Mathematics Guidance

Indiana
DEPARTMENT OF EDUCATION

Introduction

Families, caregivers, and early educators all work together to help children grow and learn. This guidance is intended to be a resource for educators to support and enhance children's learning and development while using the Foundations, Indiana's Early Learning Development Framework. While this is not an exhaustive list, this guidance is meant to serve as a suggestion for practice from birth to age five including the transition into kindergarten. It can be used to support a child's development at different levels of learning and promotes fluid movement between developmental stages. The Foundations are not intended to be a curriculum, but what children should know and be able to do throughout developmental stages. Curricula is content that children should learn and methods to teach the content whereas lesson plans are intended to demonstrate how the content is conveyed to children. This guidance is a resource for educators to use while developing an intentional lesson plan.

Looking Ahead to Kindergarten

High quality early experiences help a child become ready for kindergarten and beyond. The Foundations show early educators the developmental progression that typically developing young children should experience as they grow toward kindergarten readiness. In 2014, Indiana's Early Learning Advisory Committee approved the following definition of kindergarten readiness: "In Indiana, we work together so that every child can develop to his or her fullest potential socially, emotionally, physically, cognitively, and academically. Through growth in all of these domains, the child will become a healthy, capable, competent, and powerful learner."

Family Engagement

Indiana's Early Learning Advisory Committee (2016) has approved the following definition for family engagement:
"• Families actively supporting their children's learning and development, and sharing the responsibility with early care and education providers who are committed to engaging with families in meaningful, culturally respectful ways;
• Continuous across a child's life, beginning in infancy and extending through college and career preparation programs;
• Occurring across the various early care and learning settings where children play and grow."

Children develop in the context of their environments, which includes family, culture, and community. Family engagement is a strong predictor of children's development, wellness, educational attainment, and success later in school and life. Early educators can use the Family Engagement sections and the Powerful Practices throughout this guidance for strategies that they can encourage family members to use at home. Children and their families also face a number of complex challenges and situations. Communities are strengthened when there are strong partnerships between organizations. Educators and program administrators are encouraged to refer families to agencies that have the most in depth knowledge to meet their needs.

Special Populations

The Indiana Core Knowledge and Competencies encourage educators to see children as unique individuals within a family and community and to be sensitive to individual developmental needs. This guidance supports special populations including dual language (DLL), exceptional, and high ability learners; however, many of the recommended strategies are appropriate and beneficial to all children. It's encouraged that educators use a flexible approach when designing curriculum and keep the needs of all children in mind. The use of the Universal Design for Learning (UDL) provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone (See Appendix B for additional information). Additionally, with family/parental consent, we encourage educators to engage and collaborate with other professionals in closely related sectors supporting the child and family to further inform and align services. This could include professionals from education, health, and social services (e.g. First Steps/Early intervention, public schools, therapists, and physicians).

Mathematics Foundation 1: Numeracy

Early learners develop foundational skills in learning and understanding counting, cardinality, written numerals, quantity, and comparison.

M1.1: Demonstrate strong sense of counting

Numeracy/number sense refers to a general understanding of number information that enables a person to have a sense of what numbers mean, understand their relationship to one another, being able to perform mental math, understanding symbolic representation, and use numbers in real world situations. Counting is a foundational skill needed to develop numeracy and leads to the ability to:

- Understand 1:1 correspondence
- Develop increasingly advanced counting skills
- Understand concepts of cardinality
- Develop algebraic thinking

Looking Ahead to Kindergarten

In kindergarten, students will count to at least 100 by ones and tens, and count one by one from any number (K.NS.1). Additionally, students will be able to say the number names in standard order and understand the last number named is the number of objects regardless of the arrangement (K.NS.4). Lastly, students will be able to recognize sets of 1 to 10 objects in a pattern arrangement and tell how many without counting (K.NS.6).

Family Engagement

Encourage families to:

- Play games and sing songs that include counting, estimating, understanding patterns, and number recognition.
- Have children estimate how many are in a particular group of objects then count them together (e.g. counting individual socks while doing laundry then counting the pairs of socks).
- Count steps to a certain location.
- Use cooking, baking, and meal time as opportunities to talk about numbers (e.g. have the child set the table, counting and placing the items).

