



Grade 5 Concept Maps

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Concept Map for *Mathematical Thinking at Grade 5* (Page 1 of 2)

In this unit, students explore factors and multiples of three important landmark numbers: 100, 1000, and 10,000. They build numbers in different ways (such as by skip counting); multiply factor pairs; use their knowledge of factor pairs of 100 to help them find factor pairs of multiples of 100 up to 1000—and factor pairs of 10,000; and use their knowledge of the relationships among landmark numbers up to 10,000 to develop strategies for solving computation problems

INVESTIGATION 1: *Exploring Numbers and Number Relationships* – Students describe numbers and number relationships using specific vocabulary (*factor, multiple, even, odd, prime, square*); develop, discuss, and compare strategies for solving problems involving number relationships; learn that problems may have one solution, more than one solution, or no solution; communicate their mathematical thinking through written and spoken language

Sessions 1, 2, 3: Rectangles and Factor Pairs

Students describe numbers and number relationships using mathematical terms such as *factor, multiple, prime, and square*; represent factor pairs as dimensions of rectangular arrays

Sessions 4, 5, 6: Number Puzzles

Students reason about number characteristics; develop, discuss, and compare different strategies for solving problems; write about their mathematical thinking and look for multiple solutions

INVESTIGATION 2: *Multiples and Factors up to 1000* – Students use their knowledge of landmark numbers up to 100 to explore landmarks up to 1000; develop strategies for exploring number composition; read, write, and order numbers to 1000; develop a sense of the magnitude of 1000; become familiar with factors and factor pairs of 1000, and with skip-counting patterns that lead to 1000

Session 1: Skip Counting and Other Ways to Multiply

Students skip count by factors of 100 and their multiples; develop strategies for using known factor pairs to find other factor pairs

Sessions 2, 3, 4: Factor Pairs from 100 to 1000

Students develop a sense of the magnitude of 1000; become familiar with factor pairs of 1000; find relationships among factor pairs of different multiples of 100

Session 5: Exploring Rectangles of 1000 Squares

Students read, write, and order numbers to 1000; become familiar with important landmarks to 1000; develop a sense of the magnitude of 10,000

INVESTIGATION 3: *Multiples and Factors up to 10,000* – Students use their knowledge of landmark numbers up to 1000 to explore landmarks up to 10,000; develop multiplication and division strategies that rely on landmarks up to 10,000; become familiar with skip-counting patterns that lead to 10,000; become familiar with some factor pairs of 10,000

Session 1: Comparing Factors of 100, 1000, and 10,000

Students find relationships among factors of 100, 1000, and 10,000

Sessions 2, 3, 4: Multiplication and Division Clusters

Students develop mental multiplication and division strategies that rely on landmarks up to 10,000

Session 5: Factor Pairs of 1100

Students find factor pairs of one number by using their knowledge of related factor pairs and number relationships; explain their mathematical thinking and reasoning in writing

Concept Map for *Mathematical Thinking at Grade 5* (Page 2 of 2)

INVESTIGATION 4: Reasoning About Landmarks up to 10,000 – Students develop mental and written strategies for finding sums and differences of three- and four-digit numbers; read, write, and order numbers to 10,000; develop a sense of the magnitude of 10,000

Session 1: Close to 1000 and Close to 0

Students develop mental and written strategies for three- and four-digit addition/subtraction; understand the relationships among place values up to the thousands place

Sessions 2, 3, 4: Using Landmarks up to 10,000

Students use their knowledge of landmarks up to 10,000 to solve a variety of problems and puzzles

Sessions 5, 6: Reasoning About 1000 and 10,000

(Assessment)
Students reason about factors of 1000 and 10,000 and multiples of those factors; explain their reasoning in writing

Concept Map for *Picturing Polygons*

As students create polygons with shape pieces, they construct, apply, discuss, and evaluate mathematical definitions of these shapes.

