

GRADES 3-5

DISTRICT 742 COMMUNITY SCHOOLS

MATH PROGRAM GOALS

STANDARD ONE: NUMBER SENSE

Experience numbers in contextual situations and use them flexibly to solve problems, gradually moving to a more abstract understanding of number concepts, relationships and procedures.

GOAL 1: Intermediate/Grades 3-5:

Develop an understanding about numbers, their magnitude and their relationships.

- A. Recognize and select appropriate uses of number: to quantify, label, measure and compare.
- B. Understand and appreciate the need for rational numbers and integers.
- C. Develop models for whole numbers, common fractions, decimals and integers.
- D. Identify uses for and order and compare integers (e.g., temperature, number lines, bank accounts).
- E. Compare and order simple rational numbers.
- F. Apply understanding of numbers in real-world contexts.
- G. Build benchmarks for 500, 1000 and 1,000,000.
- H. Read and write whole numbers to 1,000,000 and decimal numbers to the hundredth.
- I. Explore decimal concepts by ordering, comparing and computing money values.
- J. Understand when and how to use a variety of estimation strategies.
- K. Use whole numbers, simple fractions and money amounts to quantify, label, measure and locate numerical information.
- L. Develop an understanding of prime and composite numbers.

GOAL 2: Intermediate/Grades 3-5:

Develop an understanding of numeration system and their properties.

- A. Extend understanding of the base 10 number system up to 7 digits.
- B. Extend knowledge of place value of whole numbers to decimal numbers.
- C. Explore multiples and factors.
- D. Examine historical and cultural contributions to the development of number systems.
- E. Understand concepts of place value.
- F. Solve a variety of multiple-step problems using number relationships and properties; number patterns (e.g., counting, arithmetic, geometric, visual) and appropriate computation or estimation procedure(s).

GOAL 3: Intermediate/Grades 3-5:

Translate among equivalent forms of numbers to facilitate problem solving.

- A. Represent and use whole numbers and common rational numbers in mathematical situations.
- B. Identify location of integers on a number line.
- C. Identify coordinates of points on a coordinate graph.
- D. Recognize and generate different representations for the same number (e.g., model and explain that \$12.43 is: 1243 pennies, 124 dimes and 3 pennies, 12 dollars, 4 dimes and 3 pennies. Model and explain that 243 is: $100 + 100 + 50 - 7$, $(10 \text{ to the second power} \times 2) + 43$, $240 + \text{the square root of } 9$, $(10 \times 24) + 3$ and $1000/5 + 43$).

GOAL 4: Intermediate/Grades 3-5:

Develop operation sense, and use it to estimate results of operations.

- A. Mentally perform basic operations of addition, subtraction (positive integer answers), multiplication and division (integer answers) with integers from 0 through 10.
- B. Know when it is appropriate to estimate and when an exact answer is needed.
- C. Develop strategies for making reasonable and appropriate estimates of quantities involving whole numbers and common rational numbers.
- D. Estimate computations with whole numbers and common rational numbers.
- E. Use manipulatives and other models to explain the results of operations on whole numbers, fractions and decimals.

- F. Explore the relationship between multiplication and division.
- G. Understand when and how to use number operations (e.g., addition, subtraction, multiplication and division).
- H. Understand when and how to use a variety of estimation strategies.

GOAL 5: Intermediate/Grades 3-5:

Understand the operations, and apply them to solve problems.

- A. Select and use appropriate methods for computing: mental math, paper and pencil, calculator and computer.
- B. Use number sense, number relationships and a variety of computational procedures to solve problems.
- C. Explore commutative, distributive and associative properties.
- D. Develop and apply an understanding of the properties of 0 and 1 in operations.
- E. Use diagrams, symbols and verbal descriptions to communicate reasoning and strategies used in solving problems.
- F. Apply operations efficiently and accurately in solving problems.
- G. Use the language of mathematics appropriately to describe the problem situation and its solution.
- H. Understand when and how to use number operations (e.g., *addition, subtraction, multiplication and division*), and add, subtract and multiply single-digit multiples of powers of ten (e.g., 30×200).
- I. Solve a variety of multiple-step problems using number relationships and properties, number patterns (e.g., *counting, arithmetic, geometric, visual*) and appropriate computation or estimation procedure(s).
- J. Generate and describe more than one method to solve problems.

STANDARD TWO: SHAPE, SPACE AND MEASUREMENT

Develop visualization and reasoning skills by investigating shape, space and measurement concepts and axiomatic systems, using appropriate tools and technologies.

GOAL 1: Intermediate/Grades 3-5:

Recognize, describe and model shapes and relationships, and represent and reason about them in increasingly abstract ways.

