

# Number Theory Patterns

Grades: Kindergarten and 1st

By:

Beth Anderson - Bemidji Area Schools

[beth1106hl@yahoo.com](mailto:beth1106hl@yahoo.com)

Lana Hunsberger - Paul Bunyan Elementary

[lhunsberger@bemidji.k12.mn.us](mailto:lhunsberger@bemidji.k12.mn.us)

Ruby Sundberg - Goodridge Public Schools

[ruby.sundberg@goodridgeisd561.org](mailto:ruby.sundberg@goodridgeisd561.org)

June 2016

Number Theory

Bemidji State University

# Executive Summary

The lessons, projects and activities we have collected are meant to supplement any curriculum. This is a collection of some of our favorites that also incorporate the different learning styles of students. It is a very hands-on unit and will be very effective in meeting the Kindergarten and 1st grade standards for patterns. We used Systematic Listing, Literacy, Manipulatives, Technology, and assessments to complete this unit. They are not designed in any specific order. You can pick and choose which lessons work within whichever part of a unit you are on.

## Kindergarten

### STANDARD K.1.1

Understand the relationship between quantities and whole numbers up to 31.

K.1.1.1 Recognize that a number can be used to represent how many objects are in a set or to represent the position of an object in a sequence.

K.1.1.2 Read, write, and represent whole numbers from 0 to at least 31.

Representations may include numerals, pictures, real objects and picture graphs, spoken words, and manipulatives such as connecting cubes.

K.1.1.3 Count, with and without objects, forward and backward to at least 20.

K.1.1.4 Find a number that is 1 more or 1 less than a given number.

K.1.1.5 Compare and order whole numbers, with and without objects, from 0 to 20.

### STANDARD K.1.2

Use objects and pictures to represent situations involving combining and separating.

K.1.2.1 Use objects and draw pictures to find the sums and differences of numbers between 0 and 10.

K.1.2.2 Compose and decompose numbers up to 10 with objects and pictures.

## STANDARD K.2.1

Recognize, create, complete, and extend patterns.

K.2.1.1 Identify, create, complete, and extend simple patterns using shape, color, size, number, sounds and movements. Patterns may be repeating, growing or shrinking such as ABB, ABB, ABB or •,••,•••.

## First Grade

### STANDARD 1.1.1

Count, compare and represent whole numbers up to 120, with an emphasis on groups of tens and ones.

1.1.1.2 Read, write and represent whole numbers up to 120. Representations may include numerals, addition and subtraction, pictures, tally marks, number lines and manipulatives, such as bundles of sticks and base 10 blocks

1.1.1.3 Count, with and without objects, forward and backward from any given number up to 120.

1.1.1.4 Find a number that is 10 more or 10 less than a given number. *For example:* Using a hundred grid, find the number that is 10 more than 27.

1.1.1.5 Compare and order whole numbers up to 120.

1.1.1.6 Use words to describe the relative size of numbers. *For example:* Use the words equal to, not equal to, more than, less than, fewer than, is about, and is nearly to describe numbers.

### STANDARD 1.1.2

Use a variety of models and strategies to solve addition and subtraction problems in real-world and mathematical contexts.

#### 1.1.2.1

Use words, pictures, objects, length-based models (connecting cubes), numerals and number lines to model and solve addition and subtraction problems in part-part-total, adding to, taking away from and comparing situations.

#### 1.1.2.2

Compose and decompose numbers up to 12 with an emphasis on making ten. *For example: Given 3 blocks, 7 more blocks are needed to make 10.*

1.1.2.3

Recognize the relationship between counting and addition and subtraction. Skip count by 2s, 5s, and 10s.

#### STANDARD 1.2.1

Recognize and create patterns; use rules to describe patterns.

1.2.1.1 Create simple patterns using objects, pictures, numbers and rules. Identify possible rules to complete or extend patterns. Patterns may be repeating, growing or shrinking. Calculators can be used to create and explore patterns.

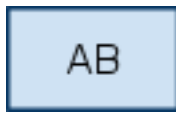
1.2.2.1

Represent real-world situations involving addition and subtraction basic facts, using objects and number sentences.

Name \_\_\_\_\_

## Kindergarten Pre Test

1. Using different objects, make each pattern in two ways.



Solution: Successfully creates each pattern in two ways using different materials.

Benchmark: K.2.1.1

2. Extend these patterns.



Solution: Correctly extends the patterns.

Benchmark: K.2.1.1

3. Extend these patterns.



Solution: Correctly extends the patterns.

