Building Blocks

Teacher's Edition Sampler

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Building Blocks

Overview

Good early mathematics is broader and deeper than early practice on "school skills." Quality mathematics is a joy, not a pressure. It emerges from children's play, their curiosity, and their natural ability to think. ***Building Blocks*** *builds on children's love of patterns, counting and shape to develop foundational understandings and skills.*

Building Blocks *is one of a small number of projects that the National Science Foundation funded to create mathematics curriculum materials for young children. Its basic approach is to* find the mathematics in, and develop mathematics from children's experiences and interests. *The materials are intended to help children extend and "mathematize" their everyday activities.*

Building Blocks *is a program that acknowledges the critical role teachers play in math education. The program is designed to provide thorough background, teaching strategies, and resources to support teacher delivery of a coherent and effective mathematics curriculum.*

The program is designed to

- Build upon young children's experiences with mathematics with activities that integrate ways to explore and represent mathematics: with children's bodies, manipulatives, computers, books, and children's drawings
- Involve children in "doing mathematics"
- Establish a solid foundation for future study of mathematics
- Develop a strong conceptual framework that provides anchoring for skill acquisition
- Emphasize the development of children's mathematical thinking and reasoning abilities
- Develop the big ideas for early childhood mathematics learning in line with state and national standards
  - Number and Operations
  - Geometry
  - Measurement
  - Patterns and Algebra
  - Data Analysis and Classification
- Make appropriate and ongoing use of technology
- Develop teachers' understanding of mathematics so that they direct and understand mathematical topics, integrate math into the curriculum at large, and provide appropriate pedagogy. Successful teachers interpret what a child is doing and thinking and attempt to see the situation from the child's point of view. From their interpretations, these teachers speculate about what concepts the child might be able to learn or abstract from his or her experiences.
- Incorporate assessment as an integral part of learning events

Building Blocks develops the power of young children's mathematical thinking. Using their bodies, manipulatives, paper, and computers, children engage in activities that guide them through fine-tuned research-based learning trajectories. These activities connect children's informal knowledge to more formal school mathematics. The materials include research-based computer tools, with activities and a management system that guides children through research-based learning trajectories. These activities-through-trajectories connect children's informal knowledge to more formal school mathematics.The result is a curriculum that is not only motivating for children but also comprehensive.

The Research Behind Building Blocks

Building Blocks was designed upon research conducted in a well-defined, rigorous, and complete fashion. Results indicate strong positive effects with achievement gains near or exceeding those recorded for individual tutoring.

Building Blocks' development was supported by a grant from the National Science Foundation Research. Phases of the research included the following:

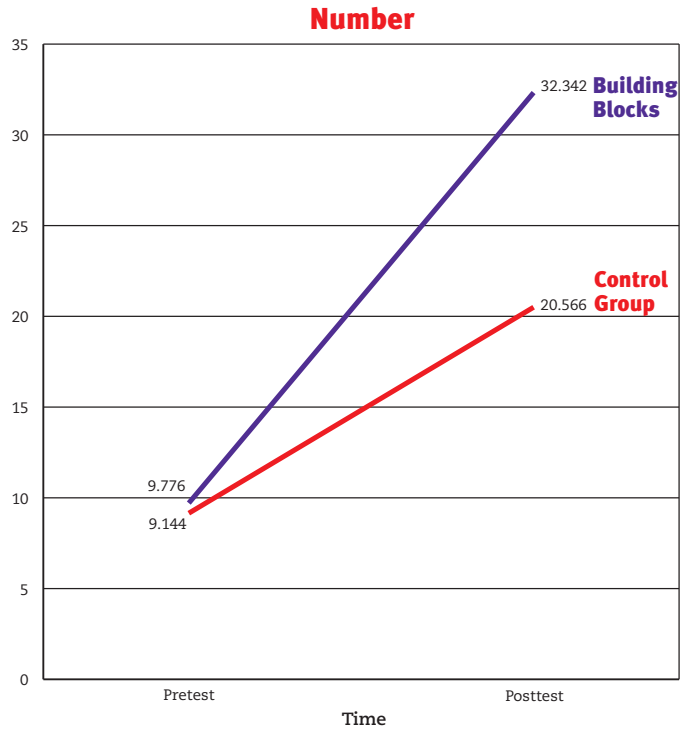
- Drafting curriculum goals
- Building an explicit model of the learning trajectories of children's knowledge and learning for each goal
- Creating initial activities and software
- Assessing prototypes and curriculum with one-on-one interviews with students and teachers
- Conducting pilot tests in several classrooms
- Conducting field tests in numerous classrooms

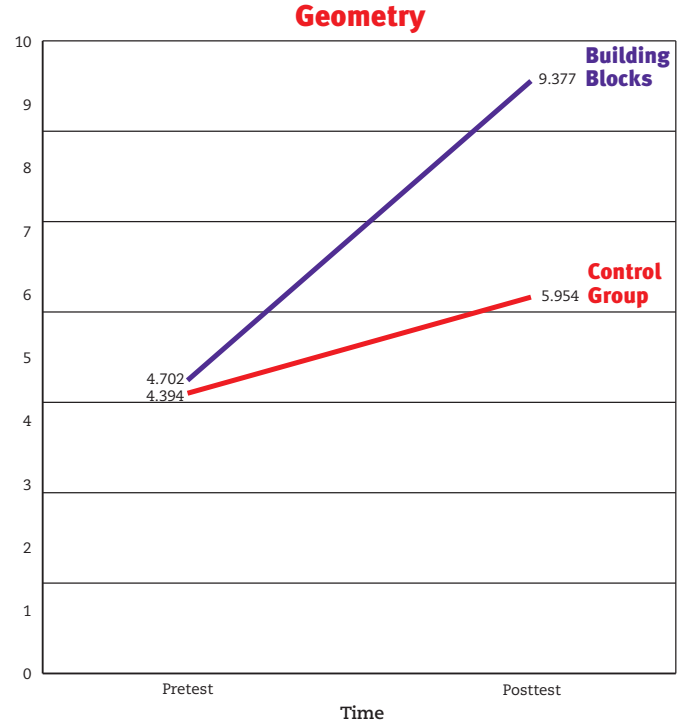
Results

Three different studies were conducted.

1. ***Building Blocks Summative Evaluation.*** This tested the effectiveness in a small number of classrooms. In this study, ***Building Blocks*** was shown to increase knowledge of multiple essential mathematical concepts and skills.

The results are illustrated in two graphs. We computed effect sizes using the accepted benchmarks of .25 as indicating practical significance (for example, educationally meaningful), .5 as indicating moderate strength, and .8 as indicating a large effect. The effect sizes comparing ***Building Blocks*** children's posttest to the control children's posttest were .85 and 1.44 for number and geometry, respectively, and the effect sizes comparing ***Building Blocks*** children's posttest to their pretest (measuring achievement gains) were 1.71 and 2.12. Therefore, *all effects were positive and large. Achievement gains were comparable to the Bloom's coveted "2-sigma," or two standard deviations, effect of excellent individual tutoring.*





Getting Started

Results indicate strong positive effects of the ***Building Blocks*** materials, with achievement gains near or exceeding those recorded for individual tutoring. This is the result of implementing a curriculum built on comprehensive research-based principles.

2. ***Preschool Curriculum Evaluation Research.*** In this study, Building Blocks was used in 40 classrooms with no additional support or training. Mathematics achievement significantly increased in these classrooms as a result.

3. ***The TRIAD/Building Blocks Studies.*** This study tested ***Building Blocks*** against a comparable preschool math program and a no-treatment control group. All classrooms were randomly assigned, the "gold standard" of scientific evaluation. ***Building Blocks*** children significantly outperformed both control children and the comparison group. Again, effect sizes *doubled* those usually considered "strong" and matched those of individual tutoring.

As a result of the positive results ***Building Blocks,*** under a grant from the U.S. Department of Education, is now being tested in a rigorous scale-up study with random assignment in more than a hundred classrooms.

"Basing the curriculum on learning trajectories is even more important than we originally assumed. They helped sequence activities and were critical for allowing our software to provide correlated, individualized activities. In addition, we found that teachers who understood the learning trajectories were more effective in teaching small groups and encouraging informal, incidental mathematics at an appropriate and deep level....We have found this the most powerful way to help our teachers understand children's development, conduct observational assessment, teach, and appreciate the worth of a curriculum."

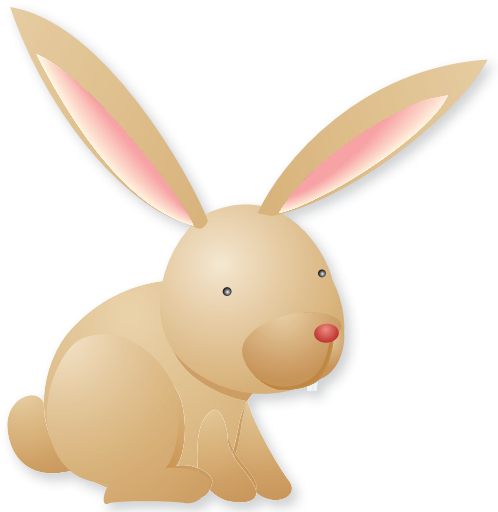
Sarama, Julie and Clements, Douglas. "***Building Blocks*** for Early Childhood Mathematics" *Early Childhood Research Quarterly* 19 (2004) 181–189.

Building Blocks activities are based on the developmental levels of mathematics learning trajectories.

Learning Trajectories

Learning trajectories are the observable, natural developmental progressions in learning. Curriculum research has revealed sequences of activities that are effective in guiding children through these levels of thinking. These developmental paths are the basis for ***Building Blocks*** learning trajectories.

Learning trajectories have three parts: a mathematical goal, a developmental path along which children develop to reach that goal, and a set of activities matched to each of the levels of thinking in that path that help children develop the next higher level of thinking. Thus, each learning trajectory has levels of understanding and skill, each more sophisticated than the last, with tasks that promote growth from one level to the next. The ***Building Blocks*** learning trajectories give simple labels, descriptions, and examples of each level. Complete learning trajectories describe the goals of learning, the thinking and learning processes of children at various levels, and the learning activities in which they might engage.



Building Blocks activities are carefully designed and sequenced to address each level of the learning trajectories in the following areas of mathematics:

Number

- Counting
- Comparing and Ordering Numbers
- Recognizing Number and Subitizing (Instantly Recognizing)
- Composing (Knowing Combinations of) Numbers
- Adding and Subtracting
- Multiplying and Dividing

Measuring

Patterning and Early Algebra

Classifying and Analyzing Data

Geometry

- Recognizing Geometric Shapes
- Composing Geometric Shapes
- Comparing Geometric Shapes
- Spatial Sense and Motions

As children successfully complete activities, they are presented with the challenge of the next developmental level.

For more information about Learning Trajectories, see Appendix B.

The Big Ideas In Early Childhood Learning

The specific topics ***Building Blocks*** teaches are children's mathematical ***Building Blocks***—ways of knowing the world mathematically. They are organized into two areas: (1) number and simple arithmetic and (2) geometry, measurement, and spatial sense. These are the two emphases of NCTM's *preschool standards*. Three mathematical subthemes, (1) patterns; (2) data and graphing, and (3) classifying, sorting, and ordering, are woven through both main areas. These are not elementary school topics "pushed down" to younger ages, but developmentally appropriate areas that are meaningful and interesting to children.

The program sequences these topics based on the considerable research identifying specific "developmental continua" or "learning trajectories" that young children follow.

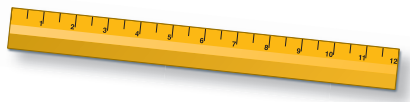
Number and Operations

- Numbers can be used to tell us how many, describe order, and measure; they involve numerous relations, and can be represented in various ways.
- Operations with numbers can be used to model a variety of real-world situations and to solve problems; they can be carried out in various ways.

Geometry

- Geometry can be used to understand and to represent the objects, directions, locations in our world, and the relationships between them.
- Geometric shapes can be described, analyzed, transformed, and composed and decomposed into other shapes.

Measurement

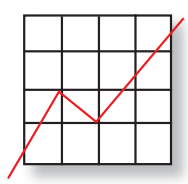


- Comparing and measuring can be used to specify "how much" of an attribute (for example, length) objects possess.
- Measures can be determined by repeating a unit or using a tool.

Patterns and Algebra

Patterns can be used to recognize relationships and can be extended to make generalizations.

Data Analysis and Classification



Objects can be sorted and classified in a variety of ways. Data analysis can be used to classify, represent, and use information to ask and answer questions.

Building Blocks mathematics is distinct in several ways.

- It connects children's informal and school mathematics. Research tells us this is early childhood mathematics education's "missing link."
- It includes everyday activities and objects, and also mathematical objects specifically designed to facilitate mathematical thinking.
- It helps children "mathematize" key activities from everyday life, such as setting a table.
- It encourages children to explore special mathematical objects and actions or processes, especially in the ***Building Blocks*** software.

In this way, the ***Building Blocks*** mathematics program offers the best of natural everyday life, as well as low-tech (manipulatives) and high-tech support for children's mathematical thinking.

Much of our world can be better understood with mathematics. Preschool is a good time for children to become interested in counting, sorting, building shapes, finding patterns, measuring, and estimating. Quality preschool mathematics is not elementary arithmetic pushed onto younger children. Instead, it invites children to experience mathematics as they play in, describe, and think about their world.

Why Preschool Mathematics?

We need preschool mathematics for four reasons:

1. Preschoolers already experience curricula. Currently most preschool curricula is limited in mathematics. Effective preschool mathematics curriculum can strengthen this area.

2. Many preschoolers especially from low-income groups later experience considerable difficulty in school mathematics. Effective preschool mathematics curriculum can narrow the gap between these children and others.

3. Preschoolers possess informal mathematical abilities and enjoy using them. They are self-motivated to investigate patterns, shapes, measurement, the meaning of numbers, and how numbers work, but they need assistance to bring these ideas to an explicit level of awareness. Effective preschool mathematics curriculum can nurture these interests.

4. Preschoolers' brains undergo significant development and grow most as the result of complex activities, not from simple skill learning. Effective preschool mathematics curriculum can support this development.

Preschoolers can and should engage in mathematical thinking. All young children possess informal mathematics and can learn more. Teachers should build on and extend the mathematics that arises in children's daily activities, interests, and questions. They should struggle to see children's points of view and use their interpretations to plan their interactions with children and the curriculum. A combination of an environment that is conducive to mathematical explorations, appropriate observations and interventions, and specific mathematical activities helps preschoolers build premathematical and explicit mathematical knowledge.

Building Blocks software is an essential element of the Building Blocks curriculum.

Why Use Computers?

While opinions may vary, research is clear: Used in a developmentally-appropriate way, computers are interesting and beneficial for preschoolers. They help children "mathematize" and learn in a variety of ways. Research shows that when used wisely, computers can be developmentally appropriate, fun, and beneficial for young children. The computer offers many practical advantages. Children enjoy that the blocks "snap" to each other and stay together accurately. They like saving and returning to, as well as printing, their work. Children often learn more by using the computer's tools to perform actions on the shapes. Because they have to figure out how to choose a motion such as slide, flip, or turn, they become more conscious of these geometric motions. They think ahead and talk to one another about which shape and action to choose next.

Most importantly the ***Building Blocks*** software provides activities at the appropriate level of the learning trajectory for each student.

Very young children have shown comfort and confidence in using software. They can follow pictorial directions and use situational and visual cues to understand and think about their activities.

Building Blocks software has these advantages:

- It combines visual displays, animated graphics and speech.
- It provides feedback.

- It provides opportunities to explore.
- It focuses children's attention and increases their motivation.
- It individualizes—gives children tasks at children's own ability levels.
- It keeps a variety of records.
- It provides more manageable manipulatives (for example, manipulatives "snap" into position).
- It offers more flexible and extensible manipulatives (for example, manipulatives can be cut apart).
- It provides more manipulatives (you never run out!).
- It stores and retrieves children's work, so they can work on it again and again, which facilitates reflection and long-term projects.
- It records and replays children's actions.
- It links "concrete" (graphical) and symbolic (for example, numerals or spoken words) representations, which builds understanding and provides valuable feedback.
- It presents clearer mathematics (for example, using tools, such as a "turn tool," helps children become aware of mathematical processes).

Building Blocks software stores records of how children are doing on every activity. It assigns them to just the right difficulty level. It's like each child having a personal tutor! Also, you can view records of how the whole group or any individual is doing at any time. It's like having a personal aide!

Finally, computers make a special contribution to special education. These advantages lead to significant learning improvements for children with special needs:

- It is patient and non-judgmental.
- It provides undivided attention, proceeding at the child's pace.
- It provides immediate reinforcement.

For more information on the software and research on its advantages see Appendix A.

Matt Meadows

Getting Started with Building Blocks

*This section provides an overview of classroom management issues and explanations of the **Building Blocks** program elements and how to use them.*

Program Materials

A variety of program materials are designed to help teachers provide a quality mathematics curriculum. The first step in getting started is to familiarize yourself with the program resources.

Teacher's Edition

The ***Teacher's Edition*** is the heart of the Building Blocks curriculum. It provides background for teachers and complete lesson plans with explicit suggestions on how to develop math concepts. It explains when and how to use the program resources.

Teacher's Resource Guide

The ***Teacher's Resource Guide*** offers key resources that help in delivering the curriculum. These include:

- Family Letters for each week
- English Learner support for each week
- Counting Cards
- Puzzles and Patterns
- Shape Sets
- Shape Flip Book

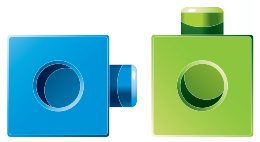
Building Blocks Software

The engaging software activities are essential to the curriculum. Each activity addresses a specific developmental level of the math learning trajectories.

Assessment

Building Blocks Assessment is a comprehensive research-based guide to assessing and preschool children's math proficiencies.

Manipulatives



The ***PreKindergarten Manipulative Kit*** includes key manipulatives and props for hands-on activity.

Big Books

Four big books provide excellent math related literature children will want to experience again and again.

Building Shapes

Makayla's Magnificent Machine

Victor Diego Seahawk's Big Red Wagon

Where's One?

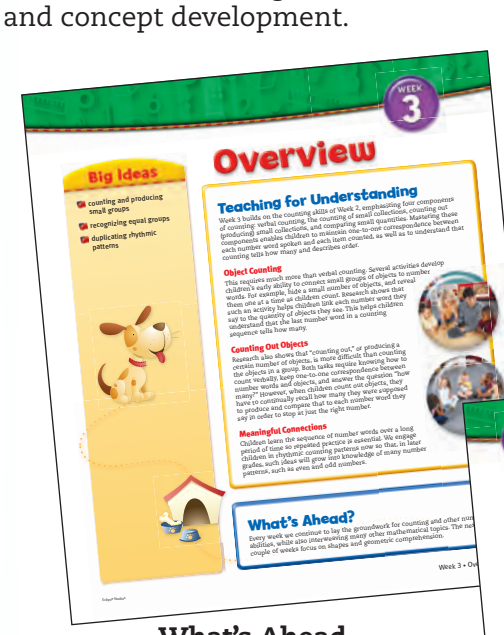
Technology Resources

Math resources designed to facilitate instruction and record keeping expand student learning

	For Teachers	For Students	
Online Planner	A tool to help teachers plan daily lessons and plot year-long goals	Building Blocks	Engaging research-based activities designed to reinforce levels of mathematical development in different strands of mathematics
Online Assessment	An assessment tool to grade, track and report electronic versions of all assessments		
Interactive Whiteboard Activities	Resources for teachers and students to explore numbers, shapes, and patterns		

Program Organization

The curriculum is organized into 30 weeks of activities and concept development.



What's Ahead outlines where students are headed and how teachers can facilitate their learning.

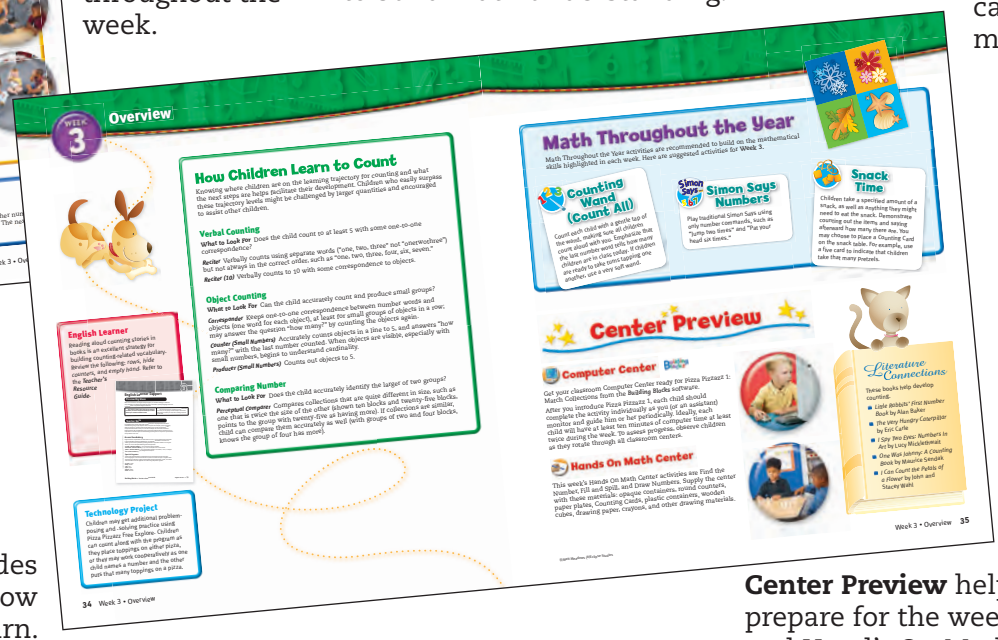
Overview provides information about how children learn.

Teaching for Understanding provides information about how children learn the key concepts.

Big Ideas outline the key concepts that will be developed throughout the week.

Math Throughout the Year overviews math strategies and props that teachers can use throughout the day to build math understanding.

Literature Connections identifies specific trade books that can enhance mathematics.



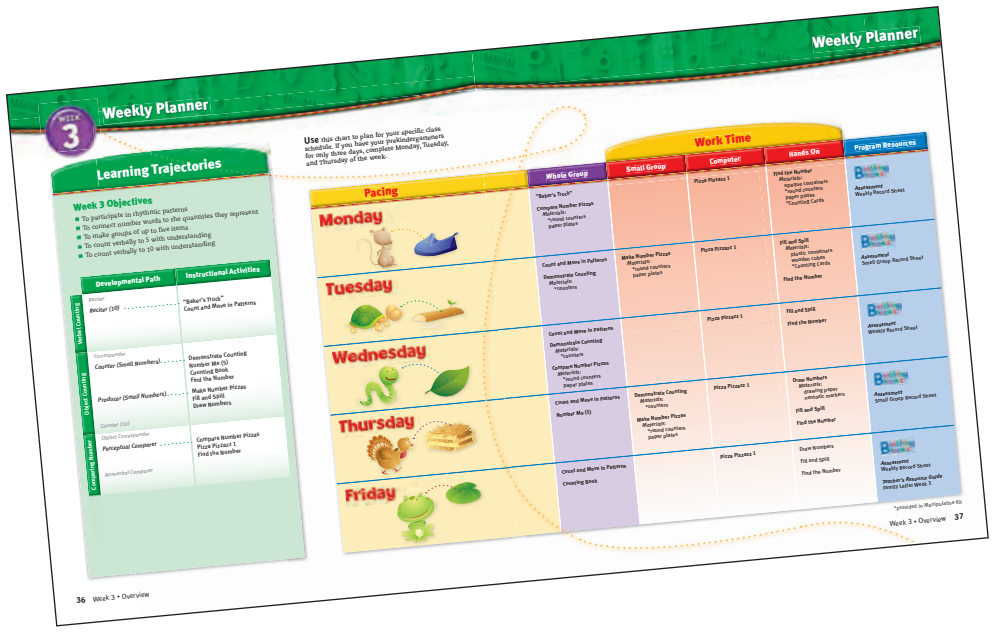
Center Preview helps teachers prepare for the week's Computer and Hand's On Math Centers.

For more detailed information about Learning Trajectories and Building Blocks software, see Appendix B.

Weekly Planner

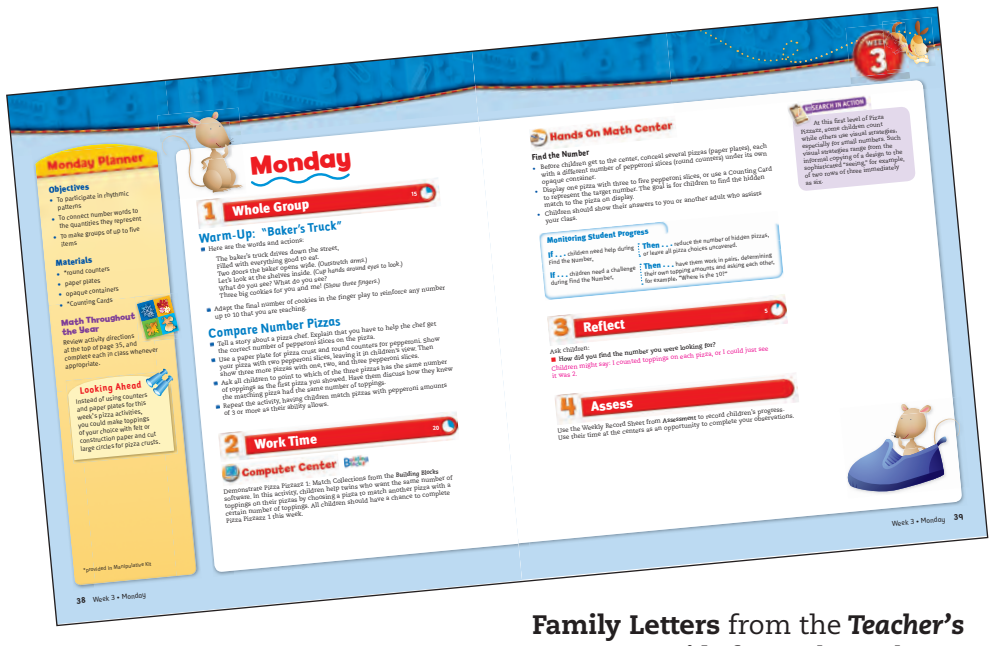
Provides objectives, learning trajectories, correlating activities, materials, and program-specific resources to prepare for each week.