Special Populations[1]

Educators can:

- Work with families to identify what is being done at home and match or expand on familiar practices and skills.
- Use movement with counting (e.g. pointing to objects or groups of objects).
- For DLL, use one-on-one interventions focused on matching number words in the home language to English.

[1]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' number sense:

M1.1: Demonstrate strong sense of counting
Across all developmental stages, educators can:

- Make counting materials available, including books with counting stories.
- Describe their own actions using math and counting in daily routines.
- Use parallel talk or sports cast by describing child's actions using math and counting.
- Offer opportunities to organize objects.
- Integrate planned and spontaneous counting opportunities into the daily program, walks or field trips.
- Share fingerplays and songs used throughout the day with families.
- Avoid practices and activities that emphasize rote memorization or counting to three as a disciplinary strategy.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Introduce songs, rhymes, and fingerplays with a predictable beat and number sense (e.g. *1,2 Buckle My Shoe*) Demonstrate clapping and beat-counting activities for children (e.g. *If You're Happy and You Know It*)	Model counting within routines (e.g. counting crackers at snack, counting children during transitions, and counting down before cleaning up) Offer objects for play that are easy to manipulate, line up, and organize (e.g. socks, large counters, blocks, cars, and animals) Engage in books and songs that involve counting and numbers Use counting and number sense during play (e.g. "You have *two* eyes, and so does your bear. Let's count: one, two.")	Encourage child to count along with you when distributing objects (e.g. "One, two, three! We set out three plates for our friends!") Offer objects and opportunities for children to count independently using 1:1 correspondence (e.g. snack helper places one cup at each plate or educator asks child, "Could you please bring me three blocks?")	Provide opportunities for children to count the number sequence 1-15 (e.g. count aloud and have children count along the number of children present in environment during transition periods) Encourage children to count when creating sets and distributing objects Facilitate games and activities that involve creating small sets up to five (e.g. role play restaurant and have children draw a picture of the number of plates needed)	Provide opportunities for children to count the number sequence 1-20 (e.g. count aloud and have children count along the number of children present in environment during transition periods) Encourage children to count when creating sets and distributing objects Facilitate games and activities that involve creating small sets up to 10 (e.g. children roll a die and count out number of manipulatives) Provide opportunities where children can work together to write a counting song

Mathematics Foundation 1: Numeracy

Early learners develop foundational skills in learning and understanding counting, cardinality, written numerals, quantity, and comparison.

M1.2: Demonstrate understanding of written numerals

Basic math and number concepts are the foundation for learning more advanced math skills. ***Understanding written numerals*** leads to the ability to:

- Identify numerals as different from letters or other symbols
- Begin to recognize that numerals indicate quantity
- Begin to recognize different numerals indicate different quantities
- Match numerals with amounts
- Name and write numerals

Looking Ahead to Kindergarten

In kindergarten, students will be able to find the number that is one more than or less than any whole number up to 20 (K.NS.3). Lastly, they will be able to write whole numbers form 0 to 20 and recognize number words from 0 to 10 (K.NS.2).

Family Engagement

Encourage families to:

- Provide their child with many opportunities for counting objects at home (e.g. bottle caps or buttons) then have their child match the objects to a written number.
- Provide opportunities for their child to explore writing numerals by tracing, painting, or creating numerals.

Special Populations[2]

Educators can:

- Provide children with a variety of textured or tactile numbers to feel and use.
- Use children's interests to discuss numbers (e.g. counting dinosaurs and making groups to have conversations about the amount.)
- For DLL, provide numbers in native language to support learning of the concept in both the native language and English.

[2] With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' understanding of written numerals:

M1.2: Demonstrate understanding of written numerals

Across all developmental stages, educators can:

- Provide access to a variety of types of writing materials throughout the environment.
- Point out numerals in the environment (e.g. when reading a book, going for a field trip or walk, or when children create something that looks like a numeral, etc).
- Have numeral books freely available for children.
- Provide opportunities where children can form numeral shapes out of pasta, rice, paint, other sensory materials, or "loose parts".
- Incorporate different ways for children to practice writing numerals (e.g. writing numerals in shaving cream, sand, or other sensory materials).
- Model the practical use of written numerals (e.g. calendars, weather temperature, etc).
- Share with families the importance of effort (e.g attempting to write numerals and simply holding writing utensils).

