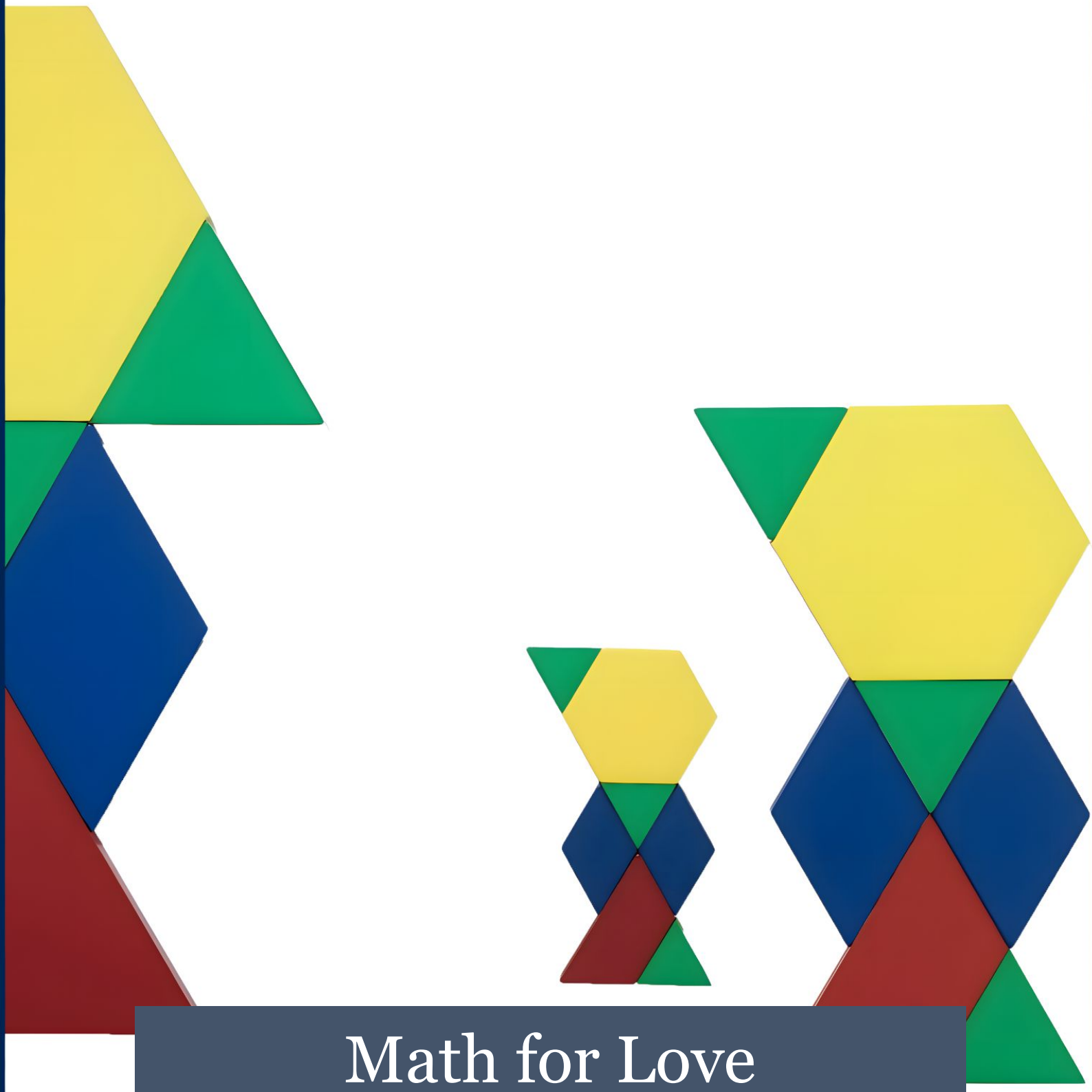


Math for Love
Grade 1 Teacher's Guide

Introduction

Welcome to the Math For Love Supplemental Curriculum! We are thrilled that you will be using this curriculum with your students. Like the lesson plans, we'll make this introduction quick, easy to read, and useful.

We are Math For Love, an organization dedicated to transforming how math is taught and learned. Our passion is connecting students and teachers with opportunities to experience excellent mathematics, deepening everyone's skill and enjoyment in the process.

The Math For Love Supplemental Curriculum is built on our belief that *play* and *rigor* go hand in hand, and that the best of mathematics is accessible to students and teachers who are ready to work hard and have fun. You and your students will learn a lot of math over the next 80 lessons, and by the end we hope you'll see why we think math is one of the best parts of the day.

The Big Picture

We built this curriculum with a few key principles in mind.

Principle 1.
Every student can participate in rigorous mathematical thinking.
Rigorous mathematical thinkers want to understand *why*, not just get the answer. They make connections and seek underlying structure and coherence. They develop powerful tools to solve problems, including fact fluency and procedural efficiency. Rigorous mathematical thinkers ask questions, make conjectures and predictions, test out their ideas relentlessly, and expect to be surprised.

Principle 2.
Play is the engine of learning.
Mathematicians engage in play constantly: exploring, wondering, noticing, and being led by curiosity. Play can transform math class from tedious to joyful, from shallow to deep, from mundane into fascinating. Students at play are more likely to persist, to build tenacity, to remember, and to learn. Play is the secret sauce that helps students come to love and succeed in mathematics.

Principle 3.
Without rigor, mathematical play is formless.
Without play, mathematical rigor is unsustainable.
We need both, together, to get the most out of mathematics.

In this introduction, we'll discuss some specific teacher moves that can help encourage rigorous mathematical play.

But first, some details.

The Details

The Math For Love Supplemental Curriculum is built to provide eighty days of 1-hour (or longer) classes, intended to complement a standard curriculum. It can be used for small groups, enrichment, remediation, after school programs, and summer programs. Every lesson is written to accommodate a wide range of student skill level, making it easy and enjoyable to differentiate and support each individual's learning. Our belief is that beautiful and interesting math problems — when designed to be appropriately accessible — should be offered to everyone, no matter where they are in their math journey.

Materials included with curriculum:

- Teacher Guide
- Student Workbooks
- Manipulative Kit
- Math Games

The Lessons

Each lesson follows a standard format with four sections:

- Opener
- Main Activity
- Closer
- Choice Time

We sometimes provide a sketch of how a lesson might unfold, with prompts and questions to help you respond organically to what your students bring to the conversation. Any sample dialog is never meant to be a script, and precisely how the lesson goes will depend on you and your students.

We include guidelines for how long we expect each part of the day will take; however, times will vary depending on student engagement and your decisions.

When preparing for a lesson, review all sections of the lesson in advance. This will help you make decisions on how to group students, how to arrange materials, and what images to project. Even a little bit of preparation will help you be ready to emphasize what's important in the lesson and respond naturally to your students' ideas.

Choice Time Days

Occasionally a full lesson - after the Opener - is devoted to Choice Time. These Choice Time Days are intended to give students a chance to dig deeper into any lessons, or relax with some extra time to play the games they already know. As with normal Choice Time, you can use the suggestions we provide, or substitute in other options.

See the sample lesson templates on the next pages for more details about the lesson plans.

SAMPLE DAY	Opener	Main Activity	Closer	Choice Time

Overview

Focus Standards

This is where we highlight the main standards we're focusing on for the day, particularly in the main activity. We usually highlight one practice standard and one content standard.

Materials: This section will mention everything you need for the day. The main activity will also include a materials list.

Opener	**We'll say what the opener is here**	10 – 15 minutes
Main Activity	**We'll say what the main activity is here**	20 – 30 minutes
Closer	**We'll summarize what's happening in the Closer here**	5 – 10 minutes
Choice Time	• We'll provide a short list of good options for Choice Time here. • You're always welcome to choose different options!	5 – 25 minutes

Standards Connections

These are additional standards that are connected (or could connect) to today's lesson.

Opener

The lessons cycle through a short collection of our favorite opening routines. The first time you see a particular Opener, there will typically be more detail included. Later, these writeups will become shorter and more succinct. Don't be surprised to see the Opener instructions look almost identical on different days - once you're confident with a given opener, it should take very little time to prep for using it with class.

Here are the main Openers we use in this grade.

➔ Dot Talks

Project an image of dots, or build it with the magnetic ten frame.
Students figure the number of dots in as many ways as they can..

➔ Choral Counting

Skip count with the class, then look for patterns.

➔ Same and Different

Project a picture containing two images.
Prompt: "What's the same? What's different?"

➔ Target Number

Challenge students to create as many equations as they can that equal a given target number.

➔ Teacher-led Games

Guess My Number, Bullseyes and Close Calls, and more.

Tips for the Classroom

1. Look here for some specific ideas for increasing student interaction, adjusting challenge, and more.

2. If there's an image to project for an opener, it's typically on the next page.

Prompts and Questions

- Look here for useful things to say to students to help them get started or push deeper in their thinking.

Main Activity

Materials and Prep

Here's where we describe what students will need for the main activity (doesn't include choice time materials). You'll need to read the lesson to make some decisions about how to arrange the materials for the day. In general, keep this simple – offer containers of manipulatives rather than exact amounts.

Motivating Question (OR How to Play)

To begin working or playing on their own, students should either have a question that frames the day's exploration— along with the knowledge and skill to begin thinking about it — or know the rules of the game they're about to play. We essentialize that question (or summarize those rules) here.

