



PLAYFUL MATH SINGLES

70+

Things To Do

WITH A

Hundred  
Chart

NUMBER, SHAPE AND LOGIC ACTIVITIES  
FROM PRESCHOOL TO MIDDLE SCHOOL

DENISE GASKINS

Author of *Let's Play Math: How Families Can Learn Math Together—and Enjoy It*

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## CHAPTER 3

# Patterns

*What humans do*

*with the language of mathematics  
is to describe patterns.*

*To grow mathematically*

*children must be exposed  
to a rich variety of patterns  
appropriate to their own lives  
through which they can see variety,  
regularity,  
and interconnections.*

—LYNN ARTHUR STEEN

# Number Patterns

COUNTING IS NOT THE ONLY way to build number sense. Patterns are interesting, and they prepare children for multiplication and for algebra. Encourage your students to think often and deeply about patterns.

If you're like me, the word "pattern" makes you think of shapes and designs. But interesting patterns appear in numbers as well. Noticing these number patterns and thinking about why they happen will strengthen your child's understanding of math.

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## Travel Patterns

We'll look at several math-fact patterns later, as we explore addition and multiplication. But for now, let's focus on patterns created by the numbers themselves.

Walk your finger straight across the chart and pay attention to the numbers you pass. What pattern do you see when you travel along a row? Up a column?

How do the numbers change when your finger walks down a diagonal? Up a diagonal?

What if you take a zigzag path?

How will you travel through the numbers?

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## Digit Patterns

Use colored paper squares, translucent plastic Bingo chips, or other small tokens to mark patterns in the numbers on your favorite home-

made hundred chart. Or print several paper charts and use colored pencils or felt-tip markers to shade in the squares.

If you have my free *Hundred Charts Galore!* printables file, you can use the multi-chart pages to see more patterns at a glance.<sup>†</sup>

Mark all the numbers with a seven in them. Why do they make that shape?

Mark the numbers whose digits add up to ten. What shape do they make?

Mark the numbers with double digits, like twenty-two and thirty-three.

On a single chart, mark all the numbers with a four in them *and* all the numbers whose digits add up to four. Isn't that a cool trick?

What other number patterns can you find?

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

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30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

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80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

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10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
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0	1	2	3	4	5	6	7	8	9
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30	31	32	33	34	35	36	37	38	39
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50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

Print a page with several small hundred charts so you can mark and compare different patterns.

<sup>†</sup> [tabletopacademy.net/free-printables](http://tabletopacademy.net/free-printables)

## No Sharing

Use colored paper squares, translucent plastic Bingo chips, or other small tokens to mark squares on your favorite hundred chart.

Can you mark ten squares with tokens so that no two of them share the same row or column?

If you play chess, think of this as a ten-rooks puzzle. How could you place ten rook pieces on a  $10 \times 10$  “chessboard” so that all of them are safe?

Add up the numbers under your tokens to find your score for that pattern.

Can you find a different set of ten No-Sharing squares? What is the score for your new pattern?

What do you notice?

Does it make you wonder?

After you mark one square, no other token can share that row or column.

Following this rule, how many tokens can you fit onto your hundred chart?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27		29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

# Shape Patterns

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## Name Patterns

Print a blank hundred chart or draw a grid of squares on paper or a whiteboard.

Write your name in the squares. Start in the first square and write one letter per box. When you get to the last letter in your name, start over in the next square.

How many of you will fit in the hundred chart?

Color the first letter of your name each time it appears. What pattern does it make?

Try making patterns with other words.

What do you notice?

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## Pattern Machine

Print a blank hundred or 120 chart on card stock. Cut sheets of colored paper into square tiles that fit on the chart.

Arrange the tiles to make any design against the background chart. Then arrange them a different way. And then another.

