Third—Fourth Grade Lesson Sequence
(66 Lessons)

Patterns and Connections

Lesson Two Learn to relate A-B patterns to materials. Students create and share A-B patterns. Students also learn to check their neighbors to ensure that everybody understands.
Topic Pattern Blocks and A-A-B.
Topic Power Blocks and A-A-B.
Topic Pattern Blocks and A-A-A-B.
Topic Other materials and A-B patterns.

Lesson Three Learn how to record patterns. Students record patterns and use the recordings of others to reproduce and extend the patterns.
Topic Pattern Block A-B patterns recorded.
Topic Pattern Block A-B patterns copied and extended.
Topic Power Block A-B patterns recorded.
Topic Power Block A-B patterns copied and extended.

Lesson Four Learn to look for patterns in numbers. Students look at number charts for patterns and describe the patterns they see.
Topic 00-99 matrix.
Topic 10 X 10 multiplication matrix.
Topic Pascal's triangle.

Beginning Number

Lesson Two Learn to look for patterns in the counting numbers. We post numbers for students to search for patterns.
Topic Search the numbers from 0 to 100 for patterns.
Topic Look at the 00-99 matrix once again.

Lesson Four Learn the fiveness of five. We surround our students with the concept of numbers from three to as far as we decide to go.
Topic 3 with wooden cubes.
Topic 4 with wooden cubes.
Topic 5 and more with wooden cubes.

Lesson Five Record the number concepts learned in Lesson Four.
Topic Recording 3 with wooden cubes.
Topic Recording 4 with wooden cubes.
Topic Recording 5 and more with wooden cubes.

Lesson Seven Learn the families of addition facts. Students look for ways to make number combinations with Unifix Cubes using two different sets of rules.
Topic The first set of rules leads to flash cards that go home.
Topic Creating number combinations with Unifix Cubes and Rule One.
Topic Creating flash cards to accompany Rule One.
Topic Explore number patterns with Unifix Cubes and Rule Two.

Lesson Eight Learn to link number to area. Learn to prove answers found. Students prove Power Block areas before creating shapes on their geoboards and proving areas of their created shapes. Adds to the wooden cube experiences from Lessons Four and Five. Provides more beginning number experiences for the older child.
Topic Power Block S-1 square has an area of one, what are the areas of all the other shapes?
Topic Geoboards—ways to make 2, without then with recording.
Topic Reviewing other people's "2's".
Topic Ways to make 3.
Topic Ways to make 4 or more, while proving areas found.
Lesson One
Learn to sort by attributes. Students sort objects into groups in a variety of ways.
- Teacher or students list the ways.
- Each new material produces a variation of the basic lesson.
- Sorting buttons, making lists.
- Sorting keys, making lists.
- Sorting whatever else is available in quantity.
- Students trade lists and add to others' written lists.

Lesson Two
Learn to be aware of attributes everywhere. Students take sorting walks to learn to see what is already there.
- Sorting walks. Students keep written lists of what is seen.
- Each walk taken is a different topic.

Lesson Three
Use sorting and classification knowledge to create informal definitions of words. We sort shapes, words, or objects as students create definitions for the sorts.
- We use this lesson when we have a definition we wish to teach.
- Shapes—quadrilaterals, triangles, squares, etc.
- Nouns, verbs, prepositions, adjectives, etc.
- What other definitions might we choose to use?

Lesson Five
Learn to see the attributes in ourselves. Students describe themselves using attributes that define them as unique. For students who can write, we read their descriptions aloud.
- Students descriptions of themselves are read aloud.
- Each new set of descriptions is a separate topic.

Lesson Six
Learn the process of using individual attributes to categorize. Students use their attributes to develop categories that uniquely describe everyone in class.
- The teacher leads the class in sorting itself into successively smaller sub-categories.
- New categories are used on subsequent days.

Lesson Eight
Learn the meaning of selected words. In a lesson that takes five minutes now and then, we ask the class as a whole to demonstrate the meaning of selected words.
- Both-and.
- If-then.
- Either-or, neither-nor.
- Other words we choose.

