## Subject Area:         MATHEMATICS

**Component XI:   WHOLE NUMBER COMPUTATION & ESTIMATION**

**Indiana Academic Standard 1:  Number Sense and Computation**
> Fluency in computation is essential.  Students learn about numbers and how to add, subtract, multiply, and divide them.  As students progress, they learn how to add, subtract, multiply, and divide more complex whole numbers, fractions, and decimals.  They solve problems using ratios, proportions, and percentages.  They use mental arithmetic to compute as well.

### GOALS:  The student will be able to...
A.  Explain/Demonstrate the <u>concept of addition</u> as the joining of sets
B.  Explain/Demonstrate the <u>concept of subtraction</u> as take-away, comparison and missing addends
C.  Explain/Demonstrate the <u>concept of multiplication</u> as repeated addends and arrays
D.  Explain/Demonstrate the <u>concept of division</u> as equal sharing among many groups
E.  Use a variety of strategies to assist in the <u>memorization of basic facts</u> for addition, subtraction, multiplication and division
F.  Identify/<u>Use an algorithm</u> for addition, subtraction, and multiplication
G.  Identify/Use <u>estimation skills</u>
H.  Identify/Use strategies for <u>mental computation</u>

**LEGEND:**  I= the grade at which the skill is introduced
Grey-shaded area= grades at which the skill is to be developed and expanded.
**State standards are assessed annually, beginning the year after introduction**.

## The student will be able to...          The teacher will...

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| **A  Demonstrate the Concept of Addition** | | | | | | | | | |
| A1 Model addition by joining sets of objects (for any two sets with fewer than 10 objects when joined). (K.1.5, 4.1.6) | I | | | | | | | | |
| A2 Describe addition and subtraction situations.  (K.2.1) | I | | | | | | | | |
| A3 Show the meaning of addition (putting together, increasing) using objects. (K.1.6) | I | | | | | | | | |
| A4 Understand the meaning of the symbols +, -, and =. | | I | | | | | | | |

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| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| A5 Write and solve number sentences from problem situations involving addition and subtraction. (1.1.5) | | I | | | | | | | |
| A6 Model addition numbers less than 100 with objects and pictures. (1.1.5) | | I | | | | | | | |
| A7 Add two whole numbers less than 100 with and without regrouping. (2.1.6) | | | I | | | | | | |
| A8 Understand and use the inverse relationship between addition and subtraction. (2.1.6) | | | I | | | | | | |
| A9 Add and subtract whole numbers up to 1,000 with or without regrouping, using relevant properties of the number system. | | | | I | | | | | |
| **B Demonstrate the Concept of Subtraction** | | | | | | | | | |
| B1 Model subtraction by removing objects from sets (for numbers less than 10). (K.1.5) | I | | | | | | | | |
| B2 Describe addition and subtraction situations. (K.2.1) | I | | | | | | | | |
| B3 Show the meaning of subtraction (taking away, comparing, finding the difference) using objects. (1.1.5) | | I | | | | | | | |
| B4 Understand the meaning of the symbols =, -, and +. | | I | | | | | | | |
| B5 Subtract two whole numbers less than 100 without regrouping. (1.1.5) | | I | | | | | | | |
| B6 Add and subtract whole numbers up to 1,000 with or without regrouping, using relevant properties of the number system. | | | | I | | | | | |
| **C Demonstrate the Concept of Multiplication** | | | | | | | | | |
| C1 Use manipulatives/pictures to represent multiplication as repeated addition or arrays. (3.1.6) | | | | I | | | | | |
| C2 Illustrate multiplication when given a situation involving repeated addends/arrays, or arrays, equal-sized groups, area models, equal "jumps" on a number line. (3.1.6) | | | | I | | | | | |
| C5 Solve problems involving multiplication and division of any whole numbers. (5.1.5) | | | | | | I | | | |
| **D Demonstrate the Concept of Division** | | | | | | | | | |

