3rd Grade Mathematics

UNIT 1: Solving Problems with Data

ESSENTIAL QUESTION	BIG IDEAS
How can graphs help us interpret data, make predictions, and better understand the world in which we live?	Students make sense of graphs that display data.

GUIDING QUESTIONS

Content and Process

- How do scaled picture and bar graphs represent data in multiple categories? **3.MD.4**
- How can a scaled picture graph and a scaled bar graph be drawn to represent data in multiple categories? **3.MD.4**
- How can a scaled bar or picture graph be used to solve one-step and two-step “how many more” and “how many less” problems? **3.MD.4**

Reflective

- How do I know when data doesn’t make sense on a graph?
- How do I decide what data to collect to answer my questions?
- How do I decide how to informatively display my data?
- What features on a graph are helpful in interpreting the data?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.4 Model with mathematics

MP.6 Attend to precision

Content Standards - Assessed

3.MD.4 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

Supporting Standards - Not Assessed

3.OA.8 Solve two-step word problems using any of the four operations. Represent these problems using both situation equations and/or solution equations with a letter or symbol standing for the unknown quantity (refer to Table 1 and Table 2 and standard 3.OA.3). Assess the reasonableness of answers using mental computation and estimation strategies including rounding. This standard is limited to problems posed with whole numbers and having whole-number answers.

3rd Grade Mathematics

UNIT 1.5: Addition and Subtraction within 1000

ESSENTIAL QUESTION	BIG IDEAS
How does number sense help to add and subtract numbers efficiently, accurately and flexibly?	Students fluently add and subtract within 1000. Students explore rounding to the nearest ten and hundred.

GUIDING QUESTIONS

Content and Process

- How is knowledge of place value used to round to the nearest 10 or 100? **3.NBT.1**
- How are tools such as a hundreds chart or number line used to round to the nearest 10 or 100? **3.NBT.1**
- What strategies (*composing/decomposing by like base-10 units, using friendly or benchmark numbers, using related equations, compensation, number line*) are useful when adding and subtracting numbers within 1000? **3.NBT.2**
- What algorithms *(traditional, partial-sums, etc.)* are useful when adding and subtracting numbers within 1000? **3.NBT.2**
- How can mental math and estimation be used to determine if a solution is reasonable? **3.NBT.1, 3.NBT.2**

Reflective

- When and why might I round when adding or subtracting?
- How does rounding help me to determine if a sum or difference is reasonable?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.4 Model with mathematics

MP.6 Attend to precision

Content Standards- Assessed

3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.2 Fluently (efficiently, accurately, & flexibly) add and subtract within 1000 using strategies *(e.g. composing/decomposing by like base-10 units, using friendly or benchmark numbers, using related equations, compensation, number line, etc.)* and algorithms (including, but not limited to: traditional, partial-sums, etc.) based on place value, properties of operations, and/or the relationship between addition and subtraction.

3rd Grade Mathematics

UNIT 2: Thinking in Equal Groups

ESSENTIAL QUESTION	BIG IDEAS
How can equal groups be used to conceptually understand multiplication and division?	Students use equal groups to illustrate multiplication and division. Students understand the relationship between multiplication and division.

GUIDING QUESTIONS

Content & Process

- How is repeated addition related to multiplication? **3.OA.1**
- How can a division problem be modeled to find how many in each group? **3.OA.2**
- How can a division problem be modeled to find how many equal groups? **3.OA.2**
- How are equal groups related to multiplication and division? **3.OA.2**
- How do fact families relate multiplication and division? **3.OA.3**
- How are the associative and distributive properties used as a strategy to efficiently multiply numbers? **3.OA.5**
- How can knowledge of multiplication be used to solve related division questions? **3.OA.4, 3.OA.6**
- What patterns can be found when exploring multiplication and division? **3.OA.5, 3.OA.9**
- How can multiples of 10 be used as a strategy when multiplying? **3.NBT.3**

Reflective

- How do I visually prove the relationship between multiplication and division?
- How do I multiply and divide numbers using patterns and derived strategies from known facts?
- What patterns do I notice on a multiplication table?