Launch

This is how to introduce the motivating question and get students excited and curious to think about it, or to teach the game in a way students will understand and find irresistible. In the case of games, demonstrating with a student volunteer is almost always the most powerful way to communicate how the game is played.

In general, the Launch should be as thorough as necessary *and* as short as possible. The goal should always be to have the students spending as much time as possible doing the thinking during math class. Whenever you are speaking to the whole class, pose questions and look for opportunities to ask for student ideas, questions, and contributions.

Work

As soon as they're ready, students go to work on their own or in pairs or small groups. This section will have some ideas of what to look for, the lesson flow, extensions, good hints, and (occasionally) solutions.

While students work, circulate in the room, offering help, prompts, hints, asking questions, making connections between ideas, and getting a sense of your students' strengths and where they could benefit from greater support.

Tips for the Classroom

1. Look here for additional ideas on how to implement this activity.
2. We'll often include extensions or simplifications to help with differentiation.
3. Student workbook pages will typically be included on the page right after the Tips for the Classroom.

Launch Key Points

- We try to include some key points for how to help the launch succeed in getting students excited to work.
- Points about the essential knowledge or skills might be here too.

Prompts and Questions

- This section gives ideas for what you might say to students during the "Work" section of the lesson, when they're working on their own or in small groups.
- Sometimes a prompt, hint, or nudge to talk to someone else is all students need.

Closer

Gather the students together for a whole-class discussion when the Main Activity is done. This is where students reflect, consolidate their learning, and potentially try an extension or variation of the Main Activity. To make sure the engaged thinking continues during this part of the day, rather than just summing up what everyone should have learned, take the opportunity to pose questions, invite student comments, and use partner sharing to give everyone a chance to participate.

Prompts and Questions

- These prompts are for the Closer.
- They might be useful things to say to the class as a whole.
- They also might be helpful replies to anticipated student contributions to a closing discussion.

Choice Time

Choice Time is when students get a chance to revisit games, puzzles, and other material they want to spend more time with. Getting to choose their activity helps with buy-in and self-regulation, and is a chance for students to reflect on what they want to think about more.

Choice Time works like this:

1. Present students with a short list of suggested activities.
2. Students choose the game, worksheet, challenge problem, block set, or other activity they'd like to pursue and commit to sticking with it for at least 5 - 10 minutes.
3. If time permits, students can try more than one activity.

The suggestions for Choice Time are only suggestions. If there is another activity from the curriculum that you think would be a better fit here, or if a student has a strong preference for something not on the suggested list, feel free to make a swap.

You may need to print some materials in advance to prepare for Choice Time. Since the final Choice options are up to you, we don't give a list of materials you'll need for them.

Here are some options that can be freely offered any Choice Time:

- Challenge Problems
- Free Block Play
- Addition by Heart (once students know how to play it)
- Tiny Polka Dot games (once students know how to play them)
- Work on problems from an earlier lesson

Teacher Moves

Here are some useful ways to support your students during these lessons.

- **Model enthusiasm and curiosity.** Ask questions. Statements like "I wonder if…" and "I notice that…" go a long way. If students see you enjoying the work, they'll be much more likely to enjoy it too.

- **Keep instructions and launches as brief as possible** (but as long as necessary) and look for places to invite student questions or ideas. As much and as often as possible, we want students to be spending classroom time doing mathematics and thinking mathematically.

- When launching games, **play a demo game with a volunteer** to help students learn the rules. When students play games against each other during work time, try these ways of grouping students:
    - Students play one against one and switch opponents often.
    - Students play in groups of three. Two play while one watches as a referee. When the game is over, the referee position rotates.
    - Students play two against two, and have to agree on moves with their teammate.
    - Students play collaboratively with a partner, and try to get the highest score they can, rather than beat an opponent.

- **Resist solving students' problems for them.** While working on hard problems, it's natural to feel stuck, or unsure of what to do next. Sometimes a key insight requires a lot of exploration first. Give students the time they need.

- **On the other hand, support students when they need it.** There's no use in leaving students feeling dispirited or unsuccessful, and the goal is for students to be productive, even if stuck. We provide ideas for questions, prompts, and hints to keep students motivated and engaged. Even when students are playing or exploring, understand your job as looking for opportunities to help students develop greater efficiency, organization, and power in their methods.

- **Have a plan for how to respond to wrong ideas and answers**. One of the strongest ways to handle these moments is to turn them back to the students by treating the idea seriously and asking for counterexamples or supporting arguments. A very good phrase to keep in your back pocket is: "Convince me."

- **Be willing to be the slowest person in the room**. This means asking for elaboration and clarification if you think there is even one student in the room who doesn't understand an argument yet.

- **Care and respect**. Show students you care about them, respect their thoughts, and that it matters to you that they learn, and enjoy, mathematics.

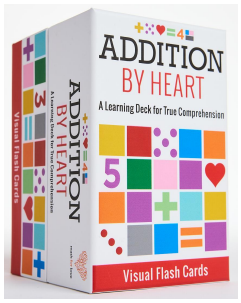
Materials

We provide just about everything you need to use this curriculum with a classroom of 25 (or more) students. The only extras you'll need are scratch paper, pencils, and crayons or colored pencils. You may occasionally need to make some additional photocopies for Choice Time, though students can often turn to earlier pages in their Student Workbook and find what they need. In addition to this Teacher's Guide and the student workbooks, manipulatives and games include:

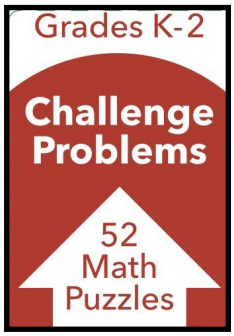
Upscale Pattern Blocks. These blocks include the class 4 pattern block shapes in three different sizes, small, medium, and large.
We'll use these for arithmetic and geometry.
They are also great for students to explore with during Choice Time.

Number Rods. Another excellent tool for understanding arithmetic operations, fractions, measurement, and more. Rods go from 1 cm to 10 cm long, in the colors named to the left.

Tiny Polka Dot. A math-enriched card deck with 6 suits, each with a different representation of number. Useful for a huge array of math games, puzzles, and explorations. Videos and more at mathforlove.com/dot.



Addition by Heart. A visual flash card deck with three subdecks. Great in the classroom for small group fact practice and for simple fluency games. Ideas included in the lessons, and at mathforlove.com/add.



Challenge Problems Deck. These extra puzzles and problems are great options for Choice Time. These generally get harder the higher the number.

Also included: Square Tiles, 6-sided and 10-sided Dice, Connecting Cubes, Ten Frames, 2-Color Counters, and one Magnetic Ten Frame.

Note: the Magnetic Ten Frame is an excellent tool for Dot Talks and 2-Color Dot Talks.

Other Stuff

- Email errata@mathforlove.com if you notice an error that should be fixed.
- **Additional Material:** We'll gather corrections and additional material at mathforlove.com/curriculum/grade1.
  Password: M4LCurriculum
- Problem with access? Email info@mathforlove.com.

Thanks and Acknowledgements

These lesson plans were built from the lessons we developed over our years working with teachers and students of all ages. However, putting together this more ambitious curriculum required a team, and we were lucky to have an amazing one.

Our curriculum writers were Karen Gallagher, Mark Goldstein, Tara Hofmann, Becky Holden, and Chase Orton. Our editors were Hana Murray and Jen Moffett. We had help with images from Bella Christianne and Hana Murray.

This team of writers and editors worked with incredible focus and skill to build the teacher's edition you're holding now — big thanks to all of them for their dedication and contributions to this project.

Finally, thanks to all the teachers, coaches, students, and staff who have used versions of our materials over the years, and welcomed us into their classrooms.

Daniel Finkel | Founder | Math for Love

Katherine Cook | Creative Director | Math for Love

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Overview

Focus Standards

MP1	Make sense of problems and persevere in solving them.
K.CC.4	Understand the relationship between numbers and quantities; connect counting to cardinality.

Materials: Upscale pattern blocks, connecting cubes, number rods, square tiles.

Opener	**Guess My Number**	10 – 15 minutes
Main Activity	**Exploring Materials**	35 - 40 minutes
Closer	**Notice and Wonder**	5 – 10 minutes
Choice Time	• No Choice Time Today	

Standards Connections

MP5 | MP6 | K.CC.4 | K.CC.6

Guess My Number

Write the numbers from 1 to 10 on the board. Tell your students that you are going to think of a number from 1 to 10, and they will try to guess it in the fewest number of guesses possible. After every guess, you will tell them whether your number is greater or less than their guess.

1 2 3 4 5 6 7 8 9 10

Little do the students know that you haven't actually chosen a number. Instead, always make their guess turn out as poorly for them as possible. If they guess 8, your number is less than 8. If they guess 2, your number is greater than 2.

Plan to play 2 - 3 games. You can increase the range of numbers after each game, playing to 12, 15, or 20 instead of 10.

You can help them think about the power of their guess by crossing out numbers that guess has disqualified. For example, if they guess "2" and you tell them that your number is greater than 2, you can cross out the 1 and 2 (or lead them to tell you to do it). This encourages them toward guesses that will cross out as many numbers as possible.

Tips for the Classroom

1. If kids make a bad guess, don't try to steer them toward a good guess right away. But you can ask the students after you write the guesses down which guesses were most helpful, or whether they would make a different guess if they could take it back.

2. Don't play for too long at one time. Two to three games is usually enough to get the kids mentally alert and ready for whatever is coming next.