The **Wrap-Up** for each week includes **Assess** and **Differentiate** strategies for teachers based on where students are in a week's key learning trajectories for math.



Daily Lessons

Each daily lesson follows a consistent plan.



1. **Whole Group** includes Warm-Up activity to get children ready for math.

2. **Work Time** outlines the Computer Center, the Hands On Math Center, and Small Group on Tuesday and Thursday.

3. **Reflect** engages children in summarizing and analyzing their mathematical thinking.

4. **Assess** reminds teachers of their informal assessment opportunities each day.

Family Letters from the ***Teacher's Resource Guide*** for each week communicate what children are doing in school and provide an opportunity for children to demonstrate their knowledge.

The following schedule describes one way to engage children in all the activities effectively.

Week by Week

Monday

- *Before school,* set the computer for the week's activity(ies) (do this Friday or anytime before starting school on Monday).
- *Before school,* read the instructions in the ***Teacher's Edition.***
- Whole Group introduction and activities
- In addition to the Whole Group activities, introduce the software to the children, along with any new centers.
- Demonstrate new Hands On centers (Assistant monitors other children).
- Have children sign-up on list—two at a time work on each of 2 computers. Make sure an adult is available, especially at the beginning of the year, to help at the computer as needed. They can help children know it's their turn, sign on, and provide scaffolding as children work.

Tuesday

- Whole group activities
- Introduce any new software to children.
- Introduce any new center activities.
- Small groups work with teacher.
- Assistant helps other children use the sign-up lists to rotate their use of the computer and monitors all centers.

Wednesday

- Whole group activities
- Review any Work Time activities that need discussion.
- Engage in Computer and Hands On Math Centers.
- Planning time: Management
- Check the computer management system: Are all children completing activities?
- Check all assessment notes. Who needs extra help? Challenge?

Thursday

- Whole group activities
- Small Group
- Repeat Tuesday's Work time as needed, guiding children you have not yet worked with or any who need extra experience.
- Other children engage in Computer and Hands On Math Centers.

Friday

- Whole Group activities
- Engage in computer and Hands On Math Centers.
- During any Whole Group time, children show what they have done on the computer, or the teacher can run the activity again and discuss how children solved the problems ("Computer Show").
- Ask the "Reflect/Assess" questions at Whole Group.
- Complete all recording sheets.
- Send home Family Letter.
- After dismissal, set the computer to do the activity(ies) for the following week. Read the instructions in the ***Teacher's Edition,*** and try the activity yourself.
- Review all activities in preparation for next week.
- Planning time: Management
- Check the computer management system: Are all children completing activities?
- Check any observation and assessment notes: Who needs extra help? Challenge?
- Plan to gather any materials needed for next week.

Weekly Routines

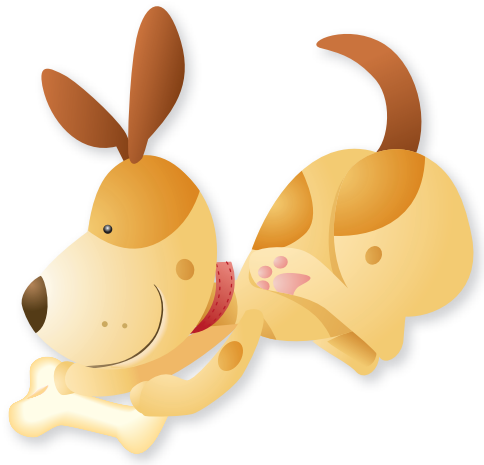
Every Week Day

1. Try to do each day as written in the curriculum.

2. Continue using any Centers from previous weeks that children are still learning from and interested in.

3. In addition to the Whole Group activities, introduce any new off-computer centers during Whole Group.

4. Ask the Reflect questions each day it is possible, but especially on Friday.



Effective whole group and small group activities develop more than mathematics knowledge. They develop children's ability to maintain attention and persist, their receptive (listening) and expressive (talking) language, their general cognitive and problem solving skills, and their social skills. The following teaching strategies help children develop in all these areas.

Conducting Successful Whole and Small Group Activities

- Be prepared ahead of time and organized so there is little or no "wait time" for the children.
- Keep the activity "moving forward" and vary the tone and pitch of your voice so that the activity is interesting to and motivating for children.
- Avoid interruptions of any kind, especially those that could come from focusing on a few misbehaving children. Instead, "draw them into" the activity.
- Use a song or finger play to increase children's attention whenever it wanes.
- In small groups especially, develop children's language and vocabulary by describing what individual children are doing and asking them to do so, developing their abilities to connect language to their activity and encouraging them to build stronger mental representations of their work by enriching them with language.

Whole Group Activities

Whole Group activities, conducted every day, should be well-paced and engaging.

- Daily whole group activities should be completed each time they appear in the week's plan. Do the activities whenever your class meets as a group. This might be story time, morning circle, or any other whole group time.
- Repeat finger plays as often as you like. If a new finger play is introduced, and you have a better one that accomplishes the same goal, substitute yours or a previous one that children would benefit from repeating.
- Have children respond or act together to keep everyone active and motivated.

Small Group Activities

Small groups, conducted at least two days per week, should be intimate and interactive. Work with a small group of children, often four at a time, to complete the activity. Then repeat the activity with another small group. Some teachers work with all the children on the first small group day, then repeat the activity the next small group day with any children who would benefit from extra work with you on the activity. Others repeat the activity on the first day until at least half of the children have had a chance. They then complete the small group activity with the remainder of the children on the next small group day. These teachers find other times to repeat the activity with children who need extra work.

- Work with a small group of four children work to solve the problems posed in the ***Teacher's Edition.*** All children should participate at least once each week.
- Record each child's name as they work with you, along with their performance (see the following section). You may also wish to set up a pocket chart with names and the days children are scheduled to work with you.
- Repeat the activity that week or a future week with any children who need more experience.

Computers are a way to help children learning mathematics. This section emphasizes guidelines for using computers. However, many of the teaching strategies apply to all centers, whether that center involves computers, manipulatives, books, or any other materials.

Computer Center

Arranging and Managing Computer Centers

Even preschool children can work on computers cooperatively with minimal instruction and supervision, if they have adult support initially. However, adults play a significant role in successful computer use. So, consider the following suggestions.

- Place your computer where adults can supervise and assist children as they need it.
- Place the computer so there is no glare on the screen.
- Ideally, use the computer as a "learning center." If you have 3 to 5 computers, you can cycle all children through the computer activity. If you have 1 or 2 computers, you will need to use the computer throughout the day to ensure that all children have a chance.
- Place one to two seats in front of the computer and one at the side for an adult to encourage positive social interaction. Placing computers close to each other can facilitate the sharing of ideas among children. Computers that are centrally located in the classroom invite other children to pause and participate in the computer activity. Such an arrangement also helps keep teacher participation at an optimum level. They are nearby to provide supervision and assistance as needed.
- Expect independent work from children gradually. Prepare them for independence, and increase the degree of such work slowly. Provide substantial support and guidance initially, even sitting with children at the computer to encourage turn taking. Then gradually foster self-directed and cooperative learning.
- Set up the computer sign-up sheet that has the children's icons on it.
- Monitor student interactions to ensure active participation of all. It is critical to make sure special education children are accepted, supported, and given equal access.

Very First Time with Children

Providing a lot of guidance and help at the beginning will pay handsomely for the rest of the year.

- Show the sign-in sheet and "act out" how to use it.
- Show how the sign-in screen has their names listed.
- Discuss the pictures that go with their names.
- Choose a child and click his or her name and password.
- Demonstrate the first assigned activity.
- Demonstrate how to return to the sign-in screen.
- Re-introduce this in small groups.
- At the beginning of each week, demonstrate and discuss the new computer activity: Describe the mathematical problem and how you solve it. Demonstrate every step of the activity. Tell children exactly what you are doing, moving the mouse to point here, clicking, and so on. Ask children to show you where to click as soon as they are able.

Teaching Strategies

- Make sure all children work on the assigned computer activities individually at least twice per week for about 15 minutes each time. See the next session, "Assessing and Recording," for suggestions on how to rotate children through the computer activities.
- Once the children have finished the assigned activities, they should always get the chance to play and learn with the *"free explore"* activity. This might be individual, but is also an excellent opportunity for *children to explore cooperatively,* posing problems for each other, solving problems together, or just learning through play.
- Demonstrate these activities to children on the computer every Monday and demonstrate and discuss them again every Tuesday.
- Children should spend about 15–20 minutes at the computer at a time, at least two times per week.
- Remember that preparation and follow-up are as necessary for computer activities as they are for any other. Do not omit critical whole-group discussion sessions following computer work. Consider using a single computer with a large screen or with overhead projection equipment.
- Use Friday's *"Computer Shows"* to lead discussions with the whole group. Help children communicate about their solution strategies and reflect on what they've learned.
- Research shows that the introduction of a computer often places many additional demands on the teacher. Be kind to yourself! Get help!
- Integrate mathematics on and off the computer throughout your day. The following section provides a wealth of suggestions.
- Ultimately, *go at the children's pace.* If the first few weeks are too slow, move on! Or, if you get near the end of the year and children need more time, take more time. Learning with understanding is the point.
- Make sure children make sense of the mathematics.

Matt Meadows

Hands On Math Centers give children concrete experiences with math concepts.

Hands On Math Center

- An effective way to manage centers is to keep all materials for any center in one box or container, and keep all these boxes on a special shelf. If you mark each box with a picture or symbol, children can help you get them out and put them away; for example, if you have a square blue rug, mark a box with a blue square, and then children will know where that box is placed in the room.
- Introduce each center when you are putting out the materials for the first time.
- Remember to have an adult—you or an aide—visit the center frequently. Sometimes, having your aide sit at the center is a productive way to introduce and engage children in the center. After that, visiting the center and discussing what children are doing helps children build and communicate about mathematical ideas.
- Children do these activities with some adult supervision.
- Explain or demonstrate the centers when you talk to the class about that day's options on the day they are introduced. Encourage children to visit the center and try the activity at least once, preferably more, during the week.

Effective Teaching Strategies at Centers

The following suggestions help adults teach effectively at centers with computer or manipulatives.

- Stay active! Closely guide children's work in and learning from the activities and encourage experimentation with the open-ended, free explore activities. Always encourage, question, and prompt children; also, demonstrate as need. Help children reflect on their strategies for solving problems.
- Once children are working independently, provide enough guidance, but not too much. However, observe each child at least once per week, so you know how they are doing and can provide appropriate help.
- Avoid quizzing or offering help before children request it. Instead, prompt children to teach each other by physically placing one child in a teaching role or verbally reminding a child to explain his or her actions and respond to specific requests for help.

Children should spend about 15 minutes at the computer at a time.

Engaging children in reflection is as important as assessing.

Reflect

Reflect is a critical part of every Building Blocks lesson. When children talk about their thinking, using their own words, they engage in mathematical generalizing and communicating. Allowing children to discuss what they did during an activity helps build mathematical reasoning, but also develops social skills such as turn taking, listening, and speaking.

A powerful reflection question is, "How do you know?" Early in the year children may or may not answer you and often cannot provide reasons for their answers. They may shrug their shoulders and say, "I don't know," "Because," or, "Because I'm smart." As the year progresses, children become accustomed to explaining their ideas. Their answers give more insight into their mathematical thinking. For example, one child picked an open shape—a "V"—as a triangle.

The key to reflect is asking questions.

Teacher: ***How do you know that's a triangle?***

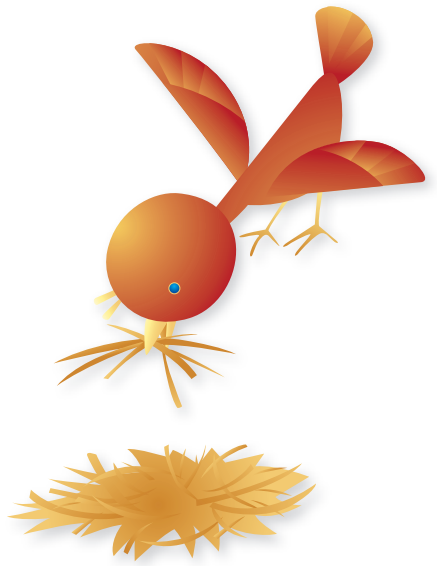
Child: *It has three sides. (She runs her finger along the two sides and runs her finger along the open space, as if there is a third side.)*

Teacher: ***But, there's no line here (pointing to the open space).***

Child: *Because they forgot to draw it.*

Without asking questions, this teacher may have assumed the child could not recognize shapes. Asking the question showed that the child had a budding understanding of triangles but did not yet understand that shapes need to be closed, and that the third line must be visible. Young children who have such discussions with teachers and with each other begin to question and correct each other. For these reasons, we recommend that you incorporate time for reflection into your classroom mathematics activities. The following are good questions and challenges.

- How do you know?
- Why?
- Show me how . . .
- Tell me about . . .
- How is that the same?
- How is that different?

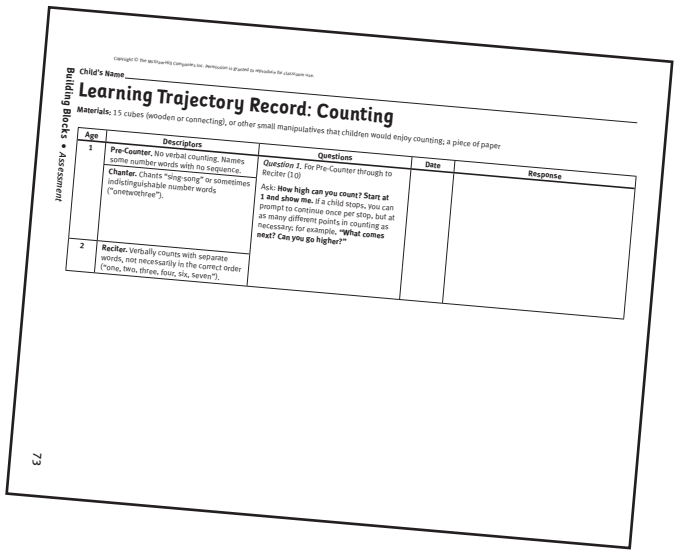


Assessment is a crucial part of making informed decisions. Effective assessment is a continual process and should involve many different types of data for a complete picture of each student's abilities.

Assessment

Goals of Assessment

1. Improve instruction by informing teachers about the effectiveness of their lessons
2. Promote growth of students by identifying where they need additional instruction and support
3. Recognize accomplishments



Child's Name _____

Learning Trajectory Record: Counting

Materials: 15 cubes (wooden or connecting), or other small manipulatives that children would enjoy counting; a piece of paper

Age	Descriptors	Questions	Date	Response
1	**Pre-Counter.** No verbal counting. Names some number words with no sequence. **Chanter.** Chants "sing-song" or sometimes indistinguishable number words ("onetwothree").	*Question 1.* For Pre-Counter through to Reciter (1.0) Ask: **How high can you count? Start at 1 and show me.** If a child stops, you can prompt to continue once per stop, but at as many different points in counting as necessary; for example, **"What comes next? Can you go higher?"**		
2	**Reciter.** Verbally counts with separate words, not necessarily in the correct order ("one, two, three, four, six, seven").			

Building Blocks • assessment

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Phases of Assessment

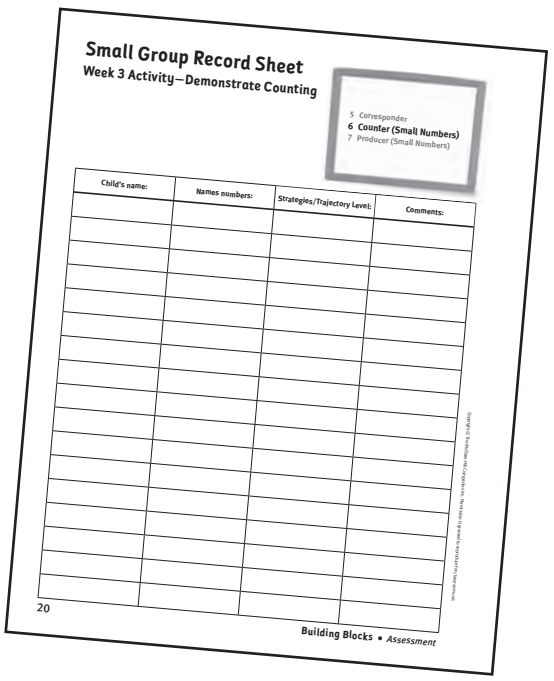
1. *Planning* As you develop lesson plans, you can consider how you might assess the instruction, determining how you will tell whether students have grasped the material.
2. *Gather Evidence* Throughout the instructional phase, you can informally and formally gather evidence of student understanding. The Informal Assessment Checklists and Student Assessment Records are provided to help you record data. The end of every lesson is designed to help in conducting meaningful assessments.
3. *Summarize Findings* Taking time to reflect on the assessments to summarize findings and make plans for follow-up is a critical part of any lesson.
4. *Use Results* Use the results of your findings to differentiate instruction or to adjust or confirm future lessons.

Building Blocks is rich in opportunities to monitor student progress to accomplish these goals.

See Appendix A for more information about Assessment.

The following assessment and recording items guide assessment and help ensure that every child has the experiences they need (for example, rotating through computers centers).

- *Small Group Activities:* Perhaps the most important assessments are the observations of children, and the most insightful observations often occur during the small group activities. Observe and interact with children during these activities and complete the assessment/record sheet for each small group activity.
- *Weekly Records:* Complete the Weekly Record Sheet for all whole group, centers, computer, small group, and everyday activities.
- *Computer Activities:* For the computer activities, use the ***Building Blocks*** *Software Sign-in Sheet*. This sheet has a printout of the icons from the software. Fill in children's names next to their individual icons (see the ***Building Blocks*** *Icons* sheet if you used other icons). Make copies of that sheet. Fill out and place a new one next to the computer each week. Have children mark (if they can, their name or initials) next to their name, filling in a new column each time they use the computer.
- *Hands On Math Centers:* For each center, use the *Center Sign-in Sheet* exactly the same way.
- *Your Assessments:* Of course, your own assessment for teaching purposes might include observation, anecdotal records, samples of children's work, interviews (preplanned or spontaneous), rating scales, photographs, audiotapes, videotapes, time sampling, and running records.


Small Group Record Sheet
Week 3 Activity—Demonstrate Counting

5 Corresponder
6 Counter (Small Numbers)
7 Producer (Small Numbers)

Child's name:	Names numbers:	Strategies/Trajectory Level:	Comments:

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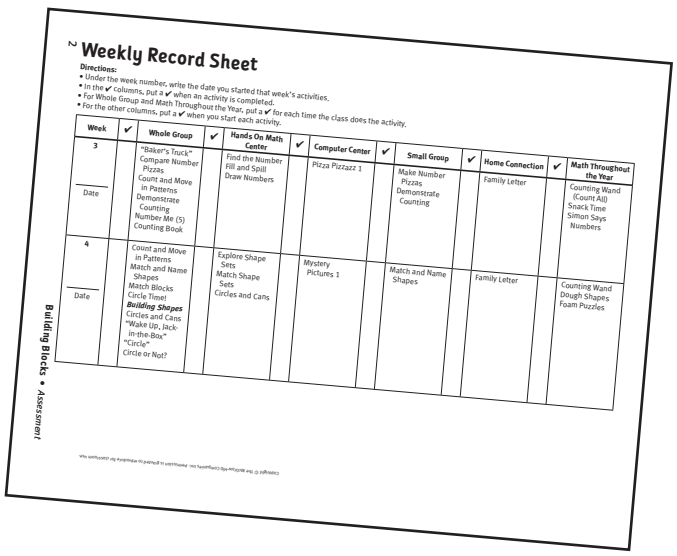
Building Blocks • *Assessment*


Weekly Record Sheet

Directions:
- Under the week number, write the date you started that week's activities.
- In the ✔ columns, put a ✔ when an activity is completed.
- For Whole Group and Math Throughout the Year, put a ✔ for each time the class does the activity.
- For the other columns, put a ✔ when you start each activity.

Week	✔	Whole Group	✔	Hands On Math Center	✔	Computer Center	✔	Small Group	✔	Home Connection	✔	Math Throughout the Year
3 Date		"Baker's Truck" Compare Number Pizzas Count and Move in Patterns Demonstrate Counting Number Me (5) Counting Book		Find the Number Fill and Spill Draw Numbers		Pizza Pizzazz 1		Make Number Pizzas Demonstrate Counting		Family Letter		Counting Wand (Count All) Snack Time Simon Says Numbers
4 Date		Count and Move in Patterns Match and Name Shapes Match Blocks Circle Time! ***Building Shapes*** Circles and Cans "Wake Up, Jack-in-the-Box" "Circle" Circle or Not?		Explore Shape Sets Match Shape Sets Circles and Cans		Mystery Pictures 1		Match and Name Shapes		Family Letter		Counting Wand Dough Shapes Foam Puzzles

Building Blocks • *Assessment*

Differentiated Instruction

Instruction can be differentiated in three key ways:

- *Content*—what the teacher wants students to learn and the materials or mechanisms through which that is accomplished. Differentiating the content may be teaching prerequisite concepts to students who need intervention.
- *Process*—how or what activities will the students do to ensure that they use key skills to make sense out of the content. Differentiating the process may include moving through the lesson more quickly or dwelling on a particular practice activity.
- *Product*—how the student will demonstrate what he or she has come to know. Differentiating the product may include assigning Enrichment, Practice, or Reteaching activities to complete.

Building Blocks offers a wealth of support for differentiating instruction.

- Every lesson includes a variety of small group, whole group, and individual activities that address differentiating the process of learning.
- ***Building Blocks*** software activities are tailored to individual needs to address differentiating the learning content. The software activities help develop students math proficiencies along the learning trajectories. Activities are supported by drills and instruction based on student performance.
- Assessments, including the ***Building Blocks*** software management system, Small Group Record Sheets, Trajectory Assessments, and informal weekly assessments, provide teachers with reliable data on which to gauge children's proficiency and inform their instruction.

See Appendix A for more information about Differentiating Instruction.

When English learners work in the core content areas, they face the challenge of both the new concept load and the new language load.

English Language Learners

Sheltered instruction designs lesson delivery to take advantage of student language strengths and techniques that do not rely solely on 'telling' but on doing so that children see, hear, and experience the new concept along with the new language. ***Building Blocks*** employs the following sheltered instruction strategies throughout the program.

Accessing Prior Knowledge Sheltered instruction begins with **accessing children's prior knowledge** to determine what they already know and how much background building may be necessary. It activates student thinking and draws on experience to enhance the new learning. Children are encouraged to think about and share what they already know, allowing the teacher to diagnose where any gaps may exist. Accessing prior knowledge enhances the lessons by connecting to children's real-life experience which reduces abstractions.

Modeling the new math skills and concepts is a huge part of ***Building Blocks,*** and it is one of the key strategies involved with Sheltered Instruction. When we introduce new skills and concepts they are built on prior learning and children see teachers demonstrate using manipulatives, hear the appropriate language terminology modeled and practice in a guided setting using these tools.

Checking for Understanding Sheltered Instruction involves interaction with the teacher, including lots of **checking for understanding** along the way. When children are in the early stages of English language acquisition, they may not always be the first to answer a question or be able to fully express their ideas in speech or in writing. The wonderful step-by-step instruction mapped out in ***Building Blocks*** builds in many modes of checking comprehension throughout the lesson so that all children can show what they know. Children are asked to respond to questions in ways including pointing, raising hands and fingers, and moving objects. In this way, English learners access the core concepts but do not have to rely only on English expression to show what they know or where they need additional help.

Explicit Instruction The step-by-step instruction in ***Building Blocks*** is carefully structured to lead children to understanding the concepts. Built into the teaching are explanations of new terms and skills. It provides for plenty of repetition and revisiting of these concepts using the new language so that children have plenty of modeling before they are expected to use these terms themselves.

Math Games English learners need to practice their new language in authentic settings rather than drills that do not capture the language tasks chiklden need to perform in school. Language learning can be a high-anxiety experience because the nature of the learning means that the speaker will make many mistakes. This can be profoundly difficult in front of one's peers or in answering individual questions in front of the whole class. Working in pairs and groups allows English learners a way to understand in a low-anxiety environment and allows more learning to take place.

A big part of the practice built into ***Building Block*** is in the form of learning activities. In addition to being fun and motivating, these math activities provide English learners ample opportunity to practice their English while practicing their math. The games provide plenty of meaningful practice. For example, children learning their numbers get not just rote counting practice, but counting while moving on a game board. Vocabulary is woven into appropriate language repetition and revisiting skills and strategies without boredom or work in isolation. In turn, children bring these games home which draws the family into the practice of English and extends the learning of mathematics beyond the school day.

In addition, these specially designed games model strategic thinking so that even children at beginning levels of proficiency learn strategy and can demonstrate strategic, higher-level thinking.

