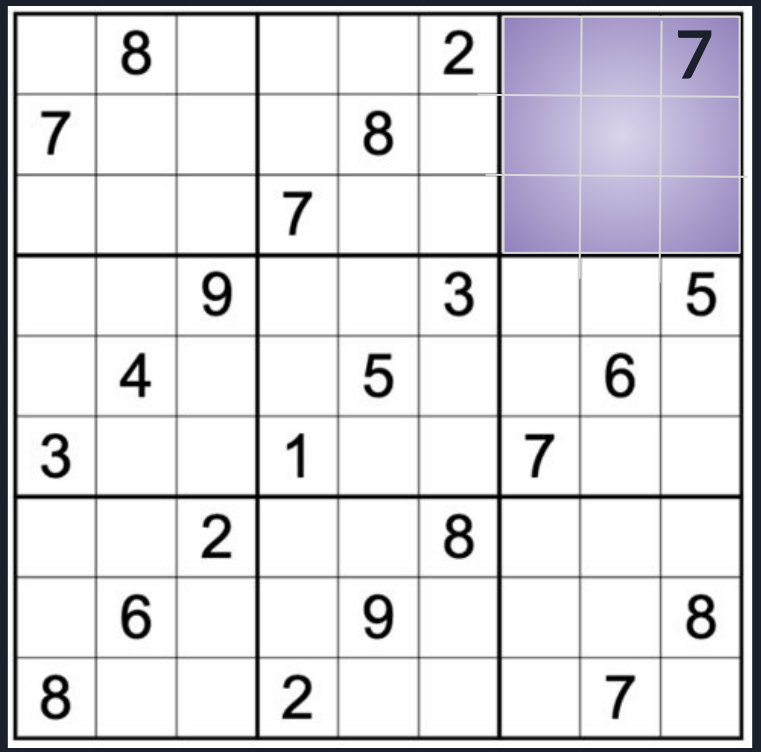
Where can 7 go in box 3?

Row 1, column 9 is a HIDDEN SINGLE: the only possible position for a particular digit within a row, column, or box.

R1c9 must be a 7.

First Unit: Solving

Asking Good Questions



	8				2			7
7				8				
			7					
		9			3			5
	4			5			6	
3			1			7		
		2			8			
	6			9				8
8			2				7	

Sneaking in the vegetables:

- Pigeonhole Principle
- Coordinate Pairs
- Notation
- Terminology and definitions
- The role of notation and terminology in communicating reasoning

First Unit: Solving

Good Questions Lead to Good Notation

What can go here? → Restricting possible VALUES → centermarks

Where can this go? → Restricting possible POSITIONS → cornermarks

First Unit: Solving

Good Questions Lead to Good Notation

What can go here? → Restricting possible VALUES → centermarks

Where can this go? → Restricting possible POSITIONS → cornermarks

Centermarks and cornermarks are conventions used by solvers to record and communicate deductions

First Unit: Solving

Foundational skills for mathematical reasoning and communication

- encoding and decoding information about relationships using symbols
- communicating reasoning using shared notation and terminology
- Introducing ideas of proof

First Unit: Solving

Keep it simple to build confidence

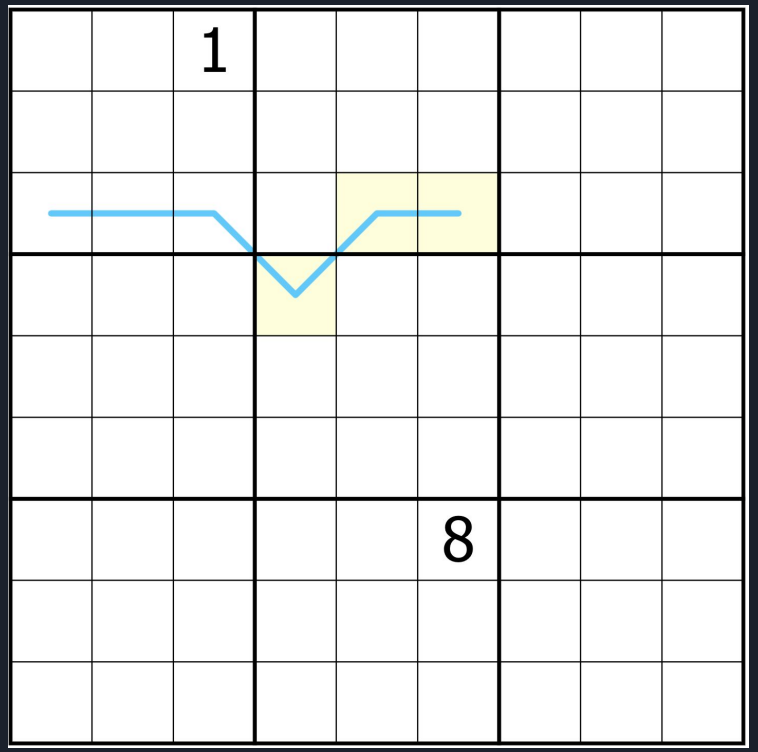
- Small puzzles to start
- Problems mixed with full puzzles
  - Problems: focus on core piece of logic
  - Puzzles: finding the good questions, deciding when information is relevant
- Limited collection of constraints

TOO MUCH TALKING!

NOT ENOUGH MATH!

Sudoku **Problem**

place digits in the highlighted cells



- Only use the digits 1-9.

- Digits may not repeat in a row, column, or 3x3 box set off by darker lines.

- Box borders divide the blue line into segments. The sum of the digits along each segment must be the same.

What types of mathematical reasoning did you use to solve the problem?

