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EDMA 625 Math, Science and Technology
Math Standards Assignment

Mathematics - Core Curriculum – MST Standard 3

Three Major Components

- ❖ **Conceptual Understanding** – related to already existing ideas, basic arithmetic facts, identifying and applying principles, knowing and applying facts/definitions, and comparing and contrasting concepts
- ❖ **Procedural Fluency** – carrying out procedures flexibly, accurately and efficiently, algorithms (step-by-step routines,) fluency, calculators to enhance understanding
- ❖ **Problem Solving** – ability to formulate, represent and solve one-step and multi-step and process problems and strategies (where and when to use it)

Process Strands (Grade Four)

Problem Solving

with Performance Indicators

Students will build new mathematical knowledge through problem solving.

1. Explore, examine, and make observations about a social problem or mathematical situation
2. Understand that some ways of representing a problem are more helpful than others
3. Interpret information correctly, identify the problem, and generate possible solutions

Students will solve problems that arise in mathematics and in other contexts.

4. Act out or model with manipulatives activities involving mathematical content from literature
5. Formulate problems and solutions from everyday situations
6. Translate from a picture/diagram to a numeric expression

7. Represent problem situations in oral, written, concrete, pictorial, and graphical forms
8. Select an appropriate representation of a problem

Students will apply and adapt a variety of appropriate strategies to solve problems.

9. Use trial and error to solve problems
10. Use process of elimination to solve problems
11. Make pictures/diagrams of problems
12. Use physical objects to model problems
13. Work in collaboration with others to solve problems
14. Make organized lists to solve numerical problems
15. Make charts to solve numerical problems
16. Analyze problems by identifying relationships
17. Analyze problems by identifying relevant versus irrelevant information
18. Analyze problems by observing patterns
19. State a problem in their own words

Students will monitor and reflect on the process of mathematical problem solving.

20. Determine what information is needed to solve a problem
21. Discuss with peers to understand a problem situation
22. Discuss the efficiency of different representations of a problem
23. Verify results of a problem
24. Recognize invalid approaches
25. Determine whether a solution is reasonable in the context of the original problem

Reasoning and Proof with Performance Indicators

Students will recognize reasoning and proof as fundamental aspects of mathematics.

1. Use representations to support mathematical ideas
2. Determine whether a mathematical statement is true or false and explain why

Students will make and investigate mathematical conjectures.

3. Investigate the use of knowledgeable guessing by generalizing mathematical ideas
4. Make conjectures from a variety of representations

Students will develop and evaluate mathematical arguments and proofs.

5. Justify general claims or conjectures, using manipulatives, models, and expressions
6. Develop and explain an argument using oral, written, concrete, pictorial, and/or graphical forms
7. Discuss, listen, and make comments that support or reject claims made by other students

Students will select and use various types of reasoning and methods of proof.

8. Support an argument by trying many cases
9. Disprove an argument by finding counterexamples

Communication

with Performance Indicators

Students will organize and consolidate their mathematical thinking through communication.

1. Understand and explain how to organize their thought process
2. Verbally explain their rationale for strategy selection
3. Provide reasoning both in written and verbal form

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

4. Organize and accurately label work
5. Share organized mathematical ideas through the manipulation of objects, drawing, pictures, charts, graphs, tables, diagrams, models, symbols, and expressions in written and verbal form
6. Answer clarifying questions from others

Students will analyze and evaluate the mathematical thinking and strategies of others.

7. Restate mathematical solutions shared by other students
8. Consider strategies used and solutions found in relation to their own work

Students will use the language of mathematics to express mathematical ideas precisely.

9. Increase their use of mathematical vocabulary and language when communicating with others
10. Describe objects, relationships, solutions, and rationale using appropriate vocabulary
11. Decode and comprehend mathematical visuals and symbols to construct meaning

Connections

with Performance Indicators

Students will recognize and use connections among mathematical ideas.

1. Recognize, understand, and make connections in their everyday experiences to mathematical ideas
2. Compare and contrast mathematical ideas
3. Connect and apply mathematical information to solve problems

Students will understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

4. Understand multiple representations and how they are related
5. Model situations with objects and representations and be able to make observations

Students will recognize and apply mathematics in contexts outside of mathematics.

6. Recognize the presence of mathematics in their daily lives
7. Apply mathematics to solve problems that develop outside of mathematics
8. Recognize and apply mathematics to other disciplines

Representation

with Performance Indicators

Students will create and use representations to organize, record, and communicate mathematical ideas.

1. Use verbal and written language, physical models, drawing charts, graphs, tables, symbols, and equations as representations
2. Share mental images of mathematical ideas and understandings
3. Recognize and use external mathematical representations
4. Use standard and nonstandard representations with accuracy and detail

Students will select, apply, and translate among mathematical representations to solve problems.

5. Understand similarities and differences in representations
6. Connect mathematical representations with problem solving
7. Construct effective representations to solve problems

Students will use representations to model and interpret physical, social, and mathematical phenomena.