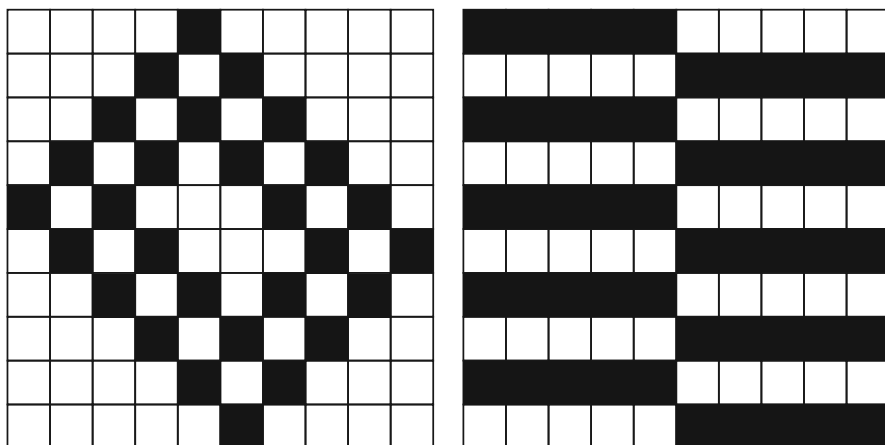
Try symmetrical patterns. Try asymmetrical patterns. Which do you prefer?

What's the simplest pattern you can think of?

What's the most intricate pattern?

Can you make a pattern that no one would expect?





When children play with patterns, they think about symmetry, angles, and geometric transformations in a playful, creative way.

Would you like to make bigger designs? Print four blank charts and tape them together to create a large game board.

Leave the pattern machine (the blank hundred chart and colored square tiles) out on a convenient table for anyone to play with.

TEACHER'S TIP: You may be tempted to laminate the chart and tiles, but that will make your pattern slide out of place at the tiniest nudge. Friction is your friend.

Or get a plastic multiplication machine and cover the numbers with vinyl tape to make Christopher Danielson's original pattern machine.<sup>†</sup>

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## Truchet Tile Patterns

On card stock, print the Truchet tiles from my *Hundred Charts Galore!* printables file. Print a blank chart for a background, if desired.

Truchet tiles seem simple—a basic square cut in two parts along

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<sup>†</sup> [christopherdanielson.wordpress.com/2016/03/11/the-sequence-machine](http://christopherdanielson.wordpress.com/2016/03/11/the-sequence-machine)  
[linescurvoesspirals.blogspot.co.uk/2018/02/diy-pattern-maker.html](http://linescurvoesspirals.blogspot.co.uk/2018/02/diy-pattern-maker.html)

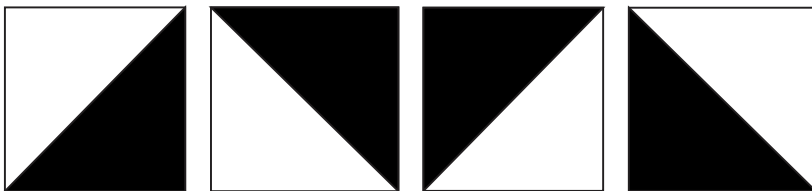
the diagonal, half white and half black. Yet they can be arranged into amazingly complex designs.

Arrange the tiles to make any design against the background chart. Or spread the Truchet tiles out on a table to make larger patterns.

Rearrange the tiles into a different pattern.

Leave the tiles out for your family to play with. Take pictures of your favorite designs.

Search for Truchet tile images online and enjoy the patterns other people have created.



A single Truchet tile may be placed in one of four positions. With two tiles, there are sixteen permutations — or more, if you consider both vertical and horizontal positions. How many can you find?

— 22.5 —

## Parquetry Patterns

In addition to the Truchet tiles above, print a sheet or two of black and white squares.