It is important to keep parents informed about what their children are doing in mathematics so they can support their mathematical understanding and development at home. Families can play a critical role in student's success in mathematics if they understand how to help.

Family Involvement

Building Blocks has several elements built into the program that can enable family school communications.

Teacher Resource Guide Home Connections

This book includes ready-made Parent Surveys, Family Letters, and Games that teachers can use to communicate with student families. Family Letters are available for every week.

Assessment Resources

The Assessment book includes several resources to communicate with families.

- The Student Assessment Record is a convenient form to record all student assessments on a daily or weekly basis. These forms are handy to use at parent-teacher conferences.
- Parent Teacher Conference Checklist provides a helpful way to organize thoughts about students in preparation for parent teacher conferences.

Parent Aides

Often parents are willing to volunteer to help out in the classroom. There are many ways they can help.

- Computer Management—Make sure computers are on and loaded with appropriate software. Be available to trouble shoot and answer questions while students use the computers.
- English Learner Aide—Use the English Learner Support Guide ideas to work with English Learners to preview and review lesson concepts.
- Manipulatives Manager—Make sure manipulatives are available for student use.

Family Participation

There are many ways that families can assist students in learning math.

1. Establish daily family routines.

a. Provide a time and place to study.
b. Assign responsibility for household chores.
c. Have a regular bedtime.
d. Have family meals.

2. Monitor out-of-school activities.

a. Set limits on television watching and computer use.
b. Know what children are watching on television.
c. Approve of what children are doing on the computer.
d. Check up on children when parents are not home.
e. Arrange after-school activities.
f. Arrange for supervised care.

3. Model the value of learning, self-discipline, and hard work.

a. Ask about school work.
b. Discuss what children are learning.
c. Communicate what everyone is learning.
d. Reward hard work.
e. Demonstrate achievement that comes from hard work.
f. Demonstrate interest in learning.
g. Express enjoyment of mathematics.

4. Express high but realistic expectations for achievement.

a. Set goals and standards appropriate for children's age and maturity.
b. Recognize and encourage talents.
c. Inform friends and family about successes.
d. Set high expectations for math achievement for both girls and boys.

5. Encourage children's progress in school.

a. Show interest in children's progress in school.
b. Help with homework, but don't do homework for children.
c. Discuss the value of a good education.
d. Communicate with teachers and school staff.

6. Encourage reading, writing, playing board and card games, and discussion among family members.

a. Read books, magazines, and newspapers, and discuss what you have read.
b. Listen to children read and talk about what they are reading.
c. Identify and discuss the different roles that numbers and math concepts play in everyday life.

See Appendix A for more information about Parent Involvement

Preschoolers do not see the world as if it were divided into separate subjects. Successful preschool teachers help children develop mathematical knowledge throughout the day.

Math Throughout the Year Activities

Classrooms are filled with opportunities to include mathematics. Use children's spontaneous questions and observations as catalysts for mathematical exploration. By encouraging children's ideas and sharing of math stories, you can support their efforts to solve problems in different ways.

Throughout the day, week, months, and year there are simple ways of incorporating math ideas and concepts. Some routines can be set up early in the year and continue throughout the year. Some of these will be done nearly every day. Others are done when they "fit" but not as a separate unit of instruction. By incorporating and emphasizing the math in these activities, you can develop and reinforce concepts. By connecting daily events to mathematical concepts, children may come to see math as an integral part of life and the classroom environment.

Incorporate these ideas to "mathematize" everyday classroom routines whenever appropriate. Use these or other similar ideas to integrate mathematics into your classroom day.

- Attendance Routines
- Meals
- Cleanup
- Lining Up
- Hello Games
- Goodbye Games
- Physical Activities, including counting motions and spatial relations
- Voting and Graphing
- Daily Calendar
- Daily Weather
- Time

For more complete descriptions of these ideas, see Appendix A.

Teachers who have used this curriculum successfully with their children have shared many ideas that you may wish to use.

Teacher Tips

- Enlarge the materials, especially for whole group activities. Reproduce the existing sheets but make them bigger. Or modify the activities; for example, make shapes shadows on walls, cut out large shapes and tape them to the floor. Also consider making some shapes more colorful.
- Look ahead to what *new materials* are "coming up" in the next week or two and lay them out, encouraging children to play with them and explore what they can do with them *before* you use them in specific activities.
- For some activities, vary the size of the group as needed. Some whole group activities could be done with only half your class if that helps. Some small group activities, typically done with 4 children at a time, can be conducted with 2, 6, or 8 children at a time, depending on the activity and your children.
- Use the "extra help" suggestions when needed. Also, use your own ideas. For example, use only *some* of the shape sets to make an activity easier for children who need it.
- Keep active helping children with the computer! Review the suggestions on pages T28 and T29.
- *Use your aide* wisely, monitoring the children at the computer center and the manipulative (off-computer) centers.

Building Blocks

Teacher's Edition Sampler

Week 3

WEEK 3

Overview

Big Ideas

- counting and producing small groups
- recognizing equal groups
- duplicating rhythmic patterns

Teaching for Understanding

Week 3 builds on the counting skills of Week 2, emphasizing four components of counting: verbal counting, the counting of small collections, counting out (producing) small collections, and comparing small quantities. Mastering these components enables children to maintain one-to-one correspondence between each number word spoken and each item counted, as well as to understand that counting tells how many and describes order.

Object Counting

This requires much more than verbal counting. Several activities develop children's early ability to connect small groups of objects to number words. For example, hide a small number of objects, and reveal them one at a time as children count. Research shows that such an activity helps children link each number word they say to the quantity of objects they see. This helps children understand that the last number word in a counting sequence tells how many.

Counting Out Objects

Research also shows that "counting out," or producing a certain number of objects, is more difficult than counting the objects in a group. Both tasks require knowing how to count verbally, keep one-to-one correspondence between number words and objects, and answer the question "how many?" However, when children count out objects, they have to continually recall how many they were supposed to produce and compare that to each number word they say in order to stop at just the right number.

Meaningful Connections

Children learn the sequence of number words over a long period of time so repeated practice is essential. We engage children in rhythmic counting patterns now so that, in later grades, such ideas will grow into knowledge of many number patterns, such as even and odd numbers.

What's Ahead?

Every week we continue to lay the groundwork for counting and other number abilities, while also interweaving many other mathematical topics. The next couple of weeks focus on shapes and geometric comprehension.

WEEK 3

Overview

How Children Learn to Count

Knowing where children are on the learning trajectory for counting and what the next steps are helps facilitate their development. Children who easily surpass these trajectory levels might be challenged by larger quantities and encouraged to assist other children.

Verbal Counting

What to Look For Does the child count to at least 5 with some one-to-one correspondence?

Reciter Verbally counts using separate words ("one, two, three" not "onetwothree") but not always in the correct order, such as "one, two, three, four, six, seven."

Reciter (10) Verbally counts to 10 with some correspondence to objects.

Object Counting

What to Look For Can the child accurately count and produce small groups?

Corresponder Keeps one-to-one correspondence between number words and objects (one word for each object), at least for small groups of objects in a row; may answer the question "how many?" by counting the objects again.

Counter (Small Numbers) Accurately counts objects in a line to 5, and answers "how many?" with the last number counted. When objects are visible, especially with small numbers, begins to understand cardinality.

Producer (Small Numbers) Counts out objects to 5.

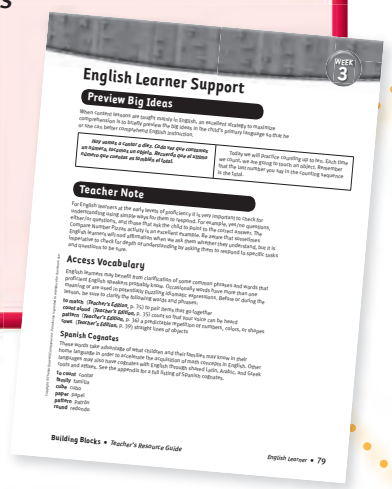
Comparing Number

What to Look For Does the child accurately identify the larger of two groups?

Perceptual Comparer Compares collections that are quite different in size, such as one that is twice the size of the other (shown ten blocks and twenty-five blocks, points to the group with twenty-five as having more). If collections are similar, child can compare them accurately as well (with groups of two and four blocks, knows the group of four has more).

English Learner

Reading aloud counting stories in books is an excellent strategy for building counting-related vocabulary. Review the following: *rows, hide counters,* and *empty hand.* Refer to the ***Teacher's Resource Guide.***


English Learner Support

WEEK 3

Preview Big Ideas

Teacher Note

Access Vocabulary

Spanish Cognates

Building Blocks • Teacher's Resource Guide

English Learner • 79

Technology Project

Children may get additional problem-posing and -solving practice using Pizza Pizzazz Free Explore. Children can count along with the program as they place toppings on either pizza, or they may work cooperatively as one child names a number and the other puts that many toppings on a pizza.

Math Throughout the Year

Math Throughout the Year activities are recommended to build on the mathematical skills highlighted in each week. Here are suggested activities for **Week 3.**

Counting Wand (Count All)

Count each child with a gentle tap of the wand, making sure all children count aloud with you. Emphasize that the last number word tells how many children are in class today. If children are ready to take turns tapping one another, use a very soft wand.

Simon Says

Play traditional Simon Says using only number commands, such as "Jump two times" and "Pat your head six times."

Snack Time

Children take a specified amount of a snack, as well as anything they might need to eat the snack. Demonstrate counting out the items and saying afterward how many there are. You may choose to place a Counting Card on the snack table. For example, use a five card to indicate that children take that many pretzels.

Center Preview

Computer Center

Building Blocks

Get your classroom Computer Center ready for Pizza Pizzazz 1: Match Collections from the ***Building Blocks*** software.

After you introduce Pizza Pizzazz 1, each child should complete the activity individually as you (or an assistant) monitor and guide him or her periodically. Ideally, each child will have at least ten minutes of computer time at least twice during the week. To assess progress, observe children as they rotate through all classroom centers.

Hands On Math Center

This week's Hands On Math Center activities are Find the Number, Fill and Spill, and Draw Numbers. Supply the center with these materials: opaque containers, round counters, paper plates, Counting Cards, plastic containers, wooden cubes, drawing paper, crayons, and other drawing materials.

Literature Connections

These books help develop counting.

- *Little Rabbits' First Number Book* by Alan Baker
- *The Very Hungry Caterpillar* by Eric Carle
- *I Spy Two Eyes: Numbers In Art* by Lucy Micklethwait
- *One Was Johnny: A Counting Book* by Maurice Sendak
- *I Can Count the Petals of a Flower* by John and Stacey Wahl

WEEK 3

Weekly Planner

Learning Trajectories

Week 3 Objectives

- To participate in rhythmic patterns
- To connect number words to the quantities they represent
- To make groups of up to five items
- To count verbally to 5 with understanding
- To count verbally to 10 with understanding

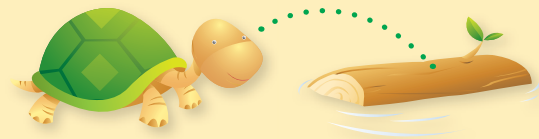
	Developmental Path	Instructional Activities
Verbal Counting	*Reciter*	
	Reciter (10)	"Baker's Truck" Count and Move in Patterns
Object Counting	*Corresponder*	
	Counter (Small Numbers)	Demonstrate Counting Number Me (5) Counting Book Find the Number
	Producer (Small Numbers)	Make Number Pizzas Fill and Spill Draw Numbers
	Counter (10)	
Comparing Number	*Object Corresponder*	
	Perceptual Comparer	Compare Number Pizzas Pizza Pizzazz 1 Find the Number
	Nonverbal Comparer	

Use this chart to plan for your specific class schedule. If you have your prekindergarteners for only three days, complete Monday, Tuesday, and Thursday of the week.

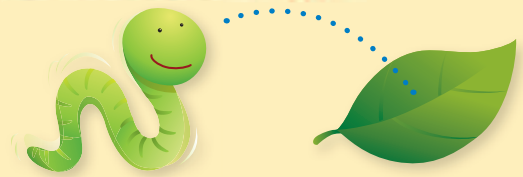
Pacing

Monday

Tuesday

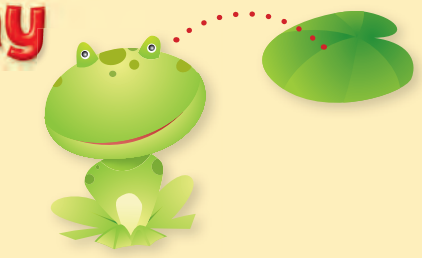


Wednesday



Thursday

Friday



Weekly Planner

Work Time

Whole Group	Small Group	Computer	Hands On	Program Resources
"Baker's Truck" **Compare Number Pizzas** *Materials:* *round counters paper plates		**Pizza Pizzazz 1**	**Find the Number** *Materials:* opaque containers *round counters paper plates *Counting Cards	Building Blocks ***Assessment*** Weekly Record Sheet
Count and Move in Patterns **Demonstrate Counting** *Materials*: *counters	**Make Number Pizzas** *Materials:* *round counters paper plates	**Pizza Pizzazz 1**	**Fill and Spill** *Materials:* plastic containers wooden cubes *Counting Cards **Find the Number**	Building Blocks ***Assessment*** Small Group Record Sheet
Count and Move in Patterns **Demonstrate Counting** *Materials:* *counters **Compare Number Pizzas** *Materials:* *round counters paper plates		**Pizza Pizzazz 1**	**Fill and Spill** **Find the Number**	Building Blocks ***Assessment*** Weekly Record Sheet
Count and Move in Patterns **Number Me (5)**	**Demonstrate Counting** *Materials:* *counters **Make Number Pizzas** *Materials:* *round counters paper plates	**Pizza Pizzazz 1**	**Draw Numbers** *Materials:* drawing paper nontoxic markers **Fill and Spill** **Find the Number**	Building Blocks ***Assessment*** Small Group Record Sheet
Count and Move in Patterns **Counting Book**		**Pizza Pizzazz 1**	Draw Numbers Fill and Spill Find the Number	Building Blocks ***Assessment*** Weekly Record Sheet ***Teacher's Resource Guide*** Family Letter Week 3

*provided in Manipulative Kit

Monday Planner

Objectives

- To participate in rhythmic patterns
- To connect number words to the quantities they represent
- To make groups of up to five items

Materials

- *round counters
- paper plates
- opaque containers
- *Counting Cards

Math Throughout the Year

Review activity directions at the top of page 35, and complete each in class whenever appropriate.

Looking Ahead

Instead of using counters and paper plates for this week's pizza activities, you could make toppings of your choice with felt or construction paper and cut large circles for pizza crusts.

*provided in Manipulative Kit

Monday

1 Whole Group 15

Warm-Up: "Baker's Truck"

- Here are the words and actions:

  The baker's truck drives down the street,
  Filled with everything good to eat.
  Two doors the baker opens wide. *(Outstretch arms.)*
  Let's look at the shelves inside. *(Cup hands around eyes to look.)*
  What do you see? What do you see?
  Three big cookies for you and me! *(Show three fingers.)*

- Adapt the final number of cookies in the finger play to reinforce any number up to 10 that you are teaching.

Compare Number Pizzas

- Tell a story about a pizza chef. Explain that you have to help the chef get the correct number of pepperoni slices on the pizza.
- Use a paper plate for pizza crust and round counters for pepperoni. Show your pizza with two pepperoni slices, leaving it in children's view. Then show three more pizzas with one, two, and three pepperoni slices.
- Ask all children to point to which of the three pizzas has the same number of toppings as the first pizza you showed. Have them discuss how they knew the matching pizza had the same number of toppings.
- Repeat the activity, having children match pizzas with pepperoni amounts of 3 or more as their ability allows.

2 Work Time 20

Computer Center Building Blocks

Demonstrate Pizza Pizzazz 1: Match Collections from the ***Building Blocks*** software. In this activity, children help twins who want the same number of toppings on their pizzas by choosing a pizza to match another pizza with a certain number of toppings. All children should have a chance to complete Pizza Pizzazz 1 this week.

Hands On Math Center

Find the Number

- Before children get to the center, conceal several pizzas (paper plates), each with a different number of pepperoni slices (round counters) under its own opaque container.
- Display one pizza with three to five pepperoni slices, or use a Counting Card to represent the target number. The goal is for children to find the hidden match to the pizza on display.
- Children should show their answers to you or another adult who assists your class.

Monitoring Student Progress

If . . . children need help during Find the Number,	**Then . . .** reduce the number of hidden pizzas, or leave all pizza choices uncovered.
If . . . children need a challenge during Find the Number,	**Then . . .** have them work in pairs, determining their own topping amounts and asking each other, for example, "Where is the 10?"

3 Reflect 5

Ask children:

■ **How did you find the number you were looking for?**

Children might say: I counted toppings on each pizza, or I could just see it was 2.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

RESEARCH IN ACTION

At this first level of Pizza Pizzazz, some children count while others use visual strategies, especially for small numbers. Such visual strategies range from the informal copying of a design to the sophisticated "seeing," for example, of two rows of three immediately as six.

Tuesday Planner

Objectives

- To participate in rhythmic patterns
- To count verbally to 5 with understanding
- To connect number words to the quantities they represent
- To make groups of up to five items

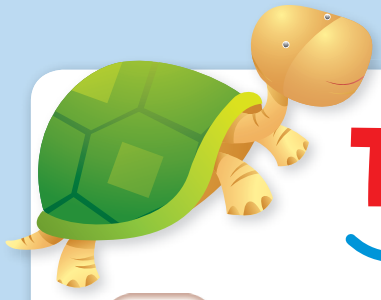
Materials

- *counters
- *round counters
- paper plates
- plastic containers
- wooden cubes
- *Counting Cards

Math Throughout the Year

Review activity directions at the top of page 35, and complete each in class whenever appropriate.

*provided in Manipulative Kit



Tuesday

1 Whole Group 10

Warm-Up: Count and Move in Patterns

- Spend just a few minutes counting in patterns of 2. Have all children count from 1 to 10, or an appropriate even number. For example, say 1 quietly, 2 loudly, 3 quietly, 4 loudly, and so on.
- Add to the fun by marching along with the counting: 1 (step), 2 (stomp), 3 (step), 4 (stomp), and so on. Incorporate class themes when possible.

Demonstrate Counting

- The goal of this activity is to teach object counting, emphasizing that counting tells how many. Hide four counters in your hand.
- Tell children you have some counters in your hand, and ask them to count aloud with you to find out how many.
- Remove one of the counters, and place it where children can see and focus on it. Say "one" with the children; emphasize that "one" tells how many counters there are now.
- Repeat until you have counted and displayed all four counters. Then show your empty hand.
- Ask children how many counters there are in all. If they reply "four," agree and reiterate that, together, you counted four counters.
- Repeat with a different number of counters, making sure children count aloud with you.

2 Work Time 25

Small Group

Make Number Pizzas

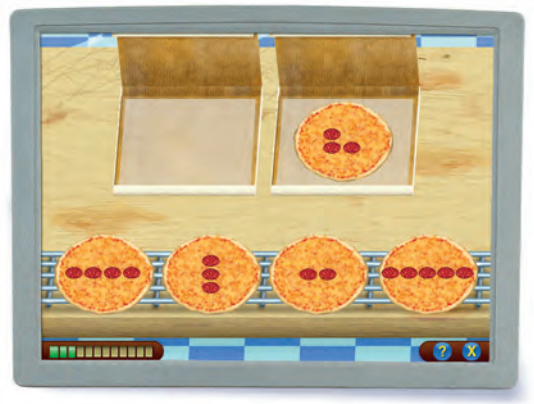
- In this activity, children put a given number of counters on paper plates. Place a plate with three counters to serve as their target.
- Make sure each pair of children has a paper plate and several counters. Tell each pair to make a pizza with the same number of toppings as the one you made (3).
- Ask children how they know there are three toppings on their pizzas. Discuss the various arrangements children made with their counters.
- Repeat with numbers up to 5 (or more as appropriate).

Monitoring Student Progress

If . . . children struggle with Make Number Pizzas,	**Then . . .** use fewer counters, or draw circles for children to put one counter in each until they can reliably count out 5.
If . . . children excel at Make Number Pizzas,	**Then . . .** increase the number of counters, and/or tell children the target number without showing it.

Computer Center Building Blocks

Continue to provide each child with a chance to complete Pizza Pizzazz 1.



Pizza Pizzazz 1

Hands On Math Center

Continue to allow children to Find the Number from yesterday's Hands On Math Center, and introduce the following activity:

Fill and Spill

- Place a Counting Card on the table to indicate a target number, such as 3.
- Children put the target amount of cubes into a plastic container, and then spill the cubes to count to check there are still that many.
- Children may repeat the activity as they like. You may put a different Counting Card at another table.
- If scaffolding is needed, refer to Wednesday's Monitoring Student Progress.

3 Reflect 5

Ask children:

■ **When does your family count to find out how many?**

Children might say: My parents count money; I count during games; and so on.

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

Wednesday Planner

Objectives

- To participate in rhythmic patterns
- To count verbally up to 10 with understanding
- To connect number words to the quantities they represent
- To make groups of up to five items

Materials

- *counters
- *round counters
- paper plates

Math Throughout the Year

Review activity directions at the top of page 35, and complete each in class whenever appropriate.

*provided in Manipulative Kit

Wednesday

1 Whole Group 15

Warm-Up: Count and Move in Patterns

- Spend just a few minutes counting in patterns of 4. Have all children count from 1 to 12. For example, say 1 quietly, 2 quietly, 3 quietly, 4 loudly, and so on.
- Add to the fun by marching along with the counting: 1 (step), 2 (step), 3 (step), 4 (stomp), and so on. Incorporate class themes when possible.

Demonstrate Counting

- Hide four counters in your hand. Tell children you have some counters in your hand, and ask them to count aloud with you to find out how many.
- Remove one of the counters, and place it where children can see and focus on it. Say "one" with the children; emphasize that "one" tells how many counters there are now.
- Repeat until you have counted and displayed all four counters. Then show your empty hand.
- Ask children how many counters there are in all. If they reply "four," agree and reiterate that, together, you counted four counters.
- Repeat with a different number of counters, making sure children count aloud with you. When possible, do this activity in small-group settings.

Compare Number Pizzas

- Remind children that you have to help a chef get the correct number of toppings on pizzas.
- Show your pizza (paper plate) with three pepperoni slices (round counters). Then show three more pizzas with one, two, and three pepperoni slices.
- Ask children which pizza has the same number of toppings as the first pizza you showed. Then ask how they knew the matching pizza had the same number of toppings.
- Repeat the activity, having children match pizzas with as many toppings as possible.

2 Work Time 20

Computer Center Building Blocks

Continue to provide each child with a chance to complete Pizza Pizzazz 1.

Hands On Math Center

Provide both Fill and Spill and Find the Number for today's Hands On Math Center. If needed, consult the Weekly Planner for corresponding materials and Monday's and Tuesday's lessons for directions.

Monitoring Student Progress

If . . . children struggle with Fill and Spill,	**Then . . .** reduce the number of cubes, or place the cube collections on paper plates.
If . . . children excel at Fill and Spill,	**Then . . .** have them work in pairs, determining their own amounts and saying, for example, "Find eight."

3 Reflect 5

Ask children:

- **How did you figure out on the computer which pizza to choose?**

Children might say: I counted; I matched toppings; or I could just see how many there were.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

Thursday Planner

Objectives

- To participate in rhythmic patterns
- To count verbally up to 10 with understanding
- To make groups of up to five items
- To connect number words to the quantities they represent

Materials

- *counters
- *round counters
- paper plates
- drawing paper
- nontoxic markers

Math Throughout the Year

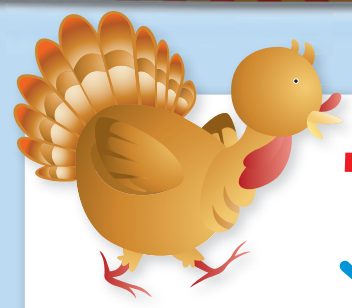
Review activity directions at the top of page 35, and complete each in class whenever appropriate.

Looking Ahead

You may choose to enlist an adult helper for today's Small Group. Select a counting book, such as Eric Carle's *The Very Hungry Caterpillar,* for Friday's Whole Group.

If you have not already, make copies of Family Letter Week 3 from the ***Teacher's Resource Guide*** for Friday.

*provided in Manipulative Kit



Thursday

1 Whole Group 10

Warm-Up: Count and Move in Patterns

- Spend just a few minutes counting in patterns of 3. Have all children count from 1 to 15. For example, say 1 loudly, 2 loudly, 3 quietly, 4 loudly, 5, loudly, 6 quietly, and so on.
- Add to the fun by marching along with the counting: 1 (stomp), 2 (stomp), 3 (step), and so on. Incorporate class themes when possible.

Number Me (5)

- Tell children to show you five of something on their body. They will most likely show their fingers on one hand. Ask how they can prove there are 5. Children might answer by actually counting to 5.
- Make silly statements, such as "I see six fingers on your hand," encouraging children to prove there are only five by counting.

2 Work Time 25

Small Group

Demonstrate Counting

- Hide five counters in your hand. Ask children to count aloud with you to find out how many.
- Remove one counter, and place it where children can see and focus on it.
- Repeat until you have counted and displayed all five counters. Then show your empty hand.
- Ask children how many counters there are in all. If they reply "five," agree and reiterate that, together, you counted five counters.
- Repeat with a different number of counters, making sure children count aloud with you.