8. Use mathematics to show and understand physical phenomena (e.g., estimate and represent the number of apples in a tree)
9. Use mathematics to show and understand social phenomena (e.g., determine the number of buses required for a field trip)
10. Use mathematics to show and understand mathematical phenomena (e.g., use a multiplication grid to solve odd and even number problems)

Content Strands (Grade Four)

Number Sense & Operations

with Performance Indicators

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

1. Skip count by 1,000's
2. Read and write whole numbers to 10,000
3. Compare and order numbers to 10,000
4. Understand the place value structure of the base ten number system:
10 ones = 1 ten
10 tens = 1 hundred
10 hundreds = 1 thousand
10 thousands = 1 ten thousand
5. Recognize equivalent representations for numbers up to four digits and generate them by decomposing and composing numbers
6. Understand, use, and explain the associative property of multiplication
7. Develop an understanding of fractions as locations on number lines and as divisions of whole numbers
8. Recognize and generate equivalent fractions (halves, fourths, thirds, fifths, sixths, and tenths) using manipulatives, visual models, and illustrations
9. Use concrete materials and visual models to compare and order unit fractions or fractions with the same denominator (with and without the use of a number line)
10. Develop an understanding of decimals as part of a whole
11. Read and write decimals to hundredths, using money as a context
12. Use concrete materials and visual models to compare and order decimals (less than 1) to the hundredths place in the context of money
13. Develop an understanding of the properties of odd/even numbers as a result of multiplication

Students will understand meanings of operations and procedures, and how they relate to one another.

14. Use a variety of strategies to add and subtract numbers up to 10,000
15. Select appropriate computational and operational methods to solve problems
16. Understand various meanings of multiplication and division

17. Use multiplication and division as inverse operations to solve problems
18. Use a variety of strategies to multiply two-digit numbers by one digit numbers (with and without regrouping)
19. Use a variety of strategies to multiply two-digit numbers by two digit numbers (with and without regrouping)
20. Develop fluency in multiplying and dividing multiples of 10 and 100 up to 1,000
21. Use a variety of strategies to divide two-digit dividends by one digit divisors (with and without remainders)
22. Interpret the meaning of remainders
23. Add and subtract proper fractions with common denominators
24. Express decimals as an equivalent form of fractions to tenths and hundredths
25. Add and subtract decimals to tenths and hundredths using a hundreds chart

Students will compute accurately and make reasonable estimates.

26. Round numbers less than 1,000 to the nearest tens and hundreds
27. Check reasonableness of an answer by using estimation

Algebra

with Performance Indicators

Students will represent and analyze algebraically a wide variety of problem solving situations. (Variables)

1. Evaluate and express relationships using open sentences with one operation

Students will perform algebraic procedures accurately.

(Equations/Inequalities)

2. Use the symbols $<$, $>$, $=$, and \neq (with and without the use of a number line) to compare whole numbers and unit fractions and decimals (up to hundredths)
3. Find the value or values that will make an open sentence true, if it contains $<$ or $>$

Students will recognize, use, and represent algebraically patterns, relations, and functions. (Patterns, Relations)

4. Describe, extend, and make generalizations about numeric and Functions ($+$, $-$, \times , \div) and geometric patterns
5. Analyze a pattern or a whole-number function and state the rule, given a table or an input/output box

Geometry

with Performance Indicators

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

1. Identify and name polygons, recognizing that their names are related to the number of sides and angles (triangle, quadrilateral, pentagon, hexagon, and octagon)
2. Identify points and line segments when drawing a plane figure
3. Find perimeter of polygons by adding sides
4. Find the area of a rectangle by counting the number of squares needed to cover the rectangle
5. Define and identify vertices, faces, and edges of three-dimensional shapes

Students will identify and justify geometric relationships, formally and informally.

6. Draw and identify intersecting, perpendicular, and parallel lines
7. Identify points and rays when drawing angles
8. Classify angles as acute, obtuse, right, and straight

Measurement

with Performance Indicators

Students will determine what can be measured and how, using appropriate methods and formulas.

1. Select tools and units (customary and metric) appropriate for the length being measured

2. Use a ruler to measure to the nearest standard unit (whole, $\frac{1}{2}$ and $\frac{1}{4}$ inches, whole feet, whole yards, whole centimeters, and whole meters)
3. Know and understand equivalent standard units of length:
12 inches = 1 foot, 3 feet = 1 yard
4. Select tools and units appropriate to the mass of the object being measured (grams and kilograms)
5. Measure mass, using grams
6. Select tools and units appropriate to the capacity being measured (milliliters and liters)
7. Measure capacity, using milliliters and liters

Students will use units to give meaning to measurements.

8. Make change, using combined coins and dollar amounts
9. Calculate elapsed time in hours and half hours, not crossing A.M./P.M.
10. Calculate elapsed time in days and weeks, using a calendar

Statistics & Probability

with Performance Indicators

Students will collect, organize, display, and analyze data.

1. Design investigations to address a question from given data
2. Collect data using observations, surveys, and experiments and record appropriately
3. Represent data using tables, bar graphs, and pictographs
4. Read and interpret line graphs

Students will make predictions that are based upon data analysis.

5. Develop and make predictions that are based on data
6. Formulate conclusions and make predictions from graphs