# Math Expressions
## Grade 5 – Scope and Sequence

### Unit 1: Multiplication and Division Word Problems

<table>
<thead>
<tr>
<th>Resources:</th>
<th>Math Expressions (teach all lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>10 - 15 days (assuming a 60 minute lesson)</td>
</tr>
</tbody>
</table>

### Algebra & Functions:
- Solve for a missing number (blank, question mark, or variable) in an equation involving a single operation with whole numbers only.
- Solve number equations using strategies that demonstrate the commutative and associative properties.
- Extend or find a missing element in a numerical or simple geometric pattern involving addition, subtraction, multiplication, or division of whole numbers. Pattern must show 3 repetitions.
- Create or replicate a numerical or geometric pattern showing 3 repetitions of that pattern involving multiplication, subtraction, or division of whole numbers may be used.
- Form a rule based on a given pattern, or illustrate a pattern based on a given rule involving multiplication, subtraction, or division of whole numbers. Pattern must show 3 repetitions.
- Match a realistic situation to an equation, expression, inequality, table and graph (variable must be isolated).
- Use graphs and charts to create a story problem.
- Use a given equation/inequality to create a story problem.

### Order of Operations – Generate and solve algebraic equations that involve grouping with parenthesis – Unit 1:6

### Calculus:
- Use more than one measurement to determine the pattern/connection between the two measurements such as time and temperature. (The temperature dropped two degrees in one hour, four degrees in two hours. If this pattern continues, what would the projected temperature be in ten hours?)

### Computation & Estimation:
- Solve problems involving addition, subtraction, multiplication, and division of whole numbers (multipliers up to 2 digits, divisors or one digit) and decimals including money (answers through hundredths; no divisors with decimals).
- Use addition, subtraction, and division to compute without a calculator (multipliers up to 2-digits, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).
- Use mental math to complete addition, subtraction, multiplication, and division of whole numbers, benchmark decimals to hundredths, fractions (1/2, ¼, 1/10, %).
- Demonstrate fluency in using the following U.S. Algorithms:
  - 3-Digit and 4-Digit Multiplication (Whole Numbers)
  - 4-Digit by 1-Digit Division (Whole Numbers)
  - 4-Digit by 2-Digit Division (using multiples of 10)
  - Addition and Subtraction of fractions through sixteenths (like or unlike denominators, LCD is one denominator)
- Use the mathematical terms: addend, sum, factor, product, difference, remainder, divisor, dividend and quotient when performing the operation.
- Use estimation to solve problems involving whole numbers and/or decimals (up to 2-digit multipliers, 1-digit divisors).
digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).

**Number, Number Systems, and Number Relationships:**
- Write an equation to solve problems involving multiplication and division of whole numbers.
- Use multiplication to solve a division problem and relate to fact families, such as: 36 divided by \( \_ \) = 4 is the same as \( 4 \times \_ \) = 36 or vice versa.

**Problem Solving and Communication:**
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.*
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language.

**Reasoning and Connections:**
- Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.
- Use an if/then statement to support related data (e.g., if \( 5 \times 4 = 20 \) then, \( 50 \times 4 = 200 \)).
## MATH EXPRESSIONS
### GRADE 5 – SCOPE AND SEQUENCE

### UNIT 2: PERIMETER AND AREA

<table>
<thead>
<tr>
<th>Resources:</th>
<th>Math Expressions (teach all lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>7 – 10 days</td>
</tr>
</tbody>
</table>

### Calculus:
- Use tiles and cubes to estimate the area and volume of 2-dimensional and 3-dimensional objects.
- Use tiles and cubes to develop a formula that can be applied in similar situations.

### Measurement and Estimation:
- Determine the appropriate unit of measure in both customary (standard) and metric units (perimeter, area, weight or capacity/volume).
- Select the appropriate unit both customary (standard) and metric for measuring weight, mass), capacity, length, perimeter, and area.
- Use a ruler to measure to the nearest 1/8 of an inch or cm.
- Find the perimeter of a figure drawn and labeled (same units throughout).
- Determine the perimeter and area of quadrilaterals and regular polygons using drawings or representations to develop a formula.
- Estimate which polygon (shown on a grid) has a greater perimeter or area (compare perimeter to perimeter OR area to area).
- Estimate the area of an irregular figure shown on a grid. *including diagonals and curved with regrouping.*
- Use tiles and cubes to develop a formula that can be applied in similar situations.
- Convert using linear measurements, capacity, and weight (mass) within the same systems to the unit immediately above or below the given unit (using only the following units and including a conversion chart or hint: mm, cm, km, ml, L, g, kg, cup, pint, quart, gallon, in., ft., yd., oz., lb.)
- Add and subtract linear measurements, (ft. and in.) and units of time (hr. and min.) without having to regroup with subtraction (answer in simplest form).
- Solve problems involving weight, time, temperature, length and capacity (limited to 3 digits; same units throughout).

