



DiscreteQuest

Meet the Cast

STANDARD EDITION

Spark & Anvil

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This book collects 7 chapter books from the DiscreteQuest cast — each character embodies a different curricular primitive; together they teach the full subject.

Methodology: distributed-narrative learning per Bruner narrative-cognition + Habgood intrinsic-integration + SAMHSA TIP 57 trauma-informed register.

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This is Volume 1 of 2 of the *DiscreteQuest — Meet the Cast* series; each volume is a complete standalone book you can read on its own.

For everyone who learns by hearing a story first.

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Introduction

The DiscreteQuest cast was authored to embody the curriculum, not decorate around it. Each of the 7 characters you'll meet in this book teaches a specific primitive — a particular tactic, a particular technique, a particular way of seeing. Together they form an ensemble: the cast IS the curriculum.

Read in any order. Each chapter stands alone.

Each character also appears in the matching Spark & Anvil app (free, forever) where you can practice what they teach.

— *The editors at Spark & Anvil*

Sortie and Tally

SET-THEN-COUNT — Sortie (sets + set operations) + Tally (counting principles) — together, the canonical describe-then-count workflow of discrete math



- 'ART'
 - 'MUSIC'
 - 'READ'
 - 'HI'
 - gate-allow-text-pattern: '^([0-9]{1,2})\$'
 - reflection-prompts:
 - prompt: "Sortie and Tally almost got it wrong until they slowed down and worked as a pair — one naming, one counting. Have you ever felt the relief of not having to do the whole hard thing by yourself, because a friend covered the part you weren't good at?"
 - prompt: "Tally wanted to rush straight to counting, and had to trust Sortie to draw the picture first. Is there a time when waiting and letting someone else go first felt uncomfortable at the start but calmer once it worked out?"

The Lantern Festival was in three days. Every grade in the academy needed a permission slip signed. The headmistress had handed Sortie and Tally a single piece of paper with a single question on it.

How many kids can attend the Festival?

Tally read the question. "How many kids."

Sortie read the question. "Can attend."

Tally said: "We have a number to find."

Sortie said: "We have a set to define."



They looked at each other across the table. They had worked together before. The drill was always the same. Tally wanted to start counting. Sortie wanted to start curating the right COLLECTION to count. And the rule between them — the rule they had learned the hard way last year, when they had failed to coordinate on the boat-race attendance question — was: *Sortie first. Then Tally.*

"All right," Tally said. "Tell me the set."

Sortie picked up a piece of chalk. "Start with the entire student body. That's our universe set. Let's call it U."

She wrote: $U = \text{all students.}$

"How big is U?" Tally asked.

"That's your job. But let me build the set first. From U, we need to remove students who CAN'T attend. There are three reasons a kid can't attend: they don't have a signed permission slip, they're in detention, or they're sick."

She drew three overlapping circles inside U.

"Let A be the set of kids without permission slips."

"Let B be the set of kids in detention."

"Let C be the set of kids who are sick."

"Some kids might be in more than one of A, B, C. Some kids have detention AND a missing slip. Some kids are sick AND in detention. So A, B, C overlap."



"What we want," Sortie said, "is the kids NOT in any of A, B, C. The kids who have a permission slip AND aren't in detention AND aren't sick. That's the set of kids who can attend."

She wrote: $\text{ATTENDING} = U - (A \cup B \cup C)$.

"All right," Tally said. "Now I count."

Tally pulled out a clipboard. "I'm going to need to count three things separately and then put them together using your formula. Let's see."

She started counting.

"U is the whole student body. There are 192 kids at the academy."

"A is the set of kids without permission slips. From the office records, that's 41 kids who didn't turn one in."

"B is the set of kids in detention. There are 18 kids in detention this week."

"C is the set of kids who are sick. There are 24 kids out sick."

She paused. "But wait. I can't just subtract $41 + 18 + 24$ from 192."



"Why not?"

"Because some kids are in MORE THAN ONE of A, B, C. If a kid is both in detention AND missing a permission slip, I would be subtracting them twice. The total of $A + B + C$ overcounts the kids who are in multiple categories."

"Right."

"I need to ADD BACK the kids who are in two categories — because I subtracted them twice and I should have subtracted them once. And then I need to SUBTRACT the kids who are in all three categories — because I added them back too many times."

Sortie nodded. "That's the inclusion-exclusion principle. The thing I name; the thing you compute."

Tally pulled out her records.

"Kids in BOTH A and B (no permission slip AND in detention): 7 kids."

"Kids in BOTH A and C (no permission slip AND sick): 5 kids."

"Kids in BOTH B and C (in detention AND sick): 2 kids."

"Kids in ALL THREE A, B, C: 1 kid."

She started writing the formula.

$$\begin{aligned}
 |A \cup B \cup C| &= |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C| \\
 &= 41 + 18 + 24 - 7 - 5 - 2 + 1 \\
 &= 70.
 \end{aligned}$$

"So 70 kids can't attend. Which means $192 - 70 = 122$ kids CAN attend."

Sortie looked at the diagram. The overlapping circles on the chalkboard told the whole story. Inside the three circles: 70 kids. Outside all three circles, but inside U: 122 kids.