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
	Draw child's attention to numbers naturally occurring in the environment Offer play materials that provide exposure to written numerals (e.g. old cell phones, number stickers, keyboards, etc.) and discuss how letters and numbers have different meanings While reading, point out pictures of numbers (1-5) and connect the numeral to the actual item (e.g. "There are two dogs. See the two. Let's count the dogs. One, two.")	Provide opportunities for children to participate in creating number signs and labels for the environment (e.g. labeling tables or chairs or indicating number of children who are present) Play games where children identify a numeral and make or move the quantity (e.g. Chutes and Ladders) Read books that incorporate numerals and encourage children to help name the numerals and count quantities	Offer a variety of materials and opportunities to practice writing numerals (e.g. white boards, easels and paper, etc.) Provide opportunities where children can create number books for 1-3 (i.e. children freely illustrate their own number books) Read books that incorporate numerals and encourage children to independently name the numerals and count quantities	Offer a variety of materials and opportunities to practice writing numerals (e.g. white boards, easels and paper, etc.) Provide opportunities where children can create number books for 1-10 (i.e. children freely illustrate their own number books) Read books that incorporate numerals and encourage children to independently name the numerals and count quantities Encourage children to identify what comes next in a counting series

Mathematics Foundation 1: Numeracy

Early learners develop foundational skills in learning and understanding counting, cardinality, written numerals, quantity, and comparison.

M1.3: Recognition of number relations

Number relations is the understanding of the relationships that exist among numbers. The development of number relations skills leads to:

- Counting skills
- Understanding of cardinality
- Comprehension of written numerals
- Understanding of quantities
- Comparison skills
- Understanding of sequence

Looking Ahead to Kindergarten

Kindergarten students will separate sets of ten or fewer objects into equal groups (K.NS.10). Additionally, they will identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group (K.NS.7). Students will also use words for comparison including: one and many; none, some, all; more and less; most and least; and equal to, more than and less than (K.NS.9). Lastly, students will be able to compare the values of two numbers from 1 to 20 presented as written numerals (K.NS.8).

Family Engagement

Encourage families to:

- Take a walk allowing their child to explore various opportunities to compare different objects they see (e.g. “Which stone is bigger?” or “Did we find more acorns or walnuts?”).
- Count stairs or steps on the way to a specific place (e.g. “Are there more steps here or at our house?”).
- Use meal time as an opportunity to talk about number relations (e.g. “I have six carrots and you have four. Who has more carrots?”).

Special Populations[3]

Educators can:

- Provide at least 30- 60 seconds for a child to consider a question. Then, ask the child if they would like to think or talk with a friend to find an answer.
- Pair children (potentially who speak the same language) to allow teamwork, using color coding to aid in grouping, and integrating other subjects.

[3] With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' recognition of number relations:

M1.3: Recognition of number relations

Across all developmental stages, educators can:

- Use descriptive language such as before and after to describe sequences of events or objects.
- Create opportunities for children to group items and compare the groups' quantities.
- Integrate math language such as "one," "many," "some," "none," "all," "more," "less", "most," and "equal" across all ages and environments in daily conversations and interactions.
- Share ideas from the program with families to extend the learning beyond the program hours (e.g. if the program drew outlines of the children's bodies, and lined them up shortest to tallest - encourage families to talk about who is the tallest in their family).

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Model asking for more and identify when more is provided (e.g. "Do you want more milk?" "I can give you more milk.") Incorporate simple hand gestures to signify concepts of more Provide opportunities to explore objects one at a time Encourage and respond to requests for more	Provide opportunities and materials to explore the concept of a group being separated into parts (e.g. breaking crackers into two pieces) Use mathematical language across environments and activities throughout the day (e.g. "Please bring me all of the crayons", "You have more/less crackers than Isaiah", or "Whose tower has more blocks?")	Provide activities where children can identify differences in quantity (e.g. sensory table, dramatic play grocery store, and blocks) Use mathematical language across environments and activities throughout the day (e.g. "You ate the rest of your snack." "Some of the pieces are missing.") Help children identify first and last (e.g. use picture schedules, identify first and last peer in a line) Sing songs with numbers, discussing "none" as representing zero (e.g. *Five Little Speckled Frogs*)	Count various quantities together with children, and compare which group has more, fewer or the same (e.g. memory card game with sets of 1-5 dots or pictures) Encourage children to use mathematical language to describe their environment (e.g. when playing store, ask the child to describe what items they have most/more/fewer in their basket) Discuss what equal amounts are and demonstrate what this looks like (e.g. when passing out supplies)	Count various quantities together with children, and compare which group has more, fewer or the same (e.g. memory card game with sets of 1-10 dots or pictures) Encourage children to use mathematical language to describe their environment (e.g. when lining up, ask children to describe positional order, "Who is first, second, third and last?") Provide opportunities for children to equally divide items/foods into small groups (e.g. sort three crackers into each bowl)