Benchmark: K.2.1.1

4. Make a growing pattern.

Solution: Correctly makes a growing pattern.

Benchmark: K.2.1.1

5. Make a shrinking pattern.

Solution: Correctly makes a shrinking pattern.

Name \_\_\_\_\_

## First Grade Pre Test

- **Recognize and Extend Patterns**

Draw the following patterns. Ask children to describe how to continue the pattern.



Solution: triangle, circle, triangle, circle: square, circle, circle, square, circle, circle.

Benchmark 1.2.1.1

- **Look at the pattern below. Identify the rule.**

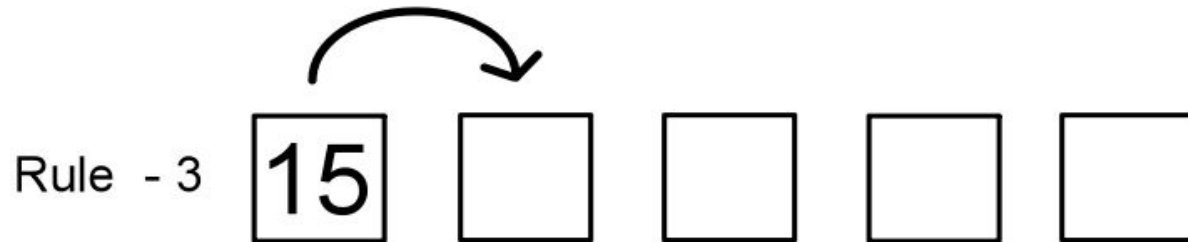
Rule \_\_\_\_\_

2	4	6	8	10
---	---	---	---	----

Solution: Indication that pattern increases by 2.

Benchmark: 1.2.1.1

- Follow the rule to complete the pattern.



Solution: 12, 9, 6, 3,

Benchmark: 1.2.1.1

- Create Patterns

Use pattern blocks or cubes to create a pattern. Draw and describe your pattern.

Solutions: Will vary

Benchmark: 1.2.1.1



**OBJECTIVE** - Students will take a pre-test to show their basic knowledge of patterns that they are starting with. They will explore with the pattern blocks, linking cubes, chain links, counting bears and any other patterning manipulatives while teachers are doing the one-on-one pre-assessment.

**LAUNCH** - Lay out the manipulatives and start calling students one by one to an area to do the pre-assessment. When students are done with the pre-assessment, they will continue to explore with the manipulatives until everyone has been assessed.

**EXPLORE** - Children will explore freely with the manipulatives and will probably discover patterns on their own during this time.

**SHARE** - Students will share what they have done or found out individually through exploration.

**SUMMARIZE** - We now have a starting point on what the students know about patterns. They have also had time to play and explore with the manipulatives, so they will be more willing to focus on directions for the following activities.

**OBJECTIVE** - Students will recognize and learn to copy/create simple AB patterns using linking colored cubes.

**LAUNCH** - Separate students into small groups. Let students know that they will be learning to copy and create a simple AB pattern. Demonstrate how the cubes attach and detach from each other. Hand out sticks of 10 linking cubes to each student, making sure they consist of 5 of one color and 5 of another.

**EXPLORE** - Teacher will explain what AB stands for in an AB pattern (color 1 and color 2 in this lesson). Explain to students that a pattern is something that REPEATS. Ask if they are able to continue the AB pattern you make. Do several, observe for understanding, and then let kids create their own AB patterns for groups to copy or continue.

**SHARE** - Each student will share with their groups the pattern they came up with and have them copy it.

**SUMMARIZE** - After this lesson, students will be able to create, copy, and continue a simple AB pattern.



### Activity 3 - linking chains with cards

**OBJECTIVE** - Students will use colored linking chains to make patterns.

**LAUNCH** - Demonstrate how to link chains together and how to make a simple pattern using two colors. Show the students some of the other cards that show other pattern choices.

**EXPLORE** - Students will use the linking chains to make different patterns. They will start by using the patterns that are depicted by the cards. As a challenge for students having success, encourage them to come up with their own pattern.

**SHARE** - Students will share their favorite pattern that they made.

**SUMMARIZE** - Students will learn basic patterning by practicing with linking manipulatives.

## Activity 4 - Pattern Blocks

**OBJECTIVE** - Students will be able to make an ABBCABBC pattern using pattern blocks.

**LAUNCH** - Discuss with students how a repeating pattern can be more complicated than a simple AB or ABC pattern. Demonstrate an ABBCABBC pattern and have students say the pattern out loud together.