### Problem Solving and Communication:
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.*
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language.

### Reasoning and Connections:
- Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.

### Trigonometry:
- Label and identify types of triangle as determined by angle measurement and length of sides.
# UNIT 3: ADDITION AND SUBTRACTION OF WHOLE NUMBERS AND DECIMALS

<table>
<thead>
<tr>
<th>Resources:</th>
<th><em>Math Expressions</em> (teach all lessons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>20 – 25 days</td>
</tr>
</tbody>
</table>

## Algebra & Functions:
- Demonstrate understanding by applying the distributive property to order of operations problems.
- Solve number equations using strategies that demonstrate the commutative and associative properties.

## Calculus:
- Determine relationships using $>$, $<$, $\geq$, $\leq$, and $\neq$.

## Computation & Estimation:
- Solve problems involving $+$, $-$, $\times$, $\div$ of whole numbers (multipliers up to 2 digits, divisors or one digit) and decimals including money (answers through hundredths; no divisors with decimals).
- Use $+$, $-$, $\times$, $\div$ to compute without a calculator (multipliers up to 2-digits, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals). (M5.3.2.1)
- Use mental math to complete $+$, $-$, $\times$, $\div$ of whole numbers, benchmark decimals to hundredths, fractions ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$, $\frac{1}{5}$).
- Demonstrate fluency in using the following U.S. Algorithms:
  - 3-Digit and 4-Digit Multiplication (Whole Numbers)
  - 4-Digit by 1-Digit Division (Whole Numbers)
  - 4-Digit by 2-Digit Division (using multiples of 10)
- •Addition and Subtraction of fractions through sixteenths (like or unlike denominators, LCD is one denominator)
- Use the mathematical terms: addend, sum, factor, product, difference, remainder, divisor, dividend and quotient when performing the operation.
- Use estimation to solve problems involving whole numbers and/or decimals (up to 2-digit multipliers, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).
- Round whole numbers through millions and decimals through hundredths.

## Number, Number Systems, and Number Relationships:
- Compare whole numbers through 9 digits using the words more, less, equal, least, most, greater than, less than, or the symbols $>$, $<$, $\geq$, $\leq$.
- Compare and/or order decimals through the hundredths (limit to 4 numbers).
- Compare and/or order decimals through the thousandths using the appropriate symbol $>$, $<$, or $\geq$.
- Match the standard form to the word form of decimal numbers through hundredths. *and thousandths*
- Use appropriate sign to indicate the relationship between decimals (greater than or less than).
- Represent decimals through the thousandths using grids.
- Use expanded notation to represent whole number (less than 10,000,000) or decimals (through hundredths). *and thousandths*
• Identify the place value of a digit (millions through hundredths).

Problem Solving and Communication:
• Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.
• Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language.

Reasoning and Connections:
• Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.
• Use an if/then statement to support related data (e.g., if $5 \times 4 = 20$ then, $50 \times 4 = 200$).

Statistics & Data Analysis:
• Display and/or interpret data shown in tables, charts, pictographs, bar graphs, and line graphs using a title, appropriate scale, and labels. A grid will be provided to display data on bar graphs and line graphs.
• Construct a properly labeled graph including title, axis labels, and key.
• Compare information between graphs and tables.
• Use a graph with multiple categories to interpret and compare data.
• Use a graph to determine reasonableness of statement(s) by summarizing numerical findings.
## UNIT 4: CIRCLES, POLYGONS, AND ANGLES

<table>
<thead>
<tr>
<th>Resources:</th>
<th><em>Math Expressions</em> (skip lesson 4 and 6) <em>See PSSA Vocabulary (hypotenuse and leg)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>5 – 7 days</td>
</tr>
</tbody>
</table>

### Geometry:
- Identify and/or describe properties of all types of quadrilaterals (parallelogram, rectangle, rhombus, square, trapezoid).
- Identify, draw and/or label points, lines, line segments, and rays.
- Identify the number of lines of symmetry and/or draw all lines of symmetry in a two-dimensional polygon.