"122," she said.



"122," Tally confirmed.

The headmistress walked in five minutes later. They handed her the slip.

How many kids can attend the Festival? 122.

"Show me how you got 122," the headmistress said.

Tally pointed to Sortie's diagram. "She defined the set."

Sortie pointed to Tally's formula. "She counted it."

"You did it together."

"We did it together."

The headmistress smiled. "Most kids would have just written $192 - 41 - 18 - 24$ and gotten 109. They would have undercounted the attending kids by 13. Because they wouldn't have noticed the overlaps."

Tally shook her head. "If Sortie hadn't drawn the overlapping circles first, I would have done exactly that. I would have subtracted everyone in each category separately and called it done. The overlap is invisible if you don't draw the set first."

Cubby the Cubby-Keeper

THE PIGEONHOLE PRINCIPLE — if you have more things than places to put them, then at least one place must hold more than one thing. You can be certain of it without ever looking inside.



Cubby was a soft grey pigeon, and the most important thing in her life was a wall.

It was the message wall at the DiscreteQuest academy — rows and rows of little open boxes, one for each student, where notes and parcels waited to be picked up. The students called the little boxes cubbies, which is exactly how Cubby got her name. She knew every box by heart. She tucked letters into them with quick, neat pushes of her beak, humming as she worked.

One morning a flustered chipmunk named Tuck came skidding up with his arms full of envelopes.

"Cubby! The morning post is a disaster. I've got thirteen letters and I don't know whose is whose yet — but they all have to go up on the wall, and the wall only has twelve cubbies free."

Cubby didn't even look at the letters. She just smiled.

"Then one cubby is going to end up with two," she said.

Tuck blinked. "You didn't count them. You didn't even look at the wall."

"Didn't need to," Cubby said. "Thirteen letters. Twelve cubbies. There's no way to spread thirteen things across twelve places without doubling up *somewhere*. I don't know *which* cubby gets two. But I know one of them must. I'd bet my breakfast on it."



Cubby had felt that strange, sure feeling for as long as she could remember.

She had grown up in a great noisy roost above a mail-house, where her family sorted letters from dawn till dusk. As a chick she used to worry herself sick trying to *see* every letter land before she could relax. Then one grey afternoon her grandmother set her on the railing and said, "Stop watching the letters, little one. Watch the *numbers*."

Her grandmother pointed a wing at the sorting shelves. "Count the slots. Count the letters. If there are even one more letter than slot, then no matter how cleverly anyone sorts — no matter who tries — at least one slot has to hold a double. You don't have to chase it down to know it's there."

Cubby remembered the feeling that washed over her: not excitement, exactly. Something quieter. A kind of steadiness. The world had a rule in it that would *always* hold, and she could lean on it. She didn't have to see everything to be sure of something. She just had to count.

From then on she stopped chasing letters. She counted slots, and she rested.



When Cubby was older she walked the long road to DiscreteQuest, because she had heard it was a place that loved sure things.

The head of the academy was an old owl with slow, kind eyes. He peered down at the small grey pigeon and asked, in his deep voice, "What is the pigeonhole principle?"

Cubby didn't fidget. "It's the surest little rule I know," she said. "If you have more things than places to put them, then at least one place has to hold more than one thing. Put five birds in four nests, and some nest has two birds. Put thirteen letters in twelve cubbies, and some cubby has two letters. You never have to look to find out *that* it happens. It just has to."

The owl tilted his head. "And if the things and the places are equal?"

"Then maybe everyone gets their own," Cubby said. "The rule only bites when there's one too many. One extra is all it takes." She ruffled her feathers. "Pigeons named the principle, you know. We've been overcrowding cubbies since the beginning of time."

The owl's eyes crinkled. "You are appointed," he said.



Cubby's favourite thing was showing a doubtful student how certain the rule could make them feel.

A young hare named Lop once came to her, gloomy. "We've got seven friends coming to the sleepover," he said, "and only six sleeping-mats. I keep counting and recounting, hoping I miscounted."

"You didn't miscount," Cubby said gently. "Seven friends, six mats. Somebody is sharing tonight — that's certain. But here's the thing, Lop." She hopped along her wall, tapping cubbies. "Certain isn't the same as *bad*. You don't know yet *who* will share. You get to decide that part. The rule only promised you a double; it didn't say it had to be a problem."

Lop thought about it. "So... two of my friends are definitely going to be squished together on one mat."

"Definitely," Cubby agreed. "And the two squished friends are probably going to whisper and giggle half the night and have the best time of anyone." She nudged him with a wing. "More things than places isn't always a disaster. Sometimes it's just how you end up sitting close to someone."

Lop went home a great deal less gloomy.



Later, when the academy had gone quiet and the last letters were tucked away, Cubby sat on her railing and looked at her wall of cubbies in the dim light.

Tuck wandered back through, the morning's chaos long over. "I found it, by the way," he said. "The doubled cubby. Number five had two letters, just like you said. How does it not drive you crazy — knowing something's true but not knowing exactly where?"

Cubby was quiet for a moment.