- A. Investigate 3-dimensional shapes by modeling, dissecting and transforming them.
- B. Describe, compare, classify and analyze attributes of 2- and 3-dimensional shapes in the physical world (e.g., sort and compare a set of quadrilaterals).
- C. Draw or represent 2-dimensional shapes using appropriate tools and technologies (e.g., Logo).
- D. Identify a 3-dimensional shape from a set of 2-dimensional views (e.g., identify a mystery Geoblock from front, side and top views).
- E. Sketch 3-dimensional shapes in two dimensions.
- F. Recognize parallel and perpendicular line segments and figures that have similarity and/or congruence.
- G. Demonstrate an understanding of shape, space, and measurement vocabulary.
- H. Use names and properties of common 2- and 3-dimensional shapes.
- I. Describe and compare 2- and 3-dimensional geometric figures existing in the physical world.
- J. Represent a 3-dimensional space in 2-dimensional view.

GOAL 2: Intermediate/Grades 3-5:

Use transformations and concepts of location, relative position and symmetry to visualize, represent and verify geometric relationships.

- A. Predict and communicate the results of sliding, flipping, turning, enlarging and reducing objects.
- B. Explore spatial relationships, and describe them using language such as congruent, similar, parallel, perpendicular.
- C. Recognize and identify lines of symmetry in 2-dimensional shapes.
- D. Use combinations of geometric shapes to explore tiling a plane.
- E. Locate points on maps and other coordinate planes.
- F. Use reference objects in the immediate environment to describe the relative position of other objects or to give directions (e.g., "look in the third drawer of the file cabinet under the clock").
- G. Analyze and create new shapes by combining, dissecting or transforming existing shapes.

GOAL 3: Intermediate/Grade 3-5:

Use measurement to make the connection between number and space in order to describe, analyze and represent real-world and abstract situations.

- A. Develop strategies for estimating measures, and decide if an estimate is "close enough" for the situation.
- B. Select and use appropriate tools to measure length, mass, time, temperature, capacity, perimeter, area and angles.
- C. Measure length, area, mass/weight, time, temperature and capacity using standard unit in both the metric and customary systems.
- D. Estimate and measure angle size.
- E. Develop the concepts of perimeter and area and their relationship to each other.
- F. Develop an awareness of the history of measurement techniques and their uses from the perspectives of various cultures.
- G. Use appropriate whole and partial units (including metric) to measure length, time, weight, volume, temperature, angle and area.
- H. Demonstrate measurement skills: identify type of measurement required; select appropriate tools and units of measurement; measure accurately.
- I. Estimate measurements by using appropriate units and comparisons to known objects or quantities.

STANDARD THREE: DATA INVESTIGATIONS

Ask questions, and collect, organize, interpret and transform data related to those questions to communicate information and make predictions and decisions.

GOAL 1: Intermediate/Grades 3-5:

Formulate a question(s), determine necessary data and choose an appropriate method of data collection in order to make sense of a problem or situation.

- A. Identify a problem of interest from class, family, school or community.
- B. Generate and refine possible questions to explore.
- C. Create a plan to investigate the question(s).
- D. Use prior experiences to predict the results of the investigation.

- E. Collect both categorical (gender, shoe color) and numerical (height, allowance) data.
- F. Answer questions, and collect and organize data.
- G. Gather information from direct observations or experiments with a variable, and frame a question.
- H. Gather information from media sources, and select a topic and frame a question.
- I. Gather information through direct observation and interviews, identify a topic or area for investigation, and conduct an interview with follow-up questions or design and conduct a survey.

**GOAL 2: Intermediate/Grades 3-5:
Collect, organize and represent data in a variety of ways.**

- A. Collect data systematically from surveys, experiments, simulations or existing sources.
- B. Modify plan to collect data when necessary.
- C. Explore various methods to display data, including tables, charts, maps, timelines, Venn diagrams, picture graphs, bar graphs and line plots.
- D. Choose an appropriate method(s) to display a specific set of data.
- E. If necessary, summarize symbolic information from a graph in a key.
- F. Answer questions: collect and organize data, represent data (e.g., *graphs, charts*).
- G. Represent data using at least two graphic forms (e.g., *graphs, tables, charts and pictures*).
- H. Gather information from media sources; access information from electronic media, print, interviews and other sources.

**GOAL 3: Intermediate/Grades 3-5:
Read, describe and interpret displays of data.**

- A. Describe what information is (and is not) shown in a graph.
- B. Use informal language and some standard descriptions to communicate an intuitive feel for what is typical of the data and how the data behaves.
- C. Use informal language to describe the shape of the data (e.g., identify bumps, holes, clumps, symmetry, clusters, outliers).