Make Number Pizzas

- Show a plate with three counters on it to model children's target number.
- Make sure each pair of children has a paper plate and several counters. Tell each pair to make a pizza with the same number of toppings as yours.
- Ask children how they know there are three toppings on their pizzas. Discuss the various arrangements children made with their counters.
- Repeat with numbers up to 5 (or more as appropriate).

Monitoring Student Progress

If . . . children struggle with Make Number Pizzas,	**Then . . .** use fewer counters, or draw circles for children to put one counter in each until they can reliably count out 5.
If . . . children excel at Make Number Pizzas,	**Then . . .** increase the number of counters, and/or tell children the target number without showing it.

Computer Center Building Blocks

Continue to provide each child with a chance to complete Pizza Pizzazz 1.

Hands On Math Center

If still beneficial to children, continue to provide both Fill and Spill and Find the Number, this week's previous Hands On Math Center activities, and introduce the following activity:

Draw Numbers

- Building on a class theme, have children draw five items on paper.
- You may model this on a board or an overhead projector. It may help to have an adult nearby to remind children of the goal: to draw only five items.
- If scaffolding is needed, refer to Friday's Monitoring Student Progress.

3 Reflect 5

Ask children:

■ **How do you make a pizza with four toppings?**

Children might say: I count; or I just know.

Have them show you how they "just know."

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

Friday Planner

Objectives

- To participate in rhythmic patterns
- To count verbally up to 10 with understanding
- To connect number words to the quantities they represent

Materials

no new materials

Math Throughout the Year

Review activity directions at the top of page 35, and complete each in class whenever appropriate.

Looking Ahead

For next week, familiarize yourself with Mystery Pictures 1: Match Shapes on the computer.

Friday

1 Whole Group 15

Warm-Up: Count and Move in Patterns

- Spend just a few minutes counting in patterns of 5. Have all children count from 1 to 15, for example, say 1 loudly, 2 loudly, 3 loudly, 4 loudly, 5 quietly, and so on.
- Add to the fun by marching along with the counting: 1 (stomp), 2 (stomp), 3 (stomp), 4 (stomp), 5 (step), and so on. Incorporate class themes when possible.

Counting Book

- Read aloud a counting book, such as *The Very Hungry Caterpillar,* in its entirety.
- Return to various pages, and ask children how many of a certain thing appears on those pages. Lead children in counting aloud to check.
- In a book like *The Very Hungry Caterpillar,* lead children in pretending to be the caterpillar, and ask how many berries they want to eat. For example, count five berries: 1 (bite and gulp), 2 (bite and gulp), 3 (bite and gulp), and so on. Adapt as needed for a character from another story.

2 Work Time 20

Computer Center Building Blocks

Continue to provide each child with a chance to complete Pizza Pizzazz 1.

Hands On Math Center

Based on what children continue to learn and benefit from most, choose from this week's Hands On Math Center activities: Draw Numbers, Fill and Spill, and Find the Number. If needed, consult Week 3's Weekly Planner for the corresponding materials, and refer to today's Monitoring Student Progress for scaffolding of Draw Numbers.

Monitoring Student Progress

If . . . children need help during Draw Numbers,	**Then . . .** provide class-themed stamps, or age-appropriate magazines, scissors, and paste for children to create five images on paper, or reduce the number children are to represent as needed.
If . . . children need a challenge during Draw Numbers,	**Then . . .** encourage them to make another drawing to start a number book.

3 Reflect

5

Briefly discuss with children what you have done in class this week, such as counting to 15.

Ask children:

- **How did you find the number you were looking for?**

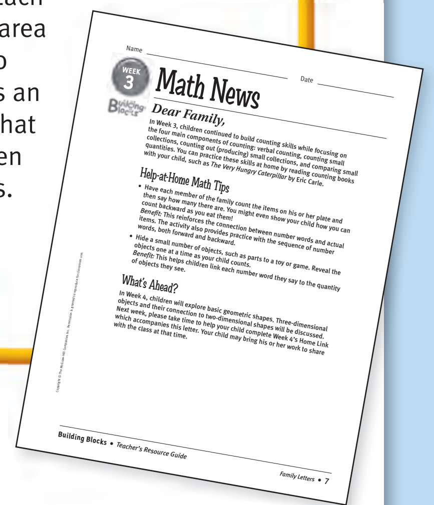
Children might say: I counted; or I could just see there were 4.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

Home Connection

From the ***Teacher's Resource Guide,*** distribute to children copies of Family Letter Week 3 to share with their family. Each letter has an area for children to show families an example of what they have been doing in class.


Math News

Dear Family,

Help-at-Home Math Tips

What's Ahead?

WEEK 3

Wrap-Up

Assess and Differentiate

A Gather Evidence

Review children's progress in mathematics by looking at the Weekly Record Sheets (Monday, Wednesday, Friday) and the Small Group Record Sheets (Tuesday, Thursday) from this past week.

B Summarize Findings

Using ***Online Assessment,*** summarize and analyze assessment data for each child based on your weekly observations and Record Sheets. Such information helps to determine where each child is on the math trajectory for counting and comparing number. See ***Assessment*** for the print companion to each Learning Trajectory Record.

C Differentiate Instruction

Once you have seen a child exhibit specific levels of the trajectory, begin to encourage and work with that child toward the next level. Refer to Appendix A for individualized instruction opportunities, including Special Education concerns.

Verbal Counting

If . . . the child can count using separate words that are mostly in order,	**Then . . .** *Reciter* Verbally counts using separate words ("one, two, three" not "onetwothree") but not always in the correct order, such as "one, two, three, four, six, seven."
If . . . the child can accurately recite number words up to 10,	**Then . . .** *Reciter (10)* Verbally counts to 10 with some correspondence to objects.

Object Counting

If . . . the child can count up to five objects with understanding,	**Then . . .** *Counter (Small Numbers)* Accurately counts objects in a line to 5, and answers the question "how many?" with the last number counted. When objects are visible, especially with small numbers, begins to understand cardinality.
If . . . the child can maintain one-to-one correspondence between number words and objects,	**Then . . .** *Corresponder* Keeps one-to-one correspondence between number words and objects (one word for each object), at least for small groups of objects in a row; may answer the question "how many?" by counting the objects again.
If . . . the child can produce up to five objects,	**Then . . .** *Producer (Small Numbers)* Counts out objects to 5.

Comparing Number

If . . . the child can accurately compare various-sized collections,	**Then . . .** *Perceptual Comparer* Compares collections that are quite different in size, such as one that is twice the size of the other (shown ten blocks and twenty-five blocks, points to the group with twenty-five as having more). If collections are similar, child can compare them accurately as well (with groups of two and four blocks, knows the group of four has more).

Building Blocks

Teacher's Edition Sampler

Week 15

WEEK 15

Overview

Big Ideas

- shape matching
- shape identification
- adding and subtracting small numbers

Teaching for Understanding

Geometric shapes can be used to represent and understand objects in the world around us. Even preschool children can learn a lot about less common yet important geometric shapes; they can even learn to reason about the attributes of such shapes. This week we emphasize reasoning about geometric shapes in order to correctly identify and describe them.

Sorting Shapes

Some activities this week will require children to sort shapes and identify the rule for sorting. They will do this by examining the categories into which shapes have been sorted. Children will identify shapes with certain attributes, as well as reason about shapes by correcting mistakes in others' naming, classification, or description of shapes.

Number Activities

Children learn to use counting strategies to add and subtract small numbers. As we have been and continue to explain, even very young children are able to figure out how many items there *will be* in a small group when one more item is added to it. In such activities, adding or subtracting two items is acceptable as long as children continue to be successful at that level.

Meaningful Connections

We connect geometry and number by discussing with children the number of sides and angles (corners) shapes have. Another key focus this week is linking knowledge of math content to the development of mathematical processes, such as knowing triangles have three sides and applying that information to finding and naming a triangular example. Children learn specific processes including sorting, reasoning, and communicating. In this way, mathematics is also connected to general thinking and language skills.

What's Ahead?

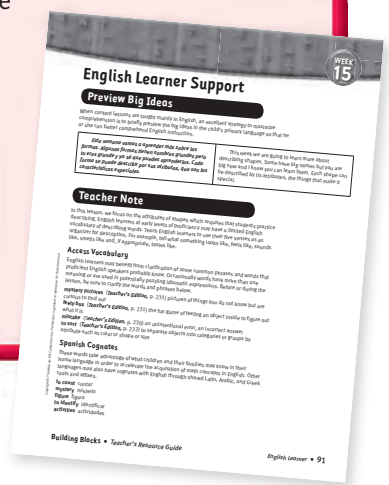
In the weeks to come, children will focus on patterns that repeat. They will connect such patterns to number and geometric ideas.

WEEK 15

Overview

English Learner

Connect repeating visual and rhythmic patterns to English language patterns. Review the following: *repeat, How do you know?, and so on*, and *attributes*. Refer to page 91 of the ***Teacher's Resource Guide.***


English Learner Support

Preview Big Ideas

Teacher Note

Access Vocabulary

Spanish Cognates

Building Blocks • Teacher's Resource Guide

English Learner • 91

Technology Project

Children may get additional shape practice using Mystery Pictures Free Explore. Encourage children to drag as many shapes as they would like to make their own pictures on the computer. If they click the play button, children can invite a classmate to complete their mystery picture, which is challenging because the correct shape in the correct orientation must be selected. As you visit children at the computer, help them describe what they are making, what shapes they are using, and why.

How Children Learn about Shape and Number

Knowing where children are on the learning trajectory for geometry and number and what the next steps are helps facilitate their development. Children who easily surpass these trajectory levels might be challenged by less familiar shapes and larger quantities and encouraged to assist other children.

Shapes: Matching

What to Look For What types of shapes can the child match?

Shape Matcher, More Shapes Matches a wider variety of shapes of same size and orientation.

Shape Matcher, Sizes and Orientations Matches a wider variety of shapes of different sizes and orientations. For example, matches the same triangle even if the examples are turned differently.

Shapes: Naming

What to Look For What types of shapes and shape parts can the child identify?

Side Recognizer Parts: Identifies sides as distinct objects. For example, the child explains that a shape is a triangle because it has three sides and runs his or her finger along the length of each side.

Shape Recognizer, More Shapes Recognizes most familiar shapes and typical examples of other shapes, such as hexagon, rhombus (diamond), and trapezoid.

Shape Identifier Names most common shapes, including rhombuses, without making mistakes, such as calling ovals circles; implicitly recognizes right angles, thus can distinguish between rectangles and parallelograms without right angles.

Parts of Shape Identifier Identifies shapes in terms of their components. For example, no matter how "skinny" a triangle is, the child knows it is a triangle because it has three sides.

Counting

What to Look For Which numerals can the child count to and from accurately?

Counter Backward from 10 Counts back verbally from 10 or when removing items from a group.

Adding and Subtracting

What to Look For What small sums can the child determine?

Small Number (+/–) Finds sums for joining problems up to 3 + 2 by counting all objects. For example: There are two crayons. One more crayon is added. How many crayons are there in all? Child counts two, counts one more, and then counts "1, 2, 3...3!"

Math Throughout the Year

Math Throughout the Year activities are recommended to build on the mathematical skills highlighted in each week. Here are suggested activities for **Week 15.**

Counting Jar

Using the jar you have been all year, vary the sizes of the items you place in the jar each week. Children spill the jar's items to count them. This week is a good time to encourage children to record their counts; provide self-sticking notes for children to write the numeral that tells how many items are in the jar. Offer writing assistance as needed and/or allow children to make marks that represent an amount instead of writing numerals.

Shape Books

Provide the Shape Flip Book, magazines and newspapers (to be cut), crayons, scissors, construction paper, and paste for this activity. Review the Shape Flip Book with children, explaining that, together, you will make a class shape book. Discuss how shapes are all around us, in things, and look for some together. As children find shapes, help them label each—actually writing out shape names. Children cut shapes from magazines and newspapers, trace the item they found the shape in if applicable (children could draw the item instead), and keep their work for a page in the shape book. Bind books with staples, yarn, or use a three-pronged folder. Optionally, this activity may be done during Whole Group or the Hands On Math Center.

Shape Walk

Go for a walk outside of the classroom to search for a specific shape.

Center Preview

Computer Center

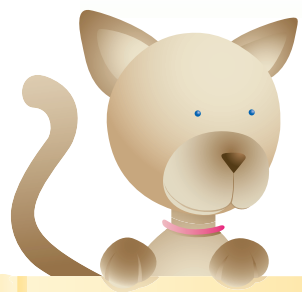
Building Blocks

Get your classroom Computer Center ready for Mystery Pictures 4: Name New Shapes, Memory Geometry 4: Shapes of Things, and Memory Geometry 5: Shapes in the World from the ***Building Blocks*** software.

After you introduce Mystery Pictures 4 and Memory Geometry 4 and 5, each child should complete the activities individually as you (or an assistant) monitor and guide him or her periodically. Ideally, each child will have at least ten minutes of computer time at least twice during the week. Use children's center time as an opportunity for assessment.

Hands On Math Center

This week's Hands On Math Center activities are Shape Pictures, Feely Box (Name), Shape Flip Book, and Memory Geometry. Supply the center with these materials: Shape Sets, pattern blocks, Feely Box, Shape Flip Book, and Memory Geometry Card Sets C1 and C2.



Literature Connections

These books help develop shape recognition.

- *Up Goes the Skyscraper!* by Gail Gibbons
- *The Village of Round and Square Houses* by Ann Grifalconi
- *Shapes and Things* by Tana Hoban
- *So Many Circles, So Many Squares* by Tana Hoban
- *Manhattan Skyscrapers* by Norman McGrath and Eric Peter Nash

Weekly Planner

WEEK 15

Learning Trajectories

Week 15 Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments
- To count forward to and backward from 10
- To add and subtract small numbers

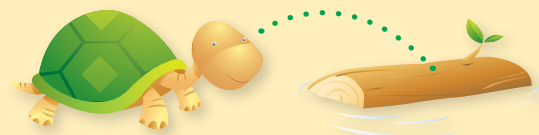
	Developmental Path	Instructional Activities
Shapes: Matching	*Shape Matcher, Sizes*	
	Shape Matcher, More Shapes	Memory Geometry 4 and 5 Memory Geometry (print)
	Shape Matcher, Sizes and Orientations	Mystery Pictures 4
	Shape Matcher, Combinations	
Shapes: Naming	*Shape Recognizer, All Rectangles*	
	Side Recognizer	Shape Step
	Shape Recognizer, More Shapes	Shape Step Mystery Pictures 4 Memory Geometry 4 and 5 Memory Geometry (print) Guess My Rule
	Shape Identifier	Mr. Mixup (Shapes) Shape Pictures Feely Box (Name) Shape Flip Book
	Parts of Shapes Identifier	Guess My Rule
	Shape Class Identifier	
Counting	*Counter and Producer (10+)*	
	Counter Backward from 10	Count and Move (Forward and Back)
	Counter from N (N +1, N − 1)	
Adding and Subtracting	*Nonverbal (+/–)*	
	Small Number (+/–)	How Many Now?
	Find Result (+/–)	

Use this chart to plan for your specific class schedule. If you have your prekindergarteners for only three days, complete Monday, Tuesday, and Thursday of the week.

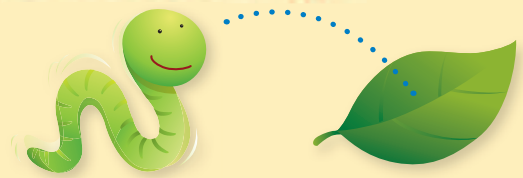
Pacing

Monday

Tuesday

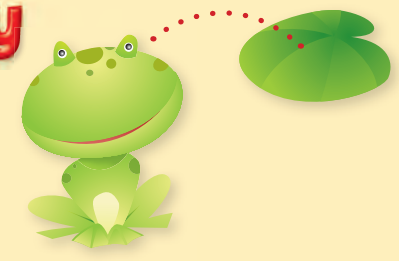


Wednesday



Thursday

Friday



Weekly Planner

Work Time

Whole Group	Small Group	Computer	Hands On	Program Resources
Shape Step *Materials:* large tape shapes ***Mr. Mixup (Shapes)** *Materials:* *Shape Set		**Mystery Pictures 4**	**Shape Pictures** *Materials:* *Shape Sets *Pattern Blocks **Feely Box (Name)** *Materials:* *Shape Sets **Shape Flip Book**	Building Blocks ***Teacher's Resource Guide*** • Shape Set • Shape Flip Book ***Assessment*** Weekly Record Sheet
Count and Move (Forward and Back) **Guess My Rule** *Materials:* *Shape Sets	**Guess My Rule** *Materials:* *Shape Sets **Shape Step** *Materials:* large tape shapes	**Memory Geometry 4**	**Shape Pictures** **Feely Box (Name)** **Shape Flip Book** **Memory Geometry**	Building Blocks ***Teacher's Resource Guide*** • Shape Flip Book • Memory Geometry Card Sets C1 and C2 ***Assessment*** Small Group Record Sheet
Shape Step *Materials:* large tape shapes **How Many Now?** *Materials:* *counters dark cloth		**Memory Geometry 5**	**Shape Pictures** **Feely Box (Name)** **Shape Flip Book**	Building Blocks ***Teacher's Resource Guide*** • Shape Set • Shape Flip Book ***Assessment*** Weekly Record Sheet
Count and Move (Forward and Back) **Guess My Rule** *Materials:* *Shape Sets	**Guess My Rule** *Materials:* *Shape Sets **Shape Step** *Materials:* large tape shapes	• **Mystery Pictures 4** • **Memory Geometry 4** • **Memory Geometry 5**	**Shape Pictures** **Feely Box (Name)** **Shape Flip Book** **Memory Geometry**	Building Blocks ***Teacher's Resource Guide*** • Shape Flip Book • Memory Geometry Card Sets C1 and C2 ***Assessment*** Small Group Record Sheet
Discuss Shape Pictures ***Mr. Mixup (Shapes)** *Materials:* *Shape Set		• **Mystery Pictures 4** • **Memory Geometry 4** • **Memory Geometry 5**	**Shape Pictures** **Feely Box (Name)** **Shape Flip Book**	Building Blocks ***Teacher's Resource Guide*** • Family Letter Week 15 • Shape Flip Book ***Assessment*** Weekly Record Sheet

*provided in Manipulative Kit

Monday Planner

Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments

Materials

- large tape shapes
- *Mr. Mixup
- *Shape Sets
- *Pattern Blocks

Math Throughout the Year

Review activity directions at the top of page 227, and complete each in class whenever appropriate.

Looking Ahead

If you have not already done so, prepare the Feely Box and Shape Flip Book ***(Teacher's Resource Guide)*** for today's Hands On Math Center.

*provided in Manipulative Kit

Monday

1 Whole Group 15

Warm-Up: Shape Step

- Use masking or colored tape to make large shapes on the floor. Show children rhombuses from the Shape Set (***Teacher's Resource Guide*** page 174), and tell them they will step only on rhombuses.
- Have a group of four or five children step on the rhombuses. Ask the rest of the class to watch carefully to make sure each group steps on all rhombuses. Whenever possible, ask children to explain why the shape they stepped on was the correct shape. Repeat with other groups of children.
- Repeat with new shapes, such as hexagons, engaging different groups of children each time.

Monitoring Student Progress

If . . . children struggle during Shape Step,	**Then . . .** review the target shape's attributes while children feel and/or trace the shape with their fingers. You might also step on a target shape, and then ask children whether it is the correct shape.
If . . . children excel during Shape Step,	**Then . . .** have them find examples of target shapes in unusual places and/or teach even less familiar shapes.

Mr. Mixup (Shapes)

- Ask children: Do you remember Mr. Mixup? Explain that they are going to help Mr. Mixup name shapes. Remind children to stop Mr. Mixup right when he makes a mistake to correct him. Use a silly voice, and have fun!
- Using Shape Set shapes, have Mr. Mixup start by confusing the names of a square and a rhombus. After children have identified the correct names, ask them to explain how their angles are different (squares must have all right angles; rhombuses may have different angles). Review that all rhombuses and squares, which are actually a special kind of rhombus with all right angles, have four straight sides of equal length.
- Repeat with a trapezoid, a hexagon, and any other shapes you would like children to practice.

2 Work Time 20

Computer Center Building Blocks

Introduce Mystery Pictures 4: Name New Shapes from the ***Building Blocks*** software, in which children have to identify each shape to create the mystery pictures. Each child should complete the activity this week.

Mystery Pictures 4

Hands On Math Center

These recurring activities may be set up at the center all week.

Shape Pictures

- Children make designs and pictures with Shape Sets and Pattern Blocks. Encourage them to name and discuss shapes, especially the trapezoids, rhombuses, and hexagons.
- To simplify, have children feel a shape's sides and corners to help with their descriptions. For a challenge, have children tell exactly why a shape is a trapezoid or a rhombus, for example, by describing their differences.
- For Friday's Whole Group, sketch or photograph children's designs, especially those that show symmetry (mirror images) or linear patterns.

Feely Box (Name)

In pairs, one child hides a Shape Set shape in the Feely Box; the other child puts his or her hand in the box to feel the shape to tell what it is. Help children explain how he or she figured out the shape, emphasizing the straightness and number of sides.

Shape Flip Book

Children match the book's panels, naming each shape.

RESEARCH IN ACTION

Watch what children do with Pattern Blocks. Children are naturally attracted to and make symmetric designs. Showing and discussing their designs are wonderful starting points for learning about symmetry. Children's designs may have line symmetry (for example, if folded, shape halves fit on each other), rotational symmetry (when a shape can be turned and fit on itself, like a parallelogram), both types of symmetry, or linear patterns (sequences in a row with a repeated core unit, such as ABC).

3 Reflect 5

Ask children:

■ **How do you know which shapes are rhombuses and which are trapezoids?**

Children might say: Rhombuses have four sides all the same, and trapezoids have different sides, or the like.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

Tuesday Planner

Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments
- To count forward to and backward from 10

Materials

- *Shape Sets
- large tape shapes

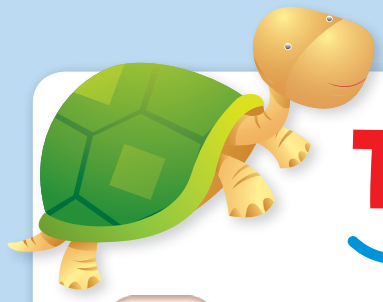
Math Throughout the Year

Review activity directions at the top of page 227, and complete each in class whenever appropriate.

Looking Ahead

If you prefer, make large shapes out of masking or colored tape on the floor ahead of time for today's Small Group.

*provided in Manipulative Kit



Tuesday

1 Whole Group 10

Warm-Up: Count and Move (Forward and Back)

Everyone starts in a crouched position, and slowly rises to a standing position while counting aloud to 10. Then, counting backward from 10, slowly sinks back down.

Guess My Rule

- Ask children to watch carefully as you sort Shape Set shapes into piles based on something that makes them alike. Tell children to silently guess your sorting rule, such as trapezoids versus triangles.
- Sort shapes one at a time, continuing until there are at least two shapes in each pile. Signal "shhh," and pick up another shape. Looking uncertain, ask all children to point silently to the pile in which the shape belongs, and then place the shape in its pile.
- Ask children to explain to a classmate what the sorting rule is. As they talk, help them consider the following: Why did you guess that rule? How did you know? Show me how the shapes match the rule. Repeat with other shapes and new rules, such as rectangles versus rhombuses.

2 Work Time 25

Small Group

Guess My Rule

Help children follow the Whole Group directions for this activity, using different rules, such as rectangles versus all other shapes, triangles versus rhombuses, trapezoids versus non-trapezoids, or hexagons versus trapezoids.

Monitoring Student Progress

If . . . children struggle during Guess My Rule,
Then . . . use simpler rules, such as squares versus circles.

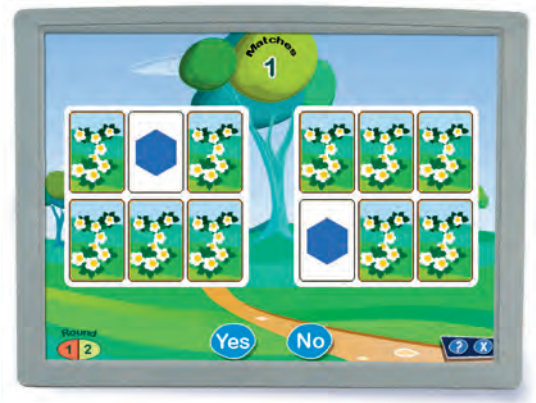
If . . . children excel during Guess My Rule,
Then . . . have them think of a sorting rule for the class, telling only you at first.

Shape Step

- If you have not already done so, make large tape shapes on the floor for children to step on, and then show them to children.
- Tell children which shape to step on. As best you can, observe whether target shapes are stepped on. Encourage groups to discuss why the shape was the correct shape.

Computer Center Building Blocks

Introduce Memory Geometry 4: Shapes of Things from the ***Building Blocks*** software, in which children play a version of the traditional concentration game by matching shapes to common objects, such as an octagon to a stop sign. Each child should complete Memory Geometry 4 this week.



Memory Geometry 4

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Shape Pictures, Feely Box (Name), and Shape Flip Book. Consult the Weekly Planner for corresponding materials and, if needed, yesterday for activity directions. Children might also benefit from a hands-on version of Memory Geometry in which they match shapes to common objects using Sets C1 and C2. You can find general directions for Memory Geometry on page 137.

3 Reflect 5

Ask children:

■ **What shape(s) did you find today?**

Children might say: We found mostly rectangles (insert corresponding target shape name); rectangles are everywhere like your desk! We also found circles like our clock.