"It used to," she admitted. "When I was small I thought I had to see everything, hold everything, check everything, or I couldn't be calm. But the wall taught me different. There are some things you can be sure of just by counting — and being sure of *one* true thing, even a small one, is enough to let you breathe."

She looked out at the dark rows of boxes, each one holding somebody's letters, somebody's news, somebody waiting to be remembered.

And as Tuck said goodnight and the wall settled into shadow, Cubby felt the old steadiness come over her again — that soft, certain warmth that had nothing to do with letters or cubbies at all. It was just the quiet comfort of knowing that in a full enough room, nobody ever truly ends up alone. Somebody is always, always sharing.

Marshal the Line-Arranger

PERMUTATIONS — when order matters, every different arrangement counts as a different outcome. To count arrangements you multiply the choices: the first spot has the most options, the next has one fewer, and so on. Swapping any two things makes a brand-new arrangement.



Marshal was a tall, bright-eyed flamingo, and he believed with his whole heart that *order matters*.

At the DiscreteQuest academy he was in charge of lining things up — performers for the spring parade, runners for a relay, names on a list. And he had a habit that drove some folks a little batty: he could never just "line them up." He fussed over the exact order, because to Marshal, a different order wasn't a small thing. It was a different parade entirely.

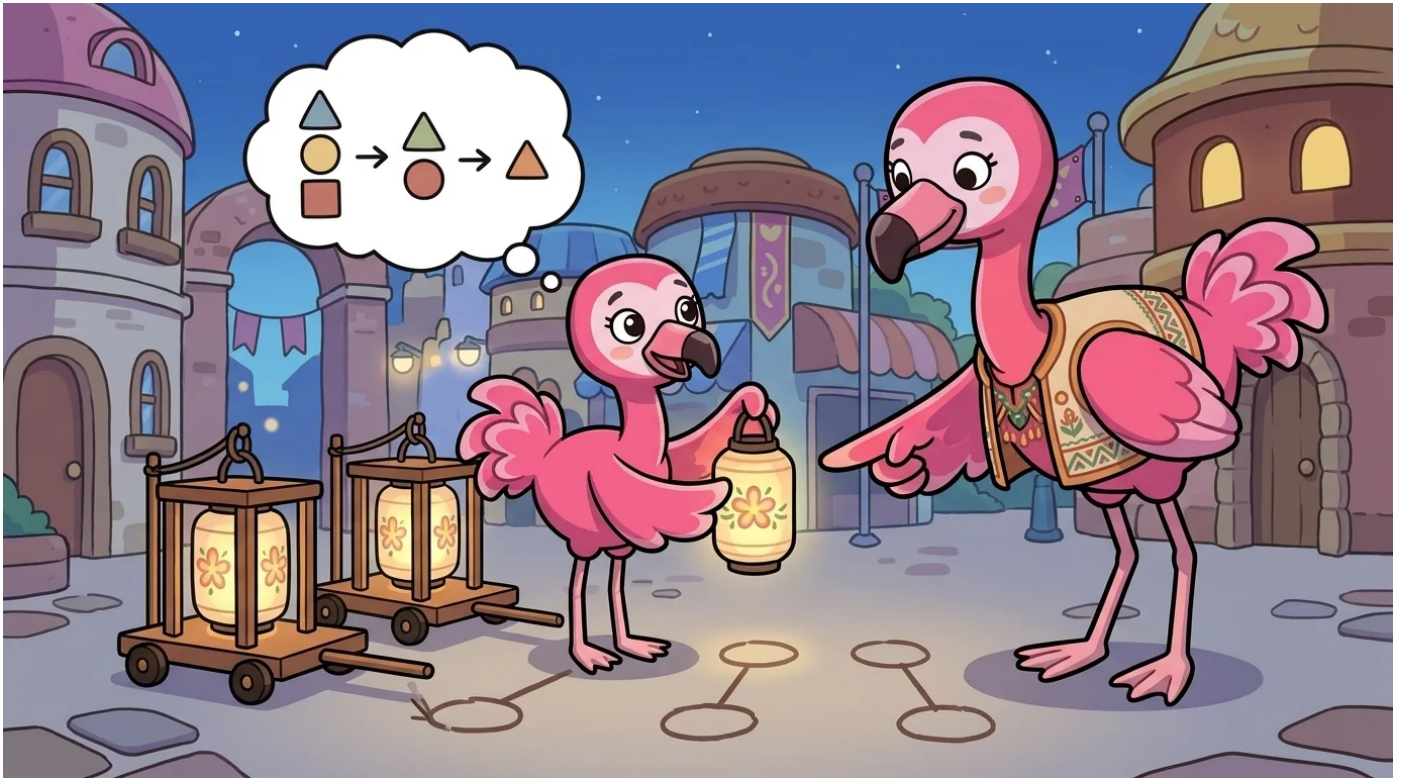
A young raccoon named Dot found him rearranging three parade floats for the tenth time.

"You already lined them up an hour ago," Dot said. "Why keep swapping?"