Geometry, Shapes, Relationships and Constructions

Lesson One
Provide a background in geometry equally for boys and girls, rich and poor while exploring shapes in geometry. Students build as our questions focus their discoveries.
- Today is building day, let's see what you can build.
- Lego blocks, Tinker Toys, Geoblocks, Pattern Blocks, Power Blocks, straws, toothpicks and clay. Each material used for building is a topic.

Lesson Two
Expand the exploration of shape. Students explore the properties of shapes guided by the questions that we ask.
- Geoboards, make shapes with 3 sides. 4 sides. 5 sides. More sides.
- Which shapes can be made with Power Blocks & duplicated on a geoboard? Which shapes cannot?

Lesson Three
Learn to recognize reflective symmetry in shapes. Students explore lines of symmetry with materials and mirrors.
- Free exploration with mirrors.
- Pattern Blocks and mirrors - exploring symmetry.
- Power Blocks and mirrors - exploring symmetry.
- Lines of symmetry in the room - make a list.
- Free exploration with hinged mirrors.
- Symmetry with Pattern Blocks and hinged mirrors.
- Symmetry with Power Blocks and hinged mirrors.
**Lesson Seven**  Learn what an angle is and how to measure it. Students learn to use angles in giving instructions. They learn to measure angles and use a protractor as a measuring device.

- **Topic** Each new question asked or material explored is like a lesson of its own.
- **Topic** Students direct each other using paces and turns.
- **Topic** Students find right angles in the room.
- **Topic** Angles are measured with straws and sticks, as lists of successively larger angles are made.
- **Topic** Protractors are explored.

**Lesson Nine**  Learn to be aware of the geometry in our lives. We ask our students to look more closely at what they already see.

- **Topic** What shall we look for today? Why are the things that we see the shape that they are?

**Lesson Ten**  The purpose is a teacher purpose. Our assignment is to find the opportunities. We make ourselves aware of the opportunities for geometric experiences that exist. We use the opportunities that we find.

- **Topic** Opportunities that we find.

**Beginning Addition and Subtraction**

**Lesson One**  Learn to create and check addition problems. Students create addition problems that they can check by counting.

- **Topic** Creating addition problems with handfuls of squares and checking the answers with calculators.

**Lesson Two**  Learn to apply the skills of addition. We give our students problem-solving questions and number patterns to explore with squares and Unifix Cubes.

- **Topic** Problems in the middle of a stream.
- **Topic** Start with, go by's.
- **Topic** Start with, go by's, both.
- **Topic** Consecutive whole numbers.
- **Topic** Odd and even numbers.

**Lesson Three**  Learn to create and check subtraction problems. Students create subtraction problems that they can check by counting.

- **Topic** Creating subtraction problems with handfuls of squares and checking the answers with calculators.

**Lesson Four**  Learn to apply skills of subtraction. We give our students problem-solving questions and number patterns to explore.

- **Topic** Starting with 100.
- **Topic** Problems in a stream, a negative flow.

**Lesson Five**  Learn the families of addition facts above ten. Students practice number facts, through flash cards and number games. There are no tests of speed.

- **Topic** Flash cards.
- **Topic** Blackjack.
- **Topic** Dominoes.
- **Topic** Shaker dice.

**Lesson Six**  Learn to solve word problems that the teacher creates. Students learn to draw the necessary numbers from the stories that we tell.

- **Topic** Word problems for adding.
- **Topic** Word problems for adding, extraneous information added in.
- **Topic** Word problems for subtracting.
- **Topic** Word problems for subtracting, extraneous information added in.
- **Topic** Adding and subtracting mixed.

**Lesson Seven**  Learn to create and solve story problems. Students create their own stories to go along with numbers. First the teacher provides numbers, then numbers are taken from student lives.

- **Topic** Students create addition stories to share.
Lesson Eight Learn to think about the reasonableness of answers. Students learn to ask: "Does the answer I have found make sense?"

Lesson Nine Learn to connect school math to life. We look for problems that exist around us for our students to solve.

Graphing, Probability and Statistics

Lesson One Learn to use graphing as a tool for finding answers to questions. Students learn to turn their curiosity into data to graph. Graphs made now will be used again in Lesson Four.