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

Wednesday Planner

Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments
- To count forward to and backward from 10
- To add and subtract small numbers

Materials

- large tape shapes
- *counters
- dark cloth

Math Throughout the Year

Review activity directions at the top of page 227, and complete each in class whenever appropriate.

*provided in Manipulative Kit

Wednesday

1 Whole Group 25

Warm-Up: Shape Step

- Use masking or colored tape to make large shapes on the floor. Review rhombuses if needed, and tell children to step only on rhombuses.
- Have a group of four or five children step on the rhombuses. Ask the rest of the class to watch carefully to make sure each group steps on all rhombuses. Whenever possible, ask children to explain why the shape they stepped on was the correct shape. Repeat with other groups of children.
- Repeat with new shapes, such as hexagons, engaging different groups of children each time.
- If children are ready, switch to the Sides and Angles version of this activity, in which you would ask children to step on shapes with three (triangles), four (quadrilaterals), or six (hexagons) sides without saying the shape's name.

How Many Now?

- Show five counters to children, and, as a group, count and say how many counters there are.
- Add one counter, and ask children how many there are now. Count together to check.
- Repeat by adding and removing one counter and, eventually, do the same with two counters.
- Once children are able, play this activity's hidden version by following the same steps, but hide the counters under a dark cloth (paper plate is optional, as counters can simply be placed on a desk and covered). Keep counters hidden as you add or remove counters, as well as during children's response portion of the activity. For example, add two counters to the others under the cloth and, after children have answered, uncover the counters and count with the class to check.

Monitoring Student Progress

If . . . children need help during How Many Now?	**Then . . .** use fewer counters, or provide answer choices.
If . . . children need a challenge during How Many Now?	**Then . . .** use more counters.

2 Work Time 10

Computer Center Building Blocks

Introduce Memory Geometry 5: Shapes in the World from the ***Building Blocks*** software, in which children play a version of the traditional concentration game by matching shapes to shapes from the "world," such as a rectangle to a cereal box. Each child should complete Memory Geometry 5 this week.

Memory Geometry 5

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Shape Pictures, Feely Box (Name), and Shape Flip Book. Consult the Weekly Planner for corresponding materials and, if needed, Monday for activity directions.

3 Reflect 5

Ask children:

- **How did you know how many counters there were?**

Children might say: I counted; I know 6 is one more than 5; or the like.

RESEARCH IN ACTION

What if a child steps on a square when asked to step on a rhombus? That is good! A square is a special kind of rhombus; it is a rhombus because it has four equal sides, and it is special because it has all right angles.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

Thursday Planner

Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments
- To count forward to and backward from 10

Materials

- *Shape Sets
- large tape shapes

Math Throughout the Year

Review activity directions at the top of page 227, and complete each in class whenever appropriate.

Looking Ahead

For tomorrow, make copies of Family Letter Week 15 from the ***Teacher's Resource Guide***.

*provided in Manipulative Kit

Thursday

1 Whole Group 10

Warm-Up: Count and Move (Forward and Back)

Everyone starts in a crouched position, and slowly rises to a standing position while counting aloud to 10. Then, counting backward from 10, slowly sinks back down. Repeat with other movements if you prefer.

Guess My Rule

- Ask children to watch carefully as you sort Shape Set shapes into piles based on something that makes them alike. Tell children to silently guess your sorting rule, such as hexagons versus all other shapes.
- Sort shapes one at a time, continuing until there are at least two shapes in each pile. Signal "shhh," and pick up another shape. Looking uncertain, ask all children to point silently to the pile in which the shape belongs, and then place the shape in its pile.
- Ask children to explain to a classmate what the sorting rule is. As they talk, help them consider the following: Why did you guess that rule? How did you know? Show me how the shapes match the rule. Repeat with other shapes and new rules (See the appendix for complete sorting rule suggestion list).

2 Work Time 25

Small Group

Guess My Rule

Help children follow the Whole Group directions for this activity, using different rules, such as circles versus ovals, triangles versus rhombuses, squares versus rectangles, or hexagons versus trapezoids.

Monitoring Student Progress

If . . . children struggle during Guess My Rule,
Then . . . use simpler rules, such as squares versus triangles.

If . . . children excel during Guess My Rule,
Then . . . have them think of a sorting rule for the class, telling only you at first.

Shape Step

Using large tape shapes on the floor, tell children which shape to step on. As best you can, observe whether target shapes are stepped on. Encourage groups to discuss why the shape was the correct shape.

Computer Center

Building Blocks

Continue to provide each child with a chance to complete this week's computer activities: Mystery Pictures 4, Memory Geometry 4, and Memory Geometry 5.

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Shape Pictures, Feely Box (Name), and Shape Flip Book. Consult the Weekly Planner for corresponding materials and, if needed, Monday for activity directions. Children might also benefit from a hands-on version of Memory Geometry in which they match shapes to common objects using Sets C1 and C2. You can find general directions for Memory Geometry on page 137.

3 Reflect 5

Ask children:

- **How did you know the sorting rule during Guess My Rule?**

Children might say: I look at all shapes to see what is the same about them; I count the sides first; I look at the piles and compare; or the like.

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

RESEARCH IN ACTION

Many computer programs, such as ***Building Blocks*** activities, can help reinforce ideas and skills by letting children know whether or not they are correct, and most children do not mind being corrected.

Friday Planner

Objectives

- To identify and match shapes
- To find and describe the shape of objects in their environments

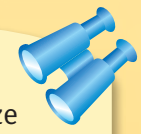
Materials

- *Mr. Mixup
- *Shape Set

Math Throughout the Year

Review activity directions at the top of page 227, and complete each in class whenever appropriate.

Looking Ahead



For next week, familiarize yourself with Pattern Zoo 1: Recognize AB, Pattern Planes 1: Duplicate AB, and Marching Patterns 1: Extend AB from the ***Building Blocks*** software.

*provided in Manipulative Kit

Friday

1 Whole Group 20

Warm-Up: Discuss Shape Pictures

- Display children's designs you copied from this week's Hands On Math Center Shape Pictures activity, and discuss each type of design, drawing special attention to those with line or rotational symmetry. Talk about how designs with line (mirror) symmetry are the same on one side as the other, and you may discuss rotational symmetry as being the same all around.
- Ask children what patterns they see. For example, square, triangle, square, triangle, and so on.

Mr. Mixup (Shapes)

- Remind children to stop Mr. Mixup right when he makes a shape mistake to correct him. Use a silly voice, and have fun!
- With Shape Set shapes, have Mr. Mixup first confuse the names of familiar shapes. After children have identified the correct names, ask them to compare and/or describe shapes, such as a square being a special kind of rhombus with all right angles.
- Repeat with a trapezoid, a hexagon, and any other shapes you would like children to practice.

Monitoring Student Progress

If . . . children struggle correcting Mr. Mixup,	**Then . . .** exaggerate Mr. Mixup's errors.
If . . . children excel at correcting Mr. Mixup,	**Then . . .** have Mr. Mixup make less obvious mistakes about less familiar shapes.

2 Work Time 15

Computer Center Building Blocks

Continue to provide each child with a chance to complete this week's computer activities: Mystery Pictures 4, Memory Geometry 4, and Memory Geometry 5.

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Shape Pictures, Feely Box (Name), and Shape Flip Book. Consult the Weekly Planner for corresponding materials and, if needed, Monday for activity directions.

3 Reflect 5

Briefly discuss with children what you have done in class this week, such as guessing and naming shapes, and ask:

■ **How do you know the names of shapes in the computer games?**

Children might say: I know by how many sides a shape has; I know because the sides are all the same; and the like.

4 Assess

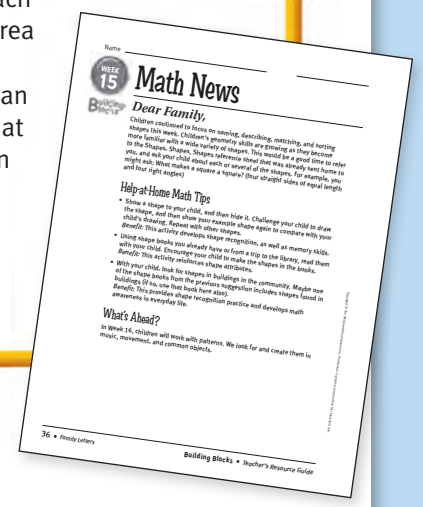
Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

RESEARCH IN ACTION

We will continue to emphasize linear patterns next week. However, any complex designs children build may also contain wonderful, noteworthy patterns.

Home Connection

From the ***Teacher's Resource Guide,*** distribute to children copies of Family Letter Week 15 to share with their family. Each letter has an area for children to show families an example of what they have been doing in class.


Name

WEEK 15 Building Blocks

Math News

Dear Family,

Children continued to focus on naming, describing, matching, and sorting shapes this week. Children's geometric skills are growing as they become more familiar with a wide variety of shapes. This would be a great time to refer to the Shapes, Shapes, Shapes reference sheet that was already sent home to you, and ask your child about each or several of the shapes. For example, you might ask: What makes a square a square? (four straight sides of equal length and four right angles)

Help-at-Home Math Tips

- Show a shape to your child, and then hide it. Challenge your child to draw the shape, and then show your example shape again to compare with your child's drawing. Repeat with other shapes.
  Benefit: This activity develops shape recognition, as well as memory skills.
- Using shape books you already have or from a trip to the library, read them with your child. Encourage your child to make the shapes in the books.
  Benefit: This activity reinforces shape attributes.
- With your child, look for shapes in buildings in the community. Maybe one of the shape books from the previous suggestion includes shapes found in buildings (if no, one that book here also).
  Benefit: This provides shape recognition practice and develops math awareness in everyday life.

What's Ahead?

In Week 16, children will work with patterns. We look for and create them in music, movement, and common objects.

36 • Family Letters

Building Blocks • Teacher's Resource Guide

Assess and Differentiate

A Gather Evidence

Review children's progress in mathematics by looking at the Weekly Record Sheets (Monday, Wednesday, Friday) and the Small Group Record Sheets (Tuesday, Thursday) from this past week.

B Summarize Findings

Using ***Online Assessment,*** summarize and analyze assessment data for each child based on your weekly observations and Record Sheets. Such information helps determine where each child is on the math trajectory for geometry and number. See ***Assessment*** for the print companion to each Learning Trajectory Record.

C Differentiate Instruction

Once you have seen a child exhibit specific levels of the trajectory, begin to encourage and work with that child toward the next level. Refer to Appendix A for individualized instruction opportunities, including Special Education concerns.

Shapes: Matching

If . . . the child can match many shapes of the same size and orientation,	**Then . . .** *Shape Matcher, More Shapes* Matches a wider variety of shapes of same size and orientation.
If . . . the child can match shapes of varied sizes and orientations,	**Then . . .** *Shape Matcher, Sizes and Orientations* Matches a wider variety of shapes of different sizes and orientations. For example, matches the same triangle even if the examples are turned differently.

Shapes: Naming

If . . . the child can recognize and point to the sides of shapes,	**Then . . .** *Side Recognizer* Parts: Identifies sides as distinct objects. For example, child explains that a shape is a triangle because it has three sides and runs finger along the length of each side.
If . . . the child can recognize familiar shapes and some examples of less familiar shapes,	**Then . . .** *Shape Recognizer, More Shapes* Recognizes most familiar shapes and typical examples of other shapes, such as hexagon, rhombus (diamond), and trapezoid.
If . . . the child can name most shapes and recognize right angles,	**Then . . .** *Shape Identifier* Names most common shapes, including rhombuses, without making mistakes, such as calling ovals circles; implicitly recognizes right angles, thus can distinguish between rectangles and parallelograms without right angles.
If . . . the child can name some shapes by their attributes,	**Then . . .** *Parts of Shapes Identifier* Identifies shapes in terms of their components. For example, no matter how "skinny" a triangle is, the child knows it is a triangle because it has three sides.

Counting

If . . . the child can accurately and consistently count backward from 10,	**Then . . .** *Counter Backward from 10* Counts back verbally from 10 or when removing items from a group.

Adding and Subtracting

If . . . the child can add or subtract small amounts by counting,	**Then . . .** *Small Number (+/–)* Finds sums for joining problems up to 3 +2 by counting all objects. For example: There are two crayons. One more crayon is added. How many crayons are there in all? Child counts two, counts one more, and then counts "1, 2, 3...3!"

Building Blocks

Teacher's Edition Sampler

Week 23

WEEK 23

Overview

Big Ideas

- shape recognition and composition
- counting
- comparing and ordering numbers
- solving problems

Teaching for Understanding

At its heart, mathematics is about figuring out puzzles—solving problems. Even very young children can solve interesting geometric/spatial and number problems, probably more so than in other academic areas. For example, learning letters, their sounds, and sound variations may be more challenging than involving children in advanced mathematical thinking, and doing so can occur at any age.

Shape Composition

For several weeks, children will put together shapes to make new shapes. Helping children see shapes as composed of various parts is one of the foundational concepts of early mathematics. Children should eventually apply this idea to other part-whole relationships, such as counting units that make up a set arrangement and, in another subject area, combining letters to create words.

Number Puzzles

As the name and task indicate, number puzzles build number skills and number sense, as well as mathematical reasoning. For example, children have to reason about the relative position and size of numbers much as they have to reason about geometric shapes.

Meaningful Connections

The concept that shapes are composed of parts is connected with, and supports the learning of, many other areas of math, including number (1 + 4 and 2 + 3 are other names for 5), addition, fractions, and measurement. There are many other connections highlighted this week. For example, several games teach shapes, shape attributes, and classification skills. Most of the activities also teach children to solve mathematical puzzles, linking the processes of problem solving, reasoning, and communication to number and geometry contexts. Thus children's language skills are continually enriched.

What's Ahead?

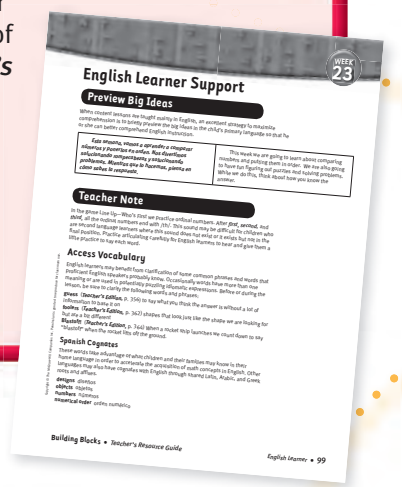
In the weeks to come, children will learn to solve more challenging shape and number puzzles. Aside from composing shapes, children will also combine numbers, further developing their ideas and skills regarding addition.

Overview

WEEK 23

English Learner

Counting in rhythm helps English learners with sounds of English number words. Review the following: *pattern, in order, in sequence,* and *puzzle*. Refer to page 99 of the ***Teacher's Resource Guide.***


English Learner Support

Preview Big Ideas

Teacher Note

Access Vocabulary

Spanish Cognates

Building Blocks • Teacher's Resource Guide

English Learner • 99

Technology Project

Children may get additional shape practice using Piece Puzzler Free Explore, in which they make their own pictures, click Play, and then ask a classmate to complete their picture as a puzzle. Children can now use the new tools of turning, flipping, and copying; you may even teach them how to use the Scissors, which enables users to "cut" shapes by clicking on two vertices or midpoints. It can be challenging to solve these puzzles because the correct shape with the correct orientation ("turned the same way") must be chosen. As you visit children at the computer, have them describe what they are making, what shapes they are using, and why.

How Children Learn about Shapes

Knowing where children are on the learning trajectory for geometry and counting and what the next steps are helps facilitate their development. Children who easily surpass these trajectory levels might be challenged by less familiar shapes and larger amounts and encouraged to assist other children.

Shapes: Naming

What to Look For Which shapes can the child identify accurately and consistently?

Shape Identifier Names most common shapes without making mistakes; implicitly recognizes right angles, thus can distinguish between rectangles and parallelograms without right angles.

Parts of Shapes Identifier Identifies shapes in terms of their components.

Shapes: Composing

What to Look For How does the child recognize and combine parts of shapes?

Pre-Composer Manipulates shapes as individual but cannot combine them to compose a larger shape.

Piece Assembler Makes pictures in which shapes touch and each represents a unique role, and fills simple outline puzzles using trial and error.

Picture Maker Puts several shapes together to make one part of a picture. Uses trial and error, chooses shapes using general shape or side length, and fills simple outline puzzles that suggest placement of each shape.

Classification

What to Look For Which general attributes can the child identify?

Attribute Identifier Names attributes of objects and groups together those with a given attribute.

Counting

What to Look For To what amount can the child count and produce objects?

Counter and Producer (10+) Accurately counts and produces objects to 10, and then beyond to 30; has explicit understanding of cardinality and keeps track of objects that have and have not been counted. Writes or draws to represent 1–10 (then 20 and 30), and gives next number to 20s or 30s; recognizes errors in others' counting and can eliminate most errors in own counting.

Counter Backward from 10 Counts back verbally from 10 or when removing items from a group.

Counter from N (N + 1, N − 1) Counts verbally with objects from numerals other than 1 but does not yet keep track of number of counts. Numerals just before or after are determined immediately.

Comparing and Ordering

What to Look For To what numeral or numeric value can the child order objects?

Ordinal Counter Identifies and uses ordinal numbers from first to tenth.

Serial Orderer to 6+ Orders lengths marked into units 1–6 and then beyond.

Math Throughout the Year

Math Throughout the Year activities are recommended to build on the mathematical skills highlighted in each week. Here are suggested activities for **Week 23.**

Counting Jar

Using the jar you have been all year, vary the sizes of the jar's items each week for children to spill and count. Encourage them to record their counts (the numeral that tells how many items are in the jar) on self-sticking notes. Offer writing assistance as needed.

How Many Seconds?

Use the time when you and your class are waiting as an opportunity to count seconds aloud. For example, say "Lunch is 35 seconds late," and count as close to the number as children can. When downtime is even longer, use a clock with a second hand to time how long children can stand on one foot or other action, and count the seconds aloud.

Measure Capacities

Provide three half-gallon containers (labeled A, B, and C in different colors) cut to hold two, four, and eight cups of a pourable material, a one-cup measuring cup, and water or sand. Show the materials to children, and ask them which container holds only four cups; help children discuss how they know. Allow them to pour from one container to another, comparing which holds more and which holds less (they can use the measuring cup to check).

Line Up—Who's First?

When lining up, do one of the following on alternate days: call children by who wants to be first, second, and so on; tell a child he or she can be next in line if he or she knows what comes next (...third, fourth, fifth...); or, after six or eight children are lined up, ask them to make spaces between each other, and then have seated children name a space in order to obtain that position.

Center Preview

Computer Center

Building Blocks

Get your classroom Computer Center ready for Piece Puzzler 1: Match Pictures and Piece Puzzler 2: Assemble Pieces from the ***Building Blocks*** software.

After you introduce both Piece Puzzlers, each child should complete the activities individually as you (or an assistant) monitor and guide him or her periodically. Ideally, each child will have at least ten minutes of computer time at least twice during the week. Use children's center time as an opportunity for assessment.

Hands On Math Center

This week's Hands On Math Center activities are Pattern Block Puzzles, X-Ray Vision 2, and Pattern Block Cutouts. Supply the center with these materials: Pattern Block Puzzles 1–10 (from the ***Teacher's Resource Guide***), Pattern Blocks, Counting Cards, and Pattern Block Cutouts (also from the ***Teacher's Resource Guide***).

Literature Connections

These books develop various math skills.

- *Changes, Changes* by Pat Hutchins
- *Lottie's New Beach Towel* by Petra Mathers
- *A Pair of Socks* by Stuart J. Murphy
- *Grandfather Tang's Story* by Ann Tompert
- *Make a Bigger Puddle, Make a Smaller Worm* by Marion Walter

Weekly Planner

WEEK 23

Learning Trajectories

Week 23 Objectives

- To identify and match shapes
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

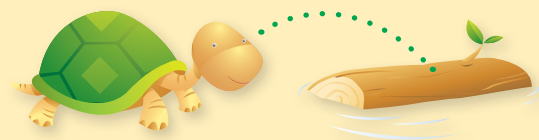
	Developmental Path	Instructional Activities
Shapes: Naming	*Shape Recognizer, More Shapes*	
	Shape Identifier	Guess My Rule Piece Puzzler 1 and 2 I Spy
	Parts of Shapes Identifier	Guess My Rule I Spy
	Shape Class Identifier	
Shapes: Composing	*Pre-Composer*	Pattern Block Puzzles 1–3 Piece Puzzler 1
	Piece Assembler	Puzzles Pattern Block Puzzles 4–10 Piece Puzzler 2 Pattern Block Cutouts
	Picture Maker	Pattern Block Cutouts
	Shape Composer	
Classification	*Attribute Identifier*	Guess My Rule I Spy
Counting	*Counter (10)*	
	Counter and Producer (10+)	X-Ray Vision 2
	Counter Backward from 10	Blast Off
	Counter from N (N + 1, N − 1)	What's the Missing Card? I'm Thinking of a Number
	Skip Counter by 10s to 100	
Ordering	*Counting Comparer (5)*	
	Ordinal Counter	Line Up—Who's First?
	Serial Orderer to 6+	X-Ray Vision 2
	Place Value Comparer	

Use this chart to plan for your specific class schedule. If you have your prekindergarteners for only three days, complete Monday, Tuesday, and Thursday of the week.

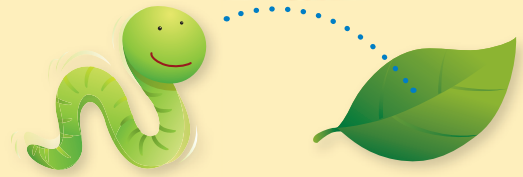
Pacing

Monday

Tuesday

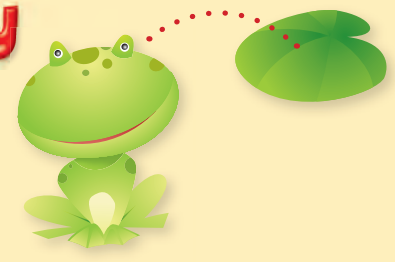


Wednesday



Thursday

Friday



Weekly Planner

Work Time

Whole Group	Small Group	Computer	Hands On	Program Resources
Blast Off **Puzzles** *Materials:* wooden puzzle *Pattern Blocks		**Piece Puzzler 1**	**Pattern Block Puzzles** *Materials:* *Pattern Blocks **X-Ray Vision 2** *Materials:* *Counting Cards	*Teacher's Resource Guide* Pattern Block Puzzles Building Blocks ***Assessment*** Weekly Record Sheet
Blast Off **I'm Thinking of a Number** *Materials:* *Counting Cards	**What's the Missing Card?** *Materials:* *Counting Cards **Pattern Block Puzzles** *Materials:* *Pattern Blocks	**Piece Puzzler 2**	**Pattern Block Cutouts** *Materials:* *Pattern Blocks **Pattern Block Puzzles** **X-Ray Vision 2**	*Teacher's Resource Guide* • Pattern Block Puzzles • Pattern Block Cutouts Building Blocks ***Assessment*** Small Group Record Sheet
I Spy *Materials:* *Shape Sets flat manipulatives **Guess My Rule** *Materials:* *Shape Sets		• **Piece Puzzler 1** • **Piece Puzzler 2**	**Pattern Block Cutouts** **Pattern Block Puzzles** **X-Ray Vision 2**	Building Blocks *Teacher's Resource Guide* • Pattern Block Puzzles • Pattern Block Cutouts ***Assessment*** Weekly Record Sheet
Blast Off **I'm Thinking of a Number** *Materials:* *Counting Cards	**What's the Missing Card?** *Materials:* *Counting Cards **Pattern Block Puzzles** *Materials:* *Pattern Blocks	• **Piece Puzzler 1** • **Piece Puzzler 2**	**Pattern Block Cutouts** **Pattern Block Puzzles** **X-Ray Vision 2**	*Teacher's Resource Guide* • Pattern Block Puzzles • Pattern Block Cutouts Building Blocks ***Assessment*** Small Group Record Sheet
I Spy *Materials:* *Shape Sets flat manipulatives **Guess My Rule**		• **Piece Puzzler 1** • **Piece Puzzler 2**	**Pattern Block Cutouts** **Pattern Block Puzzles** **X-Ray Vision 2**	Building Blocks *Teacher's Resource Guide* • Family Letter Week 23 • Pattern Block Puzzles • Pattern Block Cutouts ***Assessment*** Weekly Record Sheet

*provided in Manipulative Kit

Monday Planner

Objectives

- To identify and match shapes, including finding and describing object shapes in their environments
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

Materials

- wooden puzzle
- *Pattern Blocks
- *Counting Cards

Math Throughout the Year

Review activity directions at the top of page 355, and complete each in class whenever appropriate.

Looking Ahead

Make copies of Pattern Block Puzzles 1–10 for today's lesson, though they will be used all this week. For tomorrow, prepare the Pattern Block Cutouts. All are in the ***Teacher's Resource Guide***.

*provided in Manipulative Kit

Monday

1 Whole Group 20

Warm-Up: Blast Off

Everyone starts in a standing position, and slowly lowers to a crouching position while counting backward from 10 to 0. Then everyone yells "blast off!" and safely jumps as high as possible. Repeat as time permits, starting with numerals more than 10 as children are able.

Puzzles

- This serves as an introduction to puzzles, helping children put this week's activities in perspective. Show a wooden puzzle, and explain that doing puzzles often involves combining shapes to make new shapes and pictures. Tell children they will do many puzzles this week—even on the computer!
- Show Pattern Block Puzzle 1, and ask for volunteers to solve it with actual Pattern Blocks.
- Generally, if children need more help with puzzles, move from easy off-computer wooden puzzles to simple off-computer outline puzzles, gradually increasing complexity. For a challenge, ask children to solve the same puzzle once it is completed but with different shapes, or allow children to do puzzles from the ***Teacher's Resource Guide***.

