Minnesota Mathematics

Grade 4

Data Analysis

1 Data Sciences: Identify, formulate and investigate statistical questions by collecting data considering cultural perspectives, analyzing and interpreting data and communicating the results.

1 Notice and describe patterns in data-rich situations or two given related data sets that are descriptive and comparative. Ask meaningful statistical questions that can be answered with data. (MP7) ✣ 4.1.1.1

2 Collect and organize data to answer a statistical question, analyze variability and address missing, incomplete and bias in data. Represent data in a variety of ways, including technology. (MP1, MP5) # 4.1.1.2

3 Make predictions and recognize that how the data was collected impacts the reliability of predictions. (MP1, MP8) 4.1.1.3

4 Critically analyze data visualizations, including tables, double bar graphs, timelines, line plots or spreadsheets to support a claim and solve contextual situations. (MP3, MP7) $ # µ 4.1.1.4

2 Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.

1 Classify probability events involving dice, coins, spinners with equal and unequal partitions and blocks in a bag as impossible, certain, likely, unlikely and equally likely. (MP7) 4.1.2.1

2 Use a number line to connect the values of 0 to impossible, 1/2 to equally likely, and 1 to certain. Approximate locations on the number line where likely and unlikely would occur based on the situation. (MP4) 4.1.2.2

Spatial Reasoning

3 Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.

1 Classify angles as acute, right and obtuse by estimation, comparison with a right angle and by measurement. (MP6) ✣ 4.2.3.1

2 Determine lengths to the nearest sixteenth of an inch when measuring with inches and to the nearest tenth of a centimeter when measuring in centimeters. (MP6, MP8) 4.2.3.2

Measure angles with a protractor. (MP5) ☼ 4.2.3.3

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4 Determine the perimeter and area of two- dimensional figures and label with appropriate units. (MP2, MP6) ✣ ☼ 4.2.3.4

5 Find the areas of geometric figures that can be decomposed into rectangular shapes using tools like dot or grid paper. Label area measurements using square units. (MP2) 4.2.3.5

6 Explain why the area of a rectangle can be calculated by multiplying the length by the width and use the formula $AA = ll\ xx\ ww$ to calculate the area of rectangles with whole number side lengths. (MP3) 4.2.3.6

7 Make change up to $20 with place values, using $ and ¢ symbols appropriately. (MP7) $ 4.2.3.7

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4 Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.

1 Draw points, lines, line segments, rays, angles and perpendicular and parallel lines. Identify these in two-dimensional figures. (MP5) ☼ 4.2.4.1

2 Create representations of triangles given the relationships among the sides (scalene, isosceles, equilateral) and the angles (acute, right, obtuse). (MP1, MP6) ☼ 4.2.4.2

3 Sort and classify quadrilaterals in a hierarchy, including squares, rectangles, trapezoids, rhombuses, parallelograms and kites. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. (MP1, MP6) ✣ μ ☼ 4.2.4.3

4 Create a representation and describe the front, top and side views of three-dimensional figures composed of cubes and rectangular prisms. (MP5) 4.2.4.4

5 Draw the nets of cubes. Recognize nets that will and will not form cubes. (MP1) 4.2.4.5

Patterns and Relationships

5 Number Relationships: Describe/Interpret and use quantities, relationships between and representations of quantities and number systems. Describe and relate operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.

1 Recognize that in a multi-digit whole number, a digit in one place represents 10 times what it represents in the place to its right. (MP7) $ 4.3.5.1

2 Compare and order whole numbers from 0 to 1,000,000 with place value understanding, number lines and other tools using >, = and < symbols to record the results of comparisons. (MP4) $ 4.3.5.2

3 Estimate sums and differences, within 1,000,000 using strategies based on place value, approximation and properties of operations. (MP3) ✣ $ ☼ 4.3.5.3

4 Estimate products and quotients of multi-digit whole numbers by using simple multiplicative relationships, approximation and place value to assess the reasonableness of results. (MP1) $ ☼ 4.3.5.4

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5 Fluently multiply two numbers from 0 to 12 using flexible strategies based on the associative, commutative and distributive properties of multiplication. (MP6, MP7) 4.3.5.5

6 Use place value language to describe how to multiply a number by 10, 100 and 1,000. (MP7) 4.3.5.6

7 Flexibly decompose numbers into addends or factors to multiply two two-digit numbers with a one-digit number, by and up to a four-digit number. Justify the strategy using equations, rectangular arrays and area models. (MP2, MP7) µ 4.3.5.7

8 Solve contextual situations using division with dividends up to the thousands place and using one- digit divisors. Strategies may include using visual models, partial quotients, the commutative, associative and distributive properties and repeated subtraction. (MP7, MP8) $ µ 4.3.5.8

9 Solve multi-step contextual situations requiring the use of addition, subtraction and multiplication of multi-digit whole numbers. Use various strategies, including the relationship between operations, the use of technology and the context of the situation to assess the reasonableness of results. (MP4, MP7) $ ✜ 4.3.5.9

10 Read, write, represent and plot on a number line fractional values between 0 and 3, including mixed numbers and fractions greater than 1 with denominators of 2, 3, 4, 5, 6, 8, 10 and 12. Express whole numbers as fractions and recognize fractions that are equivalent to whole numbers. (MP6) 4.3.5.10

11 Explain why a fraction is equivalent to the bb product $aa\ xx$ 1 using visual models and language. bb (MP2) 4.3.5.11

12 Explain why a fraction is equivalent to a fraction $bb\ nn\ xx\ aa$ by using visual models, with attention to how $nn\ xx\ bb$ the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. (MP3) 4.3.5.12

13 Compare and order fractions between 0 and 3 and justify reasoning using pictures, position on a number line and selecting, when appropriate, among the strategies such as using a common numerator, referencing a benchmark and using a common denominator. (MP3) µ 4.3.5.13

14 Recognize the relationship between decimals and fractions. Read and write decimals and fractions in both decimal and fraction notations using words, symbols and expanded form. Recall the fraction and decimal equivalent forms of one-half, one- quarter and three-quarters. (MP7) $ 4.3.5.14

15 Compare and order decimal values to the hundredths and justify using place value language, a number line and models such as dimes, pennies, 10 x 10 grids and base 10 blocks. Use place value concepts to name and model equivalent forms of decimal values. (MP4) $ 4.3.5.15

16 Use visual models to add and subtract fractions with denominators of 2, 4 and 8 with results up to 2. (MP4) 4.3.5.16

17 Use the four operations to make financial decisions based on income, spending, saving, credit and charitable giving. (MP1) $ 4.3.5.17

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6 **Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.**

1. Use relational thinking to find a missing value in an open number sentence with multi-digit whole number multiplication and division expressions. Determine if the equation is true or false and justify your reasoning. (MP3) $ 4.3.6.1
2. Make conjectures and justifications using the distributive property to justify multi-digit multiplication with true/false and open number equations. (MP3) # 4.3.6.2

7 **Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.**

1. Develop an explicit rule that generalizes a visual pattern relating the figure number with the number of items in that figure. Use the rule to find the number of items in figure n. (MP7) µ 4.3.7.1
2. Use words to write a rule for multiplicative patterns to solve contextual situations. Compare and contrast pattern rules that are additive and multiplicative, using a variety of strategies including tables, drawings and algebraic equations with a symbol for the unknown number to represent the situation. (MP7, MP8) $ ☼ 4.3.7.2
3. Generate a number or shape pattern that follows a given descriptive rule. Identify and explain apparent features of the pattern that were not explicit in the rule itself. (MP1, MP3) $ ☼ 4.3.7.3