**EXPLORE** - Students will break into small groups to practice making an assigned ABBCABBC pattern using the pattern blocks. After they have made the pattern, encourage them to make their own ABBCABBC pattern. How many can they come up with as a group?

**SHARE** - Each group will share their favorite ABBCABBC pattern to the whole class.

**SUMMARIZE** - After this lesson, students will be able to continue, copy and create an ABBCABBC pattern.

## Activity 5 - Patterns with Even/Odd Numbers/Patterns of 2

**OBJECTIVE** - Students will be able to make and see patterns on a hundreds chart and with linking cubes of even and odd numbers. They will see both are actually counting by 2's.

**LAUNCH** - Hand out linking cubes to children, talk about how 1 cube is odd (no partner) how 2 cubes is even (partners) Have them make a type of pattern using even and odd of cubes. Working in small groups.

**EXPLORE** - Students will break into small groups to practice making patterns of evens and odds. How many different patterns can they come up with as a group? Make an odd color pattern sheet on the hundreds chart. Hand out a hundreds chart and ask if 1 is odd or even (it's odd) so color in the number 1. How about 2, odd or even? (it's even = don't color). Continue this until someone says all numbers ending with 1, 3, 5, 7, 9 are odd. Then they can color that whole column when they see and understand why they will all be colored. This color pattern sheet can be repeated for even numbers also.

**SHARE** - Each group will share their favorite pattern and what they found out about even and odd numbers to the whole class. They can compare their even/odd colored hundreds chart.

**SUMMARIZE** - After this lesson, students will be able to figure out if a number is odd or even. Odd (no partner), even (partner) Can use their even/odd colored hundreds chart.

Video for counting by 2,5,10's to introduce or reinforce counting by 2's.

<https://youtu.be/vq3cDj3Uj3I>

Extra: Even Cheer - "0,2,4,6,8, First Graders are really GREAT!" (class name can be changed)

The following chart is for coloring odd and even numbers or patterns of 2.

## 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	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	100

## Activity 6 -Growing Pattern

**OBJECTIVE** - Students will use a number chart to create a growing pattern by 1s.

**LAUNCH** - Explain to students that we are going to look at a different kind of pattern. Students need a number chart 1-10, crayons or markers.

**EXPLORE** - Teacher points out the empty boxes above the numbers. Ask students how many boxes they think we should color above the number 1. Have them color in the one box. Continue with 2, 3, 4. Ask if they notice anything about what is happening. "Taller by one", "bigger by one", "looks like steps" are all comments that might be heard. Ask students to finish the pattern while walking around to observe for understanding.

**SHARE** - Students will hold up their pictures to share how they look with their classmates. They can also share anything they observed while finishing their pictures.

**SUMMARIZE** - Students will learn how to create a growing pattern by 1's.



<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>

## Activity 7 - Patterns with 5's

**OBJECTIVE** - Students will be able to make and see patterns of 5 on a hundreds chart and with linking cubes.

**LAUNCH** - Hand out linking cubes to children, talk about 5 cubes. Have them make patterns (bigger numbers) using groups of 5 cubes. Working in small groups.

**EXPLORE** - Students will break into small groups to practice making patterns (numbers) of 5 cubes. How many different patterns (numbers) can they come up with as a group? Make color patterns of 5 on the hundreds chart.

**SHARE** - Each group will share their favorite pattern and what they found out about patterns of 5. Biggest number using 5, smallest number using 5. They can compare their 5 pattern colored hundreds chart. Can combine all groups of 5 linking cubes and count by 5's to see total number of all groups.

**SUMMARIZE** - After this lesson, students will be able to see, create and continue the patterns and numbers of 5.

Video for counting by 2,5,10's to introduce or reinforce counting by 5's.

<https://youtu.be/vq3cDj3Uj3I>

Chart following is for coloring patterns and numbers of 5.

## 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	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	100

# 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	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	100

## Activity 8 - Patterns with 10's

**OBJECTIVE** - Students will be able to make and see patterns of 10 on a hundreds chart and with linking cubes.

**LAUNCH** - Hand out linking cubes to children, talk about 10 cubes. Have them make patterns (bigger numbers) using groups of 10 cubes. Working in small groups. Groups may have to be bigger just to get more groups of 10 (depending on your amount of linking cubes)

**EXPLORE** - Students will break into small groups to practice making patterns (numbers) of 10 cubes. How many different patterns (numbers) can they come up with as a group? Make color patterns of 10 on the hundreds chart.