2 Work Time 15

Computer Center Building Blocks

Introduce Piece Puzzler 1: Match Pictures from the ***Building Blocks*** software, in which children only have to drag shapes into place. Additionally, the shapes only touch at their corners, or *vertices*, making it easy for all children to match them. Children should work through this level quickly. Each child should have the opportunity to complete Piece Puzzler 1 this week.

Hands On Math Center

These activities may be set up at the center all week.

Pattern Block Puzzles

- Children choose and complete Pattern Block Puzzles 1–10. Make a big deal when new puzzles are introduced, as it motivates children.
- For reinforcement, suggest children make their own unique puzzles using actual blocks, and then trace what they created to "see" the puzzle.

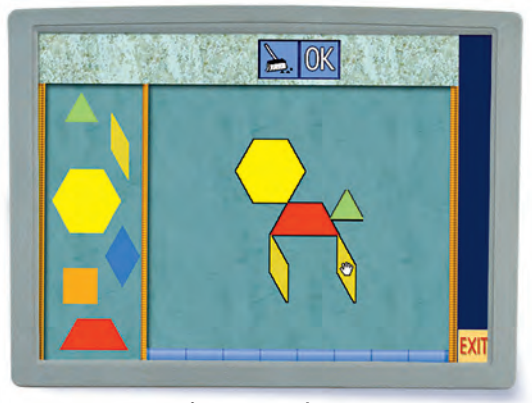
Monitoring Student Progress

If . . . children need help making Pattern Block Puzzles, **Then . . .** use your simplest puzzles, or use a pencil to draw lines within puzzles to guide children.

If . . . children need a challenge while making Pattern Block Puzzles, **Then . . .** use your hardest puzzles, or have children solve one puzzle as many ways as they can.

X-Ray Vision 2

- In pairs, children place Counting Cards 1–10 facedown in numerical order.
- Children take turns pointing to a card, using their "X-ray vision" to tell which card it is (review counting from 1 if necessary). Children flip their partner's card to show whether he or she is correct. If correct, the card remains faceup; if not, the card is replaced facedown. This continues until are cards are facing up.
- For children who need help, use cards to 5 only. For a challenge, make and use cards to 20.



Piece Puzzler 1

RESEARCH IN ACTION

Mathematics is often about solving puzzles, determining solutions to problems. This week children solve geometric/spatial puzzles, as well as number puzzles. As they begin such tasks, keep in mind that the pattern blocks from the computer activities may actually be easier for children to place because they "snap" into place and do not shift afterward.

3 Reflect 5

Ask children:

■ **How did you figure out which shapes to use in puzzles?**

Children might say: I look at corners and know the shapes that fit in there; I fill in the lines of the puzzle; I match the shapes to the puzzle; or the like.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

Tuesday Planner

Objectives

- To identify and match shapes, including finding and describing object shapes in their environments
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

Materials

- *Counting Cards
- *Pattern Blocks

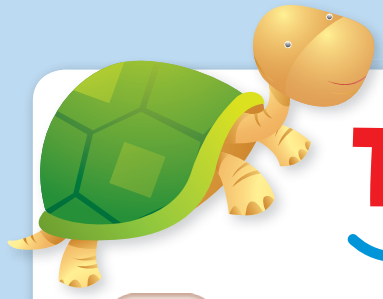
Math Throughout the Year

Review activity directions at the top of page 355, and complete each in class whenever appropriate.

Looking Ahead

Gather flat manipulatives for tomorrow's I Spy.

*provided in Manipulative Kit



Tuesday

1 Whole Group 10

Warm-Up: Blast Off

Everyone starts in a standing position, and slowly lowers to a crouching position while counting backward from 10 to 0. Then everyone yells "blast off!" and safely jumps as high as possible. Repeat as time permits, starting with numerals more than 10 as children are able.

I'm Thinking of a Number

- Choose and hide a Counting Card from 1–10. Tell children what you did, and ask them to guess the number. When a child guesses correctly, excitedly reveal the card. Until then, provide hints, telling children whether a guess is more or less than the secret number.
- As children become familiar with the game, ask them to explain their guesses. For example, a child might say: I knew 4 is more than the secret number and 2 is less than it so I said 3.

2 Work Time 25

Small Group

What's the Missing Card?

- Children work together to put Counting Cards 1–5 in numerical order.
- While one child shuts his or her eyes, the other hides a card. After the card is hidden, that child tells the other to look and then asks which card is missing. Once a child figures out the missing card, he or she should explain how he or she knew.
- For those who struggle, count each card with them; use fewer cards; provide a list of numerals for reference; or use a toy animal to model a counting strategy ("This is 3 so 1 more is 4, and add 1 more, this must be 5."). For a challenge, use more cards, or have the child who hides the card close the gap between cards before the other child guesses. Monitor the activity to make sure all children participate, not just the more capable ones.

Pattern Block Puzzles

- Children choose and complete Pattern Block Puzzles 1–10. Make a big deal when new puzzles are introduced, as it motivates children.
- For reinforcement, suggest children make their own unique puzzles using actual blocks, and then trace what they created to "see" the puzzle.

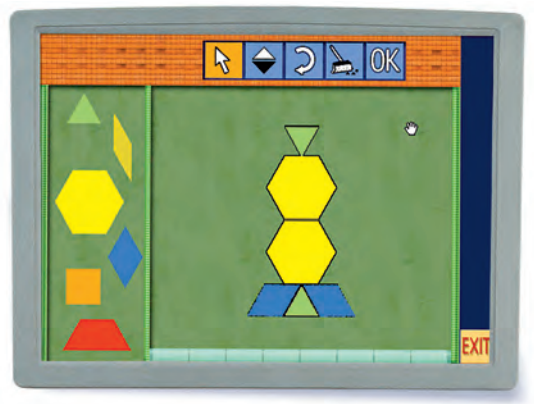
Monitoring Student Progress

If . . . children struggle during Pattern Block Puzzles, **Then . . .** use Pattern Block Puzzles 1–5 only.

If . . . children excel during Pattern Block Puzzles, **Then . . .** use Pattern Block Puzzles beyond number 10.

Computer Center Building Blocks

Introduce Piece Puzzler 2: Assemble Pieces from the ***Building Blocks*** software, in which children have to drag, but sometimes turn or flip, shapes into place (be sure to demonstrate turning and flipping). This level's shapes also touch at their sides, helping children see how shapes combine to fill regions; each shape's outline appears so the task remains introductory for composition. Each child should complete the activity this week.



Piece Puzzler 2

Hands On Math Center

After introducing today's activity, children may complete it and/or continue yesterday's.

Pattern Block Cutouts

Show children how to make copies of their favorite Pattern Block Puzzles using Pattern Block Cutouts (from the ***Teacher's Resource Guide***) and construction paper. You may eventually make a book of their best designs. See Friday's Monitoring Student Progress for scaffolding.

RESEARCH IN ACTION

To help children become more aware of geometric motions, talk to them about how they move shapes, such as sliding Pattern Blocks and using the turn and flip tools on the computer. As children manipulate shapes, they become familiar with seeing shapes in different orientations, realizing that changing a shape's orientation does not affect its name or attributes.

3 Reflect 5

Ask children:

- **How did you figure out how to fill the puzzles on the computer?**

Children might say: I think of the shapes that are easy; some places you can see the whole shape and, after I add those, I know where the others fit; and the like.

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

Wednesday Planner

Objectives

- To identify and match shapes, including finding and describing object shapes in their environments
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

Materials

- *Shape Sets
- flat manipulatives

Math Throughout the Year

Review activity directions at the top of page 355, and complete each in class whenever appropriate.

*provided in Manipulative Kit

Wednesday

1 Whole Group 15

Warm-Up: I Spy

- Name a property of something in the classroom, and have children guess what it is. Here are some shape guidelines: circles are perfectly round; triangles have three sides; equilateral triangles have three sides with all the same angles; isosceles triangles have three sides with two sides and angles the same; right triangles have three sides with one right angle; parallelograms have four sides with opposite sides the same length; squares have four sides all the same length with all right angles; and rhombuses have four sides all the same length.
- Note that this can be played during transitions, while waiting, and other downtime. If you do not have a certain shape, such as a parallelogram, to "spy" in your classroom, strategically place Shape Set shapes or other flat manipulatives around the room.

Guess My Rule

- Ask children to watch carefully as you sort Shape Set shapes into piles based on something that makes them alike. Tell children to silently guess your sorting rule, such as rhombuses versus all other shapes. Sort shapes one at a time, continuing until there are at least two shapes in each pile.
- Signal "shhh," and pick up a new shape. With a look of confusion, gesture to children to point quietly to which pile the shape belongs. Place the shape in its pile. Repeat this process until many shapes are sorted into each pile.
- Ask children to name your sorting rule and explain their answer: Why did you guess that rule? How do you know? Show me how the shapes match your rule.
- For a challenge, draw the shapes, and have children guess your rule, such as shapes sorted by numbers of sides or angles (four versus more than four), rectangles versus "foolers" (shapes that look just like rectangles but are not closed or parallelograms without right angles), and symmetrical versus non-symmetrical shapes. A complete list appears on page A3. Try several rules per session, concluding with some challenges.

Monitoring Student Progress

If . . . children struggle during Guess My Rule,
Then . . . use simpler rules, such as squares versus circles.

If . . . children excel during Guess My Rule,
Then . . . use harder rules, or have them invent their own rules for the class to guess.

2 Work Time 20

Computer Center Building Blocks

Continue to provide each child with a chance to complete Piece Puzzler 1 and 2.

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Pattern Block Cutouts, Pattern Block Puzzles, and X-Ray Vision 2. If needed, consult Monday and Tuesday for activity directions.

3 Reflect 5

Ask children:

- **How did you figure out which shapes to use in harder puzzles?**

Children might say: I have to do the ones where I can see each shape that should be there, and then I fill in more until the whole thing is done; or the like.

4 Assess

Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

RESEARCH IN ACTION

Carefully observe the level at which children are working. When filling open puzzles, *Piece Assemblers* may go outside an outline, and when creating their own pictures, they are just learning to put shapes together to make new shapes. Children who are *Picture Makers* can put shapes together to make a part, such as three shapes to make a body, but they use trial and error. Some children might be *Shape Composers*, combining shapes to make a new shape, such as using two triangles to make a rhombus, with growing anticipation: "I know what will fit."

Thursday Planner

Objectives

- To identify and match shapes, including finding and describing object shapes in their environments
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

Materials

- *Counting Cards
- *Pattern Blocks

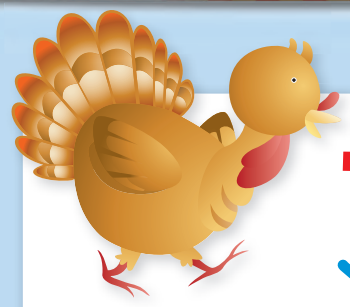
Math Throughout the Year

Review activity directions at the top of page 355, and complete each in class whenever appropriate.

Looking Ahead

For tomorrow, make copies of Family Letter Week 23 from the ***Teacher's Resource Guide.***

*provided in Manipulative Kit



Thursday

1 Whole Group 10

Warm-Up: Blast Off

Everyone starts in a standing position, and slowly lowers to a crouching position while counting backward from 10 to 0. Then everyone yells "blast off!" and safely jumps as high as possible. Repeat as time permits, starting with numerals more than 10 as children are able.

I'm Thinking of a Number

- Choose and hide a Counting Card from 1–10. Tell children what you did, and ask them to guess the number. When a child guesses correctly, excitedly reveal the card. Until then, provide hints, telling children whether a guess is more or less than the secret number.
- As children become familiar with the game, ask them to explain their guesses. For example, a child might say: I knew 4 is more than the secret number and 2 is less than it so I said 3.

2 Work Time 25

Small Group

What's the Missing Card?

- Children to work together to put Counting Cards 1–5 in numerical order.
- While one child shuts his or her eyes, the other hides a card. After the card is hidden, that child tells the other to look and then asks which card is missing. Once a child figures out the missing card, he or she should explain how he or she knew.
- For those who struggle, count each card with them; use fewer cards; provide a list of numerals for reference; or use a toy animal to model a counting strategy ("This is 3 so 1 more is 4, and add 1 more, this must be 5."). For a challenge, use more cards, or have the child who hides the card close the gap between cards before the other child guesses. Monitor the activity to make sure all children participate, not just the more capable ones.

Pattern Block Puzzles

- Children choose and complete Pattern Block Puzzles 1–10. Make a big deal when new puzzles are introduced, as it motivates children.
- For reinforcement, suggest children make their own unique puzzles using actual blocks, and then trace what they created to "see" the puzzle.

Monitoring Student Progress

If . . . children struggle during Pattern Block Puzzles, **Then . . .** use Pattern Block Puzzles 1–5 only.

If . . . children excel during Pattern Block Puzzles, **Then . . .** use Pattern Block Puzzles beyond number 10.

Computer Center Building Blocks

Continue to provide each child with a chance to complete Piece Puzzler 1 and 2.

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Pattern Block Cutouts, Pattern Block Puzzles, and X-Ray Vision 2. If needed, consult Monday and Tuesday for activity directions.

3 Reflect 5

Ask children:

- **Which numbers come between 2 and 6? How do you know?**

Children might say: I count up from 1 then I get to 2, and I think about the numbers I say before I get to 6, or the like.

4 Assess

During Small Group activities, use the Small Group Record Sheet from ***Assessment*** to observe and record children's progress.

Friday Planner

Objectives

- To identify and match shapes, including finding and describing object shapes in their environments
- To compose shapes to make pictures and designs
- To count to 10 and back to 0
- To add and subtract small numbers

Materials

- *Shape Sets
- flat manipulatives

Math Throughout the Year

Review activity directions at the top of page 355, and complete each in class whenever appropriate.

Looking Ahead

For next week, familiarize yourself with Pizza Pizzazz 4: Count Hidden Pepperoni and Dinosaur Shop 3: Add Dinosaurs (1–5) from the ***Building Blocks*** software.

*provided in Manipulative Kit

Friday

1 Whole Group 15

Warm-Up: I Spy

- Name a property of something in the classroom, and have children guess what it is. Here are some shape guidelines: circles are perfectly round; triangles have three sides; equilateral triangles have three sides with all the same angles; isosceles triangles have three sides with two sides and angles the same; right triangles have three sides with one right angle; parallelograms have four sides with opposite sides the same length; squares have four sides all the same length with all right angles; and rhombuses have four sides all the same length.
- Note that this can be played during transitions, while waiting, and other downtime. If you do not have a certain shape, such as a parallelogram, to "spy" in your classroom, strategically place Shape Set shapes or other flat manipulatives around the room.

Guess My Rule

- Ask children to watch carefully as you draw shapes and sort them by a rule, such as shapes with four sides versus shapes with more than four sides. Tell children to silently guess the rule.
- Draw shapes one at a time, continuing until there are at least three shapes in each group.
- Signal "shhh," and draw a new shape. With a look of confusion, gesture to children to point quietly to which group the shape belongs. Place (draw) the shape in that group. If you prefer drawing on a board, draw the shape between and under the two groups, erase it, and draw it again in its group. Repeat until many shapes are in each group.
- Ask children to name your sorting rule and explain their answer: Why did you guess that rule? How do you know? Show me how the shapes match your rule.
- Repeat with other rules, such as regular polygons (equilateral triangles, squares, octagons) versus any other shapes; rhombuses versus "foolers" (shapes that look just like rhombuses but are not closed or parallelograms without sides of equal length), symmetrical versus non-symmetrical shapes, and shapes with right angles versus shapes with no right angles.
- A complete list appears on page A3. Try several rules per session, concluding with some challenges.

2 Work Time 20

Computer Center Building Blocks

Continue to provide each child with a chance to complete Piece Puzzler 1 and 2.

Hands On Math Center

Based on what children learn and benefit from most, choose from this week's Hands On Math Center activities: Pattern Block Cutouts, Pattern Block Puzzles, and X-Ray Vision 2. If needed, consult Monday and Tuesday for activity directions. Scaffolding for Pattern Block Cutouts follows.

Monitoring Student Progress

If . . . children struggle during Pattern Block Cutouts,	**Then . . .** use your simplest puzzles, or use a pencil to draw lines within puzzles to guide children.
If . . . children excel during Pattern Block Cutouts,	**Then . . .** use your hardest puzzles, or have children solve one puzzle as many ways as they can.

3 Reflect 5

Briefly discuss with children what you have done in class this week, such as completing shape puzzles, and ask:

- **How did you figure out how to move shapes into the puzzles on the computer?**

Children might say: I know the arrow slides them; if I have to turn them, I just click the turn tool until they line up; or the like.

4 Assess

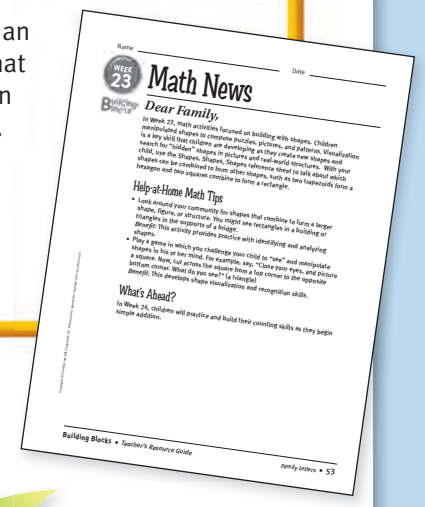
Use the Weekly Record Sheet from ***Assessment*** to record children's progress. Use their time at the centers as an opportunity to complete your observations.

RESEARCH IN ACTION

For several weeks, children will put shapes together to make new shapes. Seeing shapes as composed of various parts is central to early mathematics. This idea is connected to other mathematical topics—number, addition, fractions, and measurement.

Home Connection

From the ***Teacher's Resource Guide,*** distribute to children copies of Family Letter Week 23 to share with their family. Each letter has an area for children to show families an example of what they have been doing in class.


Name _____ Date _____

WEEK 23 Building Blocks

Math News

Dear Family,

In Week 23, math activities focused on building with shapes. Children manipulated shapes to compose puzzles, pictures, and patterns. Visualization is a key skill that children are developing as they create new shapes and learn for "hidden" shapes in pictures and real-world structures. With your child, use the shapes, shapes. Shapes reference sheet to talk about which shapes can be combined to form other shapes, such as two isosceles form a hexagon and two squares combine to form a rectangle.

Help-at-Home Math Tips

- Look around your community for shapes that combine to form a larger shape, figure, or structure. You might see rectangles in a building or triangles in the supports of a bridge.
  Benefit: This activity provides practice with identifying and analyzing shapes.
- Play a game in which you challenge your child to "see" and manipulate shapes to his or her mind. For example, say, "Close your eyes, and picture a square. Now, cut across the square from a top corner to the opposite bottom corner. What do you see?" (a triangle)
  Benefit: This develops shape visualization and recognition skills.

What's Ahead?

In Week 24, children will practice and build their counting skills as they begin simple addition.

Building Blocks • *Teacher's Resource Guide* *Family Letters* • 53

Assess and Differentiate

A Gather Evidence

Review children's progress in mathematics by looking at the Weekly Record Sheets (Monday, Wednesday, Friday) and the Small Group Record Sheets (Tuesday, Thursday) from this past week.

B Summarize Findings

Using ***Online Assessment,*** summarize and analyze assessment data for each child based on your weekly observations and Record Sheets. Such information helps determine where each child is on the math trajectory for geometry and counting. See ***Assessment*** for the print companion to each Learning Trajectory Record.

C Differentiate Instruction

Once you have seen a child exhibit specific levels of the trajectory, begin to encourage and work with that child toward the next level. Refer to Appendix A for individualized instruction opportunities, including Special Education concerns.

Shapes: Naming

If . . . the child can identify most common shapes, as well as right angles,	**Then . . .** *Shape Identifier* Names most common shapes without making mistakes; implicitly recognizes right angles, thus can distinguish between rectangles and parallelograms without right angles.
If . . . the child can recognize shape attributes,	**Then . . .** *Parts of Shapes Identifier* Identifies shapes in terms of their components.

Shapes: Composing

If . . . the child can manipulate shapes singularly,	**Then . . .** *Pre-Composer* Manipulates shapes as individual but cannot combine them to compose a larger shape.
If . . . the child can complete simple shape puzzles,	**Then . . .** *Piece Assembler* Makes pictures in which shapes touch and each represents a unique role; uses trial and error.
If . . . the child can complete shape puzzles, recognizing that parts combine to make a new part,	**Then . . .** *Picture Maker* Puts several shapes together to make one part of a picture, such as two shapes for one arm. Uses trial and error, chooses shapes, and fills simple outline puzzles.

Classification

If . . . the child can identify general attributes,	**Then . . .** *Attribute Identifier* Names attributes of objects and groups together those with a given attribute.

Counting

If . . . the child can count accurately to 10 and makes attempts beyond 10 in varied arrangements,	**Then . . .** *Counter and Producer (10+)* Accurately counts and produces objects to 10, and then beyond to 30; has explicit understanding of cardinality and keeps track of counted and uncounted objects.
If . . . the child can accurately count backward from 10,	**Then . . .** *Counter Backward from 10* Counts back verbally from 10 or when removing items from a group.
If . . . the child can name the numeral just before or after a specified numeral,	**Then . . .** *Counter from N (N +1 1, N − 1)* Counts verbally with objects from numerals other than 1 but does not yet keep track of number of counts.

Comparing And Ordering

If . . . the child can name ordinal numbers,	**Then . . .** *Ordinal Counter* Identifies and uses ordinal numbers from first to tenth.
If . . . the child can order up to 6,	**Then . . .** *Serial Orderer to 6+* Orders lengths marked into units 1–6.

Building Blocks

Teacher's Edition Sampler

Learning Trajectories

Building Blocks Software Activities

Children follow natural developmental progressions in learning. Curriculum research has revealed sequences of activities that are effective in guiding children through these levels of thinking. These developmental paths are the basis for ***Building Blocks*** *learning trajectories.*

Learning Trajectories for Primary Grades Mathematics

Learning trajectories have three parts: a mathematical goal, a developmental path along which children develop to reach that goal, and a set of activities matched to each of the levels of thinking in that path that help children develop the next higher level of thinking. The ***Building Blocks*** learning trajectories give simple labels, descriptions, and examples of each level. Complete learning trajectories describe the goals of learning, the thinking and learning processes of children at various levels, and the learning activities in which they might engage. This document provides only the developmental levels.

The following provides the developmental levels from the first signs of development in different strands of mathematics through approximately age 8. Research shows that when teachers understand how children develop mathematics understanding, they are more effective in questioning, analyzing, and providing activities that further children's development than teachers who are unaware of the development process. Consequently, children have a much richer and more successful math experience in the primary grades.

Each of the following tables, such as "Counting," represents a main developmental progression that underlies the learning trajectory for that topic.

For some topics, there are "subtrajectories"—strands within the topic. In most cases, the names make this clear. For example, in Comparing and Ordering, some levels are "Composer" levels and others are building a "Mental Number Line." Similarly, the related subtrajectories of "Composition" and "Decomposition" are easy to distinguish. Sometimes, for clarification, subtrajectories are indicated with a note in italics after the title. For example, *Parts* and *Representing* are subtrajectories within the Shape Trajectory.

Frequently Asked Questions (FAQ)

1. ***Why use learning trajectories?*** Learning trajectories allow teachers to build the mathematics of children— the thinking of children as it develops naturally. So, we know that all the goals and activities are within the developmental capacities of children. We know that each level provides a natural developmental building block to the next level. Finally, we know that the activities provide the mathematical ***Building Blocks*** for school success.
2. ***When are children "at" a level?*** Children are at a certain level when most of their behaviors reflect the thinking—ideas and skills—of that level. Often, they show a few behaviors from the next (and previous) levels as they learn. Most levels are levels of thinking. However, some are merely "levels of attainment" and indicate a child has gained knowledge. For example, children must learn to name or write more numerals, but knowing more numerals does not require deeper or more complex thinking.
3. ***Can children work at more than one level at the same time?*** Yes, although most children work mainly at one level or in transition between two levels (naturally, if they are tired or distracted, they may operate at a much lower level). Levels are not "absolute stages." They are "benchmarks" of complex growth that represent distinct ways of thinking.
4. ***Can children jump ahead?*** Yes, especially if there are separate "sub-topics." For example, we have combined many counting competencies into one "Counting" sequence with sub-topics, such as verbal counting skills. Some children learn to count to 100 at age 6 after learning to count objects to 10 or more, some may learn that verbal skill earlier. The sub-topic of verbal counting skills would still be followed.
5. ***How do these developmental levels support teaching and learning?*** The levels help teachers, as well as curriculum developers, assess, teach, and sequence activities. Through planned teaching and also encouraging informal, incidental mathematics, teachers help children learn at an appropriate and deep level.
6. ***Should I plan to help children develop just the levels that correspond to my children's ages?*** No! The ages in the table are typical ages children develop these ideas. But these are rough guides only—children differ widely. Furthermore, the ages below are lower bounds on what children achieve without instruction. So, these are "starting levels" not goals. We have found that children who are provided high-quality mathematics experiences are capable of developing to levels one or more years beyond their peers.