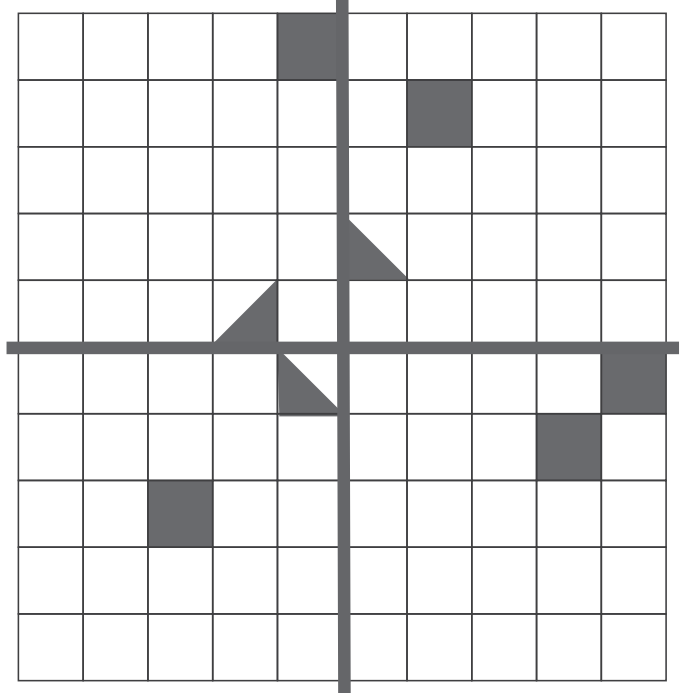
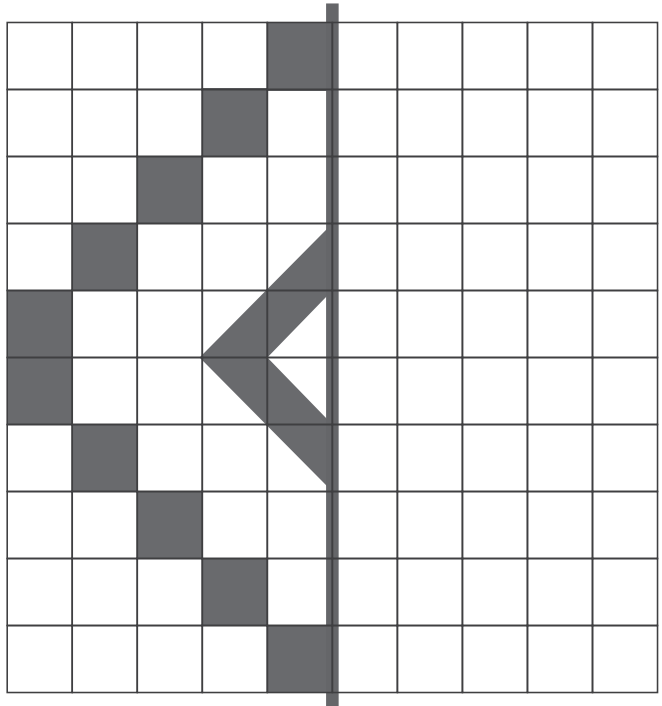
*Parquetry* (or *parquet*) is a geometric mosaic of light and dark wood pieces used for decorative effect, often as flooring or on a countertop or table.

Our parquetry patterns are less expensive than using real wood, yet full of possibilities for creative play. By adding square pieces to the basic set of Truchet tiles, we can make a nearly infinite variety of designs.

The thick lines act as mirrors.

Whatever you see on one side of the line, copy its reflection on the other side.

If you do it right, both of these puzzles will create the same design.



## Symmetry Challenge

Each player will need a printed blank chart. Draw a line that divides the page in half. Your line may be vertical, horizontal, or diagonal.

Or draw two lines that split the chart into fourths. With two lines of symmetry, the pattern will match in both directions: top reflects bottom, and left reflects right.

With felt-tip markers or colored pencils, draw lines or fill in squares to make a pattern in one section (half or fourth) of your chart.

Trade papers with a friend. Can you complete each other's puzzle? Whatever shapes you see on one side of a mirror line, draw their reflections on the other side.

**ADVANCED PUZZLE:** Color shapes in different sections of the chart. Your shapes should not match each other symmetrically, but when all of them have been reflected across the line(s) of symmetry, they will create a finished design.

## Curve Stitching

Mary Everest Boole invented curve stitching as a gentle introduction to geometric concepts in her 1904 book *The preparation of the child for science*.

On a printed blank chart, number the *intersections*—the places where lines meet—along the top from one (top left corner) to ten (next-to-last). Skip the top right corner, and then number the intersections down the right-hand side from one (just below the corner) to ten (bottom right corner).

With a ruler to draw straight lines, connect each pair of matching numbers.

What do you notice?

Create your own curves by numbering other lines on the chart and connecting points.

How can you change the curve?

What happens if the points are closer together? Or farther apart?

What happens if you use points on a diagonal line?