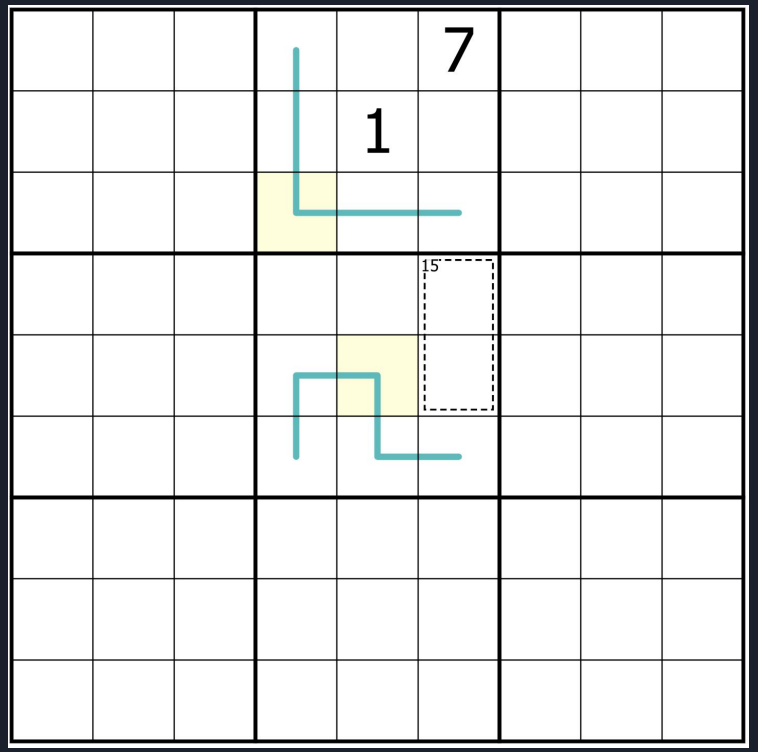
Second Unit: Reasoning

Communicating reasoning to prove your solution is unique

- More mathematically interesting constraints
- Focus on clear explanations using good notation and terminology
  - Written
  - Video solves
- Flexibility for instructor to explore different kinds of reasoning

Sudoku **Problem**

place digits in the highlighted cells



- Only use the digits 1-9.

- Digits may not repeat in a row, column, or 3x3 box set off by darker lines.

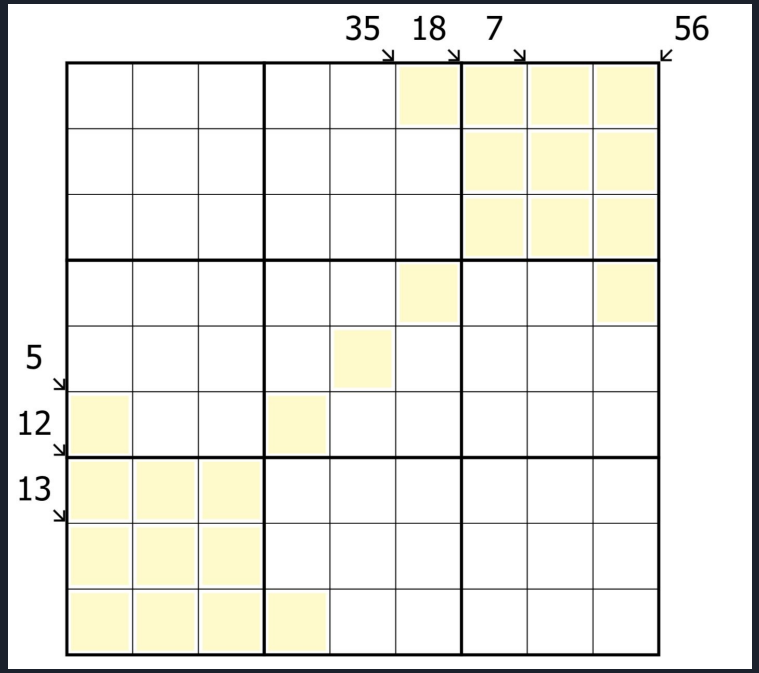
- Any set of three adjacent digits along a blue line has three different remainders when divided by 3.

- Digits inside the dashed-line "cage" sum to 15.

What types of mathematical reasoning did you use to solve the problem?

Second Unit: Reasoning

Signature assignment: determine as much as you can for highlighted cells



- Only use the digits 1-9.

- Digits may not repeat in a row, column, or 3x3 box set off by darker lines.

- Clues outside the grid give the sum of the cells along the indicated diagonal.

Second Unit: Reasoning

But first, a look back at one student

Excerpt from Math Autobiography, Week One:

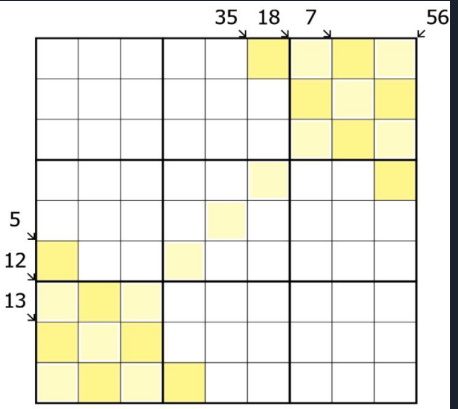
The best way to start my math autobiography is to state that I very likely have dyscalculia. I do not have a diagnosis because it does not seem to impact my life enough to warrant a diagnosis by most professionals … I cannot do basic math, and I cannot do mental math. I struggle with basic arithmetic, so adding and subtracting numbers is difficult unless I can count on my fingers, and I never was able to memorize my multiplication tables or do long division.

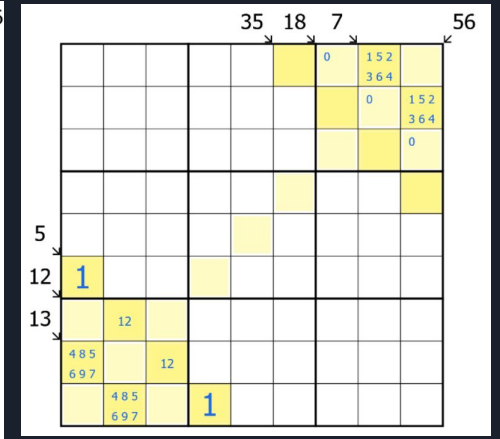
My math teachers never liked me, I wouldn't want to pay attention in class, and I have a particular memory of my tutor calling me stupid for how I was doing multiplication, by adding the numbers in a row so I would know what each multiple of a particular number was.

