

Dublin City Schools Mathematics Graded Course of Study

Early Childhood

I. Content Standard: Number, Number Sense and Operations Standard

At the heart of mathematics is an understanding of number relationships. Children need to make sense of the ways numbers are used in their everyday world. Number senses and concepts develop gradually over time as young children explore, manipulate and organize materials and as they communicate their mathematical thinking. Counting is one of the earliest number concepts; it begins with developing oral counting skills or rote counting. One-to-one correspondence follows rote counting, which means linking one number, and only one, with each item in a set of objects. Other number concepts addressed within the early mathematics curriculum include quantity, comparisons and number symbols. Quantity is the concept of an entire set: knowing that the last object counted represents the entire set of objects.

Children will begin finding ways to represent numbers. They may make marks or write numerals. Through children's curiosity and involvement in real-life experiences, they come to understand the meaning of number operations and begin making comparisons using terms such as more than, bigger than, less than and the same as.

Benchmark	Early Childhood Indicators
<p>Benchmark A: Use place value concepts to represent whole numbers using numerals, words and physical models.</p>	<p>Benchmark A Indicator(s):</p> <ul style="list-style-type: none"> • Represent quantity using invented forms (e.g., child's marks to represent a quantity of objects). • Write numerical representations (e.g., scribbles, reversals) or numerals in meaningful context (e.g., play situations). • Identify and name numerals 0-9.
<p>Benchmark B: Recognize, classify, compare and order whole numbers.</p>	<p>Benchmark B Indicator(s):</p> <ul style="list-style-type: none"> • Compare and order whole numbers up to 5. • Compare sets of equal, more and fewer and use the language of comparison (e.g., equal more and fewer).
<p>Benchmark C: Represent commonly used fractions using words and physical models.</p>	<p>Benchmark C Indicator(s):</p> <ul style="list-style-type: none"> • There are no indicators age appropriate for this level.
<p>Benchmark D: Determine the value of a collection of coins and dollar bills</p>	<p>Benchmark D Indicator(s):</p> <ul style="list-style-type: none"> • Identify penny, nickel, dime and quarter and recognize that coins have different values.
<p>Benchmark E: Make change using coins for values up to one dollar.</p>	<p>There are no indicators age appropriate for this level.</p>
<p>Benchmark F: Count, using numerals and ordinal numbers.</p>	<p>Benchmark F Indicator(s):</p> <ul style="list-style-type: none"> • Touch objects and say the number names when counting in the context of daily

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	<p>activities and play (e.g., cookies on a plate, steps on a set of stairs).</p> <ul style="list-style-type: none"> • Demonstrate one-to-one correspondence when counting objects (e.g., give one cookie to each child in group). • Count to 10 in the context of daily activities and play (e.g., number songs). • Determine “how many” in sets of 5 or fewer objects.
<p>Benchmark G: Model, represent and explain addition as combining sets and counting on.</p>	<p>Benchmark G Indicator(s):</p> <ul style="list-style-type: none"> • Group and regroup a given set in the context of daily activities and play (e.g., 5 blocks can be 2 blue and 3 green or 1 blue and 4 green). • Construct sets with more or fewer objects than a given set. • Count on (forward) using objects such as cards, number cubes or dominoes that have familiar dot patterns (e.g., when selecting 5 apples from a bag, takes out two and continues counting 3, 4, 5).
<p>Benchmark H: Model, represent and explain subtraction as comparison, take-away and part-to-whole.</p>	<p>Benchmark H Indicator(s):</p> <ul style="list-style-type: none"> • Group and regroup a given set in the context of daily activities and play (e.g., 5 blocks can be 2 blue and 3 green or 1 blue and 4 green). • Construct sets with more or fewer objects than a given set. • Count on (forward) using objects such as cards, number cubes or dominoes that have familiar dot patterns (e.g., when selecting 5 apples from a bag, takes out two and continues counting 3, 4, 5).
<p>Benchmark I: Model, represent and explain multiplication as repeated addition, rectangular arrays and skip counting.</p>	<p>Benchmark I Indicator(s):</p> <ul style="list-style-type: none"> • Construct two sets of objects, each containing the same number of objects (e.g., 5 crayons and 5 blocks). • Join two sets of objects to make one large set in the context of daily routines and play (e.g., combining 2 bags of raisins, each containing 3 pieces; combining 2 groups of blocks, each containing 3 blocks).
<p>Benchmark J: Model, represent and explain division as sharing equally, repeated subtraction</p>	<p>Benchmark J Indicator(s):</p> <ul style="list-style-type: none"> • Distribute equally a set of objects into 2 or more smaller sets (e.g., shares 6 crackers