- D. Use terms median, mode and range to describe data.
- E. Identify trends and patterns in data collected over time.
- F. Explore concrete methods for determining mean of a set of data.
- G. Compare and contrast data from more than one graph.
- H. Understand how to find range, mean and median.
- I. Understand information displayed in graphs, tables and charts.
- J. Describe patterns, trends or relationships in data displayed in graphs, tables or charts.

GOAL 4: Intermediate/Grades 3-5:

Formulate, justify and communicate conclusions, arguments, predictions, decisions and further investigations based on data.

- A. Question data points that don't seem to make sense, and suggest explanations.
- B. Compare the original predications to the results of the investigation.
- C. Discuss how interpretations of the data might change an existing attitude or opinion.
- D. Summarize information, and decide how to communicate this information and what, if any, action should be taken.
- E. Share information, and report conclusions to appropriate audience(s).
- F. Recognize that individual samples may vary.
- G. Recognize that a sample of the same size could yield different results.
- H. Answer questions, and communicate results.

STANDARD FOUR: PROBABILITY, RANDOMNESS AND UNCERTAINTY

Apply concepts of probability, randomness and uncertainty to make critical judgements, predictions and decisions.

GOAL 1: Intermediate/Grades 3-5:

Develop an intuitive sense of probability, use probability as a measure of uncertainty, and develop and use the language of probability to communicate.

- A. Use a variety of tools generate random data: spinners, spinner overlay, dice, blank dice, coins, marbles.

- B. Make comparisons about the expected outcome from two separate tools (e.g., label spinners or dice differently and explore the results).
- C. Place events in order of likelihood, and use a diagram or appropriate language to compare the chance of each event occurring (i.e., impossible, unlikely, even, likely, certain).
- D. Determine the probability of a simple event, assuming equally likely outcomes, and express it in mathematical terms (i.e., 7 out of 10 or 70%).
- E. Discriminate between random and non-random events.
- F. Understand simple concepts of likelihood: impossible, unlikely, equal chance, likely, certain, fair and unfair.
- G. Represent data using at least two graphic forms (e.g., *graphs, tables, charts, pictures*).

GOAL 2: Intermediate/Grades 3-5:

Model situations involving uncertainty by designing and carrying out experiments or simulations to estimate probabilities, solve problems and make predictions.

- A. Participate in experiments involving chance, tally and record results, and make predictions about future outcomes.
- B. Model or visualize a situation to generate all possible outcomes.
- C. With teacher assistance, set up a model to simulate a real-life context with the whole group: list possible outcomes; predict results; conduct simulations; record and communicate the results in both graphical and numerical ways; draw conclusions; and justify reasoning.
- D. Explore computer-generated simulations.
- E. Evaluate games for fairness.
- F. Conduct experiments involving uncertainty (e.g., *use spinners, number cubes, M&M's*).
- G. List possible outcomes; tally, record and explain results.
- H. Solve a variety of multiple-step problems using number patterns (e.g., *counting, arithmetic, geometric, visual*).
- I. Represent real-life situations mathematically.

GOAL 3: Intermediate/Grades 3-5:

Create and use different types of distributions as a basis for making inferences or predictions about outcomes or populations.

- A. Refer to relative frequency distributions to make/justify predictions.

- B. Explain and describe changes in a probability distribution as the number of trials increases.
- C. Compare experimental results with mathematical expectations.
- D. Understand information displayed in graphs, tables and charts.
- E. Describe patterns, trends or relationships in data displayed in graphs, tables and/or charts.

GOAL 4: Intermediate/Grades 3-5:

Explore current problems and events involving uncertainty, and recommend or justify a course of action, when appropriate.

- A. Identify issues and events that involve uncertainty.
- B. Make predictions about real-life situations based on information gathered from several sources.
- C. Develop intuition about the probability of events happening in the real world (e.g., integrate social studies).
- D. Conduct experiments involving uncertainty (e.g., *use spinners, number cubes, M&M's*), and use the results to predict future outcomes.
- E. Make systematic observations of objects, events or phenomena by recording data and predicting change.

STANDARD FIVE: PATTERNS, RELATIONSHIPS AND FUNCTIONS

Represent, compare and analyze mathematical patterns, relationships and functions to model and solve problems.

GOAL 1: Intermediate/Grades 3-5:

Recognize, describe and generalize patterns, and build mathematical models to make predictions.