Prompts and Questions

- Talk to a neighbor about what you think the next guess should be, and why.
- How many numbers do you think that guess will cross out?

Exploration of Materials

Materials and Prep
Upscale pattern blocks, connecting cubes, number rods, square tiles. Place in containers in different parts of the room.

Motivating Question
What math tools are in our classroom, and how do they work?

Launch
Gather the class and tell students that in this class, we will think about math together; we will play and explore; we will have discussions; we will use lots of different tools. Today we will explore some of them.

Let students know the options available to them. They will have 7-10 minutes at a location and then clean up and move to another one.

Work
Students will freely explore the materials around the classroom. Observe students' interests and engagement with the materials. Ask them what they're building, what they notice about the blocks so far, and what surprised them about how they work. Give them a one-minute warning when it's time to move to the next station/block type.

Tips for the Classroom
1. Consider how many students each area can accommodate and set up the room accordingly.

2. Be prepared with specific tasks for students who need more direction. You can always ask them to build you something with exactly 10 blocks, or to build something smaller or bigger, etc.

Closer
Ask students what they noticed and what they wonder about the different blocks they explored.

What sorts of things were they doing/making with the pattern blocks? The number rods? The connecting cubes? The square tiles? Collect student observations, wondering, and questions, and tell students that we will be returning to some of their questions in the future.

Launch Key Points

- Have multiple areas of each material so students will have space to choose or rotate.
- Students may need practice to make good choices. If a student is having trouble focusing, you can assign them a location. You can also run the day using stations.

Prompts and Questions

- Tell us more about what you did with the pattern blocks/square tiles/number rods/ connecting cubes?
- Are you making patterns with the math tools?
- What are you building with the materials?
- What are you noticing when you count or sort the materials?
- Do you prefer to explore with a partner or on your own?
- Do you think you could build a shape like that without using any rhombuses?

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

1.NBT.1 Count to 120, represent a number of objects with a written numeral.

Materials: Objects to count (collections of buttons, stones, pencils, markers, blocks, etc), containers to hold each collection (bowls, cups, or bags); worksheet, pencil, ten frames.

Opener	**Dot Talks**	10 – 15 minutes
Main Activity	**Counting Collections**	20 – 30 minutes
Closer	**What ways of organizing your collection makes counting easier?**	5 – 10 minutes
Choice Time	• Block Free Play • Counting Collections • Challenge Problems	5 – 25 minutes

Standards Connections

MP5 | MP6 | 1.NBT.2 | 1.OA.5 | K.CC.4 | K.CC.6

Dot Talks

Dot Talks are a powerful way to help students develop mathematical fluency, intuition, and mental math strategies.

To do a Dot Talk, project the first dot image on the board where all students can see it. (Two images are provided on the following page.) Then ask students to figure out:

1. **How many dots there are**
2. **As many ways to count them as they can**

Students can think about the questions on their own first for a couple minutes. Give the class a couple more minutes for partner sharing. Then lead a class discussion where students share their answers and approaches. Your job is to facilitate the discussion by restating and writing down counting strategies, clarifying as necessary, and making connections when appropriate.

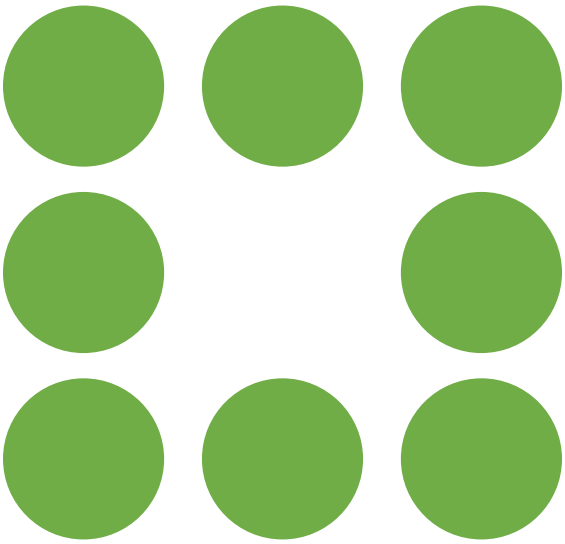
The key elements to these talks are a de-emphasis on speed and an added emphasis on process and communication. Expect some disagreements over the answers, and try to use those disagreements as a motivation for students to articulate their ideas to their classmates.

After discussing the first Dot Talk, move on to the second. For each image, discussing 3 to 5 approaches is sufficient.

Tips for the Classroom

1. Students will be looking to see if you indicate what the right answer is. Don't favor right answers over wrong ones. Make sure that the explanations are what matters.

2. Give students constructive language to use in the discussion, like, "I respectfully disagree, because…" and "I agree with _____, because…"



Prompts and Questions

- Who would like to defend this answer?
- I don't quite follow. Do you mean I should count this group first?
- How did you do that/know that?
- Does anyone else think they can explain what Shawn is saying?
- Turn to the person next to you and explain how you counted.

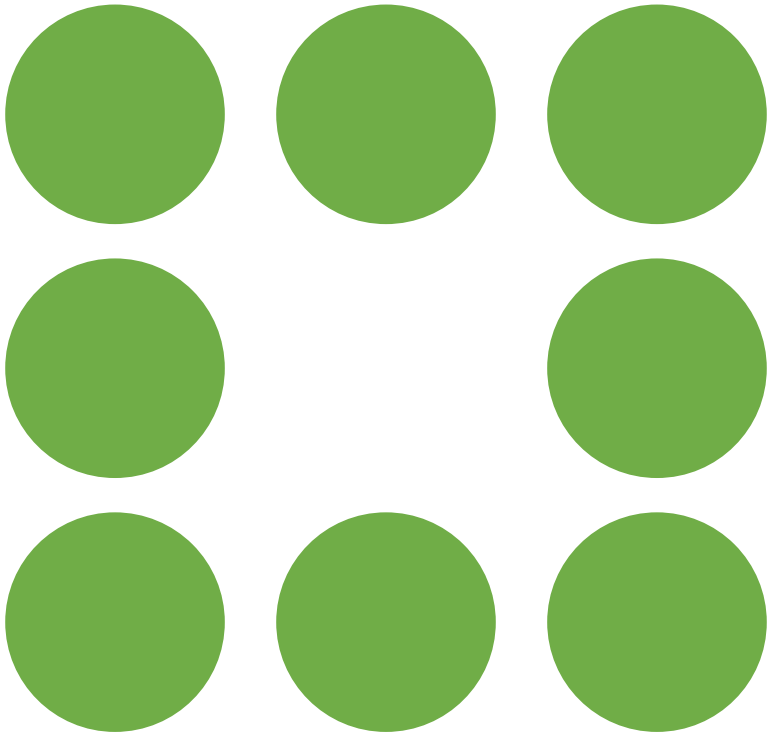


Image 1

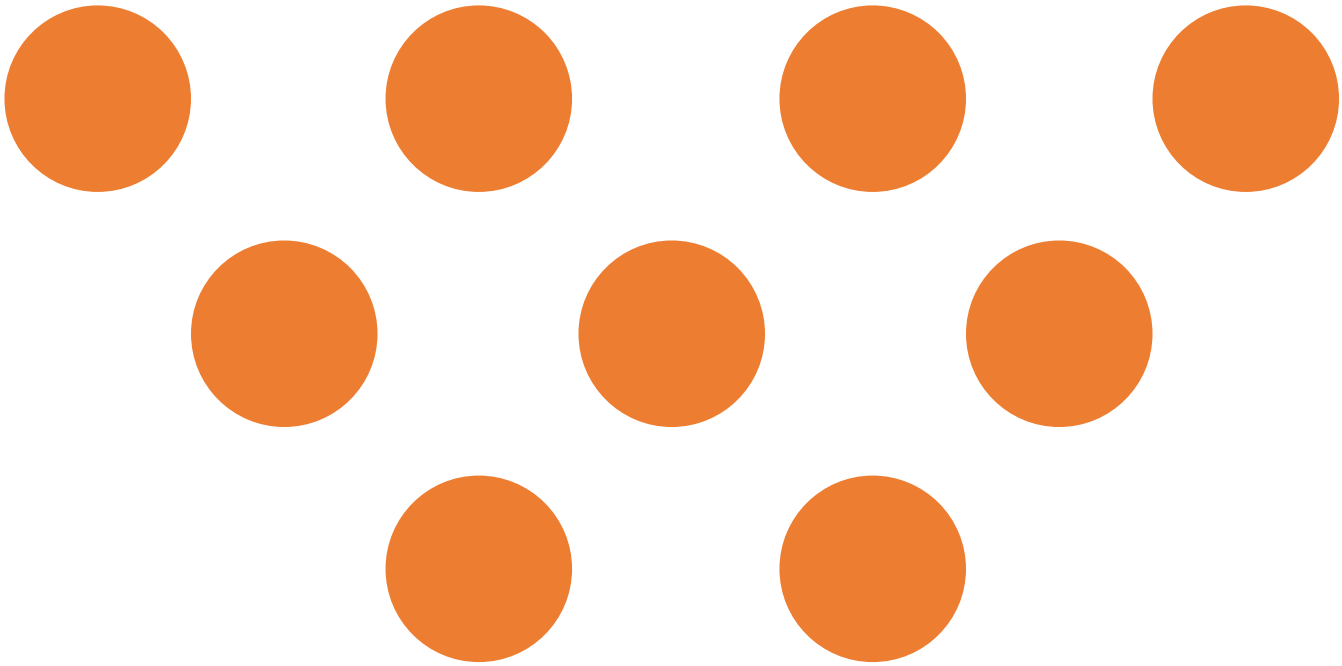


Image 2

Counting Collections

Materials and Prep
Objects to count (collections of buttons, stones, pencils, markers, blocks, etc), containers to hold each collection (bowls, cups, or bags); worksheet, pencil, ten frames.