They analyze various properties of different types of polygons (triangles, quadrilaterals, and regular polygons); draw them on coordinate grids (both on and off the computer); measure side lengths and angles; look at patterns in sums of angles and of turns

INVESTIGATION 1: *Identifying Polygons* – Students distinguish between polygons and nonpolygons; draw polygons; locate points on a coordinate grid; recognize and name polygons by number of sides

**Session 1:
Is It a Polygon?**

Students work with two-dimensional shapes; distinguish between polygons and nonpolygons; draw polygons

Session 2: Making Polygons

Students are introduced to *Power Polygons*; recognize polygons by number of sides; create and draw polygons

**Session 3: Polygon Pictures with
Coordinate Geometry**

Students use coordinate geometry as a way of replicating polygon pictures drawn on a coordinate grid

**Session 4: Coordinate Geometry with
*Geo-Logo***

Students continue to locate points on a coordinate grid; create and draw polygons

INVESTIGATION 2: *Triangles and Quadrilaterals* – Students reason and communicate about properties of geometric shapes; sort and classify triangles and quadrilaterals; develop vocabulary to describe special triangles and quadrilaterals; generate geometric figures based on descriptions of their properties; estimate and measure the sizes of angles and turns

Sessions 1, 2, 3: Sorting Polygons

Students sort, classify, and explore attributes of triangles and quadrilaterals; develop vocabulary to describe special triangles and quadrilaterals; develop an understanding of parallel lines

**Sessions 4, 5: Making Shapes
That Follow Rules**

Students generate geometric figures based on oral and written descriptions of their properties; sort and classify triangles and quadrilaterals

**Sessions 6, 7: Using Move and
Turn Commands**

Students distinguish between, and see relationships between, turns and angles; determine turn sizes for making an equilateral triangle

**Session 8:
Finding Angle Sizes**

Students estimate and measure the sizes of angles and turns; use known angles to find measures of other angles

**Session 9:
Angles and Turns Together**

Students continue their work on estimating and measuring the sizes of angles and turns; see the relationships between turns and angles

INVESTIGATION 3: *Regular Polygons and Similarity* – Students distinguish between regular and nonregular polygons; explore the relationship between the number of sides a polygon has and the sums of its turns and angles; explore relationships among angles, line lengths, and areas of similar polygons; compare areas of shapes

Sessions 1, 2: Regular Polygons

Students list attributes of regular and nonregular polygons; find patterns for turns, angles, and the sums of turns and angles for regular polygons

**Session 3: Patterns of Angles and Turns
(Assessment)**

Students share their discoveries about the relationships between the number of sides in a regular polygon and the sizes of its turns and angles

Session 4: Building Similar Shapes

Students recognize and explore similar shapes; create geometric patterns that grow in regular ways; explore connections between geometric and numerical patterns

Sessions 5, 6: Similarity Activities

Students predict the lengths of the sides of larger and smaller similar shapes; continue exploring the relationship between the side lengths and the areas of similar shapes

Concept Map for *Name That Portion* (Page 1 of 2)

Students use a variety of models (including grids, number lines, and clock faces) as they find fraction, percent, and decimal equivalencies and solve computational problems that involve amounts less than 1. They also collect data about two groups and represent those data using fractions and percents (which they then show in circle graphs)

INVESTIGATION 1: *Exploring Percents and Fractions* – Students use fractions to describe how many in a group share a particular characteristic; represent fractions and percents on a number line; find and order equivalent fractions and percents; interpret common uses of percents; use $\frac{1}{2}$ and 1 as references; build on knowledge of unit fractions to use fractions with numerators greater than 1

<p>Session 1: Connecting Fractions, Decimals, and Percents Students interpret common uses of fractions, decimals, and percents; express the same quantity as a fraction, decimal, and percent</p>	<p>Session 2: Percent Grid Patterns Students partition a whole; make patterns and identify percents on a 10-by-10 grid; identify equivalent fractions and percents</p>	<p>Sessions 3, 4: Fraction and Percent Grids Students represent common fractions (3rds, 4ths, 5ths, 6ths, 8ths) on 10-by-10 grids; identify equivalent fractions and percents</p>	<p>Sessions 5, 6: Percent Equivalents Strips Students mark a paper strip of percents to show equivalent fractions; order fractions and percents around landmark numbers</p>	<p>Session 7: Fraction and Percent Problems Students name portions with fractions and percents; use $\frac{1}{2}$ and 1 as references; use fractions with numerators greater than 1</p>
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INVESTIGATION 2: *Models for Fractions* – Students represent fractions as rotation around a circle; mark strips into fractional parts; find equivalent fractions; order and add fractions