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and rectangular arrays.	with 3 friends equally).
Benchmark K: Demonstrate fluency in addition facts with addends through 9 and corresponding subtractions.	Benchmark K Indicator(s): <ul style="list-style-type: none"> • Group and regroup a given set in the context of daily activities and play (e.g., 5 blocks can be 2 blue and 3 green or 1 blue and 4 green).
Benchmark L: Demonstrate fluency in adding and subtracting multiples of 10 and recognize combinations that make 10.	There are no indicators age appropriate for this level.
Benchmark M: Add and subtract two-digit numbers with and without regrouping.	There are no indicators age appropriate for this level.



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II. Content Standard: Measurement Standard

Preschool measurement activities focus on developing and understanding the principles and uses of measuring. Children learn measurement from opportunities to use a variety of nonstandard and standard materials for measurement through hands-on activities. As a first step, children often make comparisons without any measurement tools. Using materials provided in their play, children begin to notice materials that are longer, shorter, heavier and lighter. Next, children often demonstrate an interest in measurement through nonstandard tools by using their hand, a piece of string or a ribbon to measure objects and spaces in their world. It is often through a variety of experiences that children will find a need for more conventional measurement tools. Formal instruction on the uses of standard measures such as clocks, rulers and scales can be introduced in the preschool grades and made available through play.

Benchmark	Early Childhood Indicator(s)
<p>Benchmark A: Explain the need for standard units of measure.</p>	<p>There are no indicators age appropriate for this level.</p>
<p>Benchmark B: Select appropriate units for length, weight, volume (capacity) and time, using: 1) objects; i.e., non-standard units; 2) U.S. Customary units: inch, foot, yard, ounce, pound, cup, quart, gallon, minute, hour, day, week and year; 3) metric units: centimeter, meter, gram and liter.</p>	<p>Benchmark B Indicator(s):</p> <ul style="list-style-type: none"> • Begin to identify and use language of units of time. For example: a. Day, night, week; b. yesterday, today, tomorrow. • Recognize that various devices measure time (e.g., clock, timer, calendar). • Begin to use terms to compare the attributes of objects (e.g., bigger, smaller, lighter, heavier, taller, shorter, more and less). • Order a set of objects according to size, weight or length (e.g., cups of different sizes).
<p>Benchmark C: Develop common referents for units of measure for length, weight, volume (capacity) and time to make comparisons and estimates.</p>	<p>Benchmark C Indicator(s):</p> <ul style="list-style-type: none"> • Begin to identify and use language of units of time. For example: a. Day, night, week; b. Yesterday, today, tomorrow. • Recognize that various devices measure time (e.g., clock, timer, calendar). • Begin to use terms to compare the attributes of objects (e.g., bigger, smaller, lighter, heavier, taller, shorter, more and less). • Order a set of objects according to size, weight or length (e.g., cups of different sizes). • Sequence or order events in the context of daily activities and play (e.g., wash your



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	hands before and after snacks, who's next for the computer).
<p>Benchmark D: Apply measurement techniques to measure length, weight and volume (capacity).</p>	<p>Benchmark D Indicator(s):</p> <ul style="list-style-type: none"> • Measure length and volume (capacity) using non-standard units of measure (e.g., how many paper clips long is a pencil, how many small containers it takes to fill one big container using sand, rice or beans).
<p>Benchmark E: Recognize that using different units of measurement will yield different numbers for the same measurement.</p>	There are no indicators age appropriate for this level.