- A. Explore number patterns (including square numbers, triangular numbers and factors) with concrete materials.
- B. Represent patterns verbally, pictorially and numerically.
- C. Explore strategies for organizing information to search for patterns.
- D. Explore rules that describe and generalize what is happening in a pattern or sequence.
- E. Use mathematical language to explain the structure of a pattern (why it

behaves the way it does).

F. Develop an aesthetic sense for geometric and number patterns across cultures and disciplines.

G. Explore patterns with technological tools, including calculators and graphing software.

H. Use manipulatives and diagrams to model operations and their inverses.

I. Use patterns to solve problems.

J. Solve a variety of multiple-step problems using number patterns.

K. Represent patterns using worked, pictures and numbers.

L. Extend or create geometric patterns to solve problems.

M. Describe patterns, trends or relationships in data displayed in graphs, tables or charts.

GOAL 2: Intermediate/Grades 3-5:

Analyze the interaction between quantities and/or variables to model patterns of change.

A. Explore how changing the value of a variable may affect another variable or pattern.

B. Investigate input/output (function machine) problems.

C. Explore mathematical relations and functions by constructing and translating among tables, charts, graphs and simple equations.

D. Describe and compare different patterns which reflect change, including growing, shrinking, repeating, etc.

E. Understand concepts of place value, variables and equations.

F. Represent patterns using words, pictures and numbers.

G. Explain cause and effect relationships of events over an extended period of time.

H. Understand cycle and patterns in living organisms, earth systems, physical systems.

I. Answer a question by gathering information from direct observations or experiments with a variable, and compare individual findings to large-group findings.

GOAL 3: Intermediate/Grades 3-5:

Use algebraic concepts and processes to represent and solve problems that involve variable quantities.

- A. Use physical materials to model algebraic concepts of equality and inequality.
- B. Represent problem situations using variables (e.g., "Anna and Moc have less than \$15 together" is represented by $a+m<15$).
- C. Given an open sentence, write a story.
- D. Use variables to describe relationship(s) between/among the initial and final state(s) of quantities (e.g., function machine).
- E. Explain the meaning of variables in measurement formulas.
- F. Write and solve number sentences for an unknown quantity.
- G. Understand concepts of place value, variables and equations.
- H. Represent real-life situations mathematically.

STANDARD SIX: DISCRETE MATHEMATICS

Use discrete mathematics to model and understand concepts and relationships and to solve problems.

GOAL 1: Intermediate/Grades 3-5:

Investigate and apply systematic counting techniques, set relationships and principles of logic to represent, analyze and solve problems.

- A. Make a systematic list of permutations and combinations for a small set (see *Sample Problems I 1-1*).
- B. Sort and classify objects using two or more attributes (see *Sample Problems I 1-2*).
- C. Express a verbal rule to describe a given set of objects; sort objects to follow a given rule (see *Sample Problems I 1-3*).
- D. Use Venn diagrams or other diagrams to interpret *and*, *or* and *not* terminology (see *Sample Problems I 1-4*).
- E. Use lists or diagrams to solve counting and arrangement problems.

GOAL 2: Intermediate/Grades 3-5:

Use charts, vertex-edge graphs and matrices to model and solve problems.

- A. Use diagrams, vertex-edge graphs and simple charts to represent all

possible outcomes of an event or experiment (see *Sample Problems I 2-1*).

B. Use tree diagrams to represent steps in a decision or choices in a problem situation (see *Sample Problems I 2-2*).

C. Use a vertex-edge graph to interpret relationships between or among objects (e.g., persons, events, locations) (see *Sample Problems I 2-3*).

D. Explore the conditions for the traceability of a vertex-edge graph (see *Sample Problem I 2-4*).

E. Represent real-life situations mathematically.

F. Use lists or diagrams to solve counting and arrangement problems.

G. Conduct experiments involving uncertainty; list possible outcomes.

GOAL 3: Intermediate/Grades 3-5:

Explore, develop and analyze algorithmic thinking to accomplish a task or solve a problem.

A. Develop lists, illustrations or flow charts to describe a sequence of events.

B. Invent algorithms to accomplish a task or solve a problem involving computation; describe how they work, and evaluate which are most useful.

C. Follow a flow chart to accomplish a task.

D. Generate and describe more than one method to solve problems.

E. Use maps or graphs to determine the most efficient routes.

GOAL 4: Intermediate/ Grades 3-5:

Analyze, extend and model iterative and recursive patterns.

A. Represent iterative patterns in words, pictures and numbers.

B. Represent patterns using words, pictures and numbers.

C. Describe patterns, trends or relationships in data displayed in graphs, tables or charts.

D. Extend or create geometric patterns to solve problems.