<p>Sessions 1, 2: Fractions on Clocks Students represent fractions as rotation around a circle; add fractions</p>	<p>Session 3: Fraction Strips Students partition paper strips into halves, thirds, fourths, and sixths; find equivalencies; compare fractions of different denominators; use the fraction strips to demonstrate equivalent fractions and addition of fractions</p>	<p>Sessions 4, 5: Fraction Tracks Students use number lines to identify, label, and compare fractions having different denominators; use equivalencies to place fractions on a set of number lines</p>
<p>Session 6: The Fraction Track Game Students play the <i>Fraction Track Game</i>; find, order, and add fractions and break fractions into parts with unlike denominators</p>	<p>Sessions 7, 8: Fraction Games Students play various fraction games in which they find equivalent fractions and percents, order and add fractions</p>	<p>Session 9: Problems with Fractions Students solve word problems using fractions and percents and later share their solution strategies</p>

INVESTIGATION 3: *Exploring Decimals* – Students represent decimals on grids; read, write, order, and add decimals; divide to find decimal equivalents of fractions; compare fractions using different models and notations; make sense of and solve word problems using fractions and decimals

<p>Session 1: Interpreting Decimals Students interpret common uses of decimals; find equivalent fractions and decimals</p>	<p>Session 2: Decimals on Grids Students represent decimals on grids; read, write, order, and add decimals</p>	<p>Sessions 3, 4: Decimal Games Students play three decimal games that provide practice reading, writing, ordering, and adding decimals</p>
<p>Sessions 5, 6: Fractions to Decimals Students work with different values of decimals; find decimal equivalents for fractions greater than 1; find and explain patterns in a division table</p>	<p>Session 7: Fraction, Percent, and Decimal Problems Students solve word problems while computing with fractions, decimals, and percents; share their solution strategies</p>	<p>Session 8: Comparing Fractional Amounts (Assessment) Students compare common fractions and mixed numbers; use equivalent fractions, percents, and decimals</p>

Concept Map for *Name That Portion* (Page 2 of 2)

INVESTIGATION 4: *Data and Percents in Circle Graphs* (Excursion) – Students plan and conduct surveys; organize and represent data as fractions, as percents, and in circle graphs; interpret common uses for fractions, decimals, and percents

Session 1: Planning Age/Gender Survey;
Students represent a population (their class) as fractions and percents; choose survey questions; plan how to collect data outside of class

Session 2: Circle Graphs
Students make circle graphs to represent two groups of data; interpret the graphs

Sessions 3, 4: Interpreting Percents
Students continue work on circle graphs; interpret circle graphs; compile and organize survey results

Sessions 5, 6: Survey Reports
Students compile and organize survey results; represent their data in fractions, in percents, and in circle graphs

Session 7: Two Days in My Life
Students continue to organize, categorize, and represent data as fractions and percents and in circle graphs

Concept Map for *Between Never and Always*

Students develop a likelihood line on which they locate the probability of various events occurring; learn to interpret probability as a statement of how often a repeatable event will happen; explore a variety of spinners, predicting what will happen if they spin each one 50 times, and then comparing their predictions with actual results; investigate the “fairness” of different games and seek to modify games that are deemed to be unfair

INVESTIGATION 1: *Finding and Comparing Probabilities* – Students associate verbal descriptions of probability with numeric descriptions; see that repeating a probability experiment several times yields a variety of results; use a probability to predict about how often an event will happen in a given number of trials; estimate probabilities from results of actual trials; predict and analyze features of distribution, including center and variability; learn to add probabilities of simple events