"Because every swap makes a *new* parade," Marshal said, sliding the drum-float ahead of the flower-float. "Watch. Drum, flower, lantern — that's one parade. Now —" he swapped two — "flower, drum, lantern. Same three floats. Completely different feeling coming round the corner. Same pieces, new arrangement. When the order matters, each arrangement is its very own thing."

Dot tilted her head. "So how many parades can you even make with three floats?"

Marshal's eyes lit up like he'd been waiting all day for someone to ask.



Marshal had felt the magic of order since he was knee-high.

His family ran processions in their home town — festival lines, wedding marches, lantern walks — and young Marshal's job was to decide who went where. One evening, fretting over a line of three lantern-bearers, he discovered something that changed how he saw everything.

"For the very first spot," his aunt told him, "how many bearers could you choose?"

"Three," he said. "Any of them."

"And once that one's placed, for the second spot?"

"Only two left to pick from."

"And the last spot?"

"Just the one who's left."

"So," his aunt said, "multiply them. Three choices, then two, then one. Three times two times one is six. There are six different orders for three bearers. Six different processions hiding in the very same three people."

Marshal had counted them out, astonished, and found exactly six. Not five, not seven. Six. The multiplying *worked*. From then on he saw arrangements everywhere, each one its own small world, and he learned the multiplying trick that counted them: start with all your choices, then one fewer, then one fewer still.



When he was grown, Marshal marched the long road to DiscreteQuest, because he'd heard it honored the things most folks overlooked.

The head of the academy was an old owl with a slow, considering voice. "What is a permutation?" he asked.

Marshal stood very straight. "A permutation is an arrangement where the order counts," he said. "Same things, lined up differently, and every different line-up is a different answer. To count them, you multiply your choices down — the first spot has the most, then one fewer for the next, and so on, all the way to the last." He spread his wings. "Three things make six arrangements. Four things make twenty-four. Five things make a hundred and twenty. They pile up fast, because every new thing multiplies in."

"And when the order does *not* matter?" the owl asked gently.

"Then it's a different question, and not mine to answer," Marshal said. "I'm the order fellow. Swap two of my things and I've got something new every time. That's my whole craft."

The owl nodded, slow and pleased. "You are appointed."



Marshal's favourite thing was watching a worried student discover how arrangements blossom.

A nervous mole named Pim came to him clutching a photo frame. "I have to seat three of my friends in a row for the class photo," Pim said, "and they each want to be in the 'best' spot, and I don't know how many ways there even are, and I'm panicking."

"Then let's not panic. Let's count," Marshal said warmly. "First seat — how many friends could sit there?"

"Three," Pim said.

"Sit one down. Second seat — how many friends are left to choose?"

"Two."

"Last seat?"

"Just one."

"Three, then two, then one. Multiply: six." Marshal laid out all six in front of Pim, swapping carefully each time. "Six photos, every one different, every one fair in its own way. You're not picking the 'one right order,' Pim. You're discovering there are six lovely ones, and you get to choose your favourite."

Pim let out a long breath. "Six isn't scary. Six I can handle."

"Six you can hold in your hands," Marshal agreed. "And if it were ten friends instead of three — well. Then we'd talk about how the numbers grow. But the trick never changes. Multiply your choices down."



Later, when the parade grounds were empty and the floats stood quiet under the moon, Marshal sat on the steps and watched the lanterns sway.

Dot came and sat beside him. "Can I tell you something?" she said. "When you told me how many parades hide in just a few floats, it kind of scared me. Like the world was way too big and I'd never see all of it."

Marshal was quiet for a moment.

"I remember feeling exactly that," he said. "The first time I really understood how fast arrangements pile up, I felt dizzy — like standing at the edge of something enormous. So many possible orders, more than I could ever march in a lifetime." He smiled softly. "But then it turned. The bigness stopped feeling like a weight and started feeling like a gift. All those orders weren't there to overwhelm me. They were there because there's *so much room* — so many ways for things to be, so many parades still waiting to happen."

He nudged her gently with a wing.

And as the lanterns swayed and Dot leaned her head against the flamingo's warm side, she found the bigness didn't frighten her anymore either. It felt, instead, like a quiet promise — that there would always be another arrangement, another order, another way for the same small handful of things to become something brand-new. The world wasn't too big. It was just generous.

Surge the Growth-Racer

*ORDER OF GROWTH — the important question about a method isn't how long one job takes, but how the work *grows* when the job gets bigger. Some methods grow gently (double the job, double the work); others surge (double the job, quadruple the work). Knowing which is which tells you what will still work when things get big.*



Surge was a lean, long-legged jackrabbit, and he never cared how fast you were *right now*.

At the DiscreteQuest academy he was the one who tested how methods held up when the work piled on. While everyone else timed a single task and called it a day, Surge would do the task small, then bigger, then bigger still, watching one number the whole time: not *how long*, but *how much the time grew* each time the job doubled.

A young dormouse named Sprig found him racing two ways of stacking books.

"They finished at the same time," Sprig said. "They're equally fast. You can stop now."

"For ten books, sure," Surge said, not even breathing hard. "But watch what happens with twenty. Now forty. One of these stays gentle — double the books, double the time, fair and steady. The other one *surges* — double the books and the time leaps up far more than double." He pointed at the slower method, now lagging badly. "That's the whole question. Not how fast it is for a few. How it *grows* when there are many."

