



Planning For Success Mathematics: Numeration Inquiry Investigations

Fractions and Decimals

OVERALL EXPECTATIONS – GRADE 4

By the end of grade 4, students will:

- read, represent, compare, and order whole numbers to 10 000, decimal numbers to tenths, and simple fractions, and represent money amounts to \$100;
- demonstrate an understanding of magnitude by counting forward and backwards by 0.1 and by fractional amounts;

Specific Expectations – Grade 4

Quantity Relationships

By the end of grade 4 students will:

- represent, compare, and order decimal numbers to tenths, using a variety of tools (e.g., concrete materials such as paper strips divided into tenths and base ten materials, number lines, drawings) and using standard decimal notation (*Sample problem:* Draw a partial number line that extends from 4.2 to 6.7, and mark the location of 5.6.);
- represent fractions using concrete materials, words, and standard fractional notation, and explain the meaning of the denominator as the number of the fractional parts of a whole or a set, and the numerator as the number of fractional parts being considered;
- compare and order fractions (i.e., halves, thirds, fourths, fifths, tenths) by considering the size and the number of fractional

- compare fractions to the benchmarks of 0, $\frac{1}{2}$, and 1 (e.g., $\frac{2}{3}$ is more than $\frac{1}{2}$ because $\frac{2}{3}$ is greater than $\frac{4}{6}$ and $\frac{1}{2}$ is $\frac{3}{6}$; there are more parts in $\frac{2}{3}$ because the size of the part is larger in $\frac{2}{3}$ than in $\frac{1}{2}$)
 - $\frac{1}{4}$, $\frac{1}{2}$, and 1 (e.g., $\frac{1}{4}$ is closer to 0 than to $\frac{1}{2}$; $\frac{3}{4}$ is closer to 1 than to $\frac{1}{2}$); $\frac{1}{4}$; $\frac{1}{2}$
- demonstrate and explain the relationship between equivalent fractions, using concrete materials (e.g., fraction circles, fraction strips, pattern blocks) and drawings
 - read and represent money amounts to \$100 (e.g., five dollars, two quarters, one nickel, and four cents is \$5.59);
 - solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 10 000 (*Sample problem:* How high would a stack of 10 000 pennies be? Justify your answer.)

Counting

By the end of Grade 4, students will:

- count forward by halves, thirds, fourths, and tenths to beyond one whole, using concrete materials and number lines (e.g., use fraction circles to count fourths: “One fourth, two fourths, three fourths, four fourths, five fourths, six fourths, ...”);
- count forward by tenths from any decimal number expressed to one decimal place, using concrete materials and number lines (e.g., use base ten materials to represent 3.7 and count forward: 3.8, 3.9, 4.0, 4.1, ...; “Three and seven tenths, three and eight tenths, three and nine tenths, four, four and one tenth, ...”) (*Sample problem:* What connections can you make between counting by tenths and measuring lengths in millimetres and in centimetres?).

Operational Sense

By the end of Grade 4, students will:

- add and subtract decimal numbers to tenths, using concrete materials (e.g., paper strips divided into tenths, base ten materials) and student-generated algorithms (e.g., “When I added 6.5 and 5.6, I took five tenths in fraction circles and added six tenths in fraction circles to give me one whole and one tenth. Then I added $6 + 5 + 1.1$, which equals 12.1.”);

Proportional Relationships

By the end of Grade 4, students will:

- determine and explain, through investigation, the relationship between fractions (i.e., halves, fifths, tenths) and decimals to tenths, using a variety of tools (e.g., concrete materials, drawings, calculators) and dividing each fifth into two equal parts to

OVERALL EXPECTATIONS – GRADE 5

By the end of Grade 5, students will:

- read, represent, compare, and order whole numbers to 100 000, decimal numbers to
 - hundredths, proper and improper fractions, and mixed numbers;
- demonstrate an understanding of magnitude by counting forward and backwards by 0.01;

Specific Expectations – Grade 5

Quantity Relationships

By the end of Grade 5, students will:

- represent, compare, and order whole numbers and decimal numbers from 0.01 to 100 000, using a variety of tools (e.g., number lines with appropriate increments, base ten materials for decimals);
- demonstrate an understanding of place value in whole numbers and decimal numbers from 0.01 to 100 000, using a variety of tools and strategies (e.g., use numbers to represent 23 011 as $20\,000 + 3\,000 + 0 + 10 + 1$; use base ten materials to represent the relationship between 1, 0.1, and 0.01) (*Sample problem:* How many thousands cubes would be needed to make a base ten block for 100 000?);
- round decimal numbers to the nearest tenth, in problems arising from real-life situations;
- represent, compare, and order fractional amounts with like denominators, including proper and improper fractions and mixed numbers, using a variety of tools (e.g., fraction circles, Cuisenaire rods, number lines) and using standard fractional notation;
- demonstrate and explain the concept of equivalent fractions, using concrete materials (e.g., use fraction strips to show that
- demonstrate and explain equivalent representations of a decimal number, using concrete materials and drawings (e.g., use base ten materials to show that three tenths [0.3] is equal to thirty hundredths [0.30]);

Counting

By the end of Grade 5, students will:

- count forward by hundredths from any decimal number expressed to two decimal places, using concrete materials and number lines (e.g., use base ten materials to represent 2.96 and count forward by hundredths: 2.97, 2.98, 2.99, 3.00, 3.01, ...; “Two and ninety-six hundredths, two and ninety-seven hundredths, two and ninety-eight hundredths, two and ninety-nine hundredths, three, three and one hundredth, ...”) (*Sample problem:* What connections can you make between counting by hundredths and measuring lengths in centimetres and metres?).
- multiply decimal numbers by 10, 100, 1000, and 10 000, and divide decimal numbers by 10 and 100, using mental strategies (e.g., use a calculator to look for patterns and generalize to develop a rule);

Proportional Relationships

By the end of Grade 5, students will:

- describe multiplicative relationships between quantities by using simple fractions and decimals (e.g., “If you have 4 plums and I have 6 plums, I can say that I have...”)
- determine and explain, through investigation using concrete materials, drawings, and calculators, the relationship between fractions (i.e., with denominators of 2, 4, 5, 10, 20, 25, 50, and 100) and their equivalent decimal forms

OVERALL EXPECTATIONS - GRADE 6

By the end of Grade 6, students will:

- read, represent, compare, and order whole numbers to 1 000 000, decimal numbers to
 - o thousandths, proper and improper fractions, and mixed numbers;
- solve problems involving the multiplication and division of whole numbers, and the addition

- and subtraction of decimal numbers to thousandths, using a variety of strategies;
- demonstrate an understanding of relationships involving percent, ratio, and unit rate.

Specific Expectations – Grade 6

Quantity Relationships

By the end of Grade 6, students will:

- represent, compare, and order whole numbers and decimal numbers from to 1 000 000, using a variety of tools (e.g., number lines with appropriate increments, base ten materials for decimals);
- demonstrate an understanding of place value in whole numbers and decimal numbers from 0.001 to 1 000 000, using a variety of tools and strategies (e.g. use base ten materials to represent the relationship between 1, 0.1, 0.01, and 0.001) (*Sample problem:* How many thousands cubes would be needed to make a base ten block for 1 000 000?);
- read and print in words whole numbers to one hundred thousand, using meaningful contexts (e.g., the Internet, reference books);
- represent, compare, and order fractional amounts with unlike denominators, including proper and improper fractions and mixed numbers, using a variety of tools (e.g., fraction circles, Cuisenaire rods, drawings, number lines, calculators) and using standard fractional notation (
- estimate quantities using benchmarks of 10%, 25%, 50%, 75%, and 100% (e.g., the container is about 75% full; approximately 50% of our students walk to school);

Operational Sense

By the end of Grade 6, students will:

- add and subtract decimal numbers to thousandths, using concrete materials, estimation, algorithms, and calculators;
- multiply and divide decimal numbers to tenths by whole numbers, using concrete materials, estimation, algorithms, and calculators (e.g. calculate 4×1.4 using base ten materials; calculate 5.6 divided by 4 using base ten materials);
- multiply whole numbers by 0.1, 0. 01, 0.001 using mental strategies (e.g. use a calculator to look for patterns and generalize to develop a rule;
- multiply and divide decimal numbers by 10, 100, 1000, and 10 000 using mental strategies (e.g., “To convert 0.6 m² to square centimetres, I calculated in my head $0.6 \times 10\ 000$ and got 6000 cm².”) (*Sample problem:* Use a calculator to help you generalize a rule for multiplying