Second Unit: Reasoning

(Part of) that student's response on signature assignment

1. Starting grid. I have highlighted some of the diagonal sum cells with a darker shade of yellow to visually differentiate them. They have no other significance beyond that.
2. Starting with the diagonal sum that adds up to 5 that goes between box 4, 7, and 8, because it has four cells, the only way to have 5 divided up in a way that fits in four cells is to have three 1's and one 2. We can place two of the 1's in R6C1 and R9C4. This means we can centermark R7C2 and R8C3 with 1 and 2.

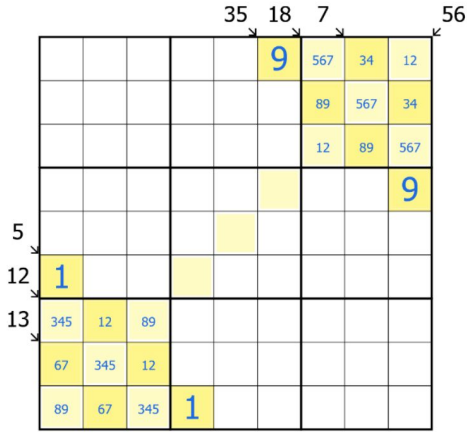




Second Unit: Reasoning

(Part of) that student's response on signature assignment

8. This means we can now refine what is in box 3. Starting with the 18-diagonal sum, knowing that an 8 or 9 cannot be apart of it, this leaves the only possible combination being 5, 6, and 7. We can now remove the 0 cornermarked shorthand and put these numbers in centermarked.
    a. This means we can also revisit the 7-diagonal sum. Knowing that 5 and 6 will be occupied already, we can remove those centermarks from those cells. Knowing that the only possible combinations that up to 7 are: 1 with 6, 2 with 5, and 3 with 4, this means that only 3 and 4 can go in these cells now.
    b. The two remaining cells in box 3, R1C9 and R3C7 will have a 1 and a 2 because those are the only other possible places to put those digits in this box.



Third Unit: Constructing

Creating mathematical puzzles empowers the students

- Overcome terror
  - Good, free software
  - Start small
  - Provide good prompts
  - COLLABORATE!!
- Construct with intentionality
- Give and receive feedback → REVISE!

Third Unit: Constructing

Giving and receiving feedback … and REVISING

It made me really think about the necessity of certain given digits, or constraints, and their interactions between each other. I had to think ahead, like, what would be fun in this puzzle? Instead of giving a digit here, how can I force this composition? What logical steps do I need to take to come to this conclusion?

When I reviewed other puzzles, I noticed how much a clearly telegraphed break-in, clean visuals, and concise rules improved the overall experience … Giving feedback taught me to think about fairness, clarity, and visibility, not just whether the puzzle technically "worked."

Providing feedback for other people's puzzles allowed me to see patterns that I could exploit for my own puzzles, like specific cage compositions being forced because of certain Kropki pair placement, Whisper-5 logic, increased understanding of parity, etc. I found that the more I provided feedback, the more I was having to think about different constraints in the context that other people had set them.