### Measurement and Estimation:
- Measure degrees in an angle up to 180 degrees with a protractor.
- Find the perimeter of a figure drawn and labeled (same units throughout).

### Problem Solving and Communication:
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written.

### Trigonometry:
- Label and identify types of triangle as determined by angle measurement and length of sides.
- Use mathematical vocabulary *
- Use a protractor to measure the angles of a right triangle to the nearest 5 degrees.

**Grade 5 Checklist requirements – not in Math Expressions.**
## UNIT 5: ADDITION AND SUBTRACTION WITH FRACTIONS

### Resources:
- *Math Expressions* (teach all lessons) *may condense lessons 1 – 10

### Estimated Timeframe:
- 20 – 25 days

### Computation & Estimation:
- Solve problems involving + and – of fractions through sixteenths for like and unlike denominators – for unlike denominators, the LCD must be one of the given denominators.
- Use mental math to complete +, -, x, ÷ of whole numbers, benchmark decimals to hundredths, fractions (½, ¼, 1/10, ⅕).
- Demonstrate fluency in using the following U.S. Algorithms:
  - 3-Digit and 4-Digit Multiplication (Whole Numbers)
  - 4-Digit by 1-Digit Division (Whole Numbers)
  - 4-Digit by 2-Digit Division (using multiples of 10)
  - Addition and Subtraction of fractions through sixteenths (like or unlike denominators, LCD is one denominator)
- Use the mathematical terms: addend, sum, factor, product, difference, remainder, divisor, dividend and quotient when performing the operation.

### Number, Number Systems, and Number Relationships:
- Compare proper fractions through sixteenths with like and unlike denominators. *Using the appropriate symbol >, <, or =.
- Use or develop regions and/or sets to model fractions and mixed numbers through hundredths (may include reducing the fractions).
- Recognize common equivalents for percents, fractions, and decimals (e.g.10%, 25%, 50%, 75%, and 100%).
- Define and identify Greatest Common Factor (GCF) and Least Common Multiple (LCM) when listing factors and multiples.

### Probability and Predictions:
- Determine the probability of an outcome (example: coin toss, roll of # cube) and express as a fraction without reduction.

### Problem Solving and Communication:
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language. [See attached PSSA Assessment](#) [Anchor Glossary.]

### Reasoning and Connections:
- Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.
- Use an if/then statement to support related data (e.g., if 5 x 4 = 20 then, 50 x 4 = 200).
# MATH EXPRESSIONS
GRADE 5 – SCOPE AND SEQUENCE

## UNIT 6: VOLUME, CAPACITY, AND WEIGHT

<table>
<thead>
<tr>
<th>Resources:</th>
<th>Math Expressions (teach all lessons, including optional – temperature lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>7 – 9 days</td>
</tr>
</tbody>
</table>

### Calculus:
- Use tiles and cubes to estimate the area and volume of 2-dimensional and 3-dimensional objects.
- Use tiles and cubes to develop a formula that can be applied in similar situations.

### Computation & Estimation:
- Solve problems involving +, -, x, ÷ of whole numbers (multipliers up to 2 digits, divisors or one digit) and decimals including money (answers through hundredths; no divisors with decimals).
- Use +, -, x, ÷ to compute without a calculator (multipliers up to 2-digits, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).
- Use mental math to complete +, -, x, ÷ of whole numbers, benchmark decimals to hundredths, fractions ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$, $\frac{1}{5}$).

### Measurement and Estimation:
- Determine the appropriate unit of measure in both customary (standard) and metric units (perimeter, area, weight or capacity/volume).
- Select the appropriate unit both customary (standard) and metric for measuring weight (mass), capacity, length, perimeter, and area.
- Calculate elapsed time to determine and/or compare elapsed time to the minute within AM or PM.
- Convert using linear measurements, capacity, and weight (mass) within the same systems to the unit immediately above or below the given unit (using only the following units and including a conversion chart or hint: mm, cm, km, ml, g, kg, cup, pint, quart, gallon, in., ft., yd., oz., lb.)
- Use tiles and cubes to develop a formula that can be applied in similar situations.
- Add and subtract linear measurements, (ft. and in.) and units of time (hr. and min.) without having to regroup with subtraction (answer in simplest form).
- Solve problems involving weight, time, temperature, length and capacity (limited to 3 digits; same units throughout).
- Use concrete objects to demonstrate the meaning of volume by adding total units that fit into a 3-D figure.
- Develop strategies that demonstrate volume formulas.