FOCUS STANDARDS

Standards of Mathematical Practice
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

Content Standards- Assessed
3.OA.1 Interpret products of whole numbers, *(e.g. interpret 5 · 7 as the total number of objects in 5 groups of 7 objects each.*)
3.OA.2 Interpret whole-number quotients of whole numbers, *(e.g. interpret as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.)*
3.OA.4 Determine the unknown whole number in a multiplication or division equation by using related equations. *For example, determine the unknown number that makes the equation true in each of the*

equations.

8 ·? = 48; 5 =Δ÷ 3; 6 x 6 =___

3.OA.5 Apply properties of operations as strategies to multiply and divide. Examples: If $6 \cdot 4 = 24$ is known, then $4 \cdot 6 = 24$ is also known. (Commutative property of multiplication.) $3 \cdot 5 \cdot 2$ can be found by $3 \cdot 5 = 15$, then $15 \cdot 2 = 30$, or by $5 \cdot 2 = 10$, then $3 \cdot 10 = 30$. (Associative property of multiplication.) Knowing that $8 \cdot 5 = 40$ and $8 \cdot 2 = 16$, one can find $8 \cdot 7$ as $8 \cdot (5 + 2) = (8 \cdot 5) + (8 \cdot 2) = 40 + 16 = 56$. (Distributive property.) Students need not use formal terms for these properties.

3.OA.6 Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be* decomposed *into two equal addends.*

3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 *(e.g.* $9 \cdot 80, 5 \cdot 60$) using strategies based on place value and properties of operations.

Supporting Standards- Not Assessed

3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities*, (e.g. by using drawings and equations with a symbol for the unknown number to represent the problem.)*

3.OA.7 Fluently (efficiently, accurately, and flexibly) multiply and divide with single digit multiplications and related divisions using strategies *(e.g. relationship between multiplication and division, doubles, double and double again, half and then double, etc.)* or properties of operations.

3rd Grade Mathematics

UNIT 3: Tiling to Understand Area

ESSENTIAL QUESTION	BIG IDEAS
How can the connection between area and multiplication be visually represented?	Students understand the concept of area. Students make connections between area and multiplication. Students apply their knowledge of multiplication and division to solve word problems.

GUIDING QUESTIONS

Content and Process

- What is area and how is it measured? **3.MD.6a, 3.MD.6b, 3.MD.7**
- How is area measurement related to multiplication? **3.MD.8**
- How are tiles used to find the area of a rectangle? **3.MD.8a**
- How are the length and width of a rectangle used to find the area? **3.MD.8b, 3.OA.3**
- How can multiplication and division strategies be used to solve word problems involving equal groups, arrays, and measurement within 100? **3.OA.3**
- How are manipulatives and visual models used to represent situations involving multiplication and division? **3.OA.3**

Reflective

- In what situation would I need to find area?
- How do area models help me better understand multiplication?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.1 Make sense and persevere in solving problems.

MP.2 Reason abstractly and quantitatively.

Content Standards- Assessed

3.MD.6 Recognize area as an attribute of plane figures and understand concepts of area measurement.

- **3.MD.6a** A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of

area, and can be used to measure area (does not require standard square units).

- **3.MD.6b** A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units (does not require standard square units).

3.MD.7 Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard square units).

3.MD.8 Relate area to the operations of multiplication and addition.

- **3.MD.8a** Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
- **3.MD.8b** Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, *(e.g. by using drawings and equations with a symbol for the unknown number to represent the problem.)*

Supporting Standards- Not Assessed

3.OA.7 Fluently (efficiently, accurately, & flexibly) multiply and divide with single digit multiplications and related divisions using strategies *(e.g. relationship between multiplication and division, doubles, double and double again, half and then double, etc.)* or properties of operations.

3rd Grade Mathematics

UNIT 4: Seeing Multiplication as Area

ESSENTIAL QUESTION	BIG IDEAS
How can visual models be used to understand and calculate area and perimeter?	Students understand how area changes when perimeter changes. Students apply a variety of strategies to calculate the area of rectangles and rectilinear figures. Students efficiently, accurately, and flexibly multiply and divide.