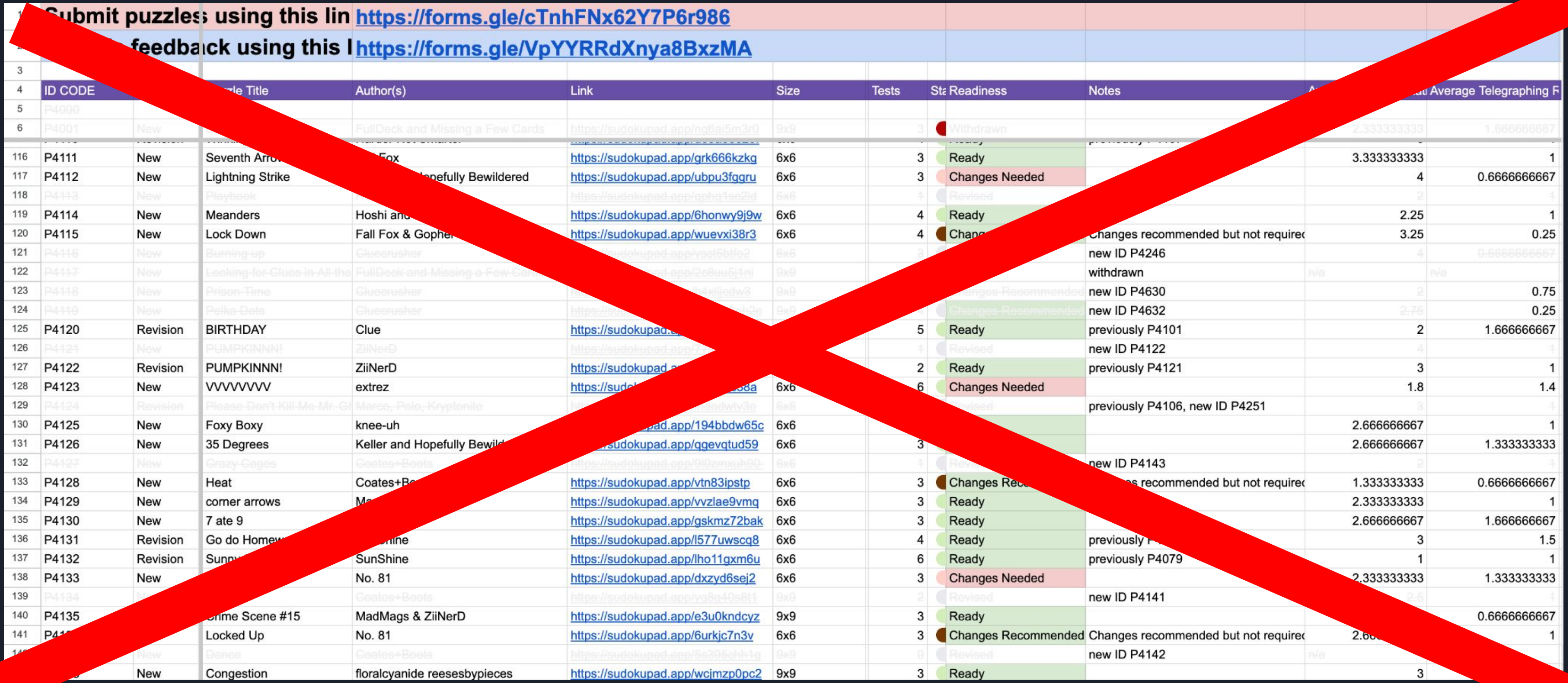
Third Unit: Constructing

Logistics of giving and receiving feedback and revising

1	**Submit puzzles using this lin**			**https://forms.gle/cTnhFNx62Y7P6r986**								
2	**Provide feedback using this l**			**https://forms.gle/VpYYRRdXnya8BxzMA**								
3												
4	ID CODE	New or re	Puzzle Title	Author(s)	Link	Size	Tests	Sta	Readiness	Notes	Average Difficulty Rati	Average Telegraphing F
5	P4000											
6	P4001	New	Cooking Cabbage	FullDeck and Missing a Few Cards	https://sudokupad.app/ng6ai5m3r0	9x9	3		Withdrawn		2.333333333	1.666666667
116	P4111	New	Seventh Arrow	Fall Fox	https://sudokupad.app/grk666kzkg	6x6	3		Ready		3.333333333	1
117	P4112	New	Lightning Strike	Keller and Hopefully Bewildered	https://sudokupad.app/ubpu3fggru	6x6	3		Changes Needed		4	0.6666666667
118	~~P4113~~	~~New~~	~~Playbook~~	~~Hoshi and Lightning~~	~~https://sudokupad.app/qphq1se2id~~	~~6x6~~	~~1~~		~~Revised~~	new ID P4257	~~2~~	~~1~~
119	P4114	New	Meanders	Hoshi and Lightning	https://sudokupad.app/6honwy9j9w	6x6	4		Ready		2.25	1
120	P4115	New	Lock Down	Fall Fox & Gopher Vacuum	https://sudokupad.app/wuevxi38r3	6x6	4		Changes Recommended	Changes recommended but not requirec	3.25	0.25
121	~~P4116~~	~~New~~	~~Burning up~~	~~Gluecrusher~~	~~https://sudokupad.app/vsot5btfo2~~	~~6x6~~	~~3~~		~~Revised~~	new ID P4246	~~4~~	~~0.6666666667~~
122	~~P4117~~	~~New~~	~~Looking for Clues in All the~~	~~FullDeck and Missing a Few Cards~~	~~https://sudokupad.app/2c8uu5j1ni~~	~~9x9~~	~~0~~		~~Revised~~	withdrawn	~~n/a~~	~~n/a~~
123	~~P4118~~	~~New~~	~~Prison Time~~	~~Gluecrusher~~	~~https://sudokupad.app/h4xlljcdw3~~	~~9x9~~	~~4~~		~~Changes Recommended~~	new ID P4630	~~2~~	0.75
124	~~P4119~~	~~New~~	~~Polka Dots~~	~~Gluecrusher~~	~~https://sudokupad.app/49hhe9ch2e~~	~~9x9~~	~~4~~		~~Changes Recommended~~	new ID P4632	~~2.75~~	0.25
125	P4120	Revision	BIRTHDAY	Clue	https://sudokupad.app/9sq5x3vquw	6x6	5		Ready	previously P4101	2	1.666666667
126	~~P4121~~	~~New~~	~~PUMPKINNN!~~	~~ZiiNerD~~	~~https://sudokupad.app/77sncef5t7~~	~~9x9~~	~~1~~		~~Revised~~	new ID P4122	~~4~~	~~1~~
127	P4122	Revision	PUMPKINNN!	ZiiNerD	https://sudokupad.app/1lzydnpyi8	9x9	2		Ready	previously P4121	3	1
128	P4123	New	VVVVVVVV	extrez	https://sudokupad.app/sh1jp7s38a	6x6	6		Changes Needed		1.8	1.4
129	~~P4124~~	~~Revision~~	~~Please Don't Kill Me Mr. Gl~~	~~Marco, Polo, Kryptonite~~	~~https://sudokupad.app/indodwtv3o~~	~~6x6~~	~~2~~		~~Revised~~	previously P4106, new ID P4251	~~3~~	~~1~~
130	P4125	New	Foxy Boxy	knee-uh	https://sudokupad.app/194bbdw65c	6x6	3		Ready		2.666666667	1
131	P4126	New	35 Degrees	Keller and Hopefully Bewildered	https://sudokupad.app/qgevqtud59	6x6	3		Ready		2.666666667	1.333333333
132	~~P4127~~	~~New~~	~~Crazy Cages~~	~~Coates+Boots~~	~~https://sudokupad.app/9l0zmxuh90-~~	~~6x6~~	~~1~~		~~Revised~~	new ID P4143	~~2~~	~~1~~
133	P4128	New	Heat	Coates+Boots	https://sudokupad.app/vtn83ipstp	6x6	3		Changes Recommended	Changes recommended but not requirec	1.333333333	0.6666666667
134	P4129	New	corner arrows	Magster of sudoku	https://sudokupad.app/vvzlae9vmq	6x6	3		Ready		2.333333333	1
135	P4130	New	7 ate 9	SunShine	https://sudokupad.app/gskmz72bak	6x6	3		Ready		2.666666667	1.666666667
136	P4131	Revision	Go do Homework!	SunShine	https://sudokupad.app/l577uwscq8	6x6	4		Ready	previously P4084	3	1.5
137	P4132	Revision	Sunny Sky	SunShine	https://sudokupad.app/lho11gxm6u	6x6	6		Ready	previously P4079	1	1
138	P4133	New	Up and Down	No. 81	https://sudokupad.app/dxzyd6sej2	6x6	3		Changes Needed		2.333333333	1.333333333
139	~~P4134~~	~~New~~	~~Cages~~	~~Coates+Boots~~	~~https://sudokupad.app/yq8g40s8t1~~	~~9x9~~	~~2~~		~~Revised~~	new ID P4141	~~2.5~~	~~1~~
140	P4135	New	Crime Scene #15	MadMags & ZiiNerD	https://sudokupad.app/e3u0kndcyz	9x9	3		Ready		3.666666667	0.6666666667
141	P4136	New	Locked Up	No. 81	https://sudokupad.app/6urkjc7n3v	6x6	3		Changes Recommended	Changes recommended but not requirec	2.666666667	1
142	~~P4137~~	~~New~~	~~Dance~~	~~Coates+Boots~~	~~https://sudokupad.app/5s395chh1g~~	~~9x9~~	~~0~~		~~Revised~~	new ID P4142	~~n/a~~	~~n/a~~
143	P4138	New	Congestion	floralcyanide reesesbypieces	https://sudokupad.app/wcjmzp0pc2	9x9	3		Ready		3	1