**SHARE** - Each group will share their favorite pattern and what they found out about patterns of 10. Biggest number using 10, smallest number using 10. They can compare their 10 pattern colored hundreds chart. Can combine all groups of 10 linking cubes and count by 10's to see total number of all groups.

**SUMMARIZE** - After this lesson, students will be able to see, create and continue the patterns and numbers of 10's.

Video for counting by 2,5,10's to introduce or reinforce counting by 10's.

<https://youtu.be/vq3cDj3Uj3I>

Literacy Book to introduce or reinforce patterns of 10.

"The M&M's Color Pattern Book" By Barbieri McGrath

Chart following is for coloring patterns and numbers of 10.

## 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	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	100

## Activity 9 - Patterns with 3's

**OBJECTIVE** - Students will be able to make and see patterns of 3 on a hundreds chart and with linking cubes.

**LAUNCH** - Hand out linking cubes to children, talk about 3 cubes. Have them make patterns (bigger numbers) using groups of 3 cubes. Working in small groups.

**EXPLORE** - Students will break into small groups to practice making patterns (numbers) of 3 cubes. How many different patterns (numbers) can they come up with as a group? Make color patterns of 3 on the hundreds chart.

**SHARE** - Each group will share their favorite pattern and what they found out about patterns of 3. Biggest number using 3, smallest number using 3. They can compare their 3 pattern colored hundreds chart. Can combine all groups of 3 linking cubes and count by 3's to see total number of all groups.

**SUMMARIZE** - After this lesson, students will be able to see, create and continue the patterns and numbers of 3's.

Chart following is for coloring patterns and numbers of 3.

# 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	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	100



# 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	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	100

## Activity 10 - Guess what color is missing

**OBJECTIVE** - Students will be able to complete a pattern that is missing a color.

**LAUNCH** - Show students a pattern of colors with one missing, such as blue, green, blue, green, \_\_\_\_\_, green, using counting bears. Have the students guess what color is missing in the pattern. After student success, make a more complex pattern, such as blue, green, red, blue, green, red, \_\_\_\_\_, green, red.

**EXPLORE** - Students will work in pairs to complete missing patterns, using counting bears. After a number of successes, extend the learning by having the students come up with a pattern with a missing color. After they make a pattern, have a neighboring pair come and try to solve it.

**SHARE** - Share with the class some of the patterns that they have come up with. Have the students respond with the missing color.

**SUMMARIZE** - Students learn how to complete a pattern with missing parts.

## Activity 10 - Guess what color is missing

**OBJECTIVE** - Students will be able to complete a pattern that is missing a color.

**LAUNCH** - Show students a pattern of colors with one missing, such as blue, green, blue, green, \_\_\_\_\_, green, using counting bears. Have the students guess what color is missing in the pattern. After student success, make a more complex pattern, such as blue, green, red, blue, green, red, \_\_\_\_\_, green, red.

**EXPLORE** - Students will work in pairs to complete missing patterns, using counting bears. After a number of successes, extend the learning by having the students come up with a pattern with a missing color. After they make a pattern, have a neighboring pair come and try to solve it.

**SHARE** - Share with the class some of the patterns that they have come up with. Have the students respond with the missing color.

**SUMMARIZE** - Students learn how to complete a pattern with missing parts.

## Activity 12 - Guess what shape is missing

**OBJECTIVE** - Students will be able to complete a pattern that is missing a shape.

**LAUNCH** - Show students a pattern of shapes with one missing, such as square, circle, square, \_\_\_\_\_, square, using pattern blocks. Have the students guess what color is missing in the pattern. After student success, make a more complex pattern such as, square, circle, triangle, square, circle, triangle, square, \_\_\_\_\_, triangle.

**EXPLORE** - Students will work in pairs to complete missing patterns, using pattern blocks. After a number of successes, extend the learning by having the students come up with a pattern with a missing shape. After they make a pattern, have a neighboring pair come and try to solve it.

**SHARE** - Share with the class some of the patterns that they have come up with. Have the students respond with the missing shapes.

**SUMMARIZE** - Students learn how to complete a pattern with missing parts.

## Activity 13 - Guess what number is missing

**OBJECTIVE** - Students will be able to complete a pattern that is missing a number.

**LAUNCH** - Show students a pattern of numbers with one missing, such as 1, \_\_, 3. Students may use linking cubes and then write answer on their whiteboards. After student success, use larger numbers to challenge them.