M2.1: Exhibit understanding of mathematical structure

Mathematical structure is the application of previously developed skills, such as language, to make sense of new mathematical ideas. Provided the opportunity to experience mathematics in a variety of forms, children will develop an understanding of new mathematical concepts. The development of understanding mathematical structure skills leads to:

- Applying known structures to new structures.
- Counting by ones (1,2,3), then counting by tens (10,20,30) etc.
- Development of strategies that children show in performing simple arithmetic
- The ability to reason and explain their mathematical activities

Looking Ahead to Kindergarten

In kindergarten, students will use objects, drawings, etc. to decompose numbers less than or equal to 10 into pairs in more than one way, and record each decomposition with a drawing or an equation (K.CA.3).

Family Engagement

Encourage families to:

- Have their child distribute cookies or toys to family members, with each person getting an equal number.
- Help their child think about the permanence of a set. (e.g. Put a specific number of objects in a row, and then change the arrangement. Then families can ask, “Are there more or less?”).
- At the grocery store, encourage families to ask questions about what there is more of in the cart (e.g. ”Did we buy more apples or tomatoes?”).

Special Populations[4]

Educators can:

- Pre-teach new terms and language and post visuals around the room.
- For DLL, use interventions focused on matching quantity and comparison terms in the child’s home language to English.

[4] With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' understanding of mathematical structure:

M2.1: Exhibit understanding of mathematical structure

Across all developmental stages, educators can:

- Play games where small quantities are combined or taken away, and point child's attention to the new quantity (e.g. a numeric card game or a simple educator created game using a dice or spinner.)
- Provide loose parts that can be grouped and ungrouped.
- Share simple math boards in zip-lock bags for families to use at home.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
	Provide materials and encourage children to fill and dump Play simple games that encourage the child to take away or add to a larger group (e.g. "Can you take all the dogs out of the pile of animals?")	Play games where child guesses what items are added or taken away from a larger group of items Provide opportunities during play for child to play with numbers and make predictions (e.g. "How much playdough would you like?" or "How many blocks tall do you think you are?")	Provide a variety of materials (e.g. loose parts) that can be grouped and ungrouped, drawing attention to the concept that combining groups creates a larger group and taking away creates a smaller group	Play games where small quantities are combined or taken away drawing attention to the new quantity Provide materials that can be used for adding and subtracting

M2.2: Demonstrate awareness of patterning

Patterns help children learn sequencing and to make predictions which leads to mathematical skills, logic structure in algebra, and to establishing order in life. Understanding patterns provides the basis for understanding algebra. This is because a major component of solving algebra problems involves data analysis which is deeply related to the understanding of patterns. Developing patterning skills leads to the ability to:

- Recognize daily routines
- Show interest in visual, auditory, and tactile patterns
- Recognize patterns in the natural environment
- Create and extend patterns
- Understand sequence of events
- Make predictions

Looking Ahead to Kindergarten

In kindergarten, students will create, extend, and give rules for simple repeating and growing patterns and shapes (N.CA.5).

Family Engagement

Encourage families to:

- Notice and point out patterns they see everyday (e.g. adult creates a pattern with crackers and pretzels at snack time. The child can recreate the pattern or create their own.).
- Help the child find the patterns in their homes (e.g. bathroom floor tile, the pattern in their backyard gate, or the pattern in a picture frame on a wall).
- Use various materials in their homes to create and demonstrate patterning.

Special Populations[5]

Educators can:

- Point to numerals as they're counting as rote counting is a common pattern children hear.
- For DLL, read books that have a familiar pattern or repetition (in native language, if possible).