### Number, Number Systems, and Number Relationships:
- Locate/identify integers on a number line (greater than or equal to -20).
- Identify negative temperatures on a thermometer (through -20 degrees C).

### Problem Solving and Communication:
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.*
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written.
Reasoning and Connections:

- Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.
Resources: Math Expressions

Estimated Timeframe: 23 – 25 days

Computation & Estimation:
- Solve problems involving +, -, x, ÷ of whole numbers (multipliers up to 2 digits, divisors or one digit) and decimals including money (answers through hundredths; no divisors with decimals).
- Use +, -, x, ÷ to compute without a calculator (multipliers up to 2-digits, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).
- Use mental math to complete +, -, x, ÷ of whole numbers, benchmark decimals to hundredths, fractions (½, ¼, ⅕).
- Demonstrate fluency in using the following U.S. Algorithms:
  - 3-Digit and 4-Digit Multiplication (Whole Numbers)
  - 4-Digit by 1-Digit Division (Whole Numbers)
  - 4-Digit by 2-Digit Division (using multiples of 10)
  - Addition and Subtraction of fractions through sixteenths (like or unlike denominators, LCD is one denominator)
- Use the mathematical terms: addend, sum, factor, product, difference, remainder, divisor, dividend and quotient when performing the operation.
- Represent and interpret the remainder as a whole number remainder, a fraction.
- Use estimation to solve problems involving whole numbers and/or decimals (up to 2-digit multipliers, 1-digit divisors or multiples of 10; whole numbers through thousands and decimals through hundredths; no divisors with decimals).
- Round whole numbers through millions and decimals through hundredths.

Number, Number Systems, and Number Relationships:
- Convert between common fractions, decimals and percents.
- Write an equation to solve problems involving multiplication and division of whole numbers.
- Use multiplication to solve a division problem and relate to fact families, such as: 36 divided by __ = 4 is the same as 4 x __ = 36 or vice versa.

Problem Solving and Communication:
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language. (See attached PSSA Assessment Anchor Glossary.)

Statistics & Data Analysis:
- Collect authentic data from classroom or home and organize it into a useful form for analyzing.
  **Grade 5 Checklist requirements – not in Math Expressions.
- Display and/or interpret data shown in tables, charts, pictographs, bar graphs, and line graphs using a title, appropriate scale, and labels. A grid will be provided to display data on bar graphs and line graphs.
MATH EXPRESSIONS
GRADE 5 – SCOPE AND SEQUENCE

- Construct a properly labeled graph including title, axis labels, and key.
- Compare information between graphs and tables.
- Determine the mean/average (answer is a whole number), median (answer is a whole number or average of two numbers), and range of data (up to 10 numbers).
- Identify the mode in a set of data (up to 10 numbers).
- Use a graph with multiple categories to interpret and compare data.
- Use a graph to determine reasonableness of statement(s) by summarizing numerical findings.
# UNIT 8: ALGEBRA, FUNCTIONS, AND GRAPHS

<table>
<thead>
<tr>
<th>Resources:</th>
<th>Math Expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>7-9 days</td>
</tr>
</tbody>
</table>

## Algebra & Functions:
- Demonstrate understanding by applying the distributive property to order of operations problems.
- Solve for a missing number (blank, question mark, or variable) in an equation involving a single operation with whole numbers only.
- Solve number equations using strategies that demonstrate the commutative and associative properties.
- Extend or find a missing element in a numerical or simple geometric pattern (+, -, x, and ÷ of whole numbers.) Pattern must show 3 repetitions.
- Create or replicate a numerical or geometric pattern showing 3 repetitions of that pattern (+, -, x, division of whole numbers may be used).
- Form a rule based on a given pattern, or illustrate a pattern based on a given rule (+, -, x, division of whole numbers). Pattern must show 3 repetitions.
- Match a realistic situation to an equation, expression, inequality, table and graph (variable must be isolated).
- Use graphs and charts to create a story problem.
- Use a given equation/inequality to create a story problem.

## Calculus:
- Solve problems involving +, -, x, ÷ of whole numbers (multipliers up to 2 digits, divisors or one digit) and decimals including money (answers through hundredths; no divisors with decimals).

## Geometry:
- Plot, locate and identify points in Quadrant I, on the x and y axis, using a sale of 1, 2, 5, or 10 on a 100 by 100 grid. Points will not be in-between lines.