Sprig stared. "So a method can look fine when it's small and turn into a disaster when it's big?"

"Now," Surge said, grinning, "you're asking the right question."



Surge had learned to watch growth, not speed, as a young buck.

His family were village messengers, and as a kit he was proud of being quick — fastest paws in the burrow. But one summer the village grew, and grew, and his old way of delivering — running back to the post-house after every single house — started taking him from dawn to dark. He was just as fast as ever. The *job* had gotten bigger, and his method couldn't keep up.

His grandmother sat him down. "Speed isn't your problem, dear. You're plenty fast. Your *method* grows badly. Every new house doesn't just add one delivery — the way you do it, every new house adds a whole trip back. The work doesn't grow gently with the village. It surges."

She showed him a better route — carry all the letters at once, deliver them in one loop. "This way, double the houses, double the walking. Gentle growth. It'll still work when the village is ten times the size. The other way will drown you."

Surge never forgot it. From then on he stopped asking "how fast am I?" and started asking "how does my work *grow*?" — because a gentle-growing method beats a fast one every time the world gets big.



When he was older, Surge raced the long road to DiscreteQuest, because he'd heard it cared about what happens at large sizes.

The head of the academy, an old owl with far-seeing eyes, asked him, "What is order of growth?"

Surge answered between easy breaths. "It's how the work grows when the job grows. Forget how long one task takes — ask what happens when you *double* the size. If the work just doubles too, that's gentle growth; it'll hold up forever. If the work *quadruples* when you only double the job, that's a surge; it'll be fine when things are small and crush you when they're big." He tapped a long foot. "The size of a single job barely matters. The *shape of its growth* is everything."

"And the fastest method is not always the best?" the owl asked.

"Almost never, once things get big," Surge said. "A method that grows gently will overtake a 'faster' one that surges — you just have to make the job big enough. And jobs always get bigger."

The owl's eyes shone with something like recognition. "You are appointed."



Surge's favourite lesson was showing a student the difference between gentle and surging growth, side by side.

A worried hedgehog named Pim came to him fretting over two class jobs. "Handing out the field-trip flyers, and organizing the welcome-handshakes where everyone greets everyone — I have to plan both for the whole school and I'm panicking about how big it'll be."

"Let's look at how each one *grows*," Surge said calmly. "Flyers first. One flyer per student. Ten students, ten flyers. Double it — twenty students, twenty flyers. Gentle. Double the school, double the flyers. That one will never hurt you."

"Okay," Pim said, breathing a little easier. "And the handshakes?"

"Ah," Surge laid out little stones. "Everyone greets everyone. With a few people it's cozy. But each new person has to shake *every other* hand. Double the people, and the handshakes don't double — they roughly *quadruple*. Ten people is manageable. A hundred people is thousands of handshakes." He looked at Pim kindly. "So plan the flyers however you like — they grow gently. But the all-greet-all? Find a smaller version, or it'll surge right out of control."

Pim sagged with relief. "I thought both jobs would explode. But it's only the one — and now I know *which* one to worry about."

"That's the gift of it," Surge said. "You stop fearing 'big' in general. You learn exactly which things grow gently and which ones surge. Then 'big' isn't scary anymore. It's just sorted."



Later, when the racing-grounds were still and the moon was up, Surge sat stretching his long legs and watching the quiet.

Sprig wandered over. "Can I tell you something? I used to get this knot in my stomach whenever anything got bigger. More homework, more chores, more everything. It always felt like it would just keep piling until I couldn't."

Surge nodded slowly. "I know that knot well."

"But the way you talk about it," Sprig went on, "it's like 'bigger' doesn't scare you at all."

"It used to terrify me," Surge said. "When I was a kit and the village grew and my old method drowned me, I thought *bigger* would always mean *worse*. Like growing up itself was a flood coming." He smiled gently. "Then I learned the secret. It's not the bigness that gets you. It's *how your way of doing things grows* inside the bigness. Find the gentle-growing way, and you can let the world get as big as it likes. You'll still be okay."

He looked out at the wide dark grounds, room enough for any race.

And as Sprig sat down beside him, the knot in her own stomach loosening, Surge felt the calm he always felt at the end of a long day — not the thrill of being fast, but something steadier and warmer. The future was going to get bigger; that was certain. But bigger didn't have to mean drowning. There was always a gentle path through it, if you knew to look for the one that wouldn't surge. And knowing that, he thought, was the most restful feeling in the world.

Swatch the Border-Painter

GRAPH COLORING — when some things are connected and mustn't match, you give each one a color so that no two connected things share the same color, using as few colors as you can. It's how you schedule, sort, and keep neighbors from clashing.



Swatch was a small, paint-spattered fox, and she could not stand to see two neighbors wearing the same color.

At the DiscreteQuest academy she kept a workshop full of little pots of paint, and her favourite job was coloring maps. Not just *any* way — her way. She would look at a map of regions all crammed together, and she would color them so that no two regions that *touched* ever shared a color. Touching meant sharing a border, a real edge, side by side. Regions that only met at a single corner-point didn't count as touching, and regions far apart could match all they liked.