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
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| | | | | | | | | | |
| D1 Use manipulatives and pictures to illustrate division as the sharing of objects restated as the number of groups of shared objects. | | | | I | | | | | |
| D2 Write a division sentence for any given situation involving the sharing of objects or the number of groups of shared objects. | | | | I | | | | | |
| D3 Develop the concept of remainder with division problems "close to" division facts. (5.1.5) | | | | | | I | | | |
| D4 Represent the concept of division as repeated subtraction, equal sharing, and forming equal groups and inverse of multiplication. (3.1.7) | | | | I | | | | | |
| D5 Represent as division any situation involving the sharing of objects or the number of group shared objects. | | | | | I | | | | |
| D6 Demonstrate fluency with multiplication facts for numbers up to at least 10 and the related division facts. Identify factors of whole numbers and multiples of whole numbers to 10. (4.1.5) | | | | | I | | | | |
| **E  Memorize Basic Facts** | | | | | | | | | |
| E1 Demonstrate understanding of addition facts with addends less than ten. | I | | | | | | | | |
| E2 Demonstrate the mastery of multiplication facts with factors up to ten. | | | | I | | | | | |
| E3 Develop division facts generated from multiplication facts. | | | | I | | | | | |
| E4 Demonstrate the mastery of addition facts (for totals up to 20) and the corresponding subtraction facts. (1.1.6) | | I | | | | | | | |
| E5 Know and use the inverse relationship between multiplication and division facts such as 6x7=42, 42÷7=6, 7x6=42, 42÷6=7. | | | | I | | | | | |
| E6 Show the mastery of multiplication facts for 2, 5, and 10. | | | | I | | | | | |
| E7 Understand the special properties of 0 and 1 in multiplication and division. | | | | | I | | | | |

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| E8 Continue number patterns using multiplication and division. | | | | | I | | | | |
| **F  Use Algorithms** | | | | | | | | | |
| F1 Use manipulatives to develop addition algorithms. (1.1.5) | | I | | | | | | | |
| F2 Add any two 2-digit numbers without regrouping. (1.1.5) | | I | | | | | | | |
| F3 Use manipulatives to develop subtraction algorithms. (1.1.5) | | I | | | | | | | |
| F4 Subtract any 2-digit numbers without regrouping.  (1.1.5) | | I | | | | | | | |
| F5 Subtract any 2-digit numbers with regrouping. | | | I | | | | | | |
| F6 Use manipulatives to illustrate an addition algorithm for numbers less than one thousand. | | | | I | | | | | |
| F7 Add two or more numbers with a sum less than one thousand. | | | | I | | | | | |
| F8 Use manipulatives to illustrate a subtraction algorithm of any two numbers with subtrahend less than one thousand. | | | | I | | | | | |
| F9 Subtract two numbers with subtrahend less than one thousand. | | | | I | | | | | |
| F10 Solve problems using multiplication of two-digit by single-digit and two-digit numbers fluently using a standard algorithmic approach. (4.1.6, 5.1.5) | | | | | I | | | | |
| F11 Create, describe, and extend number patterns using addition and subtraction. (1.2.2, 2.2.2, 2.3.4) | | | I | | | | | | |
| F12 Understand and use standard algorithms for addition and subtraction. (3.1.5) | | | | | I | | | | |
| F13 Use a standard algorithm to multiply numbers up to 100 by numbers up to 10, using relevant properties of the number system. | | | | | I | | | | |
| F14 Use a standard algorithm to divide numbers up to 100 by numbers up to 10, without remainders, using relevant properties of the number system.  (5.1.5) | | | | | I | | | | |
| F15 Add and subtract positive and negative integers.  (4.1.5) | | | | | | | I | | |
| F16 Multiply and divide positive and negative | | | | | | | I | | |