[5] With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' awareness of patterning:

M2.2: Demonstrate awareness of patterning

Across all developmental stages, educators can:

- Explain daily schedule/routines, follow consistently, and ask children to predict/recall what comes next (e.g. consider hanging a picture schedule).
- Clap along to the beat of music or create a sound pattern with rhythm instruments (e.g. BANG, tap, tap, BANG, tap, tap).
- Create a pattern with movements or actions (e.g. "Let's make a pattern with how we move. Jump. Step. Jump. Step.").
- Point out patterns in the environment (e.g. "Look, you have on stripes today! Red, blue, red, blue.").
- Create a pattern with materials that children can add on to.
- Point out patterns children have noticed while at school to their families.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Talk with infant during and about daily routines and prepare them before a routine or transition (e.g. "I am going to change your diaper next.") Provide materials to engage infant's senses (e.g. textured blankets for use during tummy time, textured balls, black and white patterns)	Sing songs that have a steady beat or songs that give instructions to clap/stomp Provide musical instruments children can play along to the beat of the music	Establish, maintain, and talk about your daily routines Give opportunities for children to predict what happens next (e.g. "What do we do after lunch?") Provide materials that encourage creating patterns (e.g. sorting animals, colored blocks, and pattern cards) While child plays with patterning materials, ask child "What comes next?" within an ABAB pattern (e.g. red block, blue block, red block, blue block, etc.)	Provide multi-step directions and support child's completion of tasks Ask predictive questions about what comes next in the daily routine Model and provide materials for patterning of various attributes including size, shape, and color (e.g. when walking in a line, arrange the children into a pattern and point it out)	Provide multi-step directions Initiate conversation about a pattern the child created Model and provide materials for patterning of various attributes including size, shape, and color (e.g. when walking in a line, arrange the children into a pattern and point it out) Provide materials and opportunities for children to create the same pattern out of different materials (e.g. educator creates red, blue, red, blue pattern with blocks and asks child to recreate with other objects)

Mathematics Foundation 3: Data Analysis

Early learners develop foundational skills in learning to understand concepts of classification, data collection, organization, and description.

M3.1: Demonstrate understanding of classifying

Classifying is a mathematical concept that is important in daily tasks as well as problem solving. The ability is necessary as a foundation for both math and science. Children who are able to classify build foundations for data analysis, which will be used in primary school. Once they have classified items, children can also compare items further to learn more specific similarities and differences between items, both within and between matched groups. The development of classifying skills leads to:

- The ability to differentiate groups of items, concepts and attributes
- An ability to analyze data in mathematics and daily tasks
- Exploration of data using graphs

Looking Ahead to Kindergarten

In kindergarten, students will identify, sort, and classify objects by size, number, and other attributes. They will also be able to identify objects that do not belong to a particular group and explain the reasoning used (K.DA.1).

Family Engagement

Encourage families to:

- Actively describe environments and objects they are engaged with at home, on the car ride, or at the store (e.g. "Look at the flowers in our yard! The petals on this one are different than the dandelions we collected.").
- Have the child help sort the laundry by various categories (e.g. matching socks by color or by who the sock belongs to).

Special Populations[6]

Educators can:

- Provide direct intervention and support while children explore different shapes, sizes, and colors.
- For DLL, consider having children work with a friend who speaks their native language.

[6]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' understanding of classifying:

M3.1: Demonstrate understanding of classifying

Across all developmental stages, educators can:

- Highlight classification in everyday life and routines (e.g. when children put a puzzle together, point out they are matching shapes. When they are putting on their shoes and socks, remind them they are matching objects. During clean up time, provide children with daily opportunities to classify toys and put them in the correct container, on the correct shelf).
- Provide varied opportunities and materials to sort and classify items by attributes, and encourage children to discuss their reasoning behind each decision.
- Use descriptive words that refer to objects' color, shape, size, texture, etc.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
	Provide diverse materials in the environment and draw attention to unique qualities of objects (e.g. "The cow has four legs. You have two." and "All these blocks are red, but this one is small and this one is big.")	Model grouping by attributes (e.g. sorting all the animals in a pile and all the cars in another) Provide materials that children can sort (e.g. blocks or socks) Point out similarities and differences (e.g. "This group is big and this group is small.")	Provide materials that children can sort, classify and name during independent and group activities Play games in which children can practice classification (e.g. classify pizza toppings) Ask children a question that allows for grouping (e.g. question of the day, "Chocolate vs. Vanilla ice cream?")	Provide complex materials that can be sorted by multiple attributes during independent and group activities Initiate conversation about strategy children can use or used to sort or classify objects Display and discuss children's responses to grouping questions