**EXPLORE** - Students will work in pairs to complete missing numbers, using linking blocks and then writing the number on their whiteboards. After a number of successes, extend the learning by having the students use larger numbers. After they make a pattern, have a neighboring pair come and try to solve it.

**SHARE** - Share with the class some of the patterns that they have come up with. Have the students respond with the missing numbers.

**SUMMARIZE** - Students learn how to complete a pattern with missing parts.

**OBJECTIVE** - Students will use knowledge gained from activities to be able to explore the computer games.

**LAUNCH** - Bring kids to the computer lab or check out technology if needed. Display the different pattern game sites for the kids to choose from. Help where needed.

**EXPLORE** - Allow kids time to explore as many sites as class time allows and send list for home for more time or give them another class period later.

**SHARE** - Students can share aloud, or even vote, on some of their favorite sites found.

**SUMMARIZE** - Students can use their knowledge of patterns to complete games using technology.

<http://www.abcya.com/patterns.htm>

<http://pbskids.org/cyberchase/math-games/pattern-quest/>

<http://www.starfall.com/>

<https://www.ixl.com/math/kindergarten>

**OBJECTIVE** - Students will take a post-test to show us their knowledge of patterns that they are ending the unit with. They will cooperatively copy and create with the pattern manipulatives while teachers are doing the one-to-one post assessment.

**LAUNCH** - Lay out the pattern blocks, linking cubes, counting bears, and other patterning manipulatives used throughout the unit for the students to use. Set up the computers in the classroom for kids to have as a choice. Start calling students one by one up to an area to do the post assessment. When students are done with the post assessment, they will continue to create with the manipulatives or computer pattern games, until everyone has been assessed.

**EXPLORE** - Children will create freely with the manipulatives or use computers with pattern games.

**SHARE** - Students will share their favorite activity from the unit.

**SUMMARIZE** - We now reached the end of our unit, and need to do an assessment to see how much the students learned through our lessons. We will be able to measure their growth by comparing the pretest to the post-test.

Name \_\_\_\_\_  
Kindergarten Post Test

1. Using different objects, make each pattern in two ways.



Solution: Successfully creates each pattern in two ways using different materials.

Benchmark: K.2.1.1

2. Extend these patterns.



Solution: Correctly extends the patterns.

Benchmark: K.2.1.1

3. Extend these patterns.





Solution: Correctly extends the patterns.

Benchmark: K.2.1.1

4. Make a growing pattern.

Solution: Correctly makes a growing pattern.

Benchmark: K.2.1.1

5. Make a shrinking pattern.

Solution: Correctly makes a shrinking pattern.

Name \_\_\_\_\_

## First Grade Post Test

- **Recognize and Extend Patterns**

Draw the following patterns. Ask children to describe how to continue the pattern.



Solution: triangle, circle, triangle, circle: square, circle, circle, square, circle, circle.

Benchmark 1.2.1.1

- **Look at the pattern below. Identify the rule.**

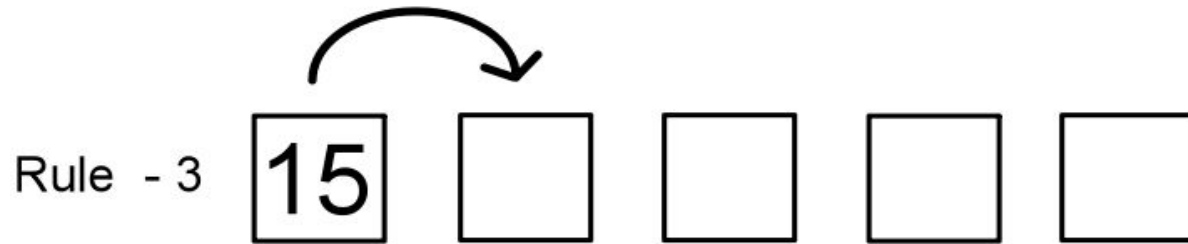
Rule \_\_\_\_\_

2	4	6	8	10
---	---	---	---	----

Solution: Indication that pattern increases by 2.

Benchmark: 1.2.1.1

- Follow the rule to complete the pattern.



Solution: 12, 9, 6, 3,

Benchmark: 1.2.1.1

- Create Patterns

Use pattern blocks or cubes to create a pattern. Draw and describe your pattern.

Solutions: Will vary

Benchmark: 1.2.1.1

