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OPERATIONS AND ALGEBRAIC THINKING

USE THE FOUR OPERATIONS WITH WHOLE NUMBERS TO SOLVE PROBLEMS

4. OA. A.1
Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

MUTLIPLICATION AS COMPARISON PROBLEMS ............................................. 005

4. OA. A.2
Multiply or divide to solve word problems involving multiplicative comparison e.g., by using drawings and equations with a symbol of unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

WORD PROBLEMS: MULTIPLICATIVE COMPARISON ............................................. 009

4. OA. A.3
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

WORD PROBLEMS: INTERPRETING REMAINDERS ............................................. 014

LITERATURE LINK TASK CARDS:
   A REMAINDER OF ONE ................................................................. 019
   BEAN THIRTEEN ............................................................... 020
   THE GREAT DIVIDE ............................................................ 021
   365 PENGUINS ............................................................. 022
   SNOWFLAKE BENTLEY ...................................................... 023
   REMAINDER RIDDLE ............................................................ 024
   WORD PROBLEMS: MULTI-STEP .................................................. 025

GAIN FAMILIARITY WITH FACTORS AND MULTIPLES

4. OA. B.4
Find all factor pairs for a whole number in the range of 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range of 1-100 is prime or composite.

EXPLORING MULTIPLES ................................................................. 030
PRIME OR COMPOSITE .......................................................... 033
PRIME NUMBER INVESTIGATION .................................................. 034
HOW MANY FACTORS? ............................................................ 035
CLIMB THE FACTOR LADDER ................................................... 036
FINDING ALL FACTORS OF A NUMBER ............................................ 039
FACTOR RIDDLES ................................................................. 040
GENERATE AND ANALYZE PATTERNS

4. OA. C.5
Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

SQUARE NUMBERS ................................................................. 041
SQUARE NUMBER SKYSCRAPER ........................................... 042
LITERATURE LINK TASK CARD:
   SEA SQUARES ............................................................... 043
TRIANGULAR NUMBERS ...................................................... 044
NUMERIC PATTERNS .......................................................... 045
PATTERNS IN PRODUCTS (V. 1) ........................................... 046
PATTERNS IN PRODUCTS (V. 2) ........................................... 047
PATTERNS IN SQUARES ..................................................... 048
PATTERNS IN RECTANGLES .................................................. 050
NUMBER AND OPERATIONS IN BASE TEN

GENERALIZE PLACE VALUE UNDERSTANDING FOR MULTI-DIGIT WHOLE NUMBERS

4. NBT. A.1
Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that $700 \div 70 = 10$ by applying concepts of place value and division.

TRUE OR FALSE? – PLACE VALUE SORT .......................... 055
TRUE OR FALSE? – RENAME IT! ...................................... 058
COMPARING DIGITS ...................................................... 061

4. NBT. A.2
Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.

PLACE VALUE TRIANGLE .................................................. 063
WHAT NUMBER AM I? ..................................................... 065
NUMERAL, WORD AND EXPANDED FORM ....................... 066
COMPARE ................................................................. 067
PLACE VALUE PUZZLE ..................................................... 070

GENERATE AND ANALYZE PATTERNS

4. NBT. A.3
Use place value understanding to round multi-digit whole numbers to any place.

WHAT’S THE NEAREST?
TEN (3-DIGIT) ............................................................. 071
TEN (4-DIGIT) ............................................................. 072
HUNDRED (4-DIGIT) .................................................... 074
THOUSAND ............................................................... 076
TEN THOUSAND ......................................................... 078

ROLL AND ROUND
NEAREST TEN (3-DIGIT) .............................................. 080
NEAREST HUNDRED (4-DIGIT) ................................. 083
NEAREST THOUSAND (5-DIGIT) ............................... 086
USE PLACE VALUE UNDERSTANDING AND PROPERTIES OF OPERATIONS TO PERFORM MULTI-DIGIT ARITHMETIC

