

गणित के मूल सिद्धांत

Mathematics



Grades K-2

MATHEMATICS GRADES K-2

Standard 1 – Number Sense and Operations Students understand and apply number sense, number theory and operations.		
Benchmark 1.2.1 - Students understand numbers, ways of representing numbers, relationships among numbers and number systems.		
<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> • Use one-to-one correspondence to 20. • Count and identify numerals to 31. • Order numbers 0-20. • Investigate and recognize number patterns. • Use concepts of comparison (more, less, and equal). • Count by tens to 100. • Write numerals 0-10. • Explore the concept of halves. 	<ul style="list-style-type: none"> • Identify and count coins (penny, nickel, dime and quarter). (Also in Benchmark 4.2.1) • Count sets of objects between 0-100 and write the corresponding numeral. • Count by fives and tens to 100. • Count by twos to 40 using a manipulative. • Group concrete objects to model place value (hundreds, tens, ones). • Recognize, compare, and write numerals 0-100 in and out of sequence. • Identify the ordinal positions first through tenth. • Identify and represent the concepts of whole, halves, thirds, and fourths using concrete objects. • Recognize the inverse relationships between addition and subtraction. 	<ul style="list-style-type: none"> • Identify the place value of each digit in a three digit numeral. • Compare whole numbers between 0-999 using symbols (<, >, =) and words. • Identify ordinal positions using the language first through twentieth. • Identify and represent the concepts of whole, halves, thirds, fourths, sixths, and eighths using concrete objects and drawing pictures. • Count by twos and fives to 100. • Count by threes and fours using manipulative (hundred chart, calculator). • Round a whole number, 99 or less, to the nearest ten. • Identify and represent problems using basic addition and subtraction facts to and from 20.
Benchmark 1.2.2 - Students understand meaning of operations and how they relate to one another.		
<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> • Explore addition and subtraction concepts. • Identify coins (penny, nickel, dime and quarter). 	<ul style="list-style-type: none"> • Count coins (penny, nickel, dime and quarter) and demonstrate equivalency. (Also in Benchmark 4.2.1) • Recognize the relationship between addition and subtraction (fact families). 	<ul style="list-style-type: none"> • Create and solve problems by completing a numerical sentence involving basic facts. • Recognize and understand the inverse relationship between addition and subtraction. • Explore informal addition of fractions with concrete objects. • Calculate the sum or difference of two digit numbers using various methods of calculation (mental computation, concrete materials, calculator, paper, pencil). • Use concrete objects to model situations such as equal grouping (multiplication) and sharing equally (division).
Benchmark 1.2.3 - Students compute fluently and make reasonable estimates.		
<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> • Explore estimation concepts. 	<ul style="list-style-type: none"> • Estimate using terms such as about, near, closer to, between, less than or more than. • Solve problems by using basic addition and subtraction facts. • Memorize basic addition and subtraction facts to 12. 	<ul style="list-style-type: none"> • Estimate the sum or difference of two digit whole numbers. • Solve problems by using basic addition and subtraction facts. • Memorize basic addition and subtraction facts to 20.

Standard 2 – Geometry
Students understand and apply concepts of geometry.

Benchmark 2.2.1- Students analyze and apply characteristics and properties of one-, two- and three- dimensional figures and develop mathematical justifications about geometric relationships.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Identify, describe and compare basic shapes: circle, triangle, square, oval, rhombus, and rectangle. 	<ul style="list-style-type: none"> Represent and describe triangles and quadrilaterals according to the number of line segments (sides), and vertices (corners). Investigate results of combining and subdividing basic shapes. 	<ul style="list-style-type: none"> Represent and describe regular polygons according to the numbers of line segments (sides) and vertices (corners). Investigate the effects of combining, subdividing, and changing basic shapes (e.g. pattern blocks/Tangrams). Identify attributes of three-dimensional shapes according to the number and shape of faces, edges, bases, and vertices. Compare and contrast plane and solid geometric shapes: circle/sphere, square/cube, triangle/pyramid and rectangle/rectangular prism.

Benchmark 2.2.2 - Students specify location and describe spatial relationships using coordinate geometry and other representational systems.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Identify simple positional words (e.g. top, middle, bottom, over, under). 	<ul style="list-style-type: none"> Describe the proximity of objects in space (e.g. near, far, close, by, below, up, down, beside, next to). 	<ul style="list-style-type: none"> Find and name locations with simple relationships using positional words and/or coordinate systems (e.g. maps, grids). Name, interpret, and apply direction and distance in navigating space (e.g. left, right, north, south, east, west).

Benchmark 2.2.3 - Students apply transformation and use symmetry to analyze mathematical situations.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Explore symmetry. 	<ul style="list-style-type: none"> Recognize and create shapes that have symmetry. 	<ul style="list-style-type: none"> Identify and create symmetrical and congruent shapes/solids in the real world. Recognize and apply slides (translations), flips (reflections), and turns (rotations).

Benchmark 2.2.4 – Students use visualization, spatial reasoning, and geometric modeling to solve problems.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Recognize geometric shapes in the environment. 	<ul style="list-style-type: none"> Recognize geometric shapes/solids in the environment (e.g. circle/sphere, square/cube, etc.). 	<ul style="list-style-type: none"> Recognize geometric shapes/solids in structures in the environment and specify their locations. Recognize and represent shapes/solids from different perspectives (e.g. recognizing a cylinder from all viewpoints).

Standard 3 – Data Analysis and Probability
Students understand and apply the concepts of data analysis, probability and statistics.

Benchmark 3.2.1 – Students formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> As a group, collect and graph data. As a group, collect data by counting and make a tally chart. 	<ul style="list-style-type: none"> Collect and record data in relevant situations (e.g. daily temperature, survey, lunch count). 	<ul style="list-style-type: none"> Collect, record, construct, and analyze data (e.g. pictograph, bar graph).

Benchmark 3.2.2 – Student select and use appropriate statistical methods to analyze data.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Explore the concepts of more, less and equal. 	<ul style="list-style-type: none"> Interpret data using vocabulary such as more, less, fewer, greater and equal. 	<ul style="list-style-type: none"> Describe that when given restricted data, solutions are limited (e.g. given 4 pairs of shorts and 5 shirts and students list the possible combinations of attire).

Benchmark 3.2.3 – Students develop and evaluate inferences and predications that are based on data.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Explore the concept of chance. 	<ul style="list-style-type: none"> Explore the concept of chance and predict outcomes. 	<ul style="list-style-type: none"> Describe the concept of probability as chance.

Standard 4 – Measurement
Students understand and apply the concepts of measurements.

Benchmark 4.2.1 – Students understand measurable attributes of objects and the units, systems, and processes of measurement.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Identify coins (e.g. penny, nickel, dime, quarter). Investigate concepts of time (e.g. yesterday, today, and tomorrow). 	<ul style="list-style-type: none"> Identify and count coins (e.g. penny, nickel, dime and quarter). (Also in benchmark 1.2.1.) Explore relationships between periods of time (e.g. minutes, hours, days, months, years). 	<ul style="list-style-type: none"> Count and record the value of coins and dollar bills, identifying the cent sign, dollar sign, and decimal point. Apply basic relationships between periods of time (e.g. seconds, minutes, hours, days, months, years).

Benchmark 4.2.2 – Students apply appropriate techniques, tools, and formulas to determine measurement.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Use appropriate vocabulary when making comparisons (e.g. shorter/longer, taller/shorter, heavier/lighter). Explore measurement using nonstandard and standard units (e.g. links, paper clips, student’s feet). 	<ul style="list-style-type: none"> Compare the capacity of two given containers by using concrete materials (e.g. jelly beans, sand, water, rice). Compare the weight of two objects using a balance scale. Measure using nonstandard and standard units. Explore the concepts area and perimeter. Count coins (penny, nickel, dime, and quarter) and demonstrate equivalence. Tell time to the nearest half hour using an analog and digital clock. 	<ul style="list-style-type: none"> Compare Metric and U.S. Customary units of measure (e.g. length, capacity, and weight/mass). Explore the concept of estimating and finding capacity using concrete objects. Estimate and measure to the nearest centimeter and inch. Explore the concept of estimating and finding area and perimeter using concrete objects. Compare money amounts and make change from a dollar. Tell time to the nearest quarter hour, using a.m. and p.m. appropriately in a real world situation. Read temperature to the nearest degree in Fahrenheit and Celsius.

Standard 5 – Algebra
Students understand and apply algebraic concepts, function, patterns, and relationships.

Benchmark 5.2.1 – Students understand patterns and relations.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Sort and classify objects according to similar attributes (size, shape, and color). Identify, describe and extend patterns. 	<ul style="list-style-type: none"> Recognize, describe, extend, and create a wide variety of patterns. Recognize basic number patterns to 100 (repeating number pattern). 	<ul style="list-style-type: none"> Identify, create, and extend a wide variety of patterns using objects and symbols (e.g. repeating, growing, shrinking). Translate simple patterns (e.g. ABAB=1212=$\Delta O \Delta O$). Complete a sequence of consecutive whole numbers 0-999 (e.g. numbers missing from a sequence).

Benchmark 5.2.2 – Students explore mathematical situations and structure using algebraic symbols.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
<ul style="list-style-type: none"> Explore the algebraic symbols (+, -, and =) to create number sentences. 	<ul style="list-style-type: none"> Use the algebraic symbols (+, -, and =) to solve number sentences. Explore commutative property with concrete models (fact families). 	<ul style="list-style-type: none"> Create and solve problems by completing a numerical sentence involving basic facts. Apply the commutative property using concrete, pictorial, symbolic and verbal representation.

Benchmark 5.2.3 – Students use mathematical models to represent and understand quantitative relationships.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
		<ul style="list-style-type: none"> Represent the + and – of whole numbers using objects, pictures and symbols.

Benchmark 5.2.4 – Students observe, explain and analyze change in various contexts.

<i>Kindergarten Critical Knowledge</i>	<i>First Grade Critical Knowledge</i>	<i>Second Grade Critical Knowledge</i>
	<ul style="list-style-type: none"> Explore qualitative change, such as a student’s growth in height. 	<ul style="list-style-type: none"> Identify qualitative change, such as a student’s growth in height over a one-year period. Explore quantitative change, such as a student’s growing two inches in one year.