OA Operations and Algebraic Thinking

- **3.OA.A Represent and solve problems involving multiplication and division.**
  - **3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in five groups of seven objects each.**
    - Count equal groups (3-E.1)
    - Identify multiplication expressions for equal groups (3-E.2)
    - Write multiplication sentences for equal groups (3-E.3)
    - Relate addition and multiplication for equal groups (3-E.4)
    - Identify multiplication expressions for arrays (3-E.5)
    - Write multiplication sentences for arrays (3-E.6)
    - Make arrays to model multiplication (3-E.7)
    - Write multiplication sentences for number lines (3-E.8)
    - Relate addition and multiplication (3-N.10)
  - **3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 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.**
    - Divide by counting equal groups (3-I.1)
    - Write division sentences for groups (3-I.2)
    - Write division sentences for arrays (3-I.4)
  - **3.OA.A.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.**
    - Multiplication word problems (3-H.6)
    - Multiplication word problems: find the missing factor (3-H.7)
    - Division word problems (3-L.5)
    - Multiplication and division word problems (3-M.10)
    - Solve for the variable: multiplication and division only (3-O.3)
    - Write variable equations to represent word problems: multiplication and division only (3-O.5)
  - **3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.**
    - Multiplication facts for 2, 3, 4, 5, and 10: find the missing factor (3-G.4)
    - Multiplication facts for 6, 7, 8, and 9: find the missing factor (3-G.8)
    - Multiplication facts up to 10: find the missing factor (3-G.12)
    - Division facts up to 10: find the missing number (3-K.10)
- **3.OA.B Understand properties of multiplication and the relationship between multiplication and division.**
  - **3.OA.B.5 Apply properties of operations to multiply.**
    - Multiply one-digit numbers by two-digit numbers using area models I (3-H.10)
    - Multiply one-digit numbers by two-digit numbers using area models II (3-H.11)
    - Multiply one-digit numbers by three-digit numbers using area models I (3-H.14)
    - Multiply one-digit numbers by three-digit numbers using area models II (3-H.15)

        - Properties of multiplication (3-N.6)
        - Distributive property: find the missing factor (3-N.7)
        - Multiply using the distributive property (3-N.8)
        - Solve using properties of multiplication (3-N.9)
        - Relate multiplication and division (3-N.11)
    - **3.OA.B.6 Understand division as an unknown-factor problem.**
        - Relate multiplication and division for groups (3-I.3)
        - Relate multiplication and division for arrays (3-I.5)
- **3.OA.C Multiply and divide within 100.**
    - **3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 × 5 = 8) or properties of operations. By the end of grade 3, know from memory all products of two single-digit numbers and related division facts.**
        - Multiply by 0 (3-F.1)
        - Multiply by 1 (3-F.2)
        - Multiply by 2 (3-F.3)
        - Multiply by 3 (3-F.4)
        - Multiply by 4 (3-F.5)
        - Multiply by 5 (3-F.6)
        - Multiply by 6 (3-F.7)
        - Multiply by 7 (3-F.8)
        - Multiply by 8 (3-F.9)
        - Multiply by 9 (3-F.10)
        - Multiply by 10 (3-F.11)
        - Multiplication tables for 2, 3, 4, 5, and 10 (3-G.1)
        - Multiplication facts for 2, 3, 4, 5, and 10: true or false? (3-G.2)
        - Multiplication facts for 2, 3, 4, 5, and 10: sorting (3-G.3)
        - Multiplication tables for 6, 7, 8, and 9 (3-G.5)
        - Multiplication facts for 6, 7, 8, and 9: true or false? (3-G.6)
        - Multiplication facts for 6, 7, 8, and 9: sorting (3-G.7)
        - Multiplication tables up to 10 (3-G.9)
        - Multiplication facts up to 10: true or false? (3-G.10)
        - Multiplication facts up to 10: sorting (3-G.11)
        - Multiplication facts up to 10: select the missing factors (3-G.13)
        - Multiplication sentences up to 10: true or false? (3-G.14)
        - Squares up to 10 x 10 (3-G.20)
        - Multiplication input/output tables (3-H.4)
        - Divide by 1 (3-J.1)
        - Divide by 2 (3-J.2)
        - Divide by 3 (3-J.3)
        - Divide by 4 (3-J.4)
        - Divide by 5 (3-J.5)
        - Divide by 6 (3-J.6)
        - Divide by 7 (3-J.7)
        - Divide by 8 (3-J.8)
        - Divide by 9 (3-J.9)
        - Divide by 10 (3-J.10)
        - Division facts for 2, 3, 4, 5, and 10 (3-K.1)
        - Division facts for 2, 3, 4, 5, and 10: true or false? (3-K.2)
        - Division facts for 2, 3, 4, 5, and 10: sorting (3-K.3)
        - Division facts for 6, 7, 8, and 9 (3-K.4)
        - Division facts for 6, 7, 8, and 9: true or false? (3-K.5)
        - Division facts for 6, 7, 8, and 9: sorting (3-K.6)

        - Division facts up to 10 (3-K.7)
        - Division facts up to 10: true or false? (3-K.8)
        - Division facts up to 10: sorting (3-K.9)
        - Division facts up to 10: select the missing numbers (3-K.11)
        - Division sentences up to 10: true or false? (3-K.12)
        - Division input/output tables (3-L.3)
        - Multiplication and division facts up to 5: true or false? (3-M.3)
        - Multiplication and division facts up to 10: true or false? (3-M.4)
        - Solve using properties of multiplication (3-N.9)
- **3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic.**
    - **3.OA.D.8 Solve two-step word problems using the four operations for problems posed with whole numbers and having whole number answers. 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.**
        - Addition, subtraction, multiplication, and division facts (3-M.1)
        - Complete the addition, subtraction, multiplication, or division sentence (3-M.2)
        - Add, subtract, multiply, and divide (3-M.7)
        - Addition, subtraction, multiplication, and division word problems (3-M.12)
        - Perform multiple operations with whole numbers (3-M.13)
        - Two-step addition and subtraction word problems (3-M.14)
        - Two-step multiplication and division word problems (3-M.15)
        - Two-step mixed operation word problems (3-M.16)
        - Solve for the variable: addition and subtraction only (3-O.2)
        - Solve for the variable (3-O.4)
        - Write variable equations to represent word problems: multiplication and division only (3-O.5)
        - Write variable equations to represent word problems (3-O.6)
        - Rounding - nearest ten or hundred only (3-P.1)
        - Rounding (3-P.2)
        - Solve inequalities using estimation (3-P.11)
        - Two-step word problems: identify reasonable answers (3-P.15)
    - **3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations.**
        - Addition patterns over increasing place values (3-C.15)
        - Subtraction patterns over increasing place values (3-D.6)
        - Multiplication input/output tables: find the rule (3-H.5)
        - Division input/output tables: find the rule (3-L.4)