## Number, Number Systems, and Number Relationships:
- Understand basic exponential notation using powers of 10.
- Define/list/identify prime and composite numbers less than or equal to 100.
- Define/list/identify factors and/or multiples of a given whole number less than or equal to 50. *or to 100.
- Define 0 and 1 as neither prime nor composite.
- Define and identify Greatest Common Factor (GCF) and Least Common Multiple (LCM) when listing factors and multiples.
- Write an equation to solve problems involving multiplication and division of whole numbers.
## UNIT 9: MULTIPLICATION AND DIVISION WITH FRACTIONS

### Resources:

*Math Expressions*

### Estimated Timeframe:

15 – 17 days

### Computation & Estimation:

- Use models to demonstrate $x$ of fractions using denominators up to 12.
- Solve problems involving + and – of fractions through sixteenths for like and unlike denominators – for unlike denominators, the LCD must be one of the given denominators.
- Convert between common fractions, decimals and percents.

**Unit 9 Division and Multiplication of fractions is extensive and not addressed within Grade 5 Checklist.**

### Number, Number Systems, and Number Relationships:

- Recognize common equivalents for percents, fractions, and decimals (e.g., 10%, 25%, 50%, 75%, and 100%).
- Convert between common fractions, decimals and percents.

### Reasoning and Connections:

- Use models, words, properties, etc. to explain the validity of mathematical conclusions. Explanations may include the use of distributive, commutative, associative, and identity properties.
- Use an if/then statement to support related data (e.g., if $5 \times 4 = 20$ then, $50 \times 4 = 200$).
<table>
<thead>
<tr>
<th>Resources:</th>
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<tbody>
<tr>
<td>Estimated Timeframe:</td>
<td>5 days</td>
</tr>
</tbody>
</table>

**Algebra & Functions:**
- Extend or find a missing element in a numerical or simple geometric pattern (+, -, x, and ÷ of whole numbers.) Pattern must show 3 repetitions.
- Create or replicate a numerical or geometric pattern showing 3 repetitions of that pattern (+, -, x, division of whole numbers may be used).
- Form a rule based on a given pattern, or illustrate a pattern based on a given rule (+, -, x, division of whole numbers). Pattern must show 3 repetitions.

**Geometry:**
- Draw or identify a translation (slide), reflection (flip), and rotation (turn) of two-dimensional shape.
- Plot, locate, and identify points in Quadrant I, on the x and y axis, using a sale of 1, 2, 5, or 10 on a 100 by 100 grid. Points will not be in-between lines.
**UNIT 11: RATIO, PROPORTION, AND PERCENT**

**Resources:**  *Math Expressions*

**Estimated Timeframe:**  17-19 days

**Algebra & Functions:**
Match a realistic situation to an equation, expression, inequality, table and graph (variable must be isolated).
Use graphs and charts to create a story problem.
Use a given equation/inequality to create a story problem.

**Probability and Predictions:**
- Determine the probability of an outcome.
- Predict or determine whether some outcomes are certain, more likely, less likely, equally likely, or impossible (information could be represented by pictographs, bar graphs, charts, tables and/or spinners).
- Determine the probability of an outcome (example: coin toss, roll of # cube) and express as a fraction without reduction.
- Determine the probability of an outcome and express as a decimal.
- Use an organized format to list all possible combinations or outcomes of an experiment.
- Use the likelihood of an event and the actual event to compare the actual results to the predicted results.

**Problem Solving and Communication:**
- Choose the correct operations to solve a problem (no more than 2 operations). *and choose the appropriate strategy.*
- Choose and explain the mathematical tools (graphs, vocabulary, and symbols, etc.) necessary to solve a problem through written and spoken language.
<table>
<thead>
<tr>
<th>UNIT 12: THREE-DIMENSIONAL FIGURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resources:</strong> Math Expressions</td>
</tr>
<tr>
<td><strong>Estimated Timeframe:</strong> 4-6 days</td>
</tr>
<tr>
<td><strong>Geometry:</strong></td>
</tr>
<tr>
<td>• Identify and/or classify cubes, rectangular prisms, and pyramids using faces, vertices, and edges.</td>
</tr>
<tr>
<td><strong>Unit 12 Three Dimensional Figures is extensive and not addressed within Grade 5 Checklist.</strong></td>
</tr>
</tbody>
</table>