GUIDING QUESTIONS

Content and Process

- How can a picture be drawn to show how area and multiplication are related? **3.MD.8**
- What strategies are used to find the area of different rectangles? **3.MD.8c, 3.MD.8d**
- How do area and perimeter change independently of each other? **3.MD.9**
- How can equations be used to find the unknown side lengths of rectangles? **3.MD.9**
- How can multiplication and division facts be solved fluently (efficiently, accurately, flexibly)? **3.OA.7**
- How can two-step problems be solved, using any of the four operations, by using a letter or symbol representing an unknown quantity in an equation? **3.OA.7**, **3.OA.8**

Reflective

- What strategies help me solve multiplication and division problems fluently?
- What are some different ways I can find the area of a rectangle?
- How does area change when perimeter changes?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.1 Make sense and persevere in solving problems.

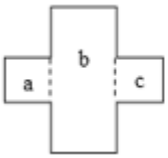
MP.3 Construct viable arguments and critique the reasoning of others.

Content Standards - Assessed

3.MD.8 Relate area to the operations of multiplication and addition.

- **3.MD.8c** Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \cdot b$ and $a \cdot c$. Use area models to represent the distributive property in mathematical reasoning.
- **3.MD.8d** Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Example:



Students can find the total area of the shape by finding the areas of a, b, and c and adding them together.

3.MD.9 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

3.OA.7 Fluently (efficiently, accurately, & flexibly) multiply and divide with single digit multiplications and related divisions using strategies *(e.g. relationship between multiplication and division, doubles, double and double again, half and then double, etc.)* or properties of operations.

3.OA.8 Solve two-step word problems using any of the four operations. Represent these problems using both situation equations and/or solution equations with a letter or symbol standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. This standard is limited to problems posed with whole numbers and having whole-number answers.

For Example:
A clown had 20 balloons. He sold some and has 12 left. Each balloon costs $2. How much money did he make?
Situation Equation: $20 - n = 12$
$n \times \$2 = \square$
Solution Equation: $20 - 12 = n$
$n \times \$2 = \square$

3rd Grade Mathematics

UNIT 5: Understanding 1/2

ESSENTIAL QUESTION	BIG IDEAS
How can models be used to show ½?	Students understand the relationship between the numerator and denominator. Students generate multiple ways to partition shapes into equal parts.

GUIDING QUESTIONS

Content and Process

- What is a fraction? **3.NF.1**
- What are different ways to represent ½ and how can it be proved? **3.NF.1**
- How are shapes partitioned into equal areas and represented as unit fractions? **3.G.2**
- How can you recognize and generate simple equivalent fractions and explain why they are equivalent? **3.NF.3a, 3.NF.3b**

Reflective

- How can I visually prove when something is ½ of a whole?
- How can the size of the whole change the meaning of ½?
- How can I predict what numbers I can find one half of?
- What does ½ mean? Tell or show as many different ways of thinking about ½ as you can.
- How can I generate multiple ways to partition a shape to represent a given benchmark fraction?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.

Content Standards- Assessed

3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by *a* parts of size $\frac{1}{b}$.

3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

For example, partition a shape into 4 parts with equal area, and describe the area of each part as $\frac{1}{4}$ of the area of the shape.

Supporting Standards- Not Assessed

3.NF.3 Explain equivalence of fractions, and compare fractions by reasoning about their size (it is a mathematical convention that when comparing fractions, the whole is the same size).

- **3.NF.3a** Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- **3.NF.3b** Recognize and generate simple equivalent fractions, *(e.g.* $\frac{1}{2}=\frac{2}{4}, \frac{4}{6}=\frac{2}{3}$*)* Explain why the fractions are equivalent, *e.g. by using a visual fraction model*.

3rd Grade Mathematics

UNIT 6: Seeing Fractions: The Parts and the Wholes

ESSENTIAL QUESTION	BIG IDEAS
How can models be used to show fractional relationships?	Students explore benchmark fractions and the relationship between part and whole. Students reason about the size of fractions.

GUIDING QUESTIONS

Content and Process

- How are fraction models used to visually represent fractions? **3.NF.1**
- How are fractions represented on a number line? **3.NF.2**
- How do you use the denominator of a fraction to represent intervals between consecutive whole numbers on a number line? **3.NF.2a, 3.NF.2b**
- What are equivalent fractions? **3.NF.3**
- How are visual fraction models, such as area models and number lines, used to generate and represent equivalent fractions? **3.NF.3a, 3.NF.3b**
- How are whole numbers represented as fractions? **3.NF.3c**
- How can two fractions with the same numerator or denominator be compared by reasoning about their size? **3.NF.3d**

Reflective

- How can I visually prove two fractions are equivalent using a variety of models?
- How can the size of the whole change the meaning of a fraction?
- How would I explain to a friend the relationship between the numerator and denominator of a fraction?
- How can I use what I know about fractions to compare two fractions?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

Content Standards- Assessed

3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

- **3.NF.2a** Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint of the part based at 0 locates the number $\frac{1}{b}$ on the number line.