Lesson Two Learn how to display information in a variety of ways. Students invent more ways to graph data than they had thought to use before.

Lesson Three Learn how to ask questions for a graph. We assemble unseen graphs to guide students in learning how to ask what it is they want to know.

Lesson Four Learn to ask questions for the graphs that students make and see. Students learn to add written questions to their graphs. The lesson on asking questions is also a lesson on learning to speak math and learning to ask math questions.

Measurement, Estimation and Time

Lesson One Learn that measurement is a part of everything we do. We create a measuring environment in our room by making measurements a tool for finding out.

Lesson Two Learn to make and read maps. Students make maps and use and critique maps made by others to refine their own map making techniques.

Lesson Four Learn about time. In general, we teach time buy using it.

Lesson Five Learn how to make good estimates. Students estimate length, surface area, weight and volume while learning what estimation means, but we do not teach estimation and then move on. Estimation is a thinking skill our students use and use. We make estimation a part of all the lessons we teach by the questions that we ask.
Beginning Multiplication and Division

**Lesson One**  Learn what it means to multiply. Learn to search for patterns in multiplication arrays. Students learn to create and record (individually and in matrices) multiplication problems. Matrices are searched for patterns.

**Topic**  Making and recording rectangles with squares.
**Topic**  Recording rectangle patterns on matrices.
**Topic**  Examining matrices for patterns.
**Topic**  Unifix matrices made and searched for patterns.
**Topic**  Geoboard matrices made and searched for patterns.
**Topic**  Add the matrix to the wall charts for pattern searches endlessly.
**Topic**  If needed, more matrices are made.

**Lesson Two**  Learn to create multiplication and division problems, with and without remainders. Students create and solve problems in a sideways L and answer three basic questions that we ask.

**Topic**  Create problems, ignore remainder. Create problems for each other. Create problems, remainder not ignored. Remainder recorded as a fraction.
**Topic**  Create times problems with hands full of squares, remainders are ignored.
**Topic**  Answer three questions for the sideways L, no remainders yet.
**Topic**  Remainders added in.
**Topic**  Three questions asked again.
**Topic**  Remainders recorded as fractions.

**Lesson Three**  Learn to look for non numeric patterns. Learn to connect the non numeric patterns to numeric patterns seen before. Students create patterns with Unifix Cubes, break the patterns apart and study the "break-aparts" for patterns. Students connect the cube patterns to patterns in multiplication and on the 0-99 chart.

**Topic**  Break-apart pattern searches.
**Topic**  Look again at the matrices on the wall for patterns.

**Lesson Four**  Learn the multiplication number facts. Students use flash cards to commit number facts to memory and examine a matrix for patterns to reduce the number of facts to be learned from 100 to 36.

**Topic**  Flash cards are used to put the multiplication facts in each student’s head.

**Lesson Five**  Learn to think about what the numbers in multiplication and division problems represent. We create multiplication and division problems that our students solve, as they identify what the numbers in their answers represent.

**Topic**  Multiplication word problems created with people and objects in the room.
**Topic**  The problems can be recorded in matrix form.
**Topic**  Division word problems created with people and objects in the room.
**Topic**  The problems can be recorded in matrix form.

**Lesson Six**  Learn to create stories for multiplication and division problems. Learn to see the stories in numbers everywhere. Students write or draw stories for numbers we provide. Students look for number stories in their own lives.

**Topic**  Students write stories or draw illustrations to accompany multiplication and division problems.
**Topic**  Selected stories written one day are read as creative inspiration the next.
**Topic**  Students write stories or draw illustrations to accompany multiplication and division problems that they provide.
**Topic**  If we choose to, we select some student stories as problems for the class to solve.

**Lesson Seven**  Learn that problems to be solved are everywhere around. Students seek the multiplication and division problems that already exist in their lives.

**Topic**  Students describe number situations that exist. Finding the answers to the situations is not required yet.
**Topic**  Selected problems from the situations found are solved by the class.
Fractions, Ratios, Money, Decimals and Percent

Lesson One  Learn about fractions informally. Learn the words to say and the numbers to write. Students explore Power Blocks, guided by the questions that we ask. We teach words and numbers that describe the fractions.