Organize objects into counting collections containers with varied quantities - smaller numbers of objects (11-30), as well as larger numbers (30-50). Make a demo collection with a small number (less than 20) for the launch.

Set counting collections containers and ten frames around the room, so students have space to work.

Motivating Question
How many are in your collection?

Launch
Point out collections around the room. Let students know they will count how many objects are in each collection.

Use the demo collection and the counting collection worksheet to demonstrate. Keep this demo brief to get students quickly counting their own collections. Demonstrate counting the small collection, write down the number you counted, and make a quick sketch on the worksheet.

Explain that student pairs will choose a collection in the room, dump out the bag and find out how many there are with their partner. Each student should fill out their own worksheet.

Work
Students count and record their numbers. Observe how students are counting, and take note of the strategies they're using. Make sure students have access to ten frames, rubber bands, cups, or other devices to help students count or group objects.

Tips for the Classroom
1. Differentiate by including collections with many or fewer objects to count. You can steer students to more or less challenging collections to count after you see how they did with their first one.

Launch Key Points

- Demonstrate using the recording sheet to record an estimate and the actual total.
- Demonstrate making a quick sketch of how many were counted.
- Don't take too long with the launch. The students will catch on quickly, and too much instruction on how to do the counting may get in their way.
- Include putting the collection back in its container as part of your demo.

Prompts and Questions

- How are you counting your collection?
- How do you know how many you've already counted?
- What number do you find is easiest to count by?
- Can you tell how your partner is counting by looking at their picture?
- Challenge: Invite students to recount their collection in a new way (by 5s, using ten frames).

Day 2

Counting Collection

Guess: _____

Picture of how I counted

How many I counted: _____

Closer

After students are done counting for the day, ask for reports on counts.

Choose 1 or 2 student recording sheets that are clearly organized and easy to follow to share with the class. Ask students if they can tell how many objects were in that student's collection and how they organized their count. What ways of organizing (or drawing) a collection makes counting easier?

If a collection was counted more than one way, choose two recordings to share. Ask if students who counted the collection agreed on the total or not. Did they count in the same way? If they used different approaches, what way seems easiest?

Prompts and Questions

- How did you count your collection?
- When you look at your classmates' drawings of their Counting Collection, what ways of organizing are easier to understand?
- What is a new idea you saw or heard about from a classmate today that you might want to try next time?

Choice Time

- Block Free Play
- Counting Collections
- Challenge Problems

Prepare students for Choice Time by explaining that they will choose from some pre-selected options. Tell students that once they choose an activity, they should spend at least 5 minutes on it before trying something else.

Show the Challenge Problem Deck and explain that it will always be among the Choice Time options. Students can simply take a challenge problem card and try to solve it, on their own or with a partner. Be sure to provide scratch paper and pencils to support student work.

Block free play and Counting Collections are also options. This is an opportunity for students to build with Pattern blocks or other manipulatives.

DAY 3	Opener	Main Activity	Closer	Choice Time

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

1.OA.5 Relate counting to addition and subtraction.

Materials: Gameboard to 15, counters, (colors), die.

Opener	**Choral Counting**	10 – 15 minutes
Main Activity	**Back and Forth (to 15)**	20 – 30 minutes
Closer	**How many rolls from 0 to 15?**	5 – 10 minutes
***Choice Time**	• Counting Collections • Block Free Play • Challenge Problems	5 – 25 minutes

Standards Connections

K.CC.2 | K.CC.4

Choral Counting

Choral counting is an incredibly powerful activity for building numeracy. Students practice counting forward, backward, skip counting, and — critically — looking for patterns.

For this first Choral Count, explain to students that you'll be counting together as a whole class. The goal is to go slow and stay together. If students aren't sure what the next number will be, you'll be going slow enough that they'll have some time to think about it.

Step 1. Tell students you'll **start at 10 and count by 1s until you reach 30**.
Step 2. The students' job is to predict to themselves what each next number will be as you write it, and to count along with you.
Step 3. Start writing out the numbers. Do this slowly, so students have time to think of what might come next. Ask them to say each number with you as you write it. For today, write the numbers in **five columns of five.** Pause after writing 18 and ask students if they are noticing any patterns in the chart.
Step 3. Once you've written out the whole sequence, recount the numbers together as a class.
Step 4. Ask students to sh
are what they notice about the number sequence. Write down their observations.

10	15	20	25	30
11	16	21	26	31
12	17	22	27	32
13	18	23	28	33
14	19	24	29	34

Tips for the Classroom

1. Changing the number of rows you use will create more or less emphasis on different kinds of patterns. You can experiment with this as you do more talks.

2. There may be some very interesting patterns that emerge. Some may be correct, some incorrect. Most important is to write students' comments down as clearly as you can, making notes/circles/arrows on the numbers if that helps.

3. Students might comment on first digits, last digits, digit sums, columns, rows, diagonals, or any other pattern. Prepare to be surprised!

Prompts and Questions

- What number am I going to write next? How do you know?
- Let's count all the numbers together.
- Take a moment to look at these numbers. What do you notice?

Back and Forth (to 15)

Materials and Prep
Gameboard to 15, counters, (colors), die.

How to Play
Place three counters on the board in any three spots, from 0 to 15. For cooperative play, place a single counter of a different color on 0. This will be the players' pawn. For competitive play, place two counters, each a different color, on 0, one for each player.

Roll the die and move your pawn forward or backward until you collect all three counters by landing on them. After each roll, the player chooses whether to add or subtract without going off the board – rolls can only be used if they entirely fit on the board. When the player lands on a space with a counter, they pick up the counter.

The game is over when all the counters have been collected. If playing competitively, a player wins if they have collected the most counters.

Launch
Choose a student volunteer to demonstrate the game where everyone can see. Explain the game and play until the rules are clear to the entire class.

Work
Students play Back and Forth (to 15) either individually/collaboratively (use one pawn and collect all the counters) or competitively (use two pawns; whoever gets the most counters wins).

Circulate to support students who need help counting, predicting, or strategizing.

Tips for the Classroom
1. For a variation, you can use the rule that if a player lands on 15 exactly, they get to roll again.

Launch Key Points

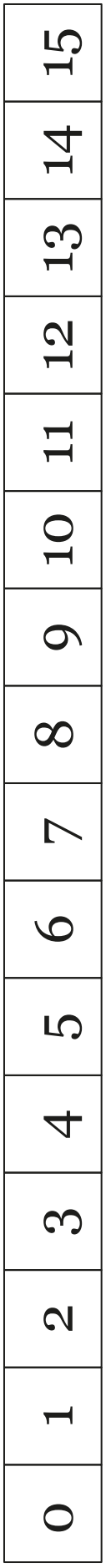
- Demonstrate and narrate the game until everyone understands and is excited to play.
- The game begins with 3 counters on the gameboard and a pawn (one counter of a different color) or pawns (one counter for each player, each a different color) beginning at 0.

Prompts and Questions

- What number do you wish you'd roll right now? What would you do if you roll it?
- Are you going to go forward or backward?
- Show me how you count forward 4.
- Show me how you count backward 3.
- Can you predict where you're going to end up without counting?
- Why do you think it's a good move to go backward right now?

Day 3

Back and Forth



Closer

Set up the board with a pawn on 0 and a counter on 15.

Ask students if they could choose their rolls, how many rolls it would take to get from 0 to 15 and what would those rolls be?

Let students think on their own, and then share their approaches. The natural answers here involve maximizing each roll, but not all students will see this immediately. The main point to highlight is the strategies used to add each roll.

Prompts and Questions

- How did you count or add?
- If you use a different strategy to add, will you get the same total?

Choice Time

- Counting Collections
- Block Free Play
- Challenge Problems

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

1.OA.1 Use addition and subtraction within 20 to solve problems.

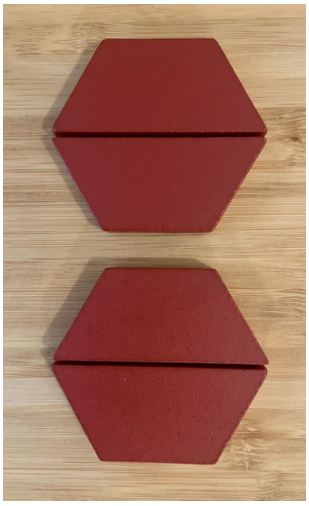
Materials: Upscale pattern blocks, fill-ins, pencil and paper.

Opener	**Same and Different**	10 – 15 minutes
Main Activity	**Pattern Block Fill-Ins 1**	20 – 30 minutes
Closer	**Which numbers of blocks filled in the shapes?**	5 – 10 minutes
Choice Time	• Block Free Play • Counting Collections • Back and Forth (to 15) • Challenge Problems	5 – 25 minutes

Standards Connections

MP5 | MP6 | MP7 | 1.OA.6 | 1.OA.7

Same and Different



Show an image that consists of two distinct parts, and ask:
What's the same? What's different?

Students then discuss what they see, first in pairs or small groups, and then with the whole class. Once students have shared 3 or 4 attributes that are either the same or different, you can try the second image if you have time.