Literature Connections

- Beasts of Burden - Math and Literature 4-6,
- Stories to Solve: Folktales from Around the World, Dividing the Horses

Strategies for Fractions and Decimals

- Effective Guides - p. 23, 14-19
- Van de Walle - chapters 16, 17

All Grade Investigations

- Activities 16.1- 16.16 - Van de.Walle
- Assessing Understanding of Fractions - 50 Problem Solving Lessons
- Comparing Fractions - 50 Problem Solving Lessons

Decimal Investigations - Grade 4

- Decimal Game - Effective Guide -p. 29
- Decimal Number Grab Bags - Effective Guide- p. 35
- Closest to Ten- Effective Guide - p.35
- Counting Tenths - Effective Guide - p. 36
- Decimal Decisions - Supersource - Base 10 Blocks - p. 30

Fraction Investigations -Grade 4

- Every Vote Counts - Effective Guide - p.29
- One Half is a Benchmark - Effective Guides - p. 36
- Between two Thirds and One -Effective Guides - p. 36
- Making the Whole- Effective Guides - p. 36
- Coasting Along - SuperSource - Colour Tiles - P. 34
- Making Fourths -SuperSource - Geoboards - P. 62
- Showing One Third - SuperSource - Snap Cubes - P. 62
- Fraction Fill Up - SuperSource - Tangrams - P. 34
- Fraction Spin -SuperSource - Tangrams - P. 38
- Fraction Bars - SuperSource - Colour Tiles - P. 46

Fractions and Decimal Investigations -Grade 5

- Number Books - Effective Guide - p. 46
- Decimal Golf - Effective Guide - p. 51
- Investigating Fraction and Decimal Tangrams - Effective Guide - p. 39

Fractions and Decimal Investigations - Grade 6

- The Contest - Effective Guides - p. 67
- Number Close Lone - Effective Guides - p. 73
- Fraction- Decimal- Percent Connectors- Effective Guides - p. 73
- Equivalent Number Triplets - Effective Guides - p. 74
- The Greater Decimal Number -Effective Guides - p. 75
- Fraction Line Up - Effective Guides - p. 58
- Fractions Between Fractions- Effective Guides - p. 64
- From Least to Greatest -Effective Guides - p. 65
- What's the Whole- Effective Guides - p. 65
- Fractions in a Venn Diagram - Effective Guides - p. 66
- Whose Fraction is Greater - Effective Guides - p. 66

Fraction Investigations – Grade 5/6

- Building Rectangles - Supersource- Colour Tiles - p. 26
- Making Flags - Supersource - Colour Tiles - p 46
- Two Thirds Blue - Supersource - Colour Tiles - p 78
- First to Finish - Cuisenaire Rods - p. 38
- Fraction Fracas - Cuisenaire Rods - p. 42
- Naming Rods - Cuisenaire Rods - p. 58
- Forming Fractions - Geoboards - p. 34
- Halving the Geoboard - Geoboards - p. 38
- Making Eighths - Geoboards - 54
- What's My Value - Pattern Blocks - p. 86
- Frac-tangles - Supersource Snap Cubes - p. 26

Decimal Investigations -Grade 5/6

- Closest to 1 - Supersource - Base 10 blocks- p. 30
- Decimal Mirrors - Supersource - Base Ten Blocks - p. 34
- Making and Writing Decimals - Supersource - Base Ten Blocks - p. 50
- Race for a Whole - Supersource - Base Ten Blocks - p. 66
- Tenths or Hundreths - Supersource - Base Ten Blocks - p 74
- What's 1 - Supersource - Base Ten Blocks - p. 86

Performance Tasks/Tickets Out the Door

- Grade 5 - ONAP - Number Sense and Numeration - p.B2-B5
- Grade 6 - ONAP - Number Sense and Numeration - C 1.1 and 1.2, B3- B5