Topic  Freely exploring, with learning directed through questions asked.
Topic  Which pieces make into other pieces?
Topic  S-1 = 1, T-1 = 1.
Topic  S-5 = 1.
Topic  Matrix for everything = 1.
Topic  Learning the words to say for fractions.

Lesson Two  Learn to find areas of shapes on geoboards. Learn to prove the areas of found shapes. Students make shapes on their geoboards and learn specific techniques for proving areas. Areas of triangles are searched specifically for patterns.

Topic  Make shapes with areas of 2 1/2 and prove areas.
Topic  Make shapes with areas of 3 1/2 and prove areas.
Topic  Make shapes with areas of any size and prove areas.
Topic  Make right triangles and prove areas.
Topic  Find areas for and search for patterns in triangles with bases on the bottom row.

Lesson Three  Learn that fractions are special numbers describing part/whole relationships. Learn to add and subtract simple fractions. Students learn to use people in the room to create simple fractions, then addition and subtraction problems. They also learn to create stories to accompany fractional numbers.

Topic  Fractions are created with people in the class.
Topic  Students create their own addition problems.
Topic  Students create their own subtraction problems.

Lesson Four  Learn to be aware of fractions in life. We ask our students to think about the sharing, cutting and dividing fractions in their lives.

Topic  Teacher lead discussion on the sharing, cutting and dividing that lead to fractions in our lives.

Lesson Five  Learn about equivalencies. Students use paper folding and Power Blocks to generate lists of equivalencies, which they then search for patterns.

Topic  Folding paper, recording the equivalencies formed.
Topic  Finding and recording Power Block equivalencies.

Lesson Seven  Learn to see fractions as a part of measurement. Learn to estimate fractions of a length. Students use strips of paper to estimate, then measure. We teach techniques for determining fractional lengths.

Topic  Estimate lengths. Calculate the fractions involved.
Topic  Estimating and calculating techniques are improved with practice and with time.

Lesson Twelve  We use real money and real money situations to teach our students how to find real money answers.

Topic  Milk money, restaurant menus, classroom store, fundraising events: any opportunities that arise provide the framework for the money lessons that we teach.

Advanced Addition and Subtraction

Lesson One  Learn to search for patterns in bases other than ten. Student record and examine plus one and minus one patterns in different bases.

Topic  Squares and cups: base 4, base 5, base 6, if needed base 3. Then squares, cups and bowls as the base cycle is repeated. Then Base ten.
Topic  + and - 1 with squares and cups, base 4.
Topic  + and - 1 with squares and cups, base 5.
Topic  + and - 1 with squares and cups, base 6.
Topic  + and - 1 with squares and cups, base 3.
Topic  + and - with squares, cups and bowls, base 4.
Topic  + and - with squares, cups and bowls, base 5.
Topic  + and - with squares, cups and bowls, base 6.
Topic  + and - with squares, cups and bowls, base 3.
Topic  + and - with squares, cups and bowls, base ten.

Lesson Two  Learn about adding or subtracting numbers greater than one in different bases.  
Students play racing-up and racing-back place-value trading games.
Topic  Racing up in base 4, winner is the first up.
Topic  Racing up in base 5, winner is the last up.
Topic  Racing up in base 6, winner is the first up.
Topic  Racing up in base 3, winner is the last up.
Topic  Racing up in base ten, winner is either the first or last up, decided in advance.
Topic  Racing back in base 4, winner is the first back.
Topic  Racing back in base 5, winner is the last back.
Topic  Racing back in base 6, winner is the first back.
Topic  Racing back in base 3, winner is the last back.
Topic  Racing back in base ten, winner is either the first or last up, decided in advance.

Lesson Three  Learn the concept of place value. Students learn a game that teaches them the value places have.
Topic  Place value game in base 4, most wins.
Topic  Place value game in base 5, least wins.
Topic  Place value game in base 6, most wins.
Topic  Place value game in base 3, least wins.
Topic  Place value game in base ten, either most or least wins, decided in advance.