Here are some attributes to consider when discussing images:

- **Material** - are both images made of the same stuff or not?
- **Number** - are there the same number of things on both sides or not?
- **Shape/arrangement** - are the things arranged in a line, in a circle, etc.?
- **Grouping** - are they grouped in twos, in threes, in fives, etc.?
- **Color**
- **Orientation** - are they pointing up, large side down, etc.?

Ideally, students will find other attributes too!

For today's Same and Different, use the images on the next page.
Possible student observations:

- The number of blocks is different.
- The space they take up (area) is the same
- The shapes are the same.
- The colors are different
- The background color is different.
- There's a line through the blocks on the right, but not on the left.

Prompts and Questions

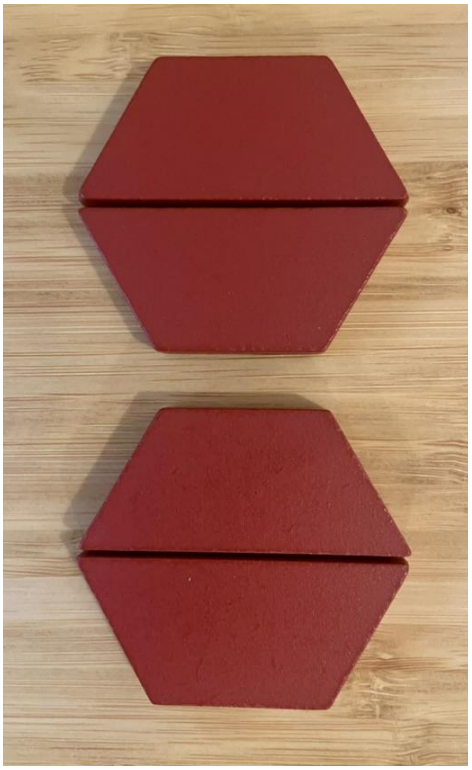
- I see they are not the same color. What is something else that's different about them?
- We've heard two things that are different. What's something that's the same?
- We just heard someone argue that there are different numbers of objects in these two images. Turn to your partner and figure out which image has more.

Tips for the Classroom

1. Same and Different is meant to help encourage and deepen student discourse. Make sure everyone feels their observation was welcomed and valued.

2. Plan to do 2 Same and Different images each day, if time permits.

A

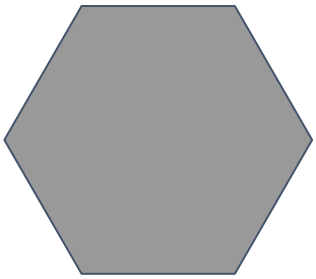


B

A

B

Pattern Block Fill-Ins 1



Materials and Prep
Upscale pattern blocks, Fill-ins, pencil, and paper.

Motivating Question
How many blocks does it take to fill in the shape? Can you fill it in with the most? With the least?

Launch
Show the hexagon fill-in and take guesses on how many blocks it will take to fill it in. Then fill it in, demonstrating how to count the blocks, and write in how many you used. A key idea here is that you can count all the hexagons, all the trapezoids, all the blue rhombuses, and all the triangles, then add them together.

Now ask if you should try to use fewer blocks or more blocks when you fill it in a second time. Make a try (but don't do the most/least possible) and recount. Tell students that if they have ideas for how to use even more/less blocks, they'll be able to try it on their own.

Work
Students work alone or in pairs to fill in shapes with pattern blocks, counting how many blocks were used, and looking for ways to use the most possible blocks, and the least number of blocks.

Tips for the Classroom
1. For some students, just filling in the shapes without gaps may be enough of a challenge.

2. Two counting methods to encourage and emphasize:
   a. Count how many of each shape first, then add
   b. Gather shapes into groups of ten to make it easier to track counting

Launch Key Points

- Make sure to take guesses on the number of blocks before you do the fill-in, and make a note of how close you were able to get.
- When counting the number of blocks, count all the hexagons, all the trapezoids and so on, then add those numbers.
- When you try to fill in with more blocks, be sure not to fill it in with the most blocks so that students can figure it out on their own.

Prompts and Questions

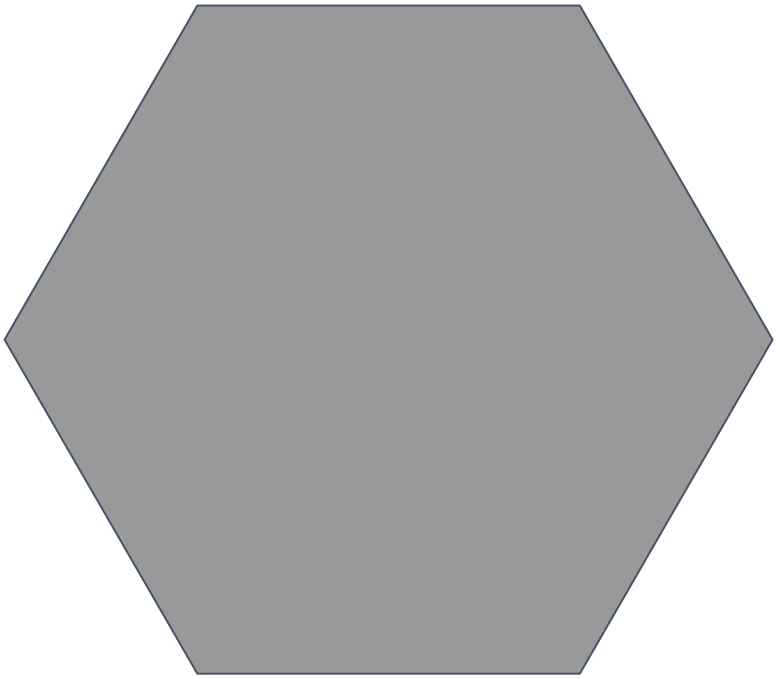
- How many blocks did you use to fill in that shape?
- Show me how you counted. What if you grouped by fives/tens?
- How many hexagons did you use? How many trapezoids? Let's write all that down.
- Do you think you could fill it in with more/less than last time?
- What's the smallest number of blocks you could use?
- What's the greatest number of blocks you could use?

Day 4

Pattern Block Fill-Ins

Fill in each hexagon in a different way.

Record how many blocks you used.



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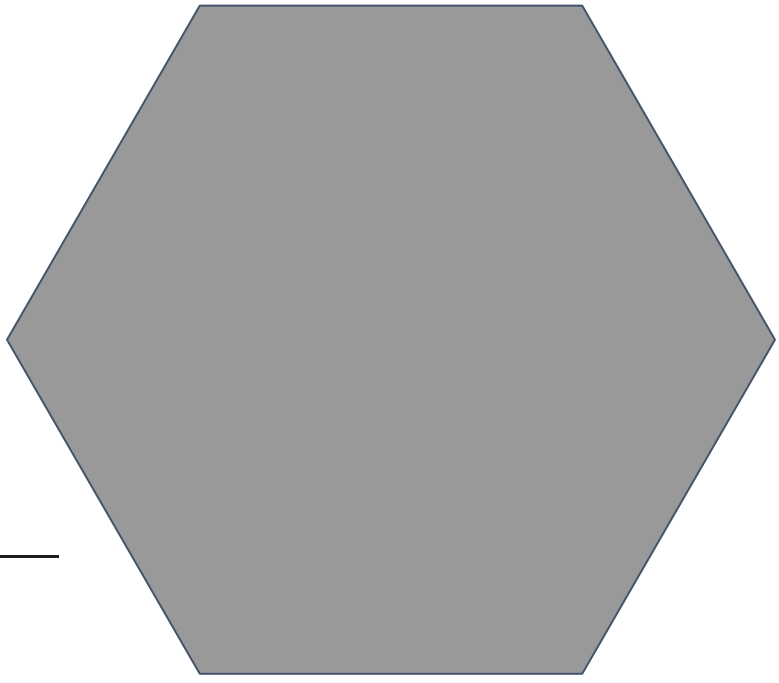
Blocks used

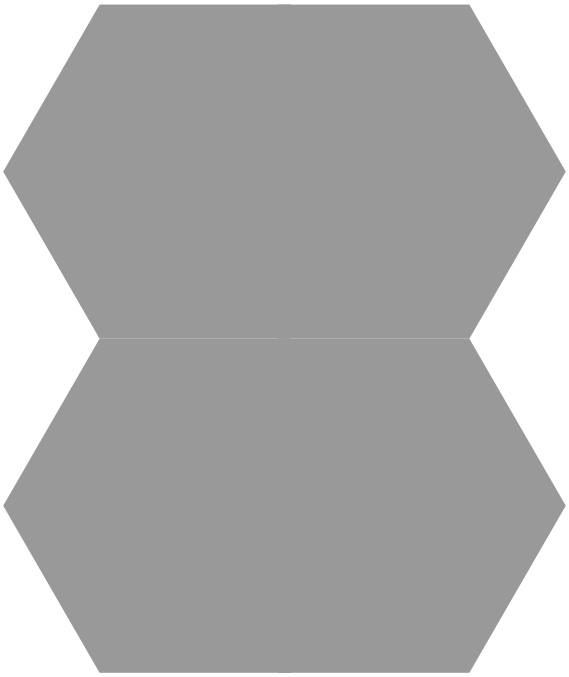


_____

Blocks used

Day 4

The Penguin



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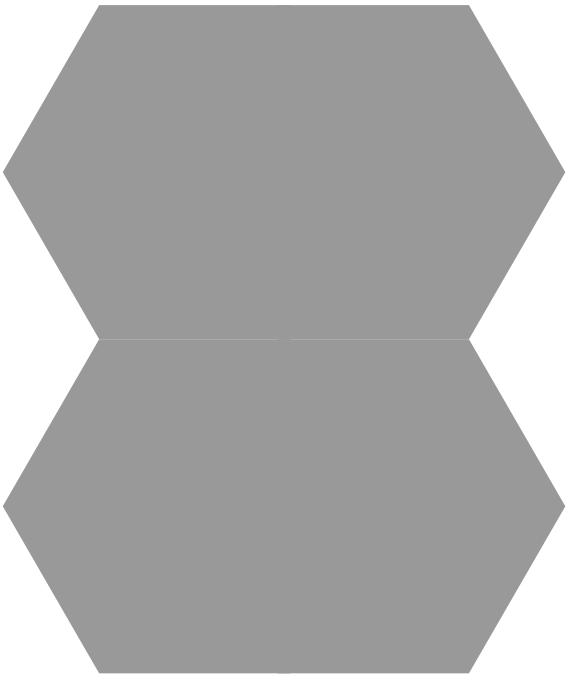
Blocks used