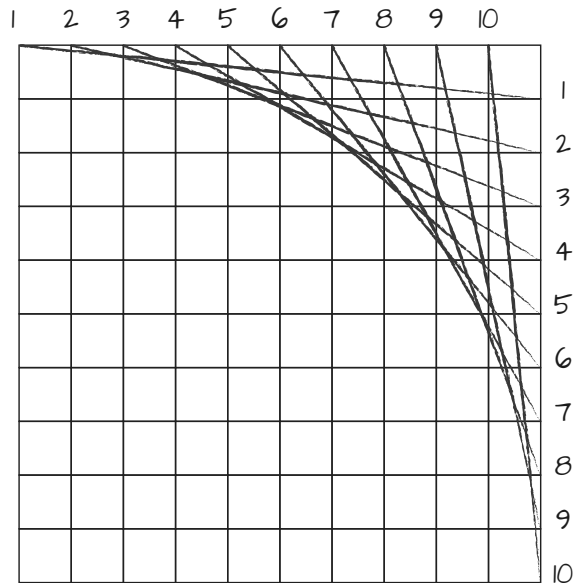
Or if the two lines cross each other?

When you find a design you like, turn it into string art. Transfer the numbered lines to card stock, and then stitch the curve with colored string.

**MATH TIDBIT:** Curve-stitching patterns are related to calculus. In differential calculus, we learn about curves by investigating the straight lines *tangent* to those curves—that is, the lines that skim along the edge of the curve, hitting just a single point.

Curves that we *create* using their tangent lines, as in curve stitching, are called *Bézier curves*. They serve as the basis for all sorts of computer graphics and animation.

A quadratic  
Bézier curve  
created by  
drawing  
tangent lines.



# Pattern Games

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## Square Nim

*two players or two teams, printed chart*

You will need a blank hundred chart and a pencil, pen, or marker. Draw lines to divide the chart into five sets of twenty squares each, to make five games.

Each game is played in one set of twenty squares.

Take turns going first. On your turn, you must mark one square, and you may take up to four squares. The player who marks the last square of the set wins that game.

Nim is a simple game, so it's easy for children to think of new ways to play.

How will you modify the rules?

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## Connect Four

*two players or two teams, printed chart*

You will need a blank hundred or 120 chart and two different colored pencils—one for each player or team—plus a sturdy eraser for correcting mistakes. Define the number values of the chart by writing (in a non-player color) a number in one of the corner squares.

Play like Tic-Tac-Toe, with players (or teams) alternating to claim

				5					10
						17		19	
		23				27	28	29	
	32		<del>34</del>	<del>35</del>	36	<del>37</del>	38	39	
			44	45	46	47	48	49	50
			54	55	<del>56</del>	<del>57</del>	<del>58</del>	<del>59</del>	<del>60</del>
			64			67	68		
					76				

Connect Four game in progress.

a square. But instead of using X and O to mark the squares, you mark the number value that belongs there.

For example, if you wrote the initial value 73 in the top left square, then a player might claim the square directly below that by adding ten and writing in “83.”

Each time you get four squares in a row of your own color—horizontal, vertical, or diagonal—draw a line through them and add a point to your score tally.

Marked squares may not be counted again in another line going the same direction, but they can be part of a line that crosses the first.

When players discover mistakes, they may erase and correct the numbers without losing their squares.

Play until the board is filled with numbers or until no more new lines are possible.

Whoever draws the most four-in-a-row lines wins.

# Learning Math Through Play

Are you looking for creative ways to help your child learn math?

You don't need a special workbook, teacher's manual, or lesson plans. All you need is an inquiring mind and something interesting to think about.

Author Denise Gaskins guides you through activities from preschool to middle school.

- ◆ Whole numbers, fractions, decimals, and percents
- ◆ Patterns, shapes, and geometric design
- ◆ Logical thinking, math debates, and strategy games

Denise makes it easy, with step-by-step instructions so you and your child can explore math together.

70+ *Things to Do with a Hundred Chart* will launch your family on a voyage of mathematical discovery. Order your copy today.



"This book is a treasure trove of amazing math games! I never imagined that so many math concepts could be taught using the hundreds chart."

—Susie Davis, reader review



"The activities are no prep or low prep, so zero excuses to avoid maths fun! A wonderful addition to our homeschool."

—Shaista Moosa Bux, reader review