A young otter named Briar watched her dab a tricky map one afternoon.

"Why's that one green?" Briar asked. "There's already a green over there."

"Because that green is far away and doesn't share a border with this one," Swatch said, not looking up. "I only care about what *touches*. Two regions that share an edge can never wear the same color — that's the one rule I never break. But two regions that never touch? They can twin all day. I don't mind."

Briar squinted at the map. "So you're not really coloring the map. You're coloring the *touching*."

Swatch finally looked up, delighted. "Now you understand my whole life."



Swatch had learned to see touching long before she learned to see anything else.

She'd grown up in a family of quilt-makers, in a workshop where scraps of cloth were stitched edge to edge into enormous blankets. Her mother had one unbreakable rule: no two patches that touched along a seam could be the same color, or the whole quilt went muddy and the pattern disappeared. Little Swatch spent years laying out patches, sliding them around, hunting for clashes.

The day everything clicked, she'd been stuck on a corner where four patches all crowded together. She kept running out of colors. Then she stopped staring at *where* the patches were and started drawing little lines — one line between every two patches that shared a seam. Suddenly the puzzle wasn't about cloth at all. It was about the *lines*. About which patch was tied to which.

"It's not the patches," she whispered to herself. "It's what's *joined*."

Once she saw the joins, the colors fell into place. She found she could almost always do it with very few colors — often just three or four, even for a quilt with hundreds of patches. The trick was never the painting. The trick was seeing what touched what.



When she was older, Swatch carried a roll of her quilts all the way to DiscreteQuest, because she'd heard it was a school that cared about how things connect.

The head of the academy, an old owl with a slow, warm voice, unrolled one of her blankets and studied it. "What is graph coloring?" he asked.

Swatch answered without hesitating. "You take a bunch of things, and you draw a line between any two that mustn't match. Then you give each thing a color so that no two things joined by a line wear the same one — and you try to do it with as few colors as you can manage." She tapped a patch. "Maps, quilts, timetables, seating plans. They're all the same puzzle wearing different clothes. It's always *what touches mustn't match*."

"And the fewest colors?" the owl asked.

"That's the art of it," Swatch said. "Anyone can color a map if you give them a hundred paints. The lovely part is finding the *smallest* number that still keeps every neighbor happy. For flat maps it's never more than four. Took the world an awfully long time to be sure of that one."

The owl's feathers settled approvingly. "You are appointed."



Swatch's favourite student problem had nothing to do with maps at all.

A harried badger named Mop came to her near tears. "The academy clubs are a mess," he said. "Chess club and choir share three members, so they can't meet on the same afternoon — those three can't be in two places. Choir and garden club share members too. And chess and garden club share one. I've got clubs clashing everywhere and I don't know how many afternoons I need!"

"Then let's not think about clubs," Swatch said calmly. "Let's think about *clashes*." She drew a dot for each club, and a line between any two clubs that shared a member. "Every line is a 'these two can't meet together.' Now I'll color the dots — and a color is just an afternoon. Joined dots get different colors, because clubs that share members need different afternoons."

She dabbed: chess blue, choir yellow, garden club blue again — because chess and garden club shared no member, so they could safely twin. "There. Two afternoons. Blue and yellow. Everybody fits, nobody's torn in half."

Mop stared at the little colored dots. "You turned my whole timetable into a coloring page."

"Every clash problem *is* a coloring page," Swatch said, grinning. "You just had to draw the lines."



Later, when the workshop lamps had burned low and the paint pots were capped for the night, Swatch sat among her maps and quilts and watched the colors glow softly in the dark.

Briar wandered back in, yawning. "Can I ask something? Doesn't it ever bother you, all those different colors crammed up against each other? Doesn't it feel... busy?"

Swatch shook her head slowly.

"It used to feel like clashing," she said. "When I was small, all that difference packed so close together felt loud, like an argument waiting to happen. But the rule changed how I saw it. Now I look at a map and I don't see things fighting to be the same. I see different things, side by side, each allowed to stay exactly what it is — just arranged so no one has to clash."

She ran a paw lightly over a finished quilt, all its touching patches gently different, none of them at war.

And as Briar curled up to sleep in the corner of the warm, paint-smelling workshop, Swatch felt the thing she always felt at the end of a good day's coloring — not pride in the painting, but a soft, settling gladness. The whole crowded, touching, jumbled world could be arranged so that everyone got to be different *and* everyone got to belong. You just had to find the colors. There were almost always enough.

Twoby the Pair-Matcher

PARITY AND INVARIANTS — pair things up two by two; if one is left over, the count is odd, and if none is, it's even. Some pairings can never come out even no matter how you try, and that single unchanging fact can prove a thing is impossible without checking every case.



Twoby was a round, gentle beaver, and she saw the whole world two by two.

At the DiscreteQuest academy she ran the partner-matching for every dance, every relay, every two-by-two thing the school did. She had a quiet little ritual: she'd pair everyone off, two and two and two, and then she'd notice — always notice — whether anyone was left standing alone at the end.

A young vole named Bit watched her match the spring dance.