Third Unit: Constructing

Logistics of giving and receiving feedback and revising



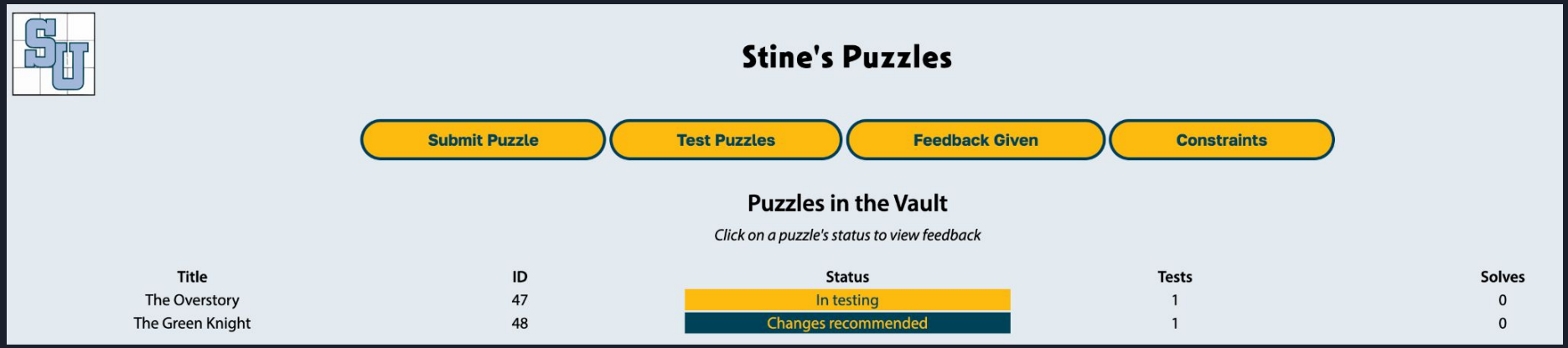
Submit puzzles using this lin https://forms.gle/cTnhFNx62Y7P6r986