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Developmental Levels for Counting

The ability to count with confidence develops over the course of several years. Beginning in infancy, children show signs of understanding numbers. With instruction and number experience, most children can count fluently by age 8, with much progress in counting occurring in kindergarten and first grade. Most children follow a natural developmental progression in learning to count with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
1–2	Pre-Counter (Verbal)	1	At the earliest level a child shows no verbal counting. The child may name some number words with no sequence.
1–2	Chanter (Verbal)	2	At this level, a child may sing-song or chant indistinguishable number words.
2	Reciter (Verbal)	3	At this level, the child may verbally count with separate words, but not necessarily in the correct order.
3	Reciter (10)	4	A child at this level may verbally count to 10 with some correspondence with objects. He or she may point to objects to count a few items, but then lose track.
3	Corresponder	5	At this level, a child may keep one-to-one correspondence between counting words and objects—at least for small groups of objects laid in a line. A corresponder may answer "how many" by recounting the objects, starting over with one each time.
4	Counter (Small Numbers)	6	At around 4 years of age, the child may begin to count meaningfully. He or she may accurately count objects in a line to 5 and answer the "how many" question with the last number counted. When objects are visible, and especially with small numbers, the child begins to understand cardinality (that numbers tell how many).
4	Producer (Small Numbers)	7	The next level after counting small numbers is to count out objects to 5. When asked to show four of something, for example, this child may give four objects.
4	Counter (10)	8	This child may count structured arrangements of objects to 10. He or she may be able to write or draw to represent 1–10. A child at this level may be able to tell the number just after or just before another number, but only by counting up from 1.
5	Counter and Producer—Counter to (10+)	9	Around 5 years of age, a child may begin to count out objects accurately to 10 and then beyond to 30. He or she has explicit understanding of cardinality (that numbers tell how many). The child may keep track of objects that have and have not been counted, even in different arrangements. He or she may write or draw to represent 1 to 10 and then 20 and 30, and may give the next number to 20 or 30. The child also begins to recognize errors in others' counting and is able to eliminate most errors in his or her own counting.
5	Counter Backward from 10	10	Another milestone at about age 5 is being able to count backward from 10 to 1, verbally, or when removing objects from a group.
6	Counter from N (N+1, N–1)	11	Around 6 years of age, the child may begin to count on, counting verbally and with objects from numbers other than 1. Another noticeable accomplishment is that a child may determine the number immediately before or after another number without having to start back at 1.
6	Skip Counting by 10s to 100	12	A child at this level may count by 10s to 100 or beyond with understanding.
6	Counter to 100	13	A child at this level may count by 1s to 100. He or she can make decade transitions (for example, from 29 to 30) starting at any number.
6	Counter On Using Patterns	14	At this level, a child may keep track of a few counting acts by using numerical patterns (spatial, auditory, or rhythmic).
6	Skip Counter	15	At this level, the child can count by 5s and 2s with understanding.
6	Counter of Imagined Items	16	At this level, a child may count mental images of hidden objects to answer, for example, "how many" when 5 objects are visible and 3 are hidden.
6	Counter On Keeping Track	17	A child at this level may keep track of counting acts numerically, first with objects, then by counting counts. He or she counts up one to four more from a given number.
6	Counter of Quantitative Units	18	At this level, a child can count unusual units, such as "wholes" when shown combinations of wholes and parts. For example, when shown three whole plastic eggs and four halves, a child at this level will say there are five whole eggs.
6	Counter to 200	19	At this level, a child may count accurately to 200 and beyond, recognizing the patterns of ones, tens, and hundreds.
7	Number Conserver	20	A major milestone around age 7 is the ability to conserve number. A child who conserves number understands that a number is unchanged even if a group of objects is rearranged. For example, if there is a row of ten buttons, the child understands there are still ten without recounting, even if they are rearranged in a long row or a circle.
7	Counter Forward and Back	21	A child at this level may count in either direction and recognize that sequence of decades mirrors single-digit sequence.

Developmental Levels for Comparing and Ordering Numbers

Comparing and ordering sets is a critical skill for children as they determine whether one set is larger than another in order to make sure sets are equal and "fair." Prekindergartners can learn to use matching to compare collections or to create equivalent collections. Finding out how many more or fewer in one collection is more demanding than simply comparing two collections. The ability to compare and order sets with fluency develops over the course of several years. With instruction and number experience, most children develop foundational understanding of number relationships and place value at ages four and five. Most children follow a natural developmental progression in learning to compare and order numbers with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Object Corresponder	1	At this early level, a child puts objects into one-to-one correspondence, but may not fully understand that this creates equal groups. For example, a child may know that each carton has a straw, but does not necessarily know there are the same numbers of straws and cartons.
2	Perceptual Comparer	2	At this level, a child can compare collections that are quite different in size (for example, one is at least twice the other) and know that one has more than the other. If the collections are similar, the child can compare very small collections.
2–3	First-Second Ordinal Counter	3	At this level the child can identify the "first" and often "second" object in a sequence.
3	Nonverbal Comparer of Similar Items	4	At this level, a child can identify that different organizations of the same number are equal and different from other sets (1–4 items). For example, a child can identify ••• and •⁘• as equal and different from •• or ⁘.
3	Nonverbal Comparer of Dissimilar Items	5	At this level, a child can match small, equal collections of dissimilar items, such as shells and dots, and show that they are the same number.
4	Matching Comparer	6	As children progress, they begin to compare groups of 1–6 by matching. For example, a child gives one toy bone to every dog and says there are the same number of dogs and bones.
4	Knows-to-Count Comparer	7	A significant step occurs when the child begins to count collections to compare. At the early levels, children are not always accurate when a larger collection's objects are smaller in size than the objects in the smaller collection. For example, a child at this level may accurately count two equal collections, but when asked, says the collection of larger blocks has more.
4	Counting Comparer (Same Size)	8	At this level, children make accurate comparisons via counting, but only when objects are about the same size and groups are small (about 1–5 items).
5	Counting Comparer (5)	9	As children develop their ability to compare sets, they compare accurately by counting, even when a larger collection's objects are smaller. A child at this level can figure out how many more or less.
5	Ordinal Counter	10	At this level, a child identifies and uses ordinal numbers from "first" to "tenth." For example, the child can identify who is "third in line."
6	Counting Comparer (10)	11	This level can be observed when the child compares sets by counting, even when a larger collection's objects are smaller, up to 10. A child at this level can accurately count two collections of 9 items each, and says they have the same number, even if one collection has larger blocks.
6	Mental Number Line to 10	12	As children move into this level, they begin to use mental images and knowledge of number relationships to determine relative size and position. For example, a child at this level can answer which number is closer to 6, 4 or 9 without counting physical objects.
6	Serial Orderer to 6+	13	At this level, the child orders lengths marked into units (1–6, then beyond). For example, given towers of cubes, this child can put them in order, 1 to 6.
7	Place Value Comparer	14	Further development is made when a child begins to compare numbers with place value understanding. For example, a child at this level can explain that "63 is more than 59 because six tens is more than five tens, even if there are more than three ones."
7	Mental Number Line to 100	15	Children demonstrate the next level when they can use mental images and knowledge of number relationships, including ones embedded in tens, to determine relative size and position. For example, when asked, "Which is closer to 45, 30 or 50?" a child at this level may say "45 is right next to 50, but 30 isn't."
8+	Mental Number Line to 1,000s	16	At about age 8, children may begin to use mental images of numbers up to 1,000 and knowledge of number relationships, including place value, to determine relative size and position. For example, when asked, "Which is closer to 3,500—2,000 or 7,000?"a child at this level may say "70 is double 35, but 20 is only fifteen from 35, so twenty hundreds, 2,000, is closer."

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Developmental Levels for Recognizing Number and Subitizing (Instantly Recognizing)

The ability to recognize number values develops over the course of several years and is a foundational part of number sense. Beginning at about age two, children begin to name groups of objects. The ability to instantly know how many are in a group, called *subitizing*, begins at about age three. By age eight, with instruction and number experience, most children can identify groups of items and use place values and multiplication skills to count them. Most children follow a natural developmental progression in learning to count with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Small Collection Namer	1	The first sign occurs when the child can name groups of 1 to 2, sometimes 3. For example, when shown a pair of shoes, this young child says, "two shoes."
3	Maker of Small Collections	2	At this level, a child can nonverbally make a small collection (no more than 4, usually 1 to 3) with the same number as another collection. For example, when shown a collection of 3, the child makes another collection of 3.
4	Perceptual Subitizer to 4	3	Progress is made when a child instantly recognizes collections up to 4 and verbally names the number of items. For example, when shown 4 objects briefly, the child says "4."
5	Perceptual Subitizer to 5	4	This level is the ability to instantly recognize collections up to 5 and verbally name the number of items. For example, when shown 5 objects briefly, the child says "5."
5	Conceptual Subitizer to 5+	5	At this level, the child can verbally label all arrangements to about 5, when shown only briefly. For example, a child at this level might say, "I saw 2 and 2, and so I saw 4."
5	Conceptual Subitizer to 10	6	This step is when the child can verbally label most arrangements to 6 shown briefly, then up to 10, using groups. For example, a child at this level might say, "In my mind, I made 2 groups of 3 and 1 more, so 7."
6	Conceptual Subitizer to 20	7	Next, a child can verbally label structured arrangements up to 20 shown briefly, using groups. For example, the child may say, "I saw 3 fives, so 5, 10, 15."
7	Conceptual Subitizer with Place Value and Skip Counting	8	At this level, a child is able to use groups, skip counting, and place value to verbally label structured arrangements shown briefly. For example, the child may say, "I saw groups of tens and twos, so 10, 20, 30, 40, 42, 44, 46...46!"
8+	Conceptual Subitizer with Place Value and Multiplication	9	As children develop their ability to subitize, they use groups, multiplication, and place value to verbally label structured arrangements shown briefly. At this level, a child may say, "I saw groups of tens and threes, so I thought, 5 tens is 50 and 4 threes is 12, so 62 in all."

Developmental Levels for Numerals

Age Range	Level Name	Level	Description
3	Quantity Representer	1	Represents and recalls sets with pictographic, iconic, representations of quantity. However, they may not incorporate written symbols into their own acting and thinking.
4	Numeral Representer	2	Can match small sets (1-5) with the corresponding numbers and represent and recall the size of sets using those numerals.
4–5	Functional Numeral User	3	Can use numerals to represent and communicate quantity. For example, can use numerals to remember results of counting or to compare quantities
6	Teen/Ten + Recognizer	4	Understand that a teen number is composed of a ten and one, two, three, ..., seven, eight or nine ones.
6–7	Decade Number Identifier	5	Understands decade words (e.g., sixty = 6 tens).
7	Digit Identifier	6	Understand that the two digits of a two-digit number represent amounts of tens and ones. In 29, for example, the 2 represents two tens and the 9 represents nine ones.

Developmental Levels for Composing (Knowing Combinations of Numbers)

Composing and decomposing are combining and separating operations that allow children to build concepts of "parts" and "wholes." Most prekindergartners can "see" that two items and one item make three items. Later, children learn to separate a group into parts in various ways and then to count to produce all of the number "partners" of a given number. Eventually children think of a number and know the different addition facts that make that number. Most children follow a natural developmental progression in learning to compose and decompose numbers with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
4	Pre-Part-Whole Recognizer	1	At the earliest levels of composing, a child only nonverbally recognizes parts and wholes. For example, when shown 4 red blocks and 2 blue blocks, a young child may intuitively appreciate that "all the blocks" includes the red and blue blocks, but when asked how many there are in all, the child may name a small number, such as 1.
5	Inexact Part-Whole Recognizer	2	A sign of development is that the child knows a whole is bigger than parts, but does not accurately quantify. For example, when shown 4 red blocks and 2 blue blocks and asked how many there are in all, the child may name a "large number," such as 5 or 10.
5	Composer to 4, then 5	3	At this level, a child knows number combinations. A child at this level quickly names parts of any whole, or the whole given the parts. For example, when shown 4, then 1 is secretly hidden, and then shown the 3 remaining, the child may quickly say "1" is hidden.
6	Composer to 7	4	The next sign of development is when a child knows number combinations to totals of 7. A child at this level quickly names parts of any whole, or the whole when given parts, and can double numbers to 10. For example, when shown 6, then 4 are secretly hidden, and then shown the 2 remaining, the child may quickly say "4" are hidden.
6	Composer to 10	5	This level is when a child knows number combinations to totals of 10. A child at this level may quickly name parts of any whole, or the whole when given parts, and can double numbers to 20. For example, this child would be able to say "9 and 9 is 18."
7	Composer with Tens and Ones	6	At this level, the child understands two-digit numbers as tens and ones, can count with dimes and pennies, and can perform two-digit addition with regrouping. For example, a child at this level may explain, "17 and 36 is like 17 and 3, which is 20, and 33, which is 53."
7–8	+/− Fact Fluency to 20	7	Quickly produces combinations (addends to 1—10)

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Developmental Levels for Adding and Subtracting

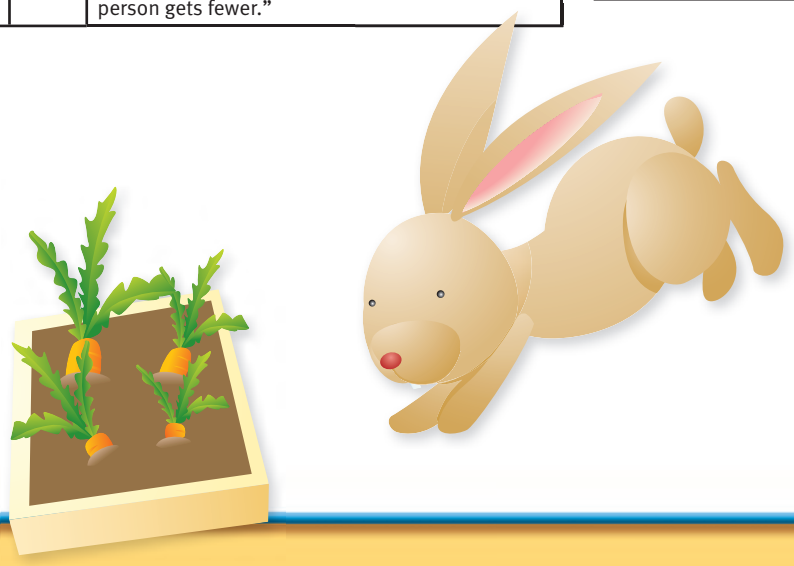
Single-digit addition and subtraction are generally characterized as "math facts." It is assumed children must memorize these facts, yet research has shown that addition and subtraction have their roots in counting, counting on, number sense, the ability to compose and decompose numbers, and place value. Research has also shown that learning methods for addition and subtraction with understanding is much more effective than rote memorization of seemingly isolated facts. Most children follow an observable developmental progression in learning to add and subtract numbers with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
1	Pre +/−	1	At the earliest level, a child shows no sign of being able to add or subtract.
3	Nonverbal +/−	2	The first sign is when a child can add and subtract very small collections nonverbally. For example, when shown 2 objects, then 1 object being hidden under a napkin, the child identifies or makes a set of 3 objects to "match."
4	Small Number +/−	3	This level is when a child can find sums for joining problems up to 3 + 2 by counting with objects. For example, when asked, "You have 2 balls and get 1 more. How many in all?" the child may count out 2, then count out 1 more, then count all 3: "1, 2, 3, 3!"
5	Find Result +/−	4	**Addition** Evidence of this level in addition is when a child can find sums for joining (you had 3 apples and get 3 more; how many do you have in all?) and part-part-whole (there are 6 girls and 5 boys on the playground; how many children were there in all?) problems by direct modeling, counting all, with objects. For example, when asked, "You have 2 red balls and 3 blue balls. How many in all?" the child may count out 2 red, then count out 3 blue, then count all 5. **Subtraction** In subtraction, a child can also solve take-away problems by separating with objects. For example, when asked, "You have 5 balls and give 2 to Tom. How many do you have left?" the child may count out 5 balls, then take away 2, and then count the remaining 3.
5	Find Change +/−	5	**Addition** At this level, a child can find the missing addend (5 + _ = 7) by adding on objects. For example, when asked, "You have 5 balls and then get some more. Now you have 7 in all. How many did you get?" The child may count out 5, then count those 5 again starting at 1, then add more, counting "6, 7," then count the balls added to find the answer, 2. **Subtraction** A child can compare by matching in simple situations. For example, when asked, "Here are 6 dogs and 4 balls. If we give a ball to each dog, how many dogs will not get a ball?" a child at this level may count out 6 dogs, match 4 balls to 4 of them, then count the 2 dogs that have no ball.
5	Make It +/−	6	A significant advancement occurs when a child is able to count on. This child can add on objects to make one number into another without counting from 1. For example, when told, "This puppet has 4 balls, but she should have 6. Make it 6," the child may put up 4 fingers on one hand, immediately count up from 4 while putting up 2 fingers on the other hand, saying, "5, 6," and then count or recognize the 2 fingers.
6	Counting Strategies +/−	7	This level occurs when a child can find sums for joining (you had 8 apples and get 3 more...) and part-part-whole (6 girls and 5 boys...) problems with finger patterns or by adding on objects or counting on. For example, when asked "How much is 4 and 3 more?" the child may answer "4...5, 6, 7. 7!" Children at this level can also solve missing addend (3 + _ = 7) or compare problems by counting on. When asked, for example, "You have 6 balls. How many more would you need to have 8?" the child may say, "6, 7 [puts up first finger], 8 [puts up second finger]. 2!"
6	Part-Whole +/−	8	Further development has occurred when the child has part-whole understanding. This child can solve problems using flexible strategies and some derived facts (for example, "5 + 5 is 10, so 5 + 6 is 11"), can sometimes do start- unknown problems (_ + 6 = 11), but only by trial and error. When asked, "You had some balls. Then you get 6 more. Now you have 11 balls. How many did you start with?" this child may lay out 6, then 3, count, and get 9. The child may put 1 more, say 10, then put 1 more. The child may count up from 6 to 11, then recount the group added, and say, "5!"
6	Numbers-in-Numbers +/−	9	Evidence of this level is when a child recognizes that a number is part of a whole and can solve problems when the start is unknown (_ + 4 = 9) with counting strategies. For example, when asked, "You have some balls, then you get 4 more balls, now you have 9. How many did you have to start with?" this child may count, putting up fingers, "5, 6, 7, 8, 9." The child may then look at his or her fingers and say, "5!"
7	Deriver +/−	10	At this level, a child can use flexible strategies and derived combinations (for example, "7 + 7 is 14, so 7 + 8 is 15") to solve all types of problems. For example, when asked, "What's 7 plus 8?" this child thinks: 7 + 8 = 7 + [7 + 1] = [7 + 7] + 1 = 14 + 1 = 15. The child can also solve multidigit problems by incrementing or combining 10s and 1s. For example, when asked "What's 28 + 35?" this child may think: 20 + 30 = 50; + 8 = 58; 2 more is 60, and 3 more is 63. He or she can also combine 10s and 1s: 20 + 30 = 50. 8 + 5 is like 8 plus 2 and 3 more, so it is 13. 50 and 13 is 63.
8+	Problem Solver +/−	11	As children develop their addition and subtraction abilities, they can solve by using flexible strategies and many known combinations. For example, when asked, "If I have 13 and you have 9, how could we have the same number?" this child may say, "9 and 1 is 10, then 3 more makes 13. 1 and 3 is 4. I need 4 more!"
8+	Multidigit +/−	12	Further development is shown when children can use composition of 10s and all previous strategies to solve multidigit +/− problems. For example, when asked, "What's 37 − 18?" this child may say, "Take 1 ten off the 3 tens; that's 2 tens. Take 7 off the 7. That's 2 tens and 0...20. I have one more to take off. That's 19." Or, when asked, "What's 28 + 35?" this child may think, 30 + 35 would be 65. But it's 28, so it's 2 less...63.

Developmental Levels for Multiplying and Dividing

Multiplication and division builds on addition and subtraction understanding and is dependent upon counting and place-value concepts. As children begin to learn to multiply, they make equal groups and count them all. They then learn skip counting and derive related products from products they know. Finding and using patterns aids in learning multiplication and division facts with understanding. Children typically follow an observable developmental progression in learning to multiply and divide numbers with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Non-quantitative Sharer "Dumper"	1	Multiplication and division concepts begin very early with the problem of sharing. Early evidence of these concepts can be observed when a child dumps out blocks and gives some (not an equal number) to each person.
3	Beginning Grouper and Distributive Sharer	2	Progression to this level can be observed when a child is able to make small groups (fewer than 5). This child can share by "dealing out," but often only between 2 people, although he or she may not appreciate the numerical result. For example, to share 4 blocks, this child may give each person a block, check that each person has one, and repeat this.
4	Grouper and Distributive Sharer	3	The next level occurs when a child makes small equal groups (fewer than 6). This child can deal out equally between 2 or more recipients, but may not understand that equal quantities are produced. For example, the child may share 6 blocks by dealing out blocks to herself and a friend one at a time.
5	Concrete Modeler ×/÷	4	As children develop, they are able to solve small-number multiplying problems by grouping—making each group and counting all. At this level, a child can solve division/sharing problems with informal strategies, using concrete objects—up to 20 objects and 2 to 5 people—although the child may not understand equivalence of groups. For example, the child may distribute 20 objects by dealing out 2 blocks to each of 5 people, then 1 to each, until the blocks are gone.
6	Parts and Wholes ×/÷	5	A new level is evidenced when the child understands the inverse relation between divisor and quotient. For example, this child may understand "If you share with more people, each person gets fewer."
7	Skip Counter ×/÷	6	As children develop understanding in multiplication and division, they begin to use skip counting for multiplication and for measurement division (finding out how many groups). For example, given 20 blocks, 4 to each person, and asked how many people, the children may skip count by 4, holding up 1 finger for each count of 4. A child at this level may also use trial and error for partitive division (finding out how many in each group). For example, given 20 blocks, 5 people, and asked how many each should get, this child may give 3 to each, and then 1 more.
8+	Deriver ×/÷	7	At this level, children use strategies and derived combinations to solve multidigit problems by operating on tens and ones separately. For example, a child at this level may explain "7 × 6, five 7s is 35, so 7 more is 42."
8+	Array Quantifier	8	Further development can be observed when a child begins to work with arrays. For example, given 7 × 4 with most of 5 × 4 covered, a child at this level may say, "There are 8 in these 2 rows, and 5 rows of 4 is 20, so 28 in all."
8+	Partitive Divisor	9	This level can be observed when a child is able to figure out how many are in each group. For example, given 20 blocks, 5 people, and asked how many each should get, a child at this level may say, "4, because 5 groups of 4 is 20."
8+	Multidigit ×/÷	10	As children progress, they begin to use multiple strategies for multiplication and division, from compensating to paper-and-pencil procedures. For example, a child becoming fluent in multiplication might explain that "19 times 5 is 95, because 20 fives is 100, and 1 less five is 95."



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Developmental Levels for Measuring

Measurement is one of the main real-world applications of mathematics. Counting is a type of measurement which determines how many items are in a collection. Measurement also involves assigning a number to attributes of length, area, and weight. Prekindergarten children know that mass, weight, and length exist, but they do not know how to reason about these or to accurately measure them. As children develop their understanding of measurement, they begin to use tools to measure and understand the need for standard units of measure. Children typically follow an observable developmental progression in learning to measure with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
3	Length Quantity Recognizer	1	At the earliest level, children can identify length as an attribute. For example, they might say, "I'm tall, see?"
4	Length Direct Comparer	2	In this level, children can physically align 2 objects to determine which is longer or if they are the same length. For example, they can stand 2 sticks up next to each other on a table and say, "This one's bigger." 
5	Indirect Length Comparer	3	A sign of further development is when a child can compare the length of 2 objects by representing them with a third object. For example, a child might compare the length of 2 objects with a piece of string. Additional evidence of this level is that when asked to measure, the child may assign a length by guessing or moving along a length while counting (without equal-length units). For example, the child may move a finger along a line segment, saying 10, 20, 30, 31, 32.
6	Serial Orderer to 6+	4	At this level, a child can order lengths, marked in 1 to 6 units. For example, given towers of cubes, a child at this level may put them in order, 1 to 6.
6	End-to-End Length Measurer	5	At this level, the child can lay units end-to-end, although he or she may not see the need for equal-length units. For example, a child might lay 9-inch cubes in a line beside a book to measure how long it is.
7	Length Unit Relater and Repeater	6	At this level, a child can relate size and number of units. For example, the child may explain, "If you measure with centimeters instead of inches, you'll need more of them because each one is smaller."
8+	Length Measurer	7	As a child develops measurement ability, they begin to measure, knowing the need for identical units, the relationships between different units, partitions of unit, and the zero point on rulers. At this level, the child also begins to estimate. The children may explain, "I used a meterstick 3 times, then there was a little left over. So, I lined it up from 0 and found 14 centimeters. So, it's 3 meters, 14 centimeters in all."
8+	Conceptual Ruler Measurer	8	Further development in measurement is evidenced when a child possesses an "internal" measurement tool. At this level, the child mentally moves along an object, segmenting it, and counting the segments. This child also uses arithmetic to measure and estimates with accuracy. For example, a child at this level may explain, "I imagine one meterstick after another along the edge of the room. That's how I estimated the room's length to be 9 meters."