Sessions 1, 2: Creating a Likelihood Line

Students distinguish events that are certain from those that are not; learn to associate the word *probability* with how likely something is to occur; distinguish among events with different probabilities; associate verbal descriptions of probability with numeric descriptions; link equivalent fractions, decimals, and percents

Sessions 3, 4: Using Spinners

Students interpret a probability as a measure of quantity; use a probability to predict how often an event will happen in a given number of trials; record results of probability experiments on line plots; compare what is expected to happen with what actually happens; compare line plots by examining general features

Session 5: Testing Guessing Skills

Students estimate probabilities from results of actual trials; infer a theoretical probability from looking at a spinner divided into sectors; compute an expected number from a probability; predict and analyze features of distributions, including center and variability

Session 6: Guessing Skills Distributions

Students judge likelihood of data based on characteristic features, such as center, spread, shape, and outliers; compare predicted results to actual results

Session 7: The Scoring Options Game

Students use their knowledge of probabilities to select events most likely to occur; learn to add probabilities of simple events

INVESTIGATION 2: *Fair and Unfair Games* – Students interpret the fairness of a game as equal probability of winning; develop systematic ways to generate a list that includes all the ways an event can occur; analyze the fairness of games; distinguish between games of chance and games of skill; analyze group data in terms of general features, such as center and spread; understand variability in the results of fair games

Sessions 1, 2: Rock, Paper, Scissors

Students interpret the fairness of a game as equal probability of winning; analyze features that make a game fair; apply their knowledge of probability to design a fair game

Session 3: Does a Fair Game Always Look Fair?

Students distinguish between games of chance and games of skill; interpret data represented on line plots; analyze group data in terms of general features such as center and spread; understand variability in the results of fair games

Sessions 4, 5: The Unfair Spinner Game

Students continue their work on interpreting the fairness of a game as equal probability of winning; analyze and play a game that is clearly unfair; modify the rules to make the game fair

Concept Map for *Building on Numbers You Know 5* (Page 1 of 2)

Students explore a wide range of strategies for computation and estimation (especially with multiplication and division) and come to recognize that there are many ways to perform each operation. The emphasis throughout the unit is on students using what they already know about number relationships and the meanings of the operations to break problems into smaller, more manageable parts

INVESTIGATION 1: *Exploring Distance Between Numbers* – Students relate repeated addition to multiplication; use skip-counting patterns to help solve multiplication and division problems; develop, explain, and compare strategies for subtracting larger numbers; record computation strategies using numbers, words, and arithmetic symbols; read, write, and sequence 4- and 5-digit numbers

<p style="text-align: center;">Session 1: Reasoning About Multiples Students reason about number relationships and record computational strategies</p>	<p style="text-align: center;">Session 2: Counting Puzzles Students develop strategies for determining and comparing distance between numbers; find and order numbers in between two other numbers</p>	<p style="text-align: center;">Sessions 3, 4: Exploring Patterns of Multiples Students find patterns in sequences of multiples; relate repeated addition to multiplication; use skip-counting patterns to solve multiplication and division problems</p>
<p style="text-align: center;">Session 5: Multiple Towers Students find multiples of (or skip count by) 2-, 3-, and 4-digit numbers</p>	<p style="text-align: center;">Sessions 6, 7: The Digits Game Students play <i>The Digits Game</i>, a game in which they develop, explain, and compare strategies for subtracting 4- and 5-digit numbers</p>	<p style="text-align: center;">Session 8: Subtraction Strategies Students explain their thinking and reasoning about subtraction in writing</p>

INVESTIGATION 2: *Multiplication and Division Situations* – Students develop, record, and compare strategies for solving multiplication and division problems; make sense of remainders; understand relationships between multiplication and division; model situations with multiplication, division, and other operations