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III. Content Standard: Geometry and Spatial Sense Standard

Geometry and spatial sense refer to the recognition of shapes and structures found in the environment. Children learn about and use their knowledge of two- and three-dimensional shapes when given the opportunity to create designs with pattern blocks; draw, paint and cut shapes for their artwork; organize blocks by sorting them; and locate shapes in outdoor settings.

Geometry also involves an understanding of space. Children gain spatial sense as they investigate, experiment and explore everyday objects and physical materials and as they become aware of themselves in relation to the world around them. Children need to feel themselves in space by climbing high or swinging low, and by crawling in, out, on top of and under other objects. Through these experiences, early childhood educators introduce children to the vocabulary of space, question them about their position in space, and help them learn about location and position (on, off, on top of, under, in, out, behind, below), movement (backward, forward, around, through, across, up, down) and distance (near, far, next to).

Benchmark	Early Childhood Indicator(s):
Benchmark A: Describe and create plane figures: circle, rectangle, square, triangle, hexagon, trapezoid, parallelogram and rhombus, and identify them in the environment.	There are no indicators age appropriate for this level.
Benchmark B: Describe solid objects: cube, rectangular prism, sphere, cylinder, cone and pyramid, and identify them in the environment.	There are no indicators age appropriate for this level.
Benchmark C: Sort and compare two-dimensional figures and three-dimensional objects according to their characteristics and properties.	Benchmark C Indicator(s): Begin to visualize, represent, and sequence an understanding of text through a variety of media and play.
Benchmark D: Identify, explain and model (superposition, copying) the concept of shapes being congruent and similar.	There are no indicators age appropriate for this level.
Benchmark E: Recognize two- and three-dimensional objects from different positions.	There are no indicators age appropriate for this level.
Benchmark F: Describe location, using comparative (before, after), directional (above, below) and positional (first, last) words.	Benchmark F Indicator(s): Demonstrate and begin to use the language of the relative position of objects in the environment and play situations (e.g., up, down, over, under, top, bottom, inside, outside, in front, behind, between, beside, next to, right side up and upside down).

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Benchmark G: Identify and draw figures with line symmetry.	There are no indicators age appropriate for this level.
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IV. Content Standard: Patterns, Functions and Algebra Standard

A pattern is an organized arrangement of shapes and objects. Pattern recognition facilitates children’s understanding of the relationships among objects and their ability to make generalizations about number combinations and counting. As a component of algebra, creating and using patterns can be interesting and assessable to young children. Children can begin noticing patterns in the routine of the day, or patterns of colors, shapes or sizes through teacher guidance and comment. Recognizing patterns and relationships is not just an important objective in mathematics, but one that children will use in other content areas, such as science and literacy. For preschoolers, the goal is to recognize and analyze simple patterns, copy them, create them and make predictions about them by extending them.

Benchmark	Early Childhood Indicator(s)
Benchmark A: Sort, classify and order objects by size, number and other properties, and describe the attributes used.	Benchmark A Indicator(s): <ul style="list-style-type: none"> Sort, order and classify objects by one attribute (e.g., size, color, shape, use).
Benchmark B: Extend sequences of sounds and shapes or simple number patterns, and create and record similar patterns.	Benchmark B Indicator(s): <ul style="list-style-type: none"> Identify, copy, extend and create simple patterns or sequences of sounds, shapes and motions in the context of daily activities and play (e.g., creates red, blue, red, blue pattern with blocks).
Benchmark C: Create and extend patterns and describe the rule in words.	Benchmark C Indicator(s): <ul style="list-style-type: none"> Sequence or order events in the context of daily activities and play (e.g., wash your hands before and after snacks, who’s next for the computer).
Benchmark D: Model problem situations using objects, pictures, tables, numbers, letters and other symbols.	Benchmark D Indicator(s): <ul style="list-style-type: none"> Use play, physical materials or drawings to model a simple problem (e.g., There are 6 cookies to be shared by 3 children. How many cookies can each child receive?)
Benchmark E: Solve open sentences and explain strategies.	There are no indicators age appropriate for this level.
Benchmark F: Represent an unknown quality as a variable using a symbol such as ●, ▲, ●.	There are no indicators age appropriate for this level.
Benchmark G: Describe and compare qualitative and quantitative change.	There are no indicators age appropriate for this level.