Developmental Levels for Recognizing Geometric Shapes

Geometric shapes can be used to represent and understand objects. Analyzing, comparing, and classifying shapes helps create new knowledge of shapes and their relationships. Shapes can be decomposed or composed into other shapes. Through their everyday activities, children build both intuitive and explicit knowledge of geometric figures. Most children can recognize and name basic two-dimensional shapes at four years of age. However, young children can learn richer concepts about shape if they have varied examples and nonexamples of shape, discussions about shapes and their characteristics, a wide variety of shape classes, and interesting tasks. Children typically follow an observable developmental progression in learning about shapes with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Shape Matcher—Identical Shape Matcher—Sizes Shape Matcher—Orientations	1	The earliest sign of understanding shape is when a child can match basic shapes (circle, square, typical triangle) with the same size and orientation. A sign of development is when a child can match basic shapes with different sizes. This level of development is when a child can match basic shapes with different orientations.
3	Shape Recognizer—Typical	2	A sign of development is when a child can recognize and name a prototypical circle, square, and, less often, a typical triangle. For example, the child names this a square. ☐ Some children may name different sizes, shapes, and orientations of rectangles, but also accept some shapes that look rectangular but are not rectangles. Children name these shapes "rectangles" (including the nonrectangular parallelogram).
3	Shape Matcher—More Shapes Shape Matcher—Sizes and Orientations Shape Matcher—Combinations	3	As children develop understanding of shape, they can match a wider variety of shapes with the same size and orientation. The child matches a wider variety of shapes with different sizes and orientations. The child matches combinations of shapes to each other.
4	Shape Recognizer—Circles, Squares, and Triangles	4	This sign of development is when a child can recognize some nonprototypical squares and triangles and may recognize some rectangles, but usually not rhombi (diamonds). Often, the child does not differentiate sides/corners. The child at this level may name these as triangles.
4	Constructor of Shapes from Parts—Looks Like *Representing*	5	A significant sign of development is when a child represents a shape by making a shape "look like" a goal shape. For example, when asked to make a triangle with sticks, the child may create the following: △.
5	Shape Recognizer—All Rectangles	6	As children develop understanding of shape, they recognize more rectangle sizes, shapes, and orientations of rectangles. For example, a child at this level may correctly name these shapes "rectangles."
5	Side Recognizer *Parts*	7	A sign of development is when a child recognizes parts of shapes and identifies sides as distinct geometric objects. For example, when asked what this shape is, the child may say it is a quadrilateral (or has 4 sides) after counting and running a finger along the length of each side.
5	Angle (Corner) Recognizer *Parts*	8	At this level, a child can recognize angles as separate geometric objects. For example, when asked, "Why is this a triangle," the child may say, "It has three angles" and count them, pointing clearly to each vertex (point at the corner).
5	Shape Recognizer—More Shapes	9	As children develop, they are able to recognize most basic shapes and prototypical examples of other shapes, such as hexagon, rhombus (diamond), and trapezoid. For example, a child can correctly identify and name all the following shapes:
6	Shape Identifier	10	At this level, the child can name most common shapes, including rhombi, without making mistakes such as calling ovals circles. A child at this level implicitly recognizes right angles, so distinguishes between a rectangle and a parallelogram without right angles. A child may correctly name all the following shapes:
6	Angle Matcher *Parts*	11	A sign of development is when the child can match angles concretely. For example, given several triangles, the child may find two with the same angles by laying the angles on top of one another.

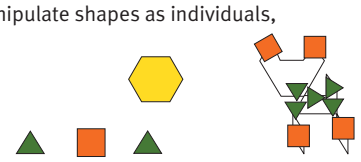
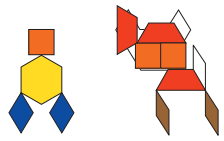
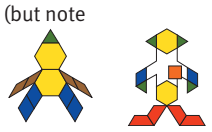
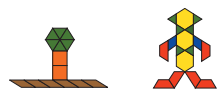
Learning Trajectories

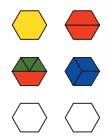
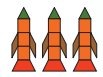
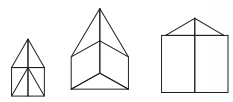
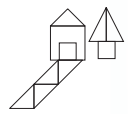
Age Range	Level Name	Level	Description
7	Parts of Shapes Identifier	12	At this level, the child can identify shapes in terms of their components. For example, the child may say, "No matter how skinny it looks, that's a triangle because it has 3 sides and 3 angles." 
7	Constructor of Shapes from Parts—Exact *Representing*	13	A significant step is when the child can represent a shape with completely correct construction, based on knowledge of components and relationships. For example, when asked to make a triangle with sticks, the child may create the following: 
8	Shape Class Identifier	14	As children develop, they begin to use class membership (for example, to sort) not explicitly based on properties. For example, a child at this level may say, "I put the triangles over here, and the quadrilaterals, including squares, rectangles, rhombi, and trapezoids, over there."
8	Shape Property Identifier	15	At this level, a child can use properties explicitly. For example, a child may say, "I put the shapes with opposite sides that are parallel over here, and those with 4 sides but not both pairs of sides parallel over there."

Age Range	Level Name	Level	Description
8	Angle Size Comparer	16	The next sign of development is when a child can separate and compare angle sizes. For example, the child may say, "I put all the shapes that have right angles here, and all the ones that have bigger or smaller angles over there."
8	Angle Measurer	17	A significant step in development is when a child can use a protractor to measure angles.
8	Property Class Identifier	18	The next sign of development is when a child can use class membership for shapes (for example, to sort or consider shapes "similar") explicitly based on properties, including angle measure. For example, the child may say, "I put the equilateral triangles over here, and the right triangles over here."
8	Angle Synthesizer	19	As children develop understanding of shape, they can combine various meanings of angle (turn, corner, slant). For example, a child at this level could explain, "This ramp is at a 45° angle to the ground."

Developmental Levels for Composing Geometric Shapes

Children move through levels in the composition and decomposition of two-dimensional figures. Very young children cannot compose shapes but then gain ability to combine shapes into pictures, synthesize combinations of shapes into new shapes, and eventually substitute and build different kinds of shapes. Children typically follow an observable developmental progression in learning to compose shapes with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

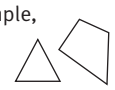
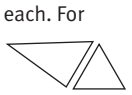
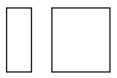
Age Range	Level Name	Level	Description
2	Pre-Composer	1	The earliest sign of development is when a child can manipulate shapes as individuals, but is unable to combine them to compose a larger shape. 
3	Pre-Decomposer	2	At this level, a child can decompose shapes, but only by trial and error. For example, given only a hexagon, the child can break it apart to make a simple picture by trial and error. 
4	Piece Assembler	3	Around age 4, a child can begin to make pictures in which each shape represents a unique role (for example, one shape for each body part) and shapes touch. A child at this level can fill simple outline puzzles using trial and error. 
5	Picture Maker	4	As children develop, they are able to put several shapes together to make one part of a picture (for example, 2 shapes for 1 arm). A child at this level uses trial and error and does not anticipate creation of the new geometric shape. The children can choose shapes using "general shape" or side length, and fill "easy" outline puzzles that suggest the placement of each shape (but note that the child is trying to put a square in the puzzle where its right angles will not fit). 
5	Simple Decomposer	5	A significant step occurs when the child is able to decompose ("take apart" into smaller shapes) simple shapes that have obvious clues as to their decomposition. 
5	Shape Composer	6	A sign of development is when a child composes shapes with anticipation ("I know what will fit!"). A child at this level chooses shapes using angles as well as side lengths. Rotation and flipping are used intentionally to select and place shapes. For example, in this puzzle, all angles are correct, and patterning is evident. 

Age Range	Level Name	Level	Description
6	Substitution Composer	7	A sign of development is when a child is able to make new shapes out of smaller shapes and uses trial and error to substitute groups of shapes for other shapes in order to create new shapes in different ways. For example, the child can substitute shapes to fill outline puzzles in different ways. 
6	Shape Decomposer (with Help)	8	As children develop, they can decompose shapes by using imagery that is suggested and supported by the task or environment. For example, given hexagons, the child can break them apart to make this shape. 
7	Shape Composite Repeater	9	This level is demonstrated when the child can construct and duplicate units of units (shapes made from other shapes) intentionally, and understands each as being both multiple, small shapes and one larger shape. For example, the child may continue a pattern of shapes that leads to tiling. 
7	Shape Decomposer with Imagery	10	A significant sign of development is when a child is able to decompose shapes flexibly by using independently generated imagery. For example, the child can break hexagons apart into shapes such as these. 
8	Shape Composer—Units of Units	11	Children demonstrate further understanding when they are able to build and apply units of units (shapes made from other shapes). For example, in constructing spatial patterns, the child can extend patterning activity to create a tiling with a new unit shape—a unit of unit shapes that he or she recognizes and consciously constructs. For example, the child may build *T*s out of 4 squares, use 4 *T*s to build squares, and use squares to tile a rectangle.
8	Shape Decomposer — Units of Units	12	As children develop understanding of shape, they can decompose shapes flexibly by using independently generated imagery and planned decompositions of shapes that themselves are decompositions. 

Learning Trajectories

Developmental Levels for Comparing Geometric Shapes

As early as four years of age, children can create and use strategies, such as moving shapes to compare their parts or to place one on top of the other for judging whether two figures are the same shape. From PreK to Grade 2, they can develop sophisticated and accurate mathematical procedures for comparing geometric shapes. Children typically follow an observable developmental progression in learning about how shapes are the same and different with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
3	"Same Thing" Comparer	1	The first sign of understanding is when the child can compare real-world objects. For example, the children may say two pictures of houses are the same or different.
4	"Similar" Comparer	2	This sign of development occurs when the child judges two shapes to be the same if they are more visually similar than different. For example, the child may say, "These are the same. They are pointy at the top." 
4	Part Comparer	3	At this level, a child can say that two shapes are the same after matching one side on each. For example, a child may say, "These are the same" (matching the two sides). 
4	Some Attributes Comparer	4	As children develop, they look for differences in attributes, but may examine only part of a shape. For example, a child at this level may say, "These are the same" (indicating the top halves of the shapes are similar by laying them on top of each other). 
5	Most Attributes Comparer	5	At this level, the child looks for differences in attributes, examining full shapes, but may ignore some spatial relationships. For example, a child may say, "These are the same." 
7	Congruence Determiner	6	A sign of development is when a child determines congruence by comparing all attributes and all spatial relationships. For example, a child at this level may say that two shapes are the same shape and the same size after comparing every one of their sides and angles.
7	Congruence Superposer	7	As children develop understanding, they can move and place objects on top of each other to determine congruence. For example, a child at this level may say that two shapes are the same shape and the same size after laying them on top of each other.
8+	Congruence Representer	8	Continued development is evidenced as children refer to geometric properties and explain with transformations. For example, a child at this level may say, "These must be congruent because they have equal sides, all square corners, and I can move them on top of each other exactly."

Developmental Levels for Spatial Sense and Motions

Infants and toddlers spend a great deal of time learning about the properties and relations of objects in space. Very young children know and use the shape of their environment in navigation activities. With guidance they can learn to "mathematize" this knowledge. They can learn about direction, perspective, distance, symbolization, location, and coordinates. Children typically follow an observable developmental progression in developing spatial sense with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
4	Simple Turner	1	An early sign of spatial sense is when a child mentally turns an object to perform easy tasks. For example, given a shape with the top marked with color, the child may correctly identify which of three shapes it would look like if it were turned "like this" (90 degree turn demonstrated), before physically moving the shape.
5	Beginning Slider, Flipper, Turner	2	This sign of development occurs when a child can use the correct motions, but is not always accurate in direction and amount. For example, a child at this level may know a shape has to be flipped to match another shape, but flips it in the wrong direction.
6	Slider, Flipper, Turner	3	As children develop spatial sense, they can perform slides and flips, often only horizontal and vertical, by using manipulatives. For example, a child at this level may perform turns of 45, 90, and 180 degrees. For example, a child knows a shape must be turned 90 degrees to the right to fit into a puzzle.
7	Diagonal Mover	4	A sign of development is when a child can perform diagonal slides and flips. For example, a children at this level may know a shape must be turned or flipped over an oblique line (45 degree orientation) to fit into a puzzle.
8	Mental Mover	5	Further signs of development occur when a child can predict results of moving shapes using mental images. A child at this level may say, "If you turned this 120 degrees, it would be just like this one."

Developmental Levels for Patterning and Early Algebra

Algebra begins with a search for patterns. Identifying patterns helps bring order, cohesion, and predictability to seemingly unorganized situations and allows one to make generalizations beyond the information directly available. The recognition and analysis of patterns are important components of the young children's intellectual development because they provide a foundation for the development of algebraic thinking. Although prekindergarten children engage in pattern-related activities and recognize patterns in their everyday environment, research has revealed that an abstract understanding of patterns develops gradually during the early childhood years. Children typically follow an observable developmental progression in learning about patterns with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Pre-Explicit Patterner	1	A child at the earliest level does not recognize patterns. For example, a child may name a striped shirt with no repeating unit a "pattern."
3	Pattern Recognizer	2	At this level, the child can recognize a simple pattern. For example, a child at this level may say, "I'm wearing a pattern" about a shirt with black, white, black, white stripes.
4	Pattern Fixer	3	At this level the child fills in missing elements of a pattern, first with ABABAB patterns. When given items in a row with an item missing, such as ABAB_BAB, the child identifies and fills in the missing element (A).
4	Pattern Duplicator AB	4	A sign of development is when the child can duplicate an ABABAB pattern, although the children may have to work alongside the model pattern. For example, given objects in a row, ABABAB, the child may make his or her own ABABAB row in a different location.
4	Pattern Extender AB	5	At this level the child extends AB repeating patterns. For example, given items in a row—ABABAB—the child adds ABAB to the end of the row.
4	Pattern Duplicator	6	At this level, the child is able to duplicate simple patterns (not just alongside the model pattern). For example, given objects in a row, ABBABBABB, the child may make his or her own ABBABBABB row in a different location.
5	Pattern Extender	7	A sign of development is when the child can extend simple patterns. For example, given objects in a row, ABBABBABB, he or she may add ABBABB to the end of the row.
6	Pattern Unit Recognizer	8	At this level, a child can identify the smallest unit of a pattern. For example, given objects in a ABBABBABB pattern, the child identifies the core unit of the pattern as ABB.
7	Numeric Patterner	9	Describes a pattern numerically, can translate between geometric and numeric representation of a series. For example, given objects in a geometric pattern, child describes the numeric progression.
7	Beginning Arithmetic Patterner	10	Recognizes and uses relatively transparent arithmetic patterns with perceptual or pedagogical support, first that involve properties of zero. Accepts number sentences not in the form of $a + b = c$ (e.g., $c = a + b$, or $a + b = c + d$); this represent a move from Pre-Equivalence, "equals-as-ananswer" to Equal Numbers Relater. For example, child recognizes and uses patterns (e.g., that can be symbolized as $a + b - b = a$)
8	Relational Thinker +/−	11	Recognizes and uses patterns that involve addition and subtraction and is an Equals Relater who can compare two sides of a number sentence with reasoning without actually carrying out the computations. For example, child recognizes $3 + 6 - 3 = 6$ as a true statement without performing computations.
8	Relational Thinker—Symbolic +/−	12	Recognizes and uses patterns that involve addition and subtraction and is an Equals Relater who can compare two sides of a number sentence with reasoning without actually carrying out the computations. For example, child recognizes $a + b = b + a$ (presented that way, symbolically) as a true statement in all cases.
9	Relational Thinker with Multiplication	13	Recognizes and uses patterns that involve multiplication as repeated addition and the use of the distributive property to partition number facts. For example, child recognizes $3 \times 6 + 3 = 4 \times 6$ as a true statement without performing all computations.

Learning Trajectories

Developmental Levels for Classifying and Analyzing Data

Data analysis contains one big idea: classifying, organizing, representing, and using information to ask and answer questions. The developmental continuum for data analysis includes growth in classifying and counting to sort objects and quantify their groups. Children eventually become capable of simultaneously classifying and counting, for example, counting the number of colors in a group of objects. Children typically follow an observable developmental progression in learning about patterns with recognizable stages or levels. This developmental path can be described as part of a learning trajectory.

Age Range	Level Name	Level	Description
2	Similarity Recognizer	1	The first sign that a child can classify is when he or she recognizes, intuitively, two or more objects as "similar" in some way. For example, "that's another doggie."
2	Informal Sorter	2	A sign of development is when a child places objects that are alike in some attribute together, but switches criteria and may use functional relationships as the basis for sorting. A child at this level might stack blocks of the same shape or put a cup with its saucer.
3	Attribute Identifier	3	The next level is when the child names attributes of objects and places objects together with a given attribute, but cannot then move to sorting by a new rule. For example, the child may say, "These are both red."
4	Attribute Sorter	4	At the next level the child sorts objects according to given attributes, forming categories, but may switch attributes during the sorting. A child at this stage can switch rules for sorting if guided. For example, the child might start putting red beads on a string, but switches to spheres of different colors.
5	Consistent Sorter	5	A sign of development is when the child can sort consistently by a given attribute. For example, the child might put several identical blocks together.
6	Exhaustive Sorter	6	At the next level, the child can sort consistently and exhaustively by an attribute, given or created. This child can use terms "some" and "all" meaningfully. For example, a child at this stage would be able to find all the attribute blocks of a certain size and color.
6	Multiple Attribute Sorter	7	A sign of development is when the child can sort consistently and exhaustively by more than one attribute, sequentially. For example, a child at this level can put all the attribute blocks together by color, then by shape.
7	Classifier and Counter	8	At the next level, the child is capable of simultaneously classifying and counting. For example, the child counts the number of colors in a group of objects.
7	List Grapher	9	In the early stage of graphing, the child graphs by simply listing all cases. For example, the child may list each child in the class and each child's response to a question.
8+	Multiple Attribute Classifier	10	A sign of development is when the child can intentionally sort according to multiple attributes, naming and relating the attributes. This child understands that objects could belong to more than one group. For example, the child can complete a two-dimensional classification matrix or form subgroups within groups.
8+	Classifying Grapher	11	At the next level the child can graph by classifying data (e.g., responses) and represent it according to categories. For example, the child can take a survey, classify the responses, and graph the result.
8+	Classifier	12	A sign of development is when the child creates complete, conscious classifications logically connected to a specific property. For example, a child at this level gives a definition of a class in terms of a more general class and one or more specific differences and begins to understand the inclusion relation.
8+	Hierarchical Classifier	13	At the next level, the child can perform hierarchical classifications. For example, the child recognizes that all squares are rectangles, but not all rectangles are squares.
8+	Data Representer	14	Signs of development are when the child organizes and displays data through both simple numerical summaries such as counts, tables, and tallies, and graphical displays, including picture graphs, line plots, and bar graphs. At this level the child creates graphs and tables, compares parts of the data, makes statements about the data as a whole, and determines whether the graphs answer the questions posed initially.

Building Blocks Software Activities

Building Blocks software provides computer math activities that address specific developmental levels of the math learning trajectories. ***Building Blocks*** software is critical to ***Building Blocks PreK*** and provides support activities for specific concepts typically taught in grades K–6.

Some ***Building Blocks*** activities have different levels of difficulty indicated by ranges in the Activity Names below. The list provides an overview of all of the ***Building Blocks*** activities along with the domains, descriptions, and appropriate age ranges.

Domain: Trajectory	Activity Name	Description	Age Range
Geometry: Composition/ Decomposition	Create a Scene	Students explore shapes by moving and manipulating them to make pictures.	4–12
Geometry: Composition/ Decomposition	Piece Puzzler 1–5, Piece Puzzler Free Explore, and Super Shape 1–7	Students complete puzzles using pattern or tangram shapes.	4–12
Geometry: Imagery	Geometry Snapshots 1–8	Students match configurations of a variety of shapes (e.g., line segments in different arrangements, 3–6 tiled shapes, embedded shapes) to corresponding configurations, given only a brief view of the goal shapes.	5–12
Geometry: Shapes (Identifying)	Memory Geometry 1–5	Students match familiar geometric shapes (shapes in same or similar sizes, same orientation) within the framework of a Concentration card game.	3–5
Geometry: Shapes (Matching)	Mystery Pictures 1–4 and Mystery Pictures Free Explore	Students construct predefined pictures by selecting shapes that match a series of target shapes.	3–8
Geometry: Shapes (Parts)	Shape Parts 1–7	Students build or fix some real-world object, exploring shape and properties of shapes.	5–12
Geometry: Shapes (Properties)	Legends of the Lost Shape	Students identify target shapes using textual clues provided.	8–12
Geometry: Shapes (Properties)	Shape Shop 1–3	Students identify a wide range of shapes given their names, with more difficult distractors.	8–12
Measurement: Length	Comparisons	Students are shown pictures of two objects and are asked to click on the one that fits the prompt (longer, shorter, heavier, and so on).	4–8
Measurement: Length	Deep Sea Compare	Students compare the length of two objects by representing them with a third object.	5–7
Measurement: Length	Reptile Ruler	Students learn about linear measurement by using a ruler to determine the length of various reptiles.	7–10
Measurement: Length	Workin' on the Railroad	Students identify the length (in nonstandard units) of railroad trestles they built to span a gully.	6–9
Multiplication/Division	Arrays in Area	Students build arrays and then determine the area of those arrays.	8–11
Multiplication/Division	Comic Book Shop	Students use skip counting to produce products that are multiples of 10s, 5s, 2s, and 3s. The task is to identify the product, given a number and bundles.	7–9
Multiplication/Division	Egg-stremely Equal	Students divide large sets of eggs into several equal parts.	4–8
Multiplication/Division	Field Trip	Students solve multidigit multiplication problems in a field-trip environment (e.g., equal number of students on each bus; number of tickets needed for all students).	8–11
Multiplication/Division	Snack Time	Students use direct modeling to solve multiplication problems.	6–8
Multiplication/Division	Word Problems with Tools 5–6, 10	Students use number tools to solve single and multidigit multiplication and division problems.	8–11
Multiplication/Division	Clean the Plates	Students use skip counting to produce products that are multiples of 10s, 5s, 2s, and 3s.	7–9
Numbers: Adding and Subtracting	Barkley's Bones 1–10 and 1–20	Students determine the missing addend in $X + \_\_ = Z$ problems to feed bone treats to a dog (Z = 10 or less).	5–8

Software Activities

Domain: Trajectory	Activity Name	Description	Age Range
Number: Adding and Subtracting	Double Compare 1–10 and 1–20	Students compare sums of cards (to 10 or 20) to determine which sum is greater.	5–8
Number: Adding and Subtracting	Word Problems with Tools 1–4, 7–9, 11–12	Students use number tools to solve single and multidigit addition and subtraction problems.	8–12
Number: Adding and Subtracting and Counting	Counting Activities (Road Race Counting Game, Numeral Train Game, et. al.)	Students identify numerals or dot amounts (totals to 20) and move forward a corresponding number of spaces on a game board.	3–9
Number: Adding and Subtracting and Multiplying and Dividing	Function Machine 1–4	Students provide inputs to a function and examine the resulting outputs to determine the definition of that function. Functions include either addition, subtraction, multiplication, or division.	6–12
Number: Comparing	Ordinal Construction Company	Students learn ordinal positions (1st through 10th) by moving objects between floors of a building.	5–7
Number: Comparing	Rocket Blast 1–3	Given a number line with only initial and final endpoints labeled and a location on that line, students determine the number label for that location.	6–12
Number: Comparing and Counting	Party Time 1–3 and Party Time Free Explore	Students use party utensils to practice one-to-one correspondence, identify numerals that represent target amounts, and match object amounts to target numerals.	4–6
Number: Comparing and Multiplication and Division	Number Compare 1–5	Students compare two cards and choose the one with the greater value.	4–11
Number: Comparing, Counting, Adding, and Subtracting	Pizza Pizzazz 1–5 and Pizza Pizzazz Free Explore	Students count items, match target amounts, and explore missing addends related to toppings on pizzas.	3–8
Number: Counting (Object)	Countdown Crazy	Students click digits in sequence to count down from 10 to 0.	5–7
Number: Counting (Object)	Memory Number 1–3	Students match displays containing both numerals and collections to matching displays within the framework of a Concentration card game.	4–6
Number: Counting (Object) and Adding and Subtracting	Dinosaur Shop 1–4 and Dinosaur Shop Free Explore	Students use toy dinosaurs to identify numerals representing target amounts, match object amounts to target numerals, add groups of objects, and find missing addends.	4–7
Number: Counting (Objects)	Book Stacks	Students fill an order by counting up from a two-digit number through the next decade. Students count on (through at least one decade) from a given number as they load books onto a cart.	6–8
Number: Counting (Objects)	School Supply Shop	Students count school supplies bundled in groups of ten to reach a target number up to 100.	6-8
Number: Counting (Objects)	Tire Recycling	Students use skip counting by 2s and 5s to count tires as the tires are moved.	6–8
Number: Counting (Strategies)	Build Stairs 1–3, and Build Stairs Free Explore	Students practice counting, sequencing, and ordering by building staircases.	4–7
Number: Counting (Strategies)	Math-O-Scope	Students identify the numbers that surround a given number in the context of a 100s Table.	7–9
Number: Counting (Strategies)	Tidal Tally	Students identify missing addends (hidden objects) by counting on from given addends (visible objects) to reach a numerical total.	6–9
Number: Counting (Verbal)	Count and Race	Students count up to 50 by adding cars to a racetrack one at a time.	3–6
Number: Counting (Verbal)	Before and After Math	Students identify and select numbers that come either just before or right after a target number.	4–7
Number: Counting (Verbal)	Kitchen Counter	Students click on objects one at a time while the numbers from 1 to 10 are counted aloud.	3–6
Number: Subitizing	Number Snapshots 1–10	Students match numerals or dot collections to corresponding numerals or collections given only a brief view of the goal collections.	3–12
Patterning	Marching Patterns 1–3	Students extend a linear pattern of marchers by one full repetition of an entire unit (AB, AAB, ABB, and ABC patterns).	5–7
Patterning	Pattern Planes 1–3	Students duplicate a linear pattern of flags based on an outline that serves as a guide (AB, AAB, ABB, and ABC patterns).	4–6
Patterning	Free Explore	Students explore patterning by creating rhythmic patterns of their own.	3–6

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