Mathematics Standards Level B

Level B emphasizes understanding base-ten notation (place value for whole numbers to 1000), developing fluency in addition and subtraction (to 3 digits), understanding and exploring strategies for multiplication and division (within 100), and a foundational understanding of fractions. These skills will prepare students for work with rational numbers, ratios, rates, and proportions in subsequent levels. A critical area of focus is on gaining a foundational understanding of fractions and preparing the way for work with rational numbers. In the areas of measurement and geometry, using standard units of measure and developing understanding of the structure of rectangular arrays and areas are priorities, as well as analyzing two-dimensional shapes as a foundation for understanding area, volume, congruence, similarity and symmetry.

LEVEL B (2-3)

Number and Operations: Base Ten

Understand place value.

Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

a. 100 can be thought of as a bundle of ten tens — called a "hundred."

b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). (2.NBT.1)

Count within 1000; skip-count by 5s, 10s, and 100s. (2.NBT.2)

Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2.NBT.3)

Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. (2.NBT.4)

Use place value understanding and properties of operations to add and subtract.

Add up to four two-digit numbers using strategies based on place value and properties of operations. (2.NBT.6)

Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds. (2.NBT.7)

Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900. (2.NBT.8)

Explain why addition and subtraction strategies work, using place value and the properties of operations. (2.NBT.9)

Use place value understanding and properties of operations to perform multi-digit arithmetic.[13]

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

Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (3.NBT.2)

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

Number and Operations: Fractions[14]

Develop understanding of fractions as numbers.

Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by a parts of size 1/*b*. (3.NF.1)

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

- Represent a fraction 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 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. (3.NF.2a)
- Represent a fraction *a/b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line. (3.NF.2b)

Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. (3.NF.3)

- Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. (3.NF.3a)
- Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model. (3.NF.3b)
- Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.* (3.NF.3c)
- 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 symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (3.NF.3d)

[13] A range of algorithms may be used.
[14] Expectations at this level in this domain are limited to fractions with denominators 2, 3, 4, 6, 8.

Operations and Algebraic Thinking

Represent and solve problems involving addition and subtraction.

Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. (2.OA.1)

Add and subtract with 20.

Fluently add and subtract within 20 using mental strategies. Know from memory all sums of two one-digit numbers. (2.OA.2)

Represent and solve problems involving multiplication and division.

Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* (3.OA.1)

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. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.* (3.OA.2)

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.3)

Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?.* (3.OA.4)

Understand properties of multiplication and the relationship between multiplication and division.

Apply properties of operations as strategies to multiply and divide.[15] *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)* (3.OA.5)

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.6)

[15] Students need not use formal terms for these properties.

Multiply and divide within 100.

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. Know from memory all products of two one-digit numbers. (3.OA.7)

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Solve two-step word problems using the four operations. 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.[16] (3.OA.8)

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.OA.9)

Geometry

Reason with shapes and their attributes.

Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.[17] Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. (2.G.1)

Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves, thirds, half of, a third of,* etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. (2.G.3)

Reason with shapes and their attributes.

Understand that shapes in different categories (e.g., rhombuses, rectangles, 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.G.1)

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 1/4 of the area of the shape.* (3.G.2)

Measurement and Data

Measure and estimate lengths in standard units.

Measure the length of an object twice, using length units of different lengths for the two

[16] This standard is limited to problems posed with whole numbers having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
[17] Sizes are compared directly or visually, not compared by measuring.

measurements; describe how the two measurements relate to the size of the unit chosen. (2.MD.2)

Estimate lengths using units of inches, feet, centimeters, and meters. (2.MD.3)

Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. (2.MD.4)

Relate addition and subtraction to length.

Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. (2.MD.6)

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

Tell and write time to the nearest minute 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.1)

Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).[18] 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.[19] (3.MD.2)

Represent and interpret data.

Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2.MD.10)

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.* (3.MD.3)

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. (3.MD.4)

Geometric measurement: understand concepts of area and relate to area of multiplication and addition.

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

[18] Excludes compound units such as cm3 and finding geometric volume of a container.
[19] Excludes multiplicative comparison problems (problems involving notions of "times as much").

a. 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.

b. 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. (3.MD.5)

Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). (3.MD.6)

Relate area to the operations of multiplication and addition. (3.MD.7)

- 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.7a)
- 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.MD.7b)
- 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 $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. (3.MD.7c)
- 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. (3.MD.7d)

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

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.MD.8)