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|---|---|---|---|---|---|---|---|---|---|
| integers. (4.1.5) | | | | | | | | | |
| **G  Estimate** | | | | | | | | | |
| G1 Estimate/Determine the reasonableness of answers in addition/subtraction problems. | | I | | | | | | | |
| G2 Estimate/Determine the reasonableness of answers for word/story problems involving addition and subtraction. | | | | I | | | | | |
| G3 Use estimation to decide whether answers are reasonable in addition, subtraction, multiplication, and division problems. | | | | I | | | | | |
| G4 Use estimation to decide whether answers are reasonable in decimal problems. | | | | | | I | | | |
| **H  Compute Mentally** | | | | | | | | | |
| H1 Use estimation/mental computation to solve problems where exact answers are not required. | | I | | | | | | | |
| H2 Use mental arithmetic to add or subtract with numbers less than 100. | | | I | | | | | | |
| H3 Use mental arithmetic to add or subtract simple decimals. | | | | | | I | | | |
| H4 Use mental arithmetic to add or subtract simple fractions and decimals. | | | | | | | I | | |
| H5 Use mental arithmetic to compute with common fractions, decimals, powers, and percents. | | | | | | | | I | |

MATHEMATICS

## Subject Area:    **MATHEMATICS**

**Component XII:**    **FRACTIONAL/DECIMAL COMPUTATION**

**Indiana Academic Standard 1:  Number Sense and Computation**
    Fluency in computation is essential.  Students learn about numbers
    and how to add, subtract, multiply, and divide them.  As students
    progress, they learn how to add, subtract, multiply, and divide more
    complex numbers, fractions, and decimals.  They solve problems using
    ratios, proportions, and percentages.  They use mental arithmetic to
    compute as well.

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### GOALS:  The student will be able to...

A. Demonstrate the concepts of <u>addition/subtraction of fractions</u> with like and
    unlike denominators using manipulatives
B. Demonstrate the concepts of <u>multiplication/division of fractions</u> with like and
    unlike denominators using manipulatives
C. Demonstrate the concepts of <u>addition and subtraction of decimals</u> using
    manipulatives
D. Demonstrate the concepts of <u>multiplication/division of decimals</u> using
    manipulatives.
E. <u>Use algorithms</u> for adding, subtracting and multiplying <u>decimals</u> and solve
    division problems using decimals
F. <u>Use algorithms</u> for adding, subtracting, multiplying and dividing <u>all rational
    numbers</u>.

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**State standards are assessed annually, beginning the year after introduction**.

## The student will be able to...    The teacher will...

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| **A  Add and Subtract Fractions** | | | | | | | | | |
| A1 Use physical models/illustrations to determine the sum/difference of fractions with like and unlike denominators. | | | | | I | | | | |
| A2 Identify/Compare/Contrast monetary values of dollar as a whole and quarters, dimes, nickels, and pennies as parts of the whole. | | | I | | | | | | |
| A3 Show equivalent fractions using equal | | | | I | | | | | |

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
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| parts. | | | | | | | | | |
| A4 Add and subtract simple fractions with the same denominator. | | | | I | | | | | |
| A5 Model addition and subtraction of simple fractions. (4.1.7) | | | | | I | | | | |
| A6 Know and use strategies for estimating results of any whole-number computations. | | | | | I | | | | |
| A7 Use mental arithmetic to add or subtract numbers rounded to hundredths or thousandths. | | | | | I | | | | |
| A8 Add and subtract fractions (including mixed numbers) with different denominators. (5.1.6) | | | | | | I | | | |
| A9 Solve problems involving addition and subtraction of positive fractions and explain why a particular operation was used for a given situation. (5.1.6, 6.1.6) | | | | | | I | | | |
| **B  Multiply/ Divide Fractions** | | | | | | | | | |
| B1 Solve division problems involving decimals/fractions. | | | | | | I | | | |
| B2 Use models to show an understanding of multiplication and division of fractions. | | | | | | I | | | |
| B3 Multiply and divide fractions to solve problems. | | | | | | I | | | |
| B4 Explain how to multiply and divide positive fractions and perform the calculations. | | | | | | | I | | |
| B5 Solve problems involving multiplication, and division of positive fractions and explain why a particular operation was used for a given situation. (5.1.7) | | | | | | I | | | |
| **C  Add and Subtract Decimals** | | | | | | | | | |
| C1 Use physical models/illustrations to determine the sum/difference of decimals. | | | | | I | | | | |
| C2 Order a series of fractions/decimals from smallest to largest. | | | | | I | | | | |
| C3 Add and subtract decimals (to hundredths), using objects or pictures. | | | | | I | | | | |
| C4 Add and subtract decimals and verify the reasonableness of the results. (6.1.6) | | | | | | I | | | |