[illegible] feedback using this l https://forms.gle/VpYYRRdXnya8BxzMA

	ID CODE		[illegible]le Title	Author(s)	Link	Size	Tests	Sta	Readiness	Notes	A[illegible]	Average Telegraphing F
5	~~P4000~~											
6	~~P4001~~	~~New~~	[illegible]	~~FullDeck and Missing a Few Cards~~	~~https://sudokupad.app/ng6ai5m3r0~~	~~9x9~~	~~3~~		~~Withdrawn~~		~~2.333333333~~	~~1.666666667~~
116	P4111	New	Seventh Arro[illegible]	[illegible]Fox	https://sudokupad.app/grk666kzkg	6x6	3		Ready		3.333333333	1
117	P4112	New	Lightning Strike	[illegible]pefully Bewildered	https://sudokupad.app/ubpu3fggru	6x6	3		Changes Needed		4	0.6666666667
118	~~P4113~~	~~New~~	~~Playbook~~	[illegible]	~~https://sudokupad.app/qphq1se2id~~	~~6x6~~	~~1~~		~~Revised~~		~~2~~	~~1~~
119	P4114	New	Meanders	Hoshi an[illegible]	https://sudokupad.app/6honwy9j9w	6x6	4		Ready		2.25	1
120	P4115	New	Lock Down	Fall Fox & Gophe[illegible]	https://sudokupad.app/wuevxi38r3	6x6	4		Chang[illegible]	Changes recommended but not required	3.25	0.25
121	~~P4116~~	~~New~~	~~Burning up~~	~~Gluecrusher~~	~~[illegible]sudokupad.app/vsel5btfo2~~	~~6x6~~	~~3~~		[illegible]	new ID P4246	~~4~~	~~0.6666666667~~
122	~~P4117~~	~~New~~	~~Looking for Clues in All the~~	~~FullDeck and Missing a Few Car[illegible]~~	~~[illegible]pad.app/2e8uu5j1ni~~	~~9x9~~			[illegible]	withdrawn	~~n/a~~	~~n/a~~
123	~~P4118~~	~~New~~	~~Prison Time~~	~~Gluecrusher~~	~~[illegible]h4xlljedw3~~	~~9x9~~			~~[illegible]anges Recommended~~	new ID P4630	~~2~~	0.75
124	~~P4119~~	~~New~~	~~Polka Dots~~	~~Gluecrusher~~	~~https://su[illegible]ah2e~~	~~9x9~~	[illegible]		~~Changes Recommended~~	new ID P4632	~~2.75~~	0.25
125	P4120	Revision	BIRTHDAY	Clue	https://sudokupad.a[illegible]	[illegible]	5		Ready	previously P4101	2	1.666666667
126	~~P4121~~	~~New~~	~~PUMPKINNN!~~	~~ZiiNerD~~	~~https://sudokupad.app/7[illegible]~~	[illegible]	~~1~~		~~Revised~~	new ID P4122	~~4~~	~~1~~
127	P4122	Revision	PUMPKINNN!	ZiiNerD	https://sudokupad.a[illegible]	[illegible]	2		Ready	previously P4121	3	1
128	P4123	New	VVVVVVVV	extrez	https://sud[illegible]38a	6x6	6		Changes Needed		1.8	1.4
129	~~P4124~~	~~Revision~~	~~Please Don't Kill Me Mr. Gl~~	~~Marco, Polo, Kryptonite~~	[illegible]	~~6x6~~	[illegible]		~~Revised~~	previously P4106, new ID P4251	~~3~~	~~1~~
130	P4125	New	Foxy Boxy	knee-uh	[illegible]pad.app/194bbdw65c	6x6	[illegible]		[illegible]		2.666666667	1
131	P4126	New	35 Degrees	Keller and Hopefully Bewil[illegible]	[illegible]sudokupad.app/qgevqtud59	6x6	3		[illegible]		2.666666667	1.333333333
132	~~P4127~~	~~New~~	~~Crazy Cages~~	~~Coates+Boots~~	~~https://sudokupad.app/9l0zmxuh90~~	~~6x6~~	~~1~~		~~Revi[illegible]~~	new ID P4143	~~2~~	~~1~~
133	P4128	New	Heat	Coates+Bo[illegible]	https://sudokupad.app/vtn83ipstp	6x6	3		Changes Rec[illegible]	[illegible]s recommended but not required	1.333333333	0.6666666667
134	P4129	New	corner arrows	Ma[illegible]	https://sudokupad.app/vvzlae9vmq	6x6	3		Ready		2.333333333	1
135	P4130	New	7 ate 9	[illegible]	https://sudokupad.app/gskmz72bak	6x6	3		Ready		2.666666667	1.666666667
136	P4131	Revision	Go do Homew[illegible]	[illegible]hine	https://sudokupad.app/l577uwscq8	6x6	4		Ready	previously P[illegible]	3	1.5
137	P4132	Revision	Sunn[illegible]	SunShine	https://sudokupad.app/lho11gxm6u	6x6	6		Ready	previously P4079	1	1
138	P4133	New	[illegible]	No. 81	https://sudokupad.app/dxzyd6sej2	6x6	3		Changes Needed		2.333333333	1.333333333
139	~~P4134~~	~~N~~[illegible]	[illegible]	~~Coates+Boots~~	~~https://sudokupad.app/yq8g40s8t1~~	~~9x9~~	~~2~~		~~Revised~~	new ID P4141	~~2.5~~	~~1~~
140	P4135	[illegible]	[illegible]rime Scene #15	MadMags & ZiiNerD	https://sudokupad.app/e3u0kndcyz	9x9	3		Ready		[illegible]	0.6666666667
141	P41[illegible]	[illegible]	Locked Up	No. 81	https://sudokupad.app/6urkjc7n3v	6x6	3		Changes Recommended	Changes recommended but not required	2.6[illegible]	1
[illegible]	[illegible]	~~New~~	~~Dance~~	~~Coates+Boots~~	~~https://sudokupad.app/5s395chh1g~~	~~9x9~~	~~0~~		~~Revised~~	new ID P4142	~~n/a~~	
[illegible]	[illegible]	New	Congestion	floralcyanide reesesbypieces	https://sudokupad.app/wcjmzp0pc2	9x9	3		Ready		3	[illegible]

Third Unit: Constructing

Logistics of giving and receiving feedback and revising



Stine's Puzzles

Submit Puzzle | Test Puzzles | Feedback Given | Constraints

Puzzles in the Vault

Click on a puzzle's status to view feedback

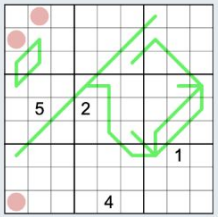
Title	ID	Status	Tests	Solves
The Overstory	47	In testing	1	0
The Green Knight	48	Changes recommended	1	0

Third Unit: Constructing

Logistics of giving and receiving feedback and revising

Puzzle Feedback

Puzzle ID: 48



The Green Knight
Stine

Status: Changes recommended
Version: 1
Tests: 1
Difficulty: 2
Fun: 3
Solve time range: 18:14-18:14
Average solve time: 18:14

Clarity of Rules

One or more testers have identified an issue with clarity of the rules. When you have made appropriate changes, submit a revision. Previous testing data will be reset.

- The rules say grey circles but the puzzle says red circles for the odd digits. Resubmit this with the odd constraint as an additional, manually entered constraint instead of using the preset version.