"Why do you always count the leftover?" Bit asked. "You pair everybody up, and then you stare at whoever's left."

"Because the leftover tells me everything," Twoby said softly. "Pair them two by two. If everyone finds a partner and none is left, the number is *even*. If one is left over, all alone, the number is *odd*. That one leftover — or no leftover — is a tiny true fact about the whole crowd. And tiny true facts," she added, "can prove the biggest things."

Bit frowned. "It's just... one person left over. How's that proving anything?"

"Oh," Twoby said, her eyes warm. "Let me show you what a leftover can do."



Twoby had been a pairer-of-things since she was small.

Her family laid tile floors — little square tiles, set down two at a time from a double-wide trowel that always placed exactly two. As a kid she loved watching the floor fill up, two tiles, two tiles, two tiles. But one day a customer asked for a floor with an odd number of spaces, and no matter how her father laid the tiles — two at a time, two at a time — there was always, always one bare square left at the end.

"Why can't we just cover it?" little Twoby had asked.

"Because we lay them *two at a time*," her father said. "Two at a time can only ever fill an even number of squares. An odd floor will fight us every single time. Not because we're clumsy. Because it simply *can't* come out even."

That landed in Twoby like a stone in a still pond. It wasn't about trying harder. Some things couldn't be done, and you could *know* they couldn't, just from the way the counting worked. You didn't have to try every arrangement and fail. You could see the impossibility from the start, in the leftover.



When she was grown, Twoby waddled the long road to DiscreteQuest, because she'd heard it was a school that respected a good "that's impossible."

The head of the academy, an old owl with patient eyes, asked her, "What is a parity argument?"

Twoby answered slowly and surely. "Parity is just even-or-odd. You pair things two by two and see what's left. And an argument from parity is this: if there's something about a puzzle that's *always* even, or *always* odd, no matter what move you make — then anything that would break that pattern simply can't happen." She folded her paws. "You don't check every case. You find the one thing that never changes, and let it do the proving."

"Give me an example," the owl said.

"Each handshake involves exactly two hands," Twoby said. "So all the hands that ever shake, counted up, must be an even number. Always. That one unchanging fact rules out whole piles of impossible claims, without my checking a single party guest."

The owl's eyes gleamed. "You are appointed."



Twoby's favourite thing was using a leftover to settle an argument for good.

A stubborn marten named Cobb came to her with a checkerboard — eight squares by eight, dark and light, sixty-four squares in all — and a pile of little tiles, each one long enough to cover exactly two squares side by side.

"I want to cover the whole board with these two-square tiles," Cobb said, "but I snipped off two corners — see, the two dark corners, opposite each other. Now I can't make it work and I've been trying for *hours*. There must be some clever way."

Twoby looked at it and shook her head, kindly. "There's no way, Cobb. And I can prove it without you trying for one more second."

She pointed at a single tile. "Every tile covers two squares that *touch* — and on a checkerboard, two touching squares are always one dark and one light. Always. One of each. That never changes." She tapped the board. "So however you lay them, the tiles always cover the same number of dark squares as light ones. But you snipped off two *dark* corners. Now there are thirty light squares and only —" she counted — "thirty-two light, thirty dark. Wait —" she recounted gently — "the board's missing two darks, so it has more light than dark. The tiles need them equal. They never can be. So it can't be covered. Not because you're not clever. Because the leftover won't allow it."

Cobb stared at the board for a long moment, then set down the tile he'd been gripping. "Hours," he breathed. "And one leftover would've told me."

"One leftover almost always knows," Twoby said.



Later, when the dance hall was swept and the tiles were stacked away, Twoby sat by the window watching the moon and counting nothing in particular.

Bit climbed up beside her. "Can I ask you something? You always notice the one who's left over without a partner. Doesn't that make you sad? Being the one nobody paired with?"

Twoby was quiet for a while.

"When I was little, I thought being the leftover meant being forgotten," she said. "The odd one out. Nobody's two. But the tiles taught me something different." She smiled. "The leftover isn't the unimportant one. The leftover is the one that *tells the truth*. It's the leftover that proves what a whole crowd is really like — even or odd, possible or not. The one standing alone is the one everyone else's answer depends on."

She looked out at the quiet grounds, where somewhere a single light still burned.

And as Bit settled against her warm side, Twoby felt the gentle thing she always felt when she found a leftover — not loneliness, but a kind of tenderness. Being the one who doesn't quite pair up isn't being unwanted. Sometimes it's being the most important one in the room: the small, unmatched, easily-overlooked thing that quietly holds the whole truth.

Sortie the Set-Curator

SETS + SET OPERATIONS — union, intersection, difference; sets are collections, and operations on sets produce new collections.



On the longest table in the DiscreteQuest workshop, a marmot-tween named Sortie unrolled a mat with two big chalk circles on it and started dropping acorns into them, one at a time, without saying a word.

Two kids leaned over the table to watch. She had labeled one circle RED and the other ROUND, and she was sorting a pile of buttons, beads, and dried berries into it. A red bead went into the RED circle. A round wooden button went into the ROUND circle. Then she picked up a small red marble — and set it right in the middle, where the two circles overlapped.