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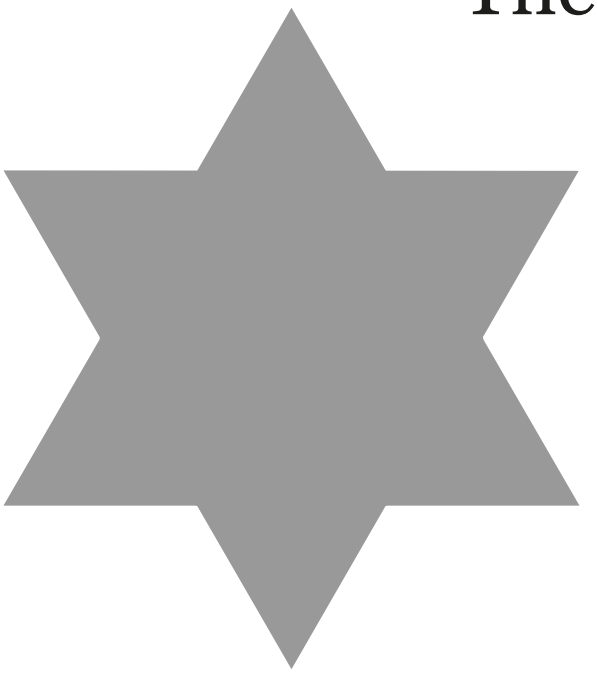
Blocks used

Day 4

The Star



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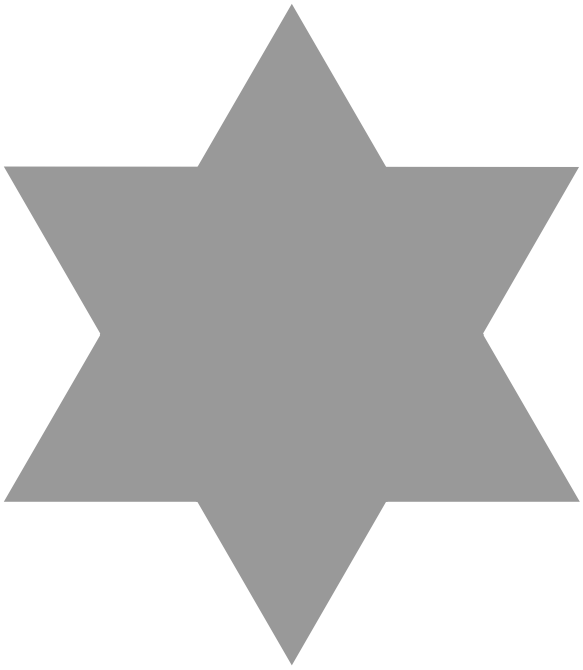
Blocks used



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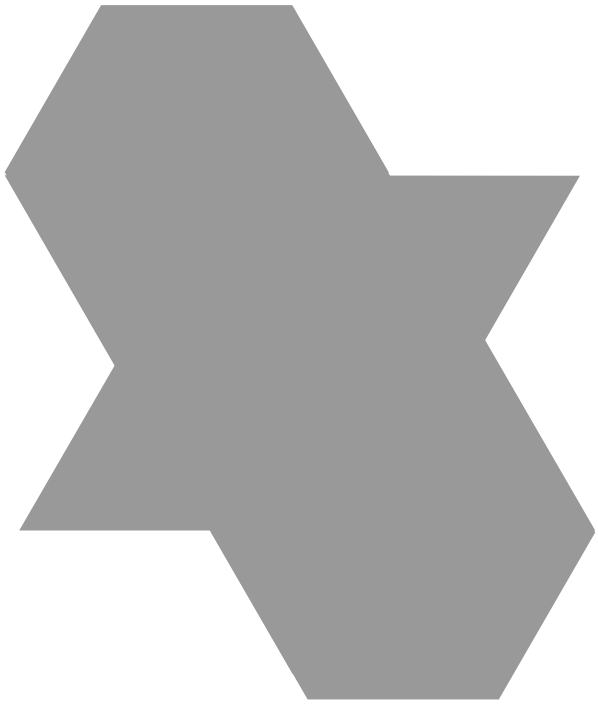
Blocks used

Day 4

The Spaceship



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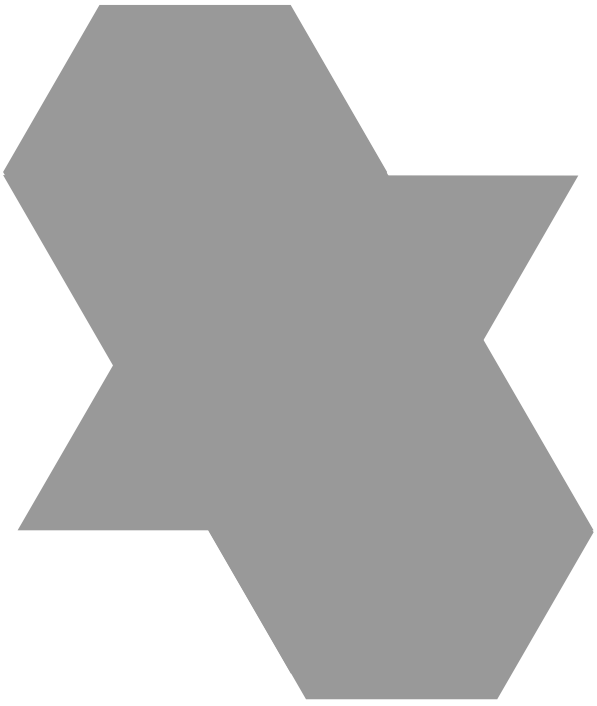
Blocks used



_____

Blocks used

Closer

Choose a student's shape fill-in to show on a document camera or in the center of the carpet where all students can see.

Discuss these questions.

- What is the largest number of blocks used to fill in the shape? Could it be filled with even more?
- What is the smallest number of blocks? Could it have been filled with even fewer blocks?

Don't feel like the students need to get accurate answers to these questions. Just exploring the ideas is enough.

Prompts and Questions

- What was the largest possible number of blocks used to fill a shape?
- What was the smallest number of blocks used to fill in a shape?
- Could you have used even more/fewer?

Choice Time

- Block Free Play
- Counting Collections
- Back and Forth (to 15)
- Challenge Problems

Overview

Focus Standards

MP1	Make sense of problems and persevere in solving them.
K.CC.5	Count to answer "how many" questions about as many as 20 objects in various configurations.

Materials: Tiny Polka Dot cards.

Opener	**Target Number**	10 – 15 minutes
Main Activity	**Card sorting and Match the Dots**	20 – 30 minutes
Closer	**Counting Dots Reflection**	5 – 10 minutes
Choice Time	• Pattern Block Fill-Ins • Back and Forth (to 15) • Block Free Play • Challenge Problems	5 – 25 minutes

Standards Connections

MP6 | MP7 | K.CC.4 | 1.OA.5

Target Number

Write a "target" number on the board.

Tell students their goal is to try to write down as many different equations as they can that have the target number as the answer.

Give students 2-5 minutes to work. While they work, you can model thinking and writing down answers also.

Once the time is up, ask students to share their favorite equations. Write them down where everyone can see. You can keep a tally next to repeat equations so that everyone's contribution can be acknowledged.

Today's target: 7

Example solutions:
7 = 4 + 3
7 = 19 - 12
7 = 1 + 2 + 4
7 = Half of 14

Tips for the Classroom

1. When answers are incorrect or unclear, use it as a chance to review the arithmetic with the class. If a student introduces advanced concepts prematurely, acknowledge it but steer the discussion back to territory everyone is familiar with.

2. For Target Number, it helps to write the target number as the first part of the equation, e.g. 7 = 6 + 1, 7 = 4 + 3, etc. This emphasizes equivalences to 7 and encourages students to correctly understand the equals sign.

3. **THIS TIP IS ESPECIALLY USEFUL.**
Let's say someone says that 7 = 5 + 3. Rather than just saying "wrong," say that 5 + 3 gets us close to 7, but we need to do something else to get all the way there, then challenge students to find what still needs to be done. If someone can explain that 5 + 3 is 8, and so you need to take 1 away, you have the number sentence 7 = 5 + 3 - 1. This is both more sophisticated and accepts the original students wrong answer as a path toward a better, accurate answer, rather than a dead end.