<p style="text-align: center;">Sessions 1, 2: Multiplication and Division Strategies Students develop, explain, and compare strategies for multiplication and division</p>	<p style="text-align: center;">Session 3: Division Strategies Students develop, explain, compare, and record strategies for solving division problems; use division notation</p>	<p style="text-align: center;">Session 4: What Should We Do with the Extras? Students make sense of remainders; understand how division notation can represent a variety of division situations</p>	<p style="text-align: center;">Sessions 5, 6: Relating Multiplication to Division Students find relationships between multiplication and division situations</p>	<p style="text-align: center;">Session 7: Problems About Our School (Excursion) Students develop real-life meaning for quantities in the thousands, ten thousands, and hundred thousands</p>
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INVESTIGATION 3: *Ways To Multiply and Divide* – Students develop, explain, record, and compare strategies for estimating and finding exact answers; solve multiplication and division problems in more than one way; use relationships between multiplication and division to help solve problems

<p style="text-align: center;">Sessions 1, 2, 3: Multiplication Clusters Students use familiar multiplication problems to estimate and solve unfamiliar ones</p>	<p style="text-align: center;">Sessions 4, 5, 6: Division Clusters Students use familiar division problems to estimate and solve unfamiliar ones; use knowledge of number relationships to solve unfamiliar multiplication and division problems</p>	<p style="text-align: center;">Sessions 7, 8, 9: How Did I Solve It? Students work on understanding different strategies for solving division problems; keep track of steps used to solve problems</p>	<p style="text-align: center;">Session 10: Ways to Multiply and Divide (Assessment) Students explain their division and multiplication strategies using equations and words</p>
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Concept Map for *Building on Numbers You Know* (Page 2 of 2)

INVESTIGATION 4: *A Million Dots* (Excursion) – Students work on developing a sense of quantities in the thousands, ten thousands, and hundred thousands; use a rectangular-array model to represent factor pairs of numbers 10,000 and larger; develop a sense of the magnitude of 1,000,000

Session 1: Arrays of Dots
Students work on developing a sense of the size of 10,000 using rectangular arrays

Session 2: How Big Is a Million?
Students begin to develop a sense of the relative sizes of 1000, 10,000, and larger powers of 10

INVESTIGATION 5: *Understanding Operations* – Students apply computation strategies to more difficult problems, including both numeric and situational problems; develop strategies for estimating answers to difficult problems; read, write, and sequence multiples of 5,000 up to 1,000,000; develop a sense of the size of 1,000,000; understand relationships among the four basic operations

**Sessions 1, 2:
The Estimation Game**
Students develop strategies for estimating answers to difficult multiplication and division problems

**Session 3:
Solving Difficult Problems**
Students work on applying strategies for multiplying and dividing to more difficult problems

**Sessions 4, 5, 6:
Exploring Operations**
Students continue applying computation strategies to more difficult problems; understand relationships among the four basic operations; read, write, and sequence multiples of 5,000 up to 1,000,000 (in work on the million dots display)

**Session 7:
Assessing Students' Understanding
(Assessment)**
Students solve difficult multiplication and division problems and write about their strategies; continue to develop a sense of the magnitude of 1,000,000

Concept Map for *Measurement Benchmarks*

Students work with metric and U.S. customary standard measures of length, distance, weight, and volume, and with measures of time; use benchmarks as reference points for particular units of measure; estimate and take actual measurements; compare their estimates with the actual measurements; investigate ways that people use measurement in their daily lives

INVESTIGATION 1: *Measures of Length and Distance* – Students use tools for measuring length, weight, volume, and time; recognize different units of measure (metric and customary); use benchmarks to estimate; decide when precise measurement is required and when estimates are good enough; keep track of and calculate total measurements; compare distances; use scale on maps to calculate approximate distances

Session 1: Exploring Measurement

Students use tools to measure length, weight, liquid quantity, and duration of time; identify units as metric or customary

Session 2: Using Length Benchmarks

Students recognize use of benchmarks to estimate measures; recognize and explain possible sources of measurement error

Session 3: Using Measuring Tools

Students become familiar with scales on foot rulers, metersticks, or tapes; measure with these tools; decide when precise measurements are required and when estimates are good enough