M4.1: Understanding of spatial relationships

Understanding ***spatial relationships*** is the ability to specify how objects are located in space in relation to a reference object. The development of spatial relationship skills leads to:

- Understanding how objects fit and move
- Understanding how to combine shapes to make new shapes
- Ability to complete basic shape puzzles
- Playing by hiding behind or between objects
- Ability to use position terms such as in, on, under, above, below, beside, and between

Looking Ahead to Kindergarten

In kindergarten, students will be able to describe the positions of objects and geometric shapes in space using the terms inside, outside, between, above, below, near far, under, over, up, down, behind, in front of, next to, to the left of and to the right now (K.G.1).

Family Engagement

Encourage families to:

- Use blocks or cardboard boxes at home. While playing, ask families to help set a goal with their child such as building a tower for a princess or ramp for a car.
- Ask the child how many blocks of one size it would take to cover a block of another size or which shaped pieces they think would be best to build an arch or a stairway.
- Create an obstacle course using chairs, tables, pillows and anything else families have. Use spatial words such as "over," "under," "through", and "around" to explain the route.

Special Populations[7]

Educators can:

- Position the manipulatives and activities to ensure that children with different physical abilities are able to comfortably play and engage in activities.
- For DLL, use position terms in native language when possible to help make connections between the term and meaning.

[7]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' understanding of spatial relationships:

M4.1: Understanding of spatial relationships

Across all developmental stages, educators can:

- Ensure toys and materials are available at children's levels.
- Provide toys or manipulatives that involve shapes or the building of shapes ranging in difficulty level.
- Use position terms when giving directions, asking questions, conversation, or during activities.
- Sing songs or read books that involve shape analysis or space position terms.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Provide materials that can be manipulated (e.g. cars, balls, ramps, basic shape sorters, and stacking rings/cups) Facilitate opportunities to play at various spatial locations (e.g. crawling under a table, in a tent, on a climber)	Provide materials that consists of shapes that can be built into more shapes (e.g. blocks) Arrange the environment to create small spaces for children to practice safely maneuvering over, under, behind, and through Use spatial language to describe children's position throughout the day (e.g. "You are under the table," or "You are between Claire and Marcus.")	Provide and facilitate use of interlocking puzzles of various complexity Facilitate opportunities for children to match picture halves (e.g. bear head with bear body, tiger head with tiger body)	Give directions using positioning terms (e.g. obstacle course or *I Spy*) Provide and encourage use of tangrams with complete lines	Sing songs or rhymes with positioning terms (e.g. *Simon Says* and *Hokey Pokey*) Provide and encourage use of tangrams with or without completed lines, as appropriate for the child

M4.2: Exhibit ability to identify, describe, analyze, compare, and create shapes

Understanding the structure of geometric shapes will allow children to learn to reason with shapes and their attributes, understand the common language of shapes (i.e. spatial sense), the basic properties of shapes (number of sides, corners, squares) and their similarities and differences. The development of spatial analysis skills leads to:

- Ability to identify different shapes, letters, and numbers
- Ability to recognize and draw geometric shapes based on the shapes specified attributes (i.e. number of angles)
- Understanding how geometric shapes are useful in representing real-life situations.

Looking Ahead to Kindergarten

In kindergarten, students will compare two and three dimensional shapes in different sizes and orientations, using informal language to describe their similarities, differences, and parts (K.G.2). Additionally, students will compose simple geometric shapes to form larger shapes (K.G.4).

Family Engagement

Encourage families to:

- Read books about shapes.
- Point out similarities and differences between circles and balls, squares and blocks.
- Use bath time as a learning time. A set of stacking cups can be a great tool to learn how to nest the cups within each other, and how to stack them on the edge of the tub.

Special Populations[8]

Educators can:

- Ensure that children with different physical abilities are able to comfortably play or engage in activities.
- Provide books and puzzles or materials at different ability levels.