Prompts and Questions

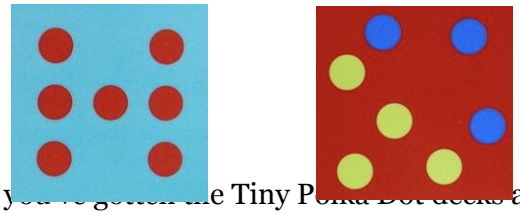
- If we only add 2 numbers, how many answers can we find?
- What if we add 3 numbers, or 4 numbers?
- What about any number of numbers?
- What if we only subtract?
- What's the longest number sequence you can find that hits the target number?
- Can you hit the target number if you only use a single number, such as the number 4, in your equation?

Card Sorting and Match the Dots

Materials and Prep
Tiny Polka Dot cards.
For Match the Dots, start with two suits, Teal 0-7 and Blue 0-7. In subsequent games, students can play with larger numbers and additional suits.

Motivating Question
How can you sort the Tiny Polka Dot cards?

Launch
Show a few different Tiny Polka Dot cards to the class. Ask students what is the same and what is different between the cards.



Tell students you've gotten the Tiny Polka Dot decks all mixed up and you need some help sorting them. (Feel free to show a jumbled up hand of cards here to make your point.)

Students will work in pairs or trios and decide how they would like to sort the cards, then sort them. Some sorting schemas you might see are by suit (color), by number, or in sequential number order. The larger the deck students are working with, the more involved their sorting will be. Encourage students to arrange their sorting in arrays rather than piles.

After every group has finished sorting, ask students to share some of the ways they decided to sort. Inviting students to walk around the room and look at the different approaches is an option here.

Once you've finished discussing the sorting strategies, tell students you'll be using the Tiny Polka Dot cards to play a game. Quickly introduce the game by playing a demonstration with a student volunteer, explaining the rules as you play.

Match the Dots
Start with two suits, Teal 0-7 and Blue 0-7. Deal the cards face up. On your turn, find two cards of the same number, and remove the pair from the board.

Take turns until all the cards are gone.

Launch Key Points

- Ask what students notice about the different sets of Tiny Polka Dot cards?
- Students should understand that their group gets to decide how they will sort the cards. There are a lot of interesting possibilities here!
- After sorting the cards, make the intro to PowerDot Pro quick by giving the student volunteers enough cards for only a few turns by the end of the game.

Work

Students play Match the Dots in pairs or trios. Circulate among students noticing different strategies students use to find matches.

Tips for the Classroom (Match the Dots)

1. Start students with easy numbers, and slowly let them increase the difficulty. Every step should feel like a fun new challenge.
2. The game is more fun if you're using an even number of suits, so every card gets taken in the end.
3. This game evolves into Dot Memory (cards are face down) and Dot Fives (card pairs sum to 5). If students are ready for a greater challenge, you can show them those games.
4. If students aren't ready for Match the Dot, you can let them play Hungry Numbers, or just play with the cards, or organize them into color piles.

Main Activity Prompts and Questions

- How do you know these two cards have the same dots?
- I'm going to pick this card. It has seven dots. Do you see a card that matches it?
- Are you sure those two cards are the same? Let's count them together.

Closer

Hold up an Orange 7 and Red 7. Ask students what counting strategies they could use to check for a match. These are both tricky suits to count. Emphasize ideas like holding a finger on the starting dot or trying to sweep methodically from left to right and up to down.

Closer Prompts and Questions

- How do you know if you over counted or under counted? How might you know if you missed a dot or double counted one?

Choice Time

- Pattern Block Fill-Ins
- Back and Forth (to 15)
- Blocks Free Play
- Challenge Problems

DAY 6	Opener	Main Activity	Closer	Choice Time

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

1.OA.5 Relate counting to addition and subtraction.

Materials: Counters (tiles, beans, pennies, etc), or paper, pencil, ten frames (optional).

Opener	**Guess My Number**	10 – 15 minutes
Main Activity	**1-2 Nim**	20 – 30 minutes
Closer	**Strategies for Nim**	5 – 10 minutes
Choice Time	• Match the Dots • Back and Forth (to 15) • Block Free Play • Challenge Problems	5 – 25 minutes

Standards Connections

MP2 | MP3 | MP5 | MP7 | MP8 | 1.OA.4

Guess My Number

Write the numbers from 1 to 10 on the board. Tell your students that you are going to think of a number from 1 to 10, and they will try to guess it in the fewest number of guesses possible. After every guess, you will tell them whether your number is greater or less than their guess.

1 2 3 4 5 6 7 8 9 10

Little do the students know that you haven't actually chosen a number. Instead, always make their guess turn out as poorly for them as possible. If they guess 8, your number is less than 8. If they guess 2, your number is greater than 2.

Plan to play 2 - 3 games. After the first game, introduce a tool for helping with strategy. Write down the numbers from 1 to 10. After each guess and your response, ask students if they know of any numbers that *can't* be your number. Cross those off from the list. This will help students begin to see the power of different guesses.

You can increase the range of numbers after each game, playing to 12, 15, or 20 instead of 10.

Prompts and Questions

- Talk to a neighbor about what you think the next guess should be, and why.
- How many numbers do you think that guess will cross out?

Tips for the Classroom

1. If kids make a bad guess, don't try to steer them toward a good guess right away. But you can ask the students after you write the guesses down which guesses were most helpful, or whether they would make a different guess if they could take it back.

2. Don't play for too long at one time. Two to three games is usually enough to get the kids mentally alert and ready for whatever is coming next.

1-2 Nim

Materials and Prep
Counters (tiles, beans, pennies, etc) or paper & pencil, ten frames (optional).

How to Play
Start with a pile of 10 counters. Players alternate removing counters from the pile. On your turn, choose whether to remove one or two counters from the pile. You must take at least one counter on your turn, but you may not take more than two. Whoever takes the last counter is the winner.

1-2 Nim is a game with a central question: Is there a perfect strategy that would allow you to win no matter what your opponent does?

Launch
Demonstrate playing 1-2 Nim with a student. Invite them to choose whether to go first or second. Narrate your choices and thinking as you play. If you happen to observe or know how to win this game, make sure not to reveal!

Work
Play 1-2 Nim in trios. Two players can play while the third observes. Then switch roles.

While the class plays, circulate and probe students' developing understanding of strategy for the game. Invite students to try to beat you in a game if they think they've got a way to do it.

Tips for the Classroom
1. Don't reveal this to students, but leaving your opponent with a multiple of 3 will guarantee your victory. The first insight toward this, that leaving them 3 will lead you to win, we call this "the three trap." It will likely students many games before they will arrive at this insight on their own.

2. For more challenge, change the size of the pile or play 1-2-3 Nim: taking one, two , or three per turn.

Launch Key Points

- Demonstrate and narrate the game until everyone understands and is excited to play.
- Verbalize your opponent's move and ask for advice about a next move.
- Clarify that every game played is an opportunity to learn. Students can expect to lose many times.
- Practice good sportsmanship in the demo games. For example, you could say, "Good game" after each game.

Prompts and Questions

- What move should I (the teacher) make?
- How did you/they/I win that game?
- What do you think your/my opponent will do if you/I take two counters?
- Would you like to take back your move?
- What have you noticed about this game?

Closer

Ask students what strategies they developed, or what theories they have about the game.

Take another volunteer who believes they can defeat you. Play as hard as you can against them. Narrate as you play and encourage them to articulate key moments in their strategy.

After a first game, ask students if they think they could beat you with a smaller number of counters. Take a challenger, and let them pick the size of the pile. Does anyone pick 1? 5? Whatever the size they choose, play them and try to win. The goal here is for students to try to figure out what starting number will allow them to win the game.

At some point today, students will likely have noticed they can win if they leave their opponent with three counters. Ask someone to convince the class that this is actually true. We call leaving your opponent with three counters "the three trap."

Prompts and Questions

- Did you find any strategy that helped you win 1-2 Nim?
- If you change the size of the pile, is there a number that you're certain you could win with (if you get to choose whether to go first or second)?

Choice Time

- Match the Dots
- Back and Forth (to 15)
- Block Free Play
- Challenge Problems

DAY 7	Opener	Main Activity	Closer	Choice Time

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

1.OA.5 Relate counting to addition and subtraction.

Materials: Connecting cubes,ten frames, square tiles, pencil, paper, ten frames (optional).

Opener	**Dot Talks**	10 – 15 minutes
Main Activity	**Handfuls of Cubes**	20 – 30 minutes
Closer	**Compare Handfuls**	5 – 10 minutes
Choice Time	• 1-2 Nim • Pattern Block Fill-Ins • Block Free Play • Challenge Problems	5 – 25 minutes

Standards Connections

MP6 | MP7 | 1.OA.1 | 1.NBT.2

Dot Talks

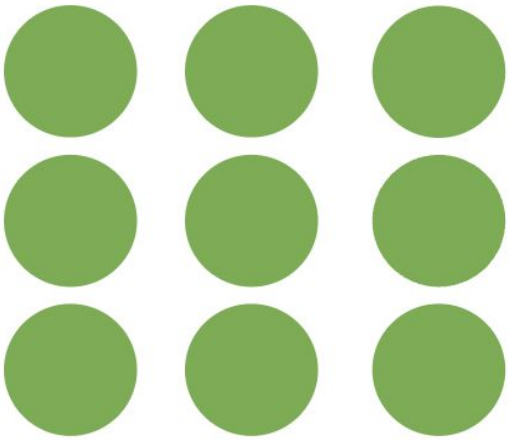
Project the first dot image on the board where all students can see it. Then ask students to figure out:

1. **How many dots there are**
2. **As many ways to count them as they can**

Students can think about the questions on their own first, and then share with a partner. Once students have had time to think the question through, lead a class discussion where students share their answers and approaches.