Session 4: Measuring and Comparing

Students compare lengths expressed in different ways; keep track of and calculate total measurements

Sessions 5, 6: Mapping 100 Meters

Students develop benchmarks for 100 meters; measure distances of 100 meters

Sessions 7, 8: How Far Do Products Travel? (Excursion)

Students compare distances expressed in hundreds or thousands of miles or kilometers; use scale on maps to calculate approximate distances

INVESTIGATION 2: *Measures of Weight and Liquid Volume* – Students order items by measures of weight and by measures of liquid quantity; compare the relative sizes of U.S. standard and metric measures; measure weight with a balance; distinguish between quantity and weight; use graphs to organize data and to determine typical data; develop benchmarks for larger weights

Sessions 1, 2: Grocery Package Contents

Students compare the relative sizes of U.S. standard and metric measures of weight and liquids; order items by measures of weight and by measures of liquid quantity

Session 3: Working with Units of Weight

Students develop benchmarks for metric and U.S. standard weight measures; use a balance and weights; compare metric and U.S. standard measures of weight by direct comparison

Session 4: Working with Units of Liquid Volume

Students develop benchmarks for measures of liquid volume; develop a sense of volume as the amount of space something takes up or the amount a container can hold

Session 5: Comparing Weight and Quantity

Students distinguish between quantity and weight; begin to develop meaning for the concept of density

Session 6: Writing About Weight and Liquid Measure (Assessment)

Students explain what they know about the difference between weight and liquid quantity (volume)

Sessions 7, 8: Ordinary and Amazing Vegetables (Excursion)

Students collect, organize, and graph data on the weights of several vegetables; develop benchmarks for large numbers of pounds; determine relative quantities

INVESTIGATION 3: *It's About Time* – Students develop vocabulary for units of time and benchmarks for a minute and for years; practice estimating in minutes and seconds; collect, display, and analyze data; use measurement conversions in the problem-solving process; keep track of their computations in multistep problems

Session 1: Estimating Half a Minute

Students develop benchmarks for units of time; use analog clocks; estimate time intervals; graph results of repeated trials

Session 2: Commercial Minutes

Students solve problems involving a series of related calculations; use measurement conversions; make and interpret line plots; evaluate statistics using real-world knowledge

Session 3: Making Sense of Years

Students work on computational and fractional concepts as they compare ages; develop meaning for longer periods of time

Concept Map for *Patterns of Change*

Students experiment with forms of geometric growth that express number patterns; show growing patterns in number tables and on graphs; distinguish among growth, shrinkage, and oscillation; note differences between steady and accelerated growth

INVESTIGATION 1: *Number Patterns in Changing Shapes* – Students build designs that change in a regular way and according to number patterns; predict later steps of number patterns and designs; make tables and graphs to display number patterns; use the language of speed and motion to describe number patterns

Sessions 1, 2: *Tile Patterns*

Students build tile designs; predict later steps in tile patterns and in number patterns; build designs that change in a regular way; make tables and graphs that describe growing tile patterns; find patterns in even numbers and totals

Sessions 3, 4: *Four Growing Tile Patterns*

Students extend tile patterns; make tables and graphs of step size and totals; compare graph shapes and explain the differences; investigate number sequences; make several growing designs that fit the same table of numbers; find the *n*th term of a series

INVESTIGATION 2: *Motion Stories, Graphs, and Tables* – Students explore relationships among distance, time, and speed; explore irregular increases and decreases in speed; explore ways that speed, time, and distance can be represented with tables, graphs, stories, and informal representations; interpret intervals in a table as reflecting speed; interpret steepness in a distance vs. time graph as reflecting speed; associate tables, graphs, and stories of the same event

Session 1:

Describing Changing Speeds

Students describe trips with changing speed along a straight-line path; make visual representations to describe trips; interpret such representations

Session 2:

From Beanbags to Tables

Students interpret spacing of dropped objects as speed; collect and record data in regular time intervals; make and interpret a table of time and distance

Session 3:

Tables for Stories

Students make tables of total distance in periods of 2 seconds; analyze intervals in tables to match tables to stories; compare tables of distances that fit the same story

Session 4:

Graphs for Tables

Students make graphs of total distance from tables of points; match graphs to tables and stories; compare graphs that match the same story

Session 5:

Stories, Tables, and Graphs

Students create a table of accumulated distance to fit a given graph and story; write a motion story to fit a given table and graphs

INVESTIGATION 3: *Computer Trips on Two Tracks* – Students develop the vocabulary to discuss motion (e.g., *speed, fast, slow, steady, speed up, slow down, rate*); represent motion with number tables, graphs, and verbal descriptions; explore the relationships among time, distance, and speed; connect slope in a graph with rate of change; compare relative motions; relate number patterns to graph shapes

Session 1:

Ways of Making Trips

Students predict trip outcomes based on step size; predict how step size and starting position affect trip outcomes

Session 2: Trips on Two Tracks

Students work on understanding the relationships among speed, distance, and time; combine discrete and continuous descriptions of motion

Session 3: Different Kinds of Trips

Students describe differences between trips with constant step size and those with changing step size; interpret position vs. time graphs

Session 4: More Match-Ups

Students continue to describe relationships among number tables, graphs, and motion stories

Sessions 5, 6: Two Types of Graphs

Students make step size vs. time graphs; explore the relationship between position vs. time and step size vs. time graphs; interpret graphs of step size vs. time and position vs. time

Session 7: Animation (Excursion)

Students show relative change or motion by creating two flipbooks: one showing a change over time; the other showing two simultaneous changes that take place at different rates

Concept Map for *Containers and Cubes*

Students develop strategies to determine how many cubes or packages will fit inside rectangular boxes; explore the concept of volume; investigate volume relationships between cylinders and cones and between pyramids and prisms having the same base and height; learn about the structure of geometric solids; improve their visualization skills

INVESTIGATION 1: *The Packaging Factory* – Students see 3-D rectangular arrays of cubes as congruent layers; determine the number of cubes that fit inside a rectangular box; use multiplication to find the number of cubes in a box; determine the relationship between the number of cubes that fill a rectangular box and the dimensions of that box

Sessions 1, 2: How Many Cubes?

Students work on developing, describing, and justifying strategies for determining the number of cubes that will fit inside a rectangular box

Sessions 3, 4: Doubling and Halving Boxes of Cubes

Students explore the relationship between the number of cubes that fill a rectangular box before and after its dimensions are changed

INVESTIGATION 2: *Packing Problems* – Students develop strategies for determining how many rectangular packages will fit inside a box; understand the relationship between the dimensions of a box and how many rectangular packages fill the box

Sessions 1, 2: Packing Packages of Different Sizes

Students predict and then determine how many rectangular packages will fit in a box

Sessions 3, 4: Designing Boxes

Students design a box that can be completely filled with several differently shaped rectangular packages

Session 5: More Packing Problems

Students figure out exactly how to use multiplication to predict the number of two-cube packages that will fit in boxes

INVESTIGATION 3: *Measuring the Space in Our Classroom* – Students work on understanding the concept of volume and units of volume; understand the characteristics of units of volume, such as shape and size; develop meaningful methods for determining the number of volume units that fit in a solid shape; describe and justify their methods for determining volume

Sessions 1, 2: Measuring the Space in a Box

Students determine the volume of a small box; visualize and construct appropriate units of volume for measuring a large-scale space

Session 3: The Space Inside Our Classroom

Students develop and justify meaningful methods for determining the number of cubic meters that fit in a room

Session 4: Measuring the Space in Other Rooms (Excursion)

Students compare the volume of one room to that of another

INVESTIGATION 4: *Prisms and Pyramids, Cylinders and Cones* – Students compare volumes of containers of different shapes; explore volume relationships between solids having the same bases and heights; understand the structure of solids through building them

Session 1: Comparing Volumes

Students compare the volumes of containers of different shapes

Sessions 2, 3: Comparing Volumes of Related Shapes

Students explore the relationships between solids, particularly those having the same base and height