Revise Puzzle | Decline Revisions

Third Unit: Constructing

Logistics of giving and receiving feedback and revising

Feedback By FullDeck

Summary

total puzzles tested: 4
puzzles returned prior to solving: 0
puzzles with complete feedback after solving: 4
puzzles with partial feedback: 0
average difficulty score you assigned: 1.75
scale: 0 = introductory to 5 = very hard
average fun score you assigned: 3
scale: 0 = not fun at all to 4 = super fun

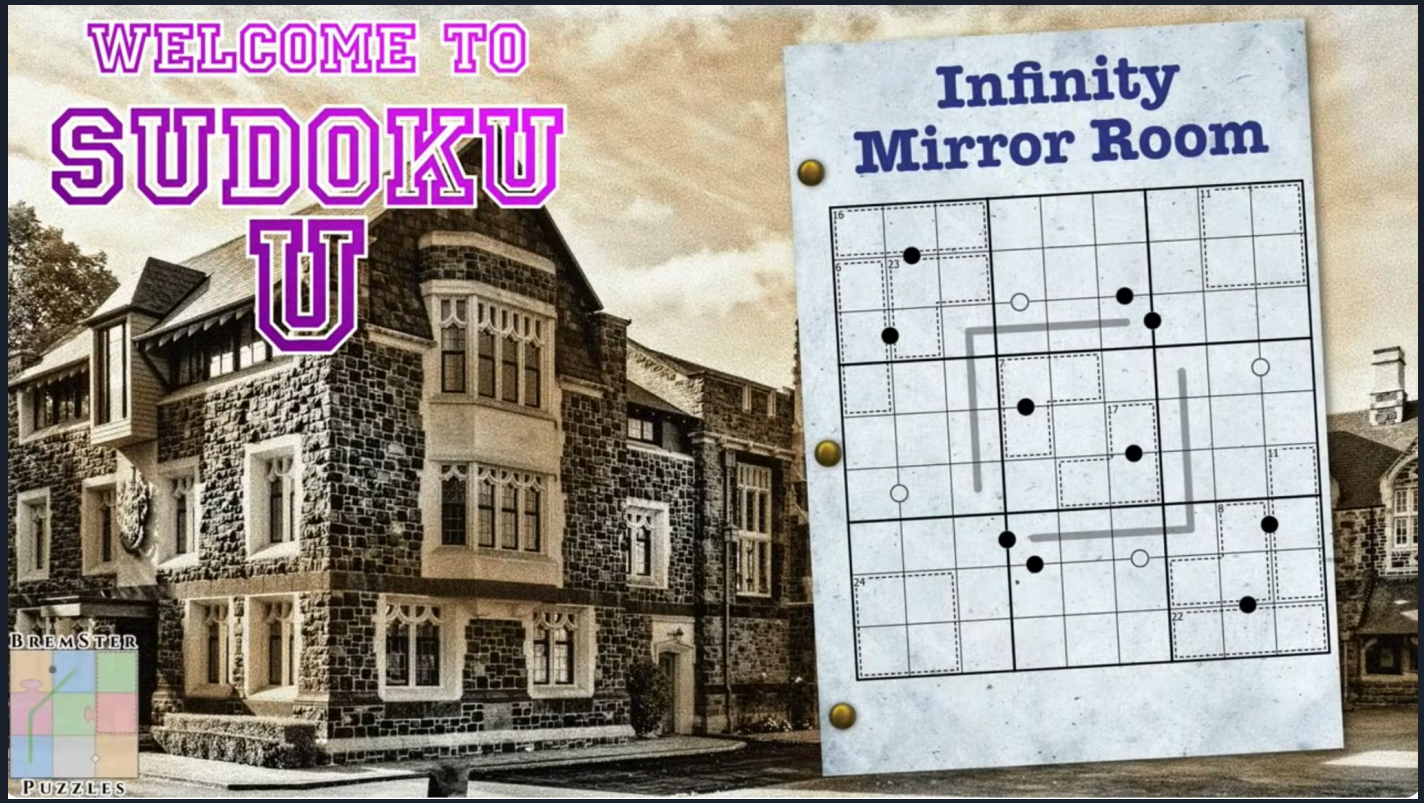
Details (completed feedback only)

Puzzle	Version	Title	Size	Diff.	Fun	Suggestions	Compliments
45	0	A Bit Cheeky, This One.	9x9	Moderate	Super fun	• I found the shafts of the arrows a bit thick; they occasionally impeded viewing centermarks • For the path I took, I did not need to use the unmarked cage in boxes 1 and 2 since the only digit that could possibly repeat was the 9 and you can't have 9 on the shaft of an arrow. It's certainly possible to solve the puzzle without that cage but there might be a different path in which the cage is revealed first and rules out some digit placements in box 1.	The break-in to this was quite tricky but very fun. There were some other tricky spots along the way but in general the flow was excellent and made very good use of the constraint logic and interactions.
47	0	The Overstory	9x9	Easy	Super fun	none given	Really fun and lovely puzzle!
49	0	Orienteering Control	9x9	Moderate	Super fun	• The break-in with the ratio dot on the whisper in r8 was lovely and the ratio dots in c5 got us our next step. Nice interactions between thermometers and other constraints.	This was good fun and we're delighted to see you return to setting; looking forward to more from you!
48	0	The Green Knight	9x9	Moderate	Super fun	none given	The visual elements of this puzzle are very pleasing and the flow is lovely.

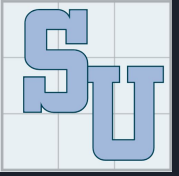
Final Reflections

First, from the student whose math autobiography we saw earlier:

> More than anything, however, my ability to construct mathematical puzzles with a unique, logical solution is the skill I developed the most that I am really proud of. This is something I never considered I could do or even learn, and now, I am looking to construct mathematical puzzles to teach mathematical ideas to my friends because my interest in puzzles has grown so much ... I still struggle in a lot of basic skills that math classes require, but I do not feel like these deficits in my ability hold me back because the class has shown me that math is less about making sure that those parts of math are hammered in, but more about the logic associated with math. My interest in mathematics is so much more than it used to be, and I look forward to continuing [sudoku] outside of class because of how much I ended up enjoying it.



NOTE: This student constructed a puzzle that wound up being solved on YouTube by BremSter, a content creator in Australia. The video has had over 1400 views and the puzzle has been solved over 1300 times around the world.