The key elements to these talks are a de-emphasis on speed and an added emphasis on process and communication. Expect some disagreements over the answers, and try to use those disagreements as a motivation for students to articulate their ideas to their classmates.

Once students have shared 3-5 approaches, move on to the second image.



Tips for the Classroom

1. Students will be looking to see if you indicate what the right answer is. Don't favor right answers over wrong ones. Make sure that the explanations are what matters.

2. Give students constructive language to use in the discussion, like, "I respectfully disagree, because..." and "I agree with _____, because..."

Prompts and Questions

- Who would like to defend this answer?
- I don't quite follow. Do you mean I should count this group first?
- How did you do that/know that?
- Does anyone else think they can explain what Shawn is saying?
- Turn to the person next to you and explain how you counted.

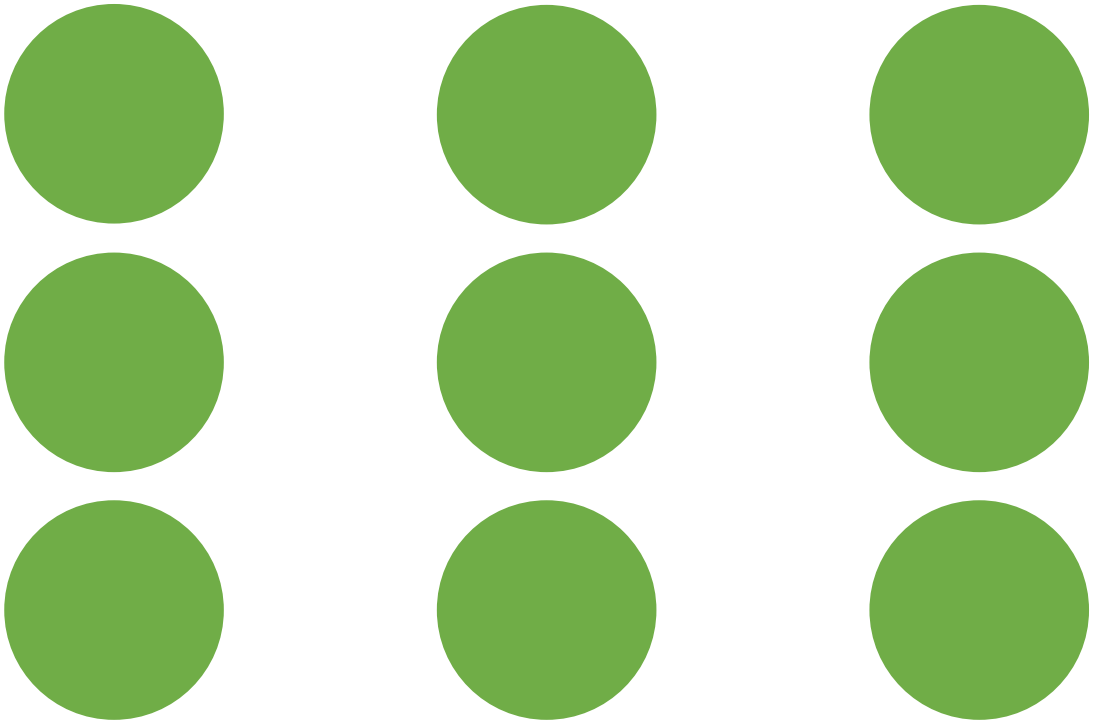


Image 1

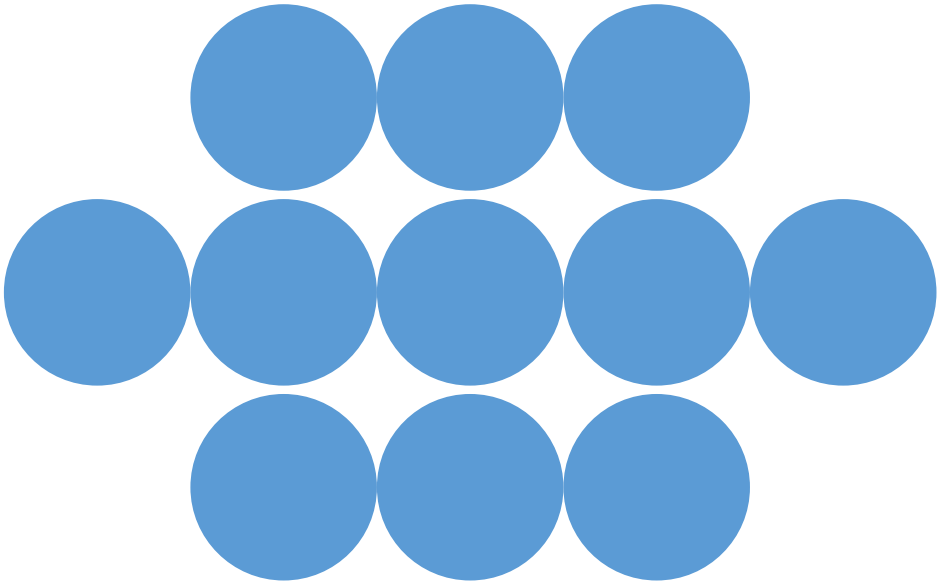


Image 2

Handfuls of Cubes

Materials and Prep
Bins of connecting cubes (make sure they are disconnected), ten frames, square tiles, pencil, paper, ten frames (optional).

Motivating Question
How many cubes can you grab in one handful?

Launch
Ask for a volunteer. Their goal is to predict how many cubes they can grab in one handful. Write their prediction down together, then let them reach into a bin of cubes with one hand and pull out as large a handful as they can.

Before counting, ask the student if they think their guess is above, below, or the same as what they actually grabbed. Then, using a ten frame, count the number they actually got, and write that number down, too. Ask which number is bigger, their first estimate or the actual count. Repeat with a second volunteer to make the activity clear.

Once everyone understands the activity, send students work.

Work
Students work in pairs around the room to estimate, grab a handful, count, and record. Encourage students to examine their estimations in relation to their actual counts. If students are ready, ask if they can find the difference between their prediction and the actual number of cubes they grabbed.

Once students have had some chances to see the range of possibilities they can grab, gather the class together, choose another volunteer, and repeat the activity, but this time, the question is how many cubes they can grab using *two* hands. Will their predictions take into account how many they grabbed with just one hand? How?

Tips for the Classroom
1. Note that there are two opportunities for making a prediction: before grabbing the cubes, and after grabbing the cubes but before counting. Attending to both will help students hone their estimation skill for this activity.

2. If students are ready for greater challenges, have them pair up asking how many cubes/tiles can two students grab together.

3. Another excellent way to extend this activity is to try grabbing other materials of varying sizes. How many erasers, paper clips, etc., can students grab in one or two hands?

Launch Key Points
- Students should understand the steps: make a prediction, write it down, grab the cubes, revise their prediction, count the cubes, and compare the count to the prediction.
- To make sure everyone understands all the steps in the activity, have two different students demonstrate.

Prompts and Questions
- How many did you get last time? How many do you think you'll get this time?
- How are you counting cubes?
- Let's count them together.
- I bet they would be easier to count if they were straightened up. Let's organize them in a row/on a ten frame.
- How much was your prediction off by?

Closer

Ask students how accurate their predictions were, and whether they improved with practice. Ask them whether their predictions tended be larger than the number of cubes or smaller than the number of cubes.

Use this as a bridge to introduce a new mathematical symbol: ">". Explain how it is used to compare numbers that are greater or smaller than each other.

Go through the steps of the activity, but at the end, write an expression using the symbol to compare your estimate to the actual count. Then repeat with a student.

Prompts and Questions

- This symbol ">" is used to compare numbers that are greater or smaller than each other.
- Which number is greater, the prediction or the number grabbed?

Choice Time

- 1-2 Nim
- Pattern Block Fill-Ins
- Block Free Play
- Challenge Problems

Overview

Focus Standards

MP1 Make sense of problems and persevere in solving them.

K.CC.5 Count to answer "how many" questions about as many as 20 objects in various configurations.

Materials: Tiny Polka Dot cards.

Opener	**Choral Counting**	10 – 15 minutes
Main Activity	**Dot Memory**	20 – 30 minutes
Closer	**Counting Arrangements**	5 – 10 minutes
Choice Time	• 1-2 Nim • Pattern Block Fill-Ins • Block Free Play • Challenge Problems	5 – 25 minutes

Standards Connections

MP6 | MP7 | K.CC.4

Choral Counting

Choral counting is an incredibly powerful activity for building numeracy. Students practice counting forward, backward, skip counting, and — critically — looking for patterns.

Step 1. Tell students you'll **start at 14 and count by 1s until you reach 35**.
Step 2. The students' job is to predict to themselves what each next number will be as you write it, and to count along with you.
Step 3. Start writing out the numbers. Do this slowly, so students have time to think of what might come next. Ask them to say each number with you as you write it. For today, write the numbers in **two columns of two.** Pause after writing 25 and ask students if they are noticing any patterns in the chart.
Step 3. Once you've written out the whole sequence, recount the numbers together as a class.