4. NBT. B.4
Fluently add and subtract multi-digit whole numbers using the standard algorithm.

MAKE THE LARGEST SUM ............................................................. 089
MAKE THE SMALLEST SUM ........................................................... 090
WRITE AND SOLVE V. 1-2 ......................................................... 091
ADDITION AND SUBTRACTION BOARD ......................................... 093

4. NBT. B.5
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

MODEL MULTIPLICATION
WITH BASE TEN BLOCKS ............................................................. 095
DECOMPOSE A FACTOR ................................................................. 096
MULTIPLY BY 10s, 100s, AND 1000s ............................................ 097
ESTIMATE PRODUCTS BY ROUNDING ......................................... 098
ESTIMATE PRODUCTS ................................................................. 099
USE PARTIAL PRODUCTS
TO MULTIPLY (V. 1-3) ............................................................... 100
USE AN AREA MODEL
TO MULTIPLY (V. 1-3) ............................................................... 107
MULTIPLICATION STRATEGY:
DOUBLING AND HALVING ......................................................... 114
DOUBLE AND HALVE (V. 1) ......................................................... 116
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MAKE THE LARGEST PRODUCT
(3 X 1-DIGIT) ........................................................................ 122
(4 X 1-DIGIT) ........................................................................ 123
(2 X 2-DIGIT) ........................................................................ 124
MAKE THE SMALLEST PRODUCT
(3 X 1-DIGIT) ........................................................................ 125
(4 X 1-DIGIT) ........................................................................ 126
(2 X 2-DIGIT) ........................................................................ 127
MULTIPLICATION RACE (1 X 3-DIGIT) .......................................... 128
MULTIPLICATION RACE (2 X 2-DIGIT) .......................................... 130
WRITE AND SOLVE:
MULTIPLICATION (V. 1) ............................................................. 132
MULTIPLICATION (V. 2) ............................................................. 133
MULTIPLICATION (V. 3) ............................................................. 134
MULTIPLICATION (V. 4) ............................................................. 135
4. NBT. B.6
Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or relationships between multiplications and division.

DIVISION STRATEGY:
- PARTIAL QUOTIENTS (V. 1) ....................................................... 136
- PARTIAL QUOTIENTS (V. 2) ....................................................... 138
- PARTITION THE DIVIDEND (V. 1) .............................................. 140
- PARTITION THE DIVIDEND (V. 2) .............................................. 142
- WHO HAS THE LARGEST QUOTIENT? (V. 1) ................................ 144
- WHO HAS THE LARGEST QUOTIENT? (V. 2) ................................ 145
- ESTIMATE THE QUOTIENT (V. 1) ............................................. 146
- ESTIMATE THE QUOTIENT (V. 2) ............................................. 149
- WRITE IT, SOLVE IT, CHECK IT! (V. 1) .................................... 152
- WRITE IT, SOLVE IT, CHECK IT! (V. 2) .................................... 153
- REMAINERS ................................................................. 154
NUMBER AND OPERATIONS: FRACTIONS

EXTEND UNDERSTANDING OF FRACTION EQUIVALENCE AND ORDERING

4. NF. A. 1
Explain why a fraction a/b is equivalent to a fraction (n x a) / (n x b) by using visual fraction models, with attention to how 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.

BUILD A FRACTION WALL .......................................................... 159
IS IT EQUIVALENT? .................................................................. 162
EQUIVALENT FRACTION ROLL ............................................... 164
EQUIVALENT FRACTIONS: SET MODEL ................................... 165
EQUIVALENT FRACTIONS ON A MULTIPLICATION GRID .......... 166
EQUIVALENT FRACTIONS: DOMINOES .................................... 168

4. NF.A. 2
Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with comparisons with symbols >, =, or < and justify the conclusions, e.g., by using a visual fraction model.