[8]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' ability to identify, describe, analyze, compare, and create shapes:

M4.2: Exhibit ability to identify, describe, analyze, compare, and create shapes

Across all developmental stages, educators can:

- Provide toys or manipulatives in a variety of shapes to encourage the construction of additional shapes.
- Provide open-ended materials (e.g. pipe cleaners, straws, or craft sticks) and encourage children to use these to make shapes. Discuss the shapes they make (e.g. "That's a triangle. How could you turn it into a square?").
- Provide materials to show how 3-D objects can be made into 2-D objects and 2-D to 3-D. Children will see the 2-D flat shapes that make up the 3-D sides of the objects.
- Share documentation (photos, conversations) from work with blocks, shapes and numbers and letters (e.g. "We noticed today that the letters O and Q are circles.").

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Facilitate engagement with materials that enable children to explore shapes (e.g. nesting cups)	Facilitate engagement with materials that enable children to explore shapes (e.g. basic shape sorter, shape puzzles) Provide several of the same shaped objects for children to match (e.g. "Can you find the other square block that looks like this one?")	Draw attention to objects that are the same shape but different sizes or orientations in books or the environment Provide materials for matching (e.g. felt pieces, play dough, stacking cups, advanced shape sorter) Encourage children to find shapes that match or look the same within the environment	Engage in conversation about the names and attributes of shapes Use environmental opportunities to identify attributes of shapes and match similar shapes (e.g. shape walk to search for spheres) Provide materials (e.g. pipe cleaners, straws, or craft sticks) as materials children can use to make into shapes. Discuss the shapes they make. (e.g. "That's a triangle. How could you turn it into a square?") Provide materials to dip 3-D objects (e.g cans, spools, candles, etc) in paints and press them on paper to make 2-D prints	Engage in conversation comparing and contrasting the attributes of shapes including non-perfect examples of shapes (e.g. compare different types of triangles and rectangles) Provide materials to deconstruct shapes for exploration (e.g. as you cut a cereal box, ask "How many rectangles are there in the box?" Then ask children how to put the box back together.)

Mathematics Foundation 5: Measurement

Early learners develop foundational skills in learning to understand concepts of time and measurement comparisons.

M5.1: Understanding concepts of time

People follow a schedule that is dictated by their responsibilities or a need to have structure. Children also crave routines, but they are not born with the sense of time. The concept of time is abstract to children and intentional support is needed to introduce it. Understanding the concept of time leads to:

- A beginning understanding that time is sequential
- The ability to conceptualize before and after and think about future and past events
- A beginning understanding of the past vs. distant past, and the future vs. distant future

Looking Ahead to Kindergarten

In kindergarten, students will work to understand concepts of time including: morning, afternoon, evening, today, yesterday, tomorrow, day, week, month and year. They will also understand that clocks and calendars are tools that measure time (K.M.2).

Family Engagement

Encourage families to:

- Discuss the day's upcoming events with their child (e.g. "We will leave for school after we have breakfast and brush our teeth.").
- Use words to indicate time such as yesterday, today and tomorrow when they are talking with their child.
- Talk with their child about their weekly schedule (e.g. "We go to gymnastics on Tuesday, which is tomorrow.").

Special Populations[9]

Educators can:

- Frequently walk with children to the picture schedule to remember, see, and touch where we are in the day and what comes next.
- For DLL, discuss time in both English and the child's native language pairing the native words with English words to support understanding.

[9]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' concepts of time:

M5.1: Understanding concepts of time

Across all developmental stages, educators can:

- Have consistent routines and daily schedules in place, and share with families the importance of a daily routine, including how to talk about it with their child.
- Consider using a visual schedule in a linear format, referring back to it frequently throughout the day.
- Take frequent photographs of events, projects, or field trips, then invite the children to help select photos for a program journal or display to show sequence. Take dictation so children and families can revisit the experience.
- Provide games for children to begin to get a feel for the length of various units of time and the vocabulary associated with them (e.g. children might guess how many seconds it takes to walk from one side of the playground to the other while someone times them).
- Give children ample time to prepare for transitions and consider using visual timers (e.g. "We are going outside in 5 minutes" or using an hourglass timer.).