Lesson Four  Learn to create addition and subtraction problems in any base three through ten.
Students learn how to create addition and subtraction problems and how to find and check the answers to the problems they create.
Topic  Addition problems are created in base 4.
Topic  Addition problems are created in base 5.
Topic  Addition problems are created in any base 3 to 6.
Topic  Subtraction problems are created in base 4.
Topic  Subtraction problems are created in base 5.
Topic  Subtraction problems are created in any base 3 to 6.
Topic  Addition problems are created in base ten.
Topic  Subtraction problems are created in base ten.

Lesson Five  Learn to see place-value patterns within and between bases. Learn to use materials to prove answers. Students record values for different bases on a single matrix and examine the matrix for patterns. Then students use the multibase blocks (if available) to create, solve, and then check problems.
Topic  Looking for patterns in 1000, 100, 10, 1.

Lesson Six  Learn the names for larger numbers. Students learn to read large numbers.
Topic  Learn to read large numbers.

Lesson Seven  Learn that addition and subtraction are tools for finding out. Learn to apply math skills to problems in real life. We work with our students to find and then solve real problems that use the skills that our students possess. Students keep a written record of their work.
Topic  Problems drawn from stories.
Topic  Problems drawn from questions.
Topic  Problems drawn from life.

Lesson Eight  Learn to look for patterns in numbers everywhere. Students look for patterns between bases, in palindromes and in ordinary events.
Topic  Compare plus one strips from different bases.
Topic  Palindromes.
Topic  Examine situations for patterns.

Lesson Nine  Learn that creativity and inventiveness are problem-solving tools. Our students use their inventiveness to solve problems that we give and share their individual or collective inventiveness with everyone in class.
Topic  Kids in class, kids in school.
Topic  Thinking and mental arithmetic. Reasonableness.
### Advanced Multiplication and Division

#### Lesson One
Learn what it means to multiply in any base. Learn to search for multiplication patterns within and between bases. Students learn to make multiplication matrices for bases three through ten as they search for patterns in each new matrix.

**Topic**
- Base-three matrix made by the class. Pairs of students work in pairs to make matrices for bases four and five. For base six, students look at the previous bases for patterns that can be anticipated will appear. The process is repeated for bases seven, eight, and nine. How much of base ten can be filled in from all the patterns seen in three through nine?
- Base-four matrix started by the full class, finished working in pairs.
- Base-five matrix in pairs, information shared collectively.
- Base-six matrix made by looking at bases three, four, and five.
- Bases seven, eight, and nine and, for some, sixteen.
- Patterns is bases three through nine are used to fill in a matrix for base ten.

#### Lesson Three
Learn techniques for finding answers to the multiplication problems likely to be on the end-of-year standardized test. If students will not be permitted to use calculators or materials on the year-end test, we teach them how to calculate answers for the test.

**Topic**
- An algorithm for multiplication is taught.

#### Lesson Four
Learn to look for patterns in multiplying numbers with zeros at the end. Learn how to find reasonable answers for multiplication problems that are large. Students use their calculators to fill in worksheets that they then examine for patterns for multiplying numbers with zeros on the right. Students use the patterns to learn to estimate reasonable answers for large problems.

**Topic**
- Multiplying by 2, 20, 200, 2000 and so on. Patterns sought.
- Reasonableness for answers to large problems.

#### Lesson Five
Learn to apply multiplication skills. With our students, we look for real problems to solve that use multiplication.

**Topic**
- A problem a day is enough to pose. A problem is posed, small groups of students discuss and write down ways it might be solved, then students share their ways with the class.
- Problem posed, discussed, solved, solutions shared.
- Another problem is posed.

#### Lesson Six
Learn what it means to divide in any base. We teach dividing techniques. Our students then use dice to create division problems for themselves.

**Topic**
- Divide in base five, then base four and base six.
- Divide in base ten. Calculators check answers.

#### Lesson Seven
Learn to use the arithmetic skills we have. We look for real problems that use division and any other arithmetic skill. Our students look, as well, and keep a written record of the problem solving steps they use.

**Topic**
- A single sandwich.
- The daily life of a child.
- Analysis.
- Averages of all kinds.