COMPARING FRACTIONS TO A BENCHMARK ............................. 169
BIRTHDAY FRACTIONS .............................................................. 175
WHO ATE MORE? ..................................................................... 176
SNACK TIME ............................................................................ 177

BUILD FRACTIONS FROM UNIT FRACTIONS BY APPLYING AND EXTENDING PREVIOUS UNDERSTANDINGS OF OPERATIONS ON WHOLE NUMBERS

4. NF.B.3
Understand a fraction a/b with a > 1 as a sum of fractions 1/b.

A Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

FRACTION ADDITION WITH:
PATTERN BLOCKS ................................................................. 178
ADDING LIKE FRACTIONS ..................................................... 179
SUBTRACTION LIKE FRACTIONS ........................................... 180
PETER'S CHOCOLATE BAR ................................................... 181
SENSE OR NONSENSE PROBLEMS ...................................... 182
LITERATURE LINK TASK CARD:
PICTURE PIE (V. 2) ............................................................... 183
Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. Examples:

\[ \frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}; \quad \frac{3}{8} = \frac{1}{8} + \frac{2}{8}; \]
\[ 2 \frac{1}{8} = 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8} \]

DECOMPOSE A FRACTION ......................................................... 184
PIZZA SHARE ........................................................................ 185

Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

RENAMEING FRACTIONS GREATER THAN ONE ......................... 186
ADD AND COMPARE: MIXED NUMBERS .................................. 187
SUBTRACT AND COMPARE: MIXED NUMBERS .......................... 189
WORD PROBLEMS:
  ADDING AND SUBTRACTING MIXED NUMBERS ..................... 191

Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

ADD AND COMPARE ............................................................... 196
SUBTRACT AND COMPARE ..................................................... 198
WORD PROBLEMS:
  ADDING AND SUBTRACTING FRACTIONS ............................. 200
WRITE AND SOLVE: FRACTIONS .............................................. 205

4. NF.B.4
Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

A Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent 5/4 as the product as 5 x (x ¼), recording the conclusion by the equation 5/4 = 5 (x ¼).

MULTIPLY A UNIT FRACTION BY A WHOLE NUMBER ............... 206
TRIANGLE FRACTIONS .......................................................... 207
QUADRILATERAL FRACTIONS .................................................. 208

B Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express 3 x (2/5) as 6 x (1/5), recognizing this product as 6/5. (In general, n x (a/b) = (n x a) / b).

MULTIPLY A FRACTION BY A WHOLE NUMBER ....................... 209
C. Solve word problems involving multiplication of a fraction by a whole number, e.g. by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?

**WORD PROBLEMS: MULIPLY A FRACTION**
**BY A WHOLE NUMBER** .......................................................... 210

**WORD PROBLEMS: MULTIPLY A MIXED NUMBER**
**BY A WHOLE NUMBER** .......................................................... 215

**LITERATURE LINK TASK CARD:**
**FULL HOUSE** ............................................................................. 220

**UNDERSTAND DECIMAL NOTATION FOR FRACTIONS**
**AND COMPARE DECIMAL FRACTIONS**

4. **NF. C.5**
Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

**SUMS OF ONE** ............................................................................. 221

**ADD FRACTIONS WITH**
**DENOMINATORS 10 AND 100** .......................................................... 224

4. **NF. C.6**
Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

**FRACTIONS AND DECIMALS** .......................................................... 226

4. **NF. C.7**
Compare two decimals to hundredths by reasoning about their size. Recognize that comparison are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

**DECIMAL SORT** ............................................................................. 228

**COMPARING DECIMALS** .......................................................... 229
MEASUREMENT AND DATA

SOLVE PROBLEMS INVOLVING MEASUREMENT
AND CONVERSION OF MEASUREMENTS FROM A
LARGER UNIT TO A SMALLER UNIT

4. MD.A.1
Know relative sizes of measurement units within one system of units
including km, m, cm; kg, g; lb, oz; l, ml; hr, mins, sec. With a single
system of measurement, express measurements in a larger unit in terms
of a smaller unit. Record measurement equivalents in a two-column table.
For example, know that 1 ft. is 12 times as long as 1 in. Express the length
of a 4ft snake as 48 in. Generate a conversion table for feet and inches
listing the number pairs (1, 12), (2, 24), (3, 36).