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Describe daily caregiving routines and ask the infant for their participation (e.g. "It's time to change your diaper. Can you help by lifting your legs?")	Establish and maintain a consistent daily schedule Create a visual of your daily schedule for the child to reference	Create tools to help children review routines (e.g. hand washing posters, picture schedules) Help children through familiar transition by giving clear two-step directions (e.g. "Get a book then lay on your cot" or "Wash your hands then sit at the table.") Introduce books and songs with a time or sequence theme (e.g. *The Very Hungry Caterpillar* or *Going On A Bear Hunt*)	Provide language exposure to concepts of time (i.e. tomorrow, morning, afternoon, earlier, later) Utilize time limit cues throughout the day to support transitions (e.g. "We will clean up in 5 minutes.") Make a countdown paper chain to countdown to special days, and let children tear off a link each day Read books with a time or sequence theme, (e.g. *The Old Lady Who Swallowed a Fly*)	Engage children in conversation around concepts of time Engage children in project work that requires using the calendar as a tool, planning for future events or keeping a record of events Ask children questions about the daily schedule, (e.g. "If we have snack at 9 and go outside at 10, which one comes first?") Make time telling tools (e.g. clocks, watches, and calendars) available for dramatic play

M5.2: Understanding measurement through description and comparison

Measurement is all around us. Measurement helps us to know when to go to school, how to prepare a certain food, or how cold or warm it is outside. The development of measurement skills leads to:

- Understanding the process and importance of measurement
- Awareness of the need for standard measurement
- Beginning to use appropriate tools and techniques to measure
- Describing objects in terms of their measurement
- Understanding comparisons (i.e. which is taller, heavier, hotter, etc.)

Looking Ahead to Kindergarten

Kindergarteners will be expected to make direct comparisons of the length, capacity, weight, and temperature of objects. They should be able to recognize which object is shorter, taller, lighter, heavier, warmer, cooler, or holds more (K.M.1).

Family Engagement

Encourage families to:

- Show their child and involve them in how measurement is used on a daily basis (e.g. make food with their child and talk specifically about measurements according to recipes).
- Measure things around their home with non-standard units of measurement (e.g. using plastic cups and stacking them to see how tall something is).

Special Populations[10]

Educators can:

- Offer children the chance to work with objects and images in order to master vocabulary.
- For DLL, provide extra support by incorporating visuals, using gestures, and displaying graphs to illustrate math concepts such as comparison of different items.

[10]With familial consent, we encourage early educators to collaborate with other service providers.

Powerful Practices

Examples of ways adults can support young learners' understanding of measurement through description and comparison:

M5.2: Understanding measurement through description and comparison

Across all developmental stages, educators can:

- Ensure measurement tools are easily accessible.
- Provide materials for non-standard units of measurement (e.g. unifix cubes, chain links etc.).
- Use and encourage children to use measurement vocabulary such as tall, taller, tallest, heavy, heavier, and heaviest.
- Ask open-ended questions about the properties of materials.

Infant	Younger Toddler	Older Toddler	Younger Preschool	Older Preschool
Provide diverse objects for infants to freely explore in a variety of shapes and sizes Offer different sized containers that allow for filling and dumping of items.	Model basic measurement words (e.g. big/little, hot/cold) Read books that include concepts of measure such as big/small Offer a variety of measurement tools in all learning areas	Provide a variety of materials for children to sort and encourage them to sort by two attributes (e.g. animals with and without spots or cars versus trucks) Model measurement using non-standard tools (e.g. shoes, hands, blocks)	Provide a variety of materials and tools to measure length, height, and volume Create opportunities for children to utilize measurement materials and tools (e.g. sensory play with water and bowls) Go on a "size" hunt to find things outdoors of different sizes (e.g. something smaller than our finger, bigger than our hand, longer than our leg, etc.) Set up a measurement exploration center with rulers, tape measures, and scales, as well as paper and pencil to recording findings	Provide a variety of materials and tools to measure length, height, and volume Create opportunities for children utilize measurement materials and tools (e.g. sensory play with water and measuring cups, as well as small group cooking activities) Provide and create books about size and measurement, and ensure books are accessible to children Set up a measurement exploration center with rulers, tape measures, and scales, as well as paper and pencil to recording findings

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For additional resources, please see the Early Learning Foundations Guidance Online Tool at www.doe.in.gov/earlylearning.