Ex: 

- **3.NF.2b** Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off *a* lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line (*a* is the countable units of $\frac{1}{b}$ that determines the place on the number line).

3.NF.3 Explain equivalence of fractions, and compare fractions by reasoning about their size (it is a mathematical convention that when comparing fractions, the whole is the same size).

- **3.NF.3a** Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- **3.NF.3b** Recognize and generate simple equivalent fractions, *(e.g.* $\frac{1}{2}=\frac{2}{4}, \frac{4}{6}=\frac{2}{3}$*.)* Explain why the fractions are equivalent, *e.g. by using a visual fraction model*.
- **3.NF.3c** Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form* $3=\frac{3}{1}$*; recognize that* $\frac{6}{1}=6$*; locate* $\frac{4}{4}$ *and 1 at the same point of a number line diagram.*
- **3.NF.3d** Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the relational symbols >, <, =, or ≠, and justify the conclusions, (e.g. by using a visual fraction model.)

Supporting Standards- Not Assessed

- **3.NF.1** Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by *a* parts of size $\frac{1}{b}$.

3rd Grade Mathematics

UNIT 7: Solving Problems with Measurement

ESSENTIAL QUESTION	BIG IDEAS
How can measurement be used to solve problems?	Students understand the concept of time including time to the minute. Students estimate and solve problems involving mass and volume. Students measure lengths and represent the data visually.

GUIDING QUESTIONS

Content and Process

- How is time measured to the nearest minute? **3.MD.1**
- How are addition and subtraction used to solve problems involving time? **3.MD.1**
- What strategies (number line, analog clock, etc.) can be used to tell elapsed time? **3.MD.1**
- How are liquid volumes estimated and measured (customary and metric)? **3.MD.2**
- How are masses of objects estimated and measured (customary and metric)? **3.MD.2**
- How are addition, subtraction, multiplication, and division used to solve one-step problems involving mass or volume? **3.MD.3**
- How can length be measured to the nearest half or fourth of an inch using a ruler? **3.MD.5**
- How can line plots be created to represent measurement data? **3.MD.5**

Reflective

- What strategies help me when solving problems involving measurement?
- How can I determine which measurement is the most appropriate to use based on the situation?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

Content Standards- Assessed

3.MD.1 Tell and write time to the nearest minute using a.m. and p.m. and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, *(e.g. by representing the problem on a number line diagram.)*

3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l) (Excludes cubed units such as $cm\ cubed$ and finding the geometric volume of a container).

3.MD.3 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, *(e.g. by using drawings (such as a beaker with a measurement scale) to represent the problem.)* (Excludes multiplicative comparison problems)

3.MD.5 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

3rd Grade Mathematics

UNIT 8: Thinking Around Shapes

ESSENTIAL QUESTION	BIG IDEAS
How are the distances around shapes measured?	Students understand the attributes of shapes within different categories and use them to help determine perimeter. Students understand perimeter and how it is measured.

GUIDING QUESTIONS

Content and Process

- What is a quadrilateral and how can attributes (angles and sides) help classify quadrilaterals? **3.G.1**
- What is perimeter and how is it measured? **3.MD.9**
- How can the missing side length of a shape be found given the perimeter of the shape? **3.MD.9**
- What different rectangles can be made given a specific perimeter? **3.MD.9**
- How is the perimeter of irregular polygons found? **3.MD.9**
- How are patterns used to find the perimeter of any size rectangle? **3.MD.9**

Reflective

- How can I classify polygons by their attributes?
- When might finding the perimeter of something be useful?
- How can I find the perimeter of a shape?
- What patterns can I find when calculating the perimeter?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.5 Use appropriate tools strategically

MP.7 Look for and make use of structure

Content Standards- Assessed

3.G.1 Understand that shapes in different categories *(e.g. rhombuses, rectangles,* trapezoids, *kites and others)* may share attributes *(e.g. having four sides),* and that the shared attributes can define a larger category *(e.g.*

quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

3.MD.9 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.