MAKING A KILOGRAM ................................................................. 237
MAKING A POUND .................................................................. 238
ONE GALLON ......................................................................... 239
MEASUREMENT CONCENTRATION (V. 1) ................................. 241
MEASUREMENT CONCENTRATION (V. 2) ................................... 245
CAPACITY CREATURE ............................................................... 248

4. MD. A.2
Use the four operations to solve word problems involving distances,
intervals of time, liquid volumes, masses of objects, and money, including
problems involving simple fractions of decimals, and problems that require
expressing measurements given in a large unit in terms of a smaller unit.
Represent measurement quantities using diagrams such as number line
diagrams that feature a measurement scale.

WORD PROBLEMS: MEASUREMENT CONVERSION .................. 251

4. MD. A.3
Apply the area and perimeter formulas for rectangles in real word and
mathematical problems. For example, find the width of a rectangular room
given the area of the flooring and the length, by viewing the area formula
as a multiplication equation with an unknown factor.

A DINNER PARTY .................................................................. 256
HOW MANY TABLES? ............................................................. 257
FENCING A GARDEN ............................................................. 258
DESIGNING A ZOO ENCLOSURE ............................................. 259
REPRESENT AND INTERPRET DATA

4. MD. B.4
Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

OBJECTS IN MY DESK LINE PLOT ................................................................. 260
LENGTH OF ANTS LINE PLOT .................................................................. 261

GEOMETRIC MEASUREMENT: UNDERSTAND CONCEPTS OF ANGLE AND MEASURE ANGLES

4. MD. C.5
Recognize angles as geometric shapes that are formed whenever two rays share a common endpoint, and understand concepts of angle measurement:

A An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles.

B An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

ANGLES IN CIRCLES .................................................................................. 262

4. MD. C.6
Measure angles in whole-number degrees using a protractor.
Sketch angles of specified measure.

PREDICTING AND MEASURING ANGLES .................................................. 264
HOW MANY DEGREES? .......................................................................... 266
ANGLE BARRIER GAME ........................................................................... 267
ANGLES IN A RIGHT TRIANGLE ............................................................... 270
ANGLES IN TRIANGLES .......................................................................... 271
ANGLES IN QUADRILATERALS ................................................................. 273
4.MD.C.7
Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measures.

ANGLE MEASURES (V. 1) ................................................................. 275
ANGLE MEASURES (V. 2) ................................................................. 276
ANGLE MEASURES (V. 3) ................................................................. 277
PATTERN BLOCK ANGLES .............................................................. 278
WORD PROBLEMS:
UNKNOWN ANGLES ................................................................ 279
GEOMETRY

DRAW AND IDENTIFY LINES AND ANGLES, AND CLASSIFY SHAPES BY PROPERTIES OF THEIR LINES AND ANGELS

4. G.A.1
Draw points, line, line segments, rays, angles, (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

ALPHABET LINES .......................................................... 285
GEOBOARD LINE SEGMENTS ........................................... 286
ANGLES ON THE GEOBOARD ........................................... 287
ANGLE BARRIER GAME .................................................... 288
NAME GEOMETRY .......................................................... 291

4. G.A.2
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

CLASSIFYING 2D FIGURES .................................................. 292
CONSTRUCTING QUADRILATERALS .................................... 293
QUADRILATERAL CRITERIA ............................................... 294
RIGHT TRIANGLES ON THE GEOBOARD ............................ 296
SORTING RIGHT TRIANGLES ............................................. 297

4. G.A.3
Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line symmetric figures and draw lines of symmetry.

SYMMETRY ON THE GEOBOARD ........................................ 299
SYMMETRY IN REGULAR POLYGONS ................................. 300
SYMMETRICAL COIN DESIGN ........................................... 302
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SYMMETRICAL DESIGN ..................................................... 304