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| C5 Use estimation to decide whether answers are reasonable in decimal problems. | | | | | | I | | | |
| **D. Multiply/Divide Decimals** | | | | | | | | | |
| D1 Solve division problems involving decimals/fractions. (6.1.6) | | | | | | I | | | |
| D2 Multiply and divide decimals. | | | | | | I | | | |
| D3 Use estimation to decide whether answers are reasonable in decimal problems. | | | | | | I | | | |
| **E Use Algorithms for Decimals** | | | | | | | | | |
| E1 Use a standard algorithm to add and subtract decimals (to hundredths). | | | | | I | | | | |
| **F Use Algorithms for All Rational Numbers** | | | | | | | | | |
| F1 Develop/Use algorithms to add/subtract or multiply decimals/fractions. | | | | | I | | | | |

## Subject Area: MATHEMATICS

**Component XIII:** RATIOS, PROPORTION, PERCENTS

**Indiana Academic Standard 1: Number Sense and Computation**
Fluency in computation is essential. Students learn about numbers and how to add, subtract, multiply, and divide them. As students progress, they learn how to add, subtract, multiply, and divide more complex numbers, fractions, and decimals. They solve problems using ratios, proportions, and percentages. They use mental arithmetic to compute as well.

**GOALS: The student will be able to...**
A. Write/Simplify ratios, illustrating given situations
B. Apply the concept of ratio/proportion solving real life problems
C. Calculate/Solve real world problems that involve percent solutions

**LEGEND:** I= the grade at which the skill is introduced
Grey-shaded area= grades at which the skill is to be developed and expanded.
**State standards are assessed annually, beginning the year after introduction**.

### The student will be able to...          The teacher will...

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| **A Write and Simplify Ratios** | | | | | | | | | |
| A1 Use models/manipulatives to illustrate ratios and proportions. | | | | | | I | | | |
| A2 Write the relationship between numbers as a ratio. | | | | | | I | | | |
| A3 Use proportions to solve problems. | | | | | | | I | | |
| A4 Interpret and use ratios to show the relative sizes of two quantities. Use the notations: a/b, a to b, a:b (6.1.7) | | | | | | I | | | |
| **B Apply Ratio/Proportion to Real Life** | | | | | | | | | |
| B1 Recognize proportional relationships and solve problems involving proportional relationships. Find the missing term in a pair of equivalent ratios and find one quantity given the other quantity and their ratio. (6.1.8) | | | | | | | I | | |

| SKILLS/CONCEPTS | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| B2 Understand proportions and use them to solve problems.  (7.1.7) | | | | | | | I | | |
| **C  Solve Real World Percent Problems** | | | | | | | | | |
| C1 Explain the relationship of percent to decimals. (6.1.4) | | | | | | | I | | |
| C2 Apply addition, subtraction, multiplication and division in solving percent problems. | | | | | | | I | | |
| C3 Calculate percent of change. (7.1.7) | | | | | | | | I | |
| C4 Use mental arithmetic to compute percents. | | | | | | | | I | |
| C5 Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.  (6.1.3, 6.1.9) | | | | | | | I | | |