Sessions 4, 5: Using Standard Volume Units

Students use standard units of volume to measure nonrectangular solids

Session 6: How Do the Heights Compare? (Excursion)

Students explore volume relationships between related solids

Sessions 7, 8, 9: Building Models

Students use geometric solids to make real-world objects; determine the volume of each solid; describe methods for determining those volumes

Concept Map for *Data: Kids, Cats, and Ads* (Page 1 of 2)

This unit builds upon students’ prior experience with collecting, graphing, and interpreting data, providing them with additional tools for data analysis. Students compare two data sets; find medians; calculate what fraction of each data set is above or below a particular value; are introduced to “sampling”; and, as an end-of-unit project, explore data about playground injuries

INVESTIGATION 1: *Balancing Act* – Students use line plots to represent data sets; compare two data sets; find medians and other fractional parts of data sets; make hypotheses based on comparisons of two data sets; make statements based on data

Session 1: Standing on One Foot

Students collect data by timing; represent data on a line plot; compare two sets of data on line plots

Sessions 2, 3: Comparing Student and Adult Data

Students find medians and other fractional parts of data sets; compare data sets; make statements based on data

Session 4: Mystery Balancers

Students choose aspects of data sets to compare; use characteristics of data to identify unlabeled data sets

INVESTIGATION 2: *Examining Cats* – Students collect and examine data that involve more than one variable; make representations of numerical and categorical variables; use fractions and percents to understand numerical and categorical data; explore the way two variables in a data set might be related; learn to enter and analyze data in a computer database

Session 1: A Set of Cats

Students make representations of numerical and categorical variables; use data representations to describe such variables

Session 2: Associations: Are Female Cats Shorter?

Students frame questions about associations between variables; construct representations and descriptions to help answer questions about associations between variables

Session 3: Using the Computer to Investigate Cats
(Excursion)

Students use a computer to examine data; learn about databases; frame and explore questions about relationships between variables

INVESTIGATION 3: *Sampling Ourselves* – Students learn what a sample is and some of the factors that make a sample reasonable; compare the data from a sample to the data in a larger population using fractions, decimals, and percents; learn why a larger sample tends to reflect a population better than a smaller one

Session 1: Review: Fractions, Decimals, Percents

Students estimate the sizes of fractions using numerical reasoning; convert unfamiliar fractions to familiar ones; find decimal and percent equivalents to fractions

Sessions 2, 3: Sampling the Classroom

Students learn what a sample is and how to compare the data from a sample to the data from a larger population; consider how sample size affects how well it represents a population

Session 4: The Classroom as a Sample

Students change data fractions into percentages; explore whether a sample is representative of a larger population

INVESTIGATION 4: *A Sample of Ads* – Students figure out what fraction of a newspaper page is covered by ads; choose a strategy to find a representative sample; compare data from a sample with a target fraction; combine fractions of pages into a single fraction of a newspaper; analyze a single data set in more than one way

Session 1: Fractions of Newspaper Pages

Students estimate fractions of areas; combine and compare fractions represented as areas

Session 2: Collecting Data from Ten Days

Students define and carry out a sampling strategy; express fractions of areas as familiar fractions; organize complex data-collection processes

Session 3: Combining Ad Data Across Pages

Students total a set of fractions using a visual model; compare fractions represented visually and as numbers; compare sampling strategies

Concept Map for *Data: Kids, Cats, and Ads* (Page 2 of 2)

INVESTIGATION 5: *Researching Play Injuries* – Students define a question and a sample; test and refine survey questions; collect and collate data; look for associations and develop theories based on data; make recommendations based on interpretation of the data

Session 1: Issues of Playground Safety

Students formulate survey questions; use background information in designing a survey

Session 2: Collecting Playground Data

Students define and carry out a sampling plan; organize and execute the data-collection process

Sessions 3, 4, 5: Analyzing and Presenting Data

Students organize and represent their data; construct and interpret data graph and charts; organize all of their analysis results; draw conclusions and make recommendations based on their data