We are happy to share resources with others wanting to teach a variant sudoku course

egallag@clemson.edu
calkin@clemson.edu
Puzzle archive: missingdeck.net

Planning a professional development mini-course in Summer 2026

egallag@clemson.edu
calkin@clemson.edu

More student comments from their final reflection ...

My perception of mathematics has changed a lot after taking this course. **I'm no longer hesitant and unwilling to come to math class**, but instead I'm excited and I look forward to it. I was actually disappointed when I could not come to class because of an injury and felt left behind. I would also say that my interest in mathematics has grown as well. I'm intrigued how the puzzles work and the logic behind them. I now like to solve these types of math problems and **have even started to do it outside of class, on my own time for fun**! I have started making them for my friends and family. I found such joy and interest in them that I **have the people around me asking for puzzles I have created so they can try and solve them**.

I also noticed that when I shared one of my variant sudoku solves with a friend, they told me they understood each step because **I explained the "why" clearly. This was something I absolutely could not do before the semester started**. I had always thought of math as something with answers that "just appear" if you're good at it, but this class forced me to slow down, articulate each move, and justify it …

Puzzle construction ended up being one of the most meaningful parts of the course. I never expected to learn how to make legitimate 4x4, 6x6, and even 9x9 puzzles with unique solutions that others could play and enjoy … One of my favorite moments was when a peer told me that my 9x9 construction had "clean logic all the way through," which **made me realize that I had actually learned to think like a puzzle designer**.

My perception of mathematics has changed a lot since the beginning of the semester because **I genuinely didn't know math could actually be fun**.

This class changed my perception of mathematics completely. Before this semester, I always thought math was rigid, formula-based, and something I just "wasn't good at" and that there was nothing I could do to change that. **Multiple people in my life have even told me that I should rethink my academic and career goals because I wasn't strong enough in math**. Starting this course, I carried that insecurity heavily. This class showed that mathematics can be creative, logical, and even artistic. Constructing a puzzle feels like designing something unique based on logic, and realizing I could actually do that rebuilt a part of my confidence I didn't think could change … Overall, **this class pushed me far outside my comfort zone, and the growth feels real and earned**. I came in with zero sudoku experience and a lot of math-related self-doubt. I'm finishing the semester able to craft puzzles, understand complicated constraints, communicate logic clearly, and believe that I can succeed in mathematics

The outcome I feel the best about is constructing puzzles with a unique, logical solution. This was my favorite unit in the class and **I learned how to organize clues, use constraints effectively, and design a path that makes sense for a solver** without relying on guessing.

Puzzle construction ended up being my favorite part of the course. I didn't expect to like creating puzzles as much as solving them, but building a puzzle with a single logical solution turned out to be weirdly satisfying. My early attempts either had multiple solutions, too many clues, or I would accidentally have dead ends, but by the time I made my showcase puzzles, I had a better sense of how constraints like XV pairs, thermometers, or kropki pairs guide the solver. **Seeing classmates actually enjoy solving something I designed was honestly one of the coolest feelings I've had in a math-related class**.

I am so shocked I did well with a math class because I haven't always felt smart but **this class redefined how I saw myself as someone who studies math**. It always felt like being good at math was something out of my reach but this class made it clear that I can succeed in math

This class also changed how I view mathematics as a whole. Instead of seeing math only as numbers, equations, or calculating answers, I started to see it more as a way of thinking and reasoning. The **puzzle-based approach made math feel more like a creative process and a tool for exploring patterns, logic, and structure**. Math became less about memorizing procedures and more about understanding relationships and constraints. I discovered that I enjoy the challenge of figuring out how different pieces fit together, and I began to appreciate the beauty in logical structure. Because of this experience, my interest in mathematics has grown.

The same skills you use in Sudoku like organizing information, checking for errors, or communicating ideas clearly also apply to my daily life with planning, problem-solving, and decision-making in everyday situations. I also learned the importance of feedback and revision which are skills that matter in school, work, and when doing creative projects. Overall, **this course has opened my eyes to viewing mathematics in a positive light** in many different ways that have also translated to skills that I use in my daily life as well.

This course also **taught me skills that I can apply outside of puzzles**. It strengthened my logical thinking, made me more patient with problems that don't have an obvious next step, and improved my attention to detail. Those are all things I know I need to work on in general, so having a class help me build them naturally was meaningful.

One thing that I learned from this class that I will continue to apply to my everyday life is the value of logical reasoning. Working on sudoku puzzles helped me break down big problems (9x9 puzzles, with multiple constraints), I would break the puzzles down into smaller parts that helped me solve the puzzles, thinking critically about each step. I can see how this skill helps beyond puzzles: for making decisions, planning, and thinking through information in everyday life or in my future career.

I would definitely say that after this semester my confidence has grown in my skills but also in who I am as an academic scholar. **At the end of my learning for this course I am sad to leave** but also comfortable in the knowledge I have learned. I'll be able to apply the knowledge to my everyday life of how to logically solve problems even if they are not sudoku puzzles. I will also take away the new hobby of making puzzles for both myself and others.

I would definitely be **interested in pursuing math for either fun or just academic enlightenment in the future**, and hopefully I can find the time to do so in the spring. I have implemented daily sudoku puzzles into my every day now, at the very least!

One thing I learned in this course that applies to life in general is patience. The puzzles forced me to slow down, try different approaches, and be okay with starting over when something didn't work. A lot of problems looked confusing or impossible at first, but once I focused on what I did know, things became clearer. It reminded me that even when something feels overwhelming, breaking it into smaller pieces and using the information you already have can make it much more manageable. Overall, this course helped me improve my logical thinking, understand puzzle construction, and build skills that are useful both inside and outside of mathematics. **Even though math is not something I naturally enjoy, I now feel more prepared to approach unfamiliar problems and communicate my reasoning** effectively.