"You put it in both," a girl said.

"I put it where it belongs," Sortie said. "It's red *and* round. So it goes in the part where red and round agree." She tapped the overlap. "This little lens-shaped bit in the middle? That's the stuff that's in both groups at once. Nothing else fits there."

She kept going. A green pinecone — not red, not round — she placed on the bare mat outside both circles.

"That one's out in the cold," the boy said.

"It's just not in either group," Sortie said, not unkindly. "That's allowed. Being in no circle is still an answer." She sat back and looked at the whole mat, all its little regions filled. "See? I didn't do anything clever. I made two groups, and then I asked each thing one honest question: which circles are you in? Both, one, or none. That's the whole trick. Everything after this is just that, done carefully."



Sortie learned to sort before she learned it had a name.

Her family, back in her home village, were the ones who put away the harvest each autumn. Root vegetables in one cellar, grains in another, dried fruit in a third. Simple enough — until the year the whole village brought in a strange knobby squash that was somehow *both* a keeper-vegetable and a thing that dried well. The elders argued for an hour. Cellar one or cellar three? Put it in the wrong place and half of it might rot.

Little Sortie had sat under the sorting-table, tummy twisted up, listening to the grown-ups get louder. It felt like the squash was a problem with no right answer, and everyone was upset, and she couldn't fix it.

Then her aunt knelt down, spread out a cloth, and drew two loops in the flour dust. "Keepers here. Driers here." She set the knobby squash right where the loops crossed. "It's in both. So we take a little from it for each. We don't have to choose. We just have to *see* that it belongs to two groups."

The knot in Sortie's stomach loosened all at once. The squash wasn't a fight. It was just an *overlap*. Once you drew the loops, the scary argument turned into a quiet, obvious picture — and pictures, she found, she could sit with.



She walked to DiscreteQuest when she was old enough to carry her own folding mat, because a place that studied patterns ought to have room for someone who thought in circles and loops.

The mentor met her at the door and asked only one thing. "What is a set?"

Sortie didn't answer with a speech. She unrolled her mat on the entryway floor, dropped a handful of pebbles into one circle and a handful of shells into another, and nudged a single pebble-that-was-also-a-shell into the overlap between them.

"A set is just a group of things you've decided to gather," she said. "These are two of them. And this—" she pointed to the middle "—is the part they share. I can combine the groups, or find where they overlap, or find what one has that the other doesn't. I don't need to be smart. I need to be able to see."

The mentor looked at the little mat for a long moment. "You belong here," he said.



Sortie's workshop filled up fast with kids who had jumbles they couldn't untangle.

One afternoon a boy came in gripping two crumpled lists. "It's the class trip," he said, miserable. "This is who wants the museum. This is who wants the aquarium. Some kids signed both, some signed neither, and I'm supposed to figure out how many people total and who to email and I—" He waved the papers. "It's just a *mess*."

Sortie knew that waving. She'd felt it under the sorting-table. "Put them down," she said, and unrolled her mat. "Two circles. Museum, aquarium. Read me a name."

"Priya. She's on both lists."

"Overlap. Middle." He set a token in the lens. "Next."

"Marcus — museum only."

"Museum circle, but only the part that doesn't overlap. Next." One by one the names became tokens, and the mess spread out into clear little regions. When the lists were empty, the mat just... showed it. Plain as anything.

"Now count," Sortie said. "Everybody in *either* circle — that's your total for the trip. That's the *union*. The kids in the middle — they'll go either day, so email them last. The kids outside both circles—" she pointed to two lonely tokens on the bare mat — "those two never signed up at all. You'd have missed them."

The boy stared at the two tokens. "I would have. I'd have totally forgotten them." He looked up. "How did you make it that easy?"

"I didn't make it easy," Sortie said. "It was always this simple. It just didn't *look* simple, all crumpled up in your hands. Circles don't add anything. They only let you see what was already true."



Later, when the workshop had gone quiet, the boy lingered by the door with the two lists smoothed flat and one more question.

"When it was all folded up in my pocket," he said slowly, "it felt impossible. Like too much. But it was the same information the whole time, wasn't it? Nothing changed except... I could see it."

Sortie thought about the flour dust, and the loosening knot, and her aunt's two loops.

"Nothing changed but the seeing," she agreed. "That's most of the messes there are, you know. They're not too big. They're just not laid out yet." She rolled her mat back up, slow and careful, and tucked it into her belt-pouch. "Any time your head gets that tight, crowded, too-much feeling — that's not the problem being impossible. That's just the picture not drawn yet. Find the circles. Ask each thing which ones it's in. And watch the whole knot come loose."

The boy nodded, and Sortie saw the tightness go out of his shoulders — the same quiet way, years ago, hers had gone loose under a sorting-table, watching a squash find its place in the overlap of two flour-dust loops.

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Methodology

Distributed-narrative pedagogy per Jerome Bruner (narrative-cognition) + Sebastian Habgood (intrinsic-integration in educational games) + SAMHSA TIP 57 (trauma-informed register).

Trauma-informed-design framework per Eggleston et al. (2025) and Stoltenburg et al. (2024).

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