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V. Content Standard: Data Analysis and Probability Standard

Active children learn through active experiences. Data collection, organization, representation and analysis in preschool involve sorting, classifying, graphing, counting, measuring and comparing. Instruction in each of these areas can build on young learners' natural interest in making collections. As part of collecting, children first sort and make sets without any plan in mind. Later, they sort more purposefully, according to properties such as color, shape or size. As children develop and refine their sorting skills, they will sort by more than one attribute. Early childhood educators can strengthen this ability when young children are encouraged to talk about their sorting rules.

Graphing is an extension of sorting and classifying. A graph presents information in a visually organized way that helps children see relationships. While graphing is an abstract concept for young children, simple graphs using concrete (real) objects and later symbolic (pictorial) representations can provide an appropriate and meaningful way to display findings and information. For Example, a simple graph of the kinds of shoes children are wearing could develop from a concrete representation (shoes with ties, hook and loop tape, buckles and slip-on shoes), to a symbolic one (pictures representing the types of shoes), or to marks for representing the number of shoes.

Benchmark	Early Childhood Indicator(s)
Benchmark A: Pose questions and gather data about everyday situations and familiar objects.	Benchmark A Indicator(s): <ul style="list-style-type: none"> • Gather, sort and compare objects by similarities and differences in the context of daily activities and play (e.g., leaves, nuts, socks).
Benchmark B: Sort and classify objects by attributes, and organize data into categories in a simple table or chart.	Benchmark B Indicator(s): <ul style="list-style-type: none"> • Place information or objects in a floor or table graph according to one attribute (e.g., size, color, shape or quantity). • Select the category or categories that have the most or fewest objects in a floor or table graph (e.g., favorite ice cream).
Benchmark C: Represent data using objects, picture graphs and bar graphs.	There are no indicators age appropriate for this level.
Benchmark D: Describe the probability of chance events as more, less or equally likely to occur.	There are no indicators age appropriate for this level.



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VI. Content Standard: Mathematical Process Standard

Young children are problem solvers. As they explore and examine their world - pulling, pushing, tasting and taking things apart - they are attempting to find out how things work. This natural drive to solve problems should be built upon in the mathematics curriculum. For example, children will need to count the number of cups of sugar to make cookies, the number of children they will need to play a game, or the number of children who can work together in the block area at one time. Within these learning opportunities, real problems are posed, and children are guided to use the mathematical processes of reasoning, communicating, representing and connecting to solve them.

Within the six standards for mathematics, mathematical processes are specified through benchmark statements only. Mathematical process skills are addressed and embedded within the pre kindergarten indicators. Young children should be guided to use these processes in problem-solving situations.

Benchmark	Early Childhood Indicator(s)
<p>Benchmark A: Use a variety of strategies to understand problem situations; e.g., discussing with peers, stating problems in own words, modeling problems with diagrams or physical materials, identifying a pattern.</p>	<p>Note: The benchmarks for mathematical processes articulate what children should demonstrate in problem solving, representation, communication, reasoning and connections at key points in their mathematics program. Specific grade-level indicators have not been included for the mathematical processes standard because content and processes have been embedded within the grade-level indicators for the five content standards.</p>
<p>Benchmark B: Identify and restate in own words the question or problem and the information needed to solve the problem.</p>	
<p>Benchmark C: Generate alternative strategies to solve problems.</p>	
<p>Benchmark D: Evaluate the reasonableness of predictions, estimations and solutions.</p>	
<p>Benchmark E: Explain to others how a problem was solved.</p>	
<p>Benchmark F: Draw pictures and use physical models to represent problem situations and solutions.</p>	
<p>Benchmark G: Use invented and conventional symbols and</p>	

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common language to describe a problem situation and solution.	
Benchmark H: Recognize the mathematical meaning of common words and phrases, and relate everyday language to mathematical language and symbols.	
Benchmark I: Communicate mathematical thinking by using everyday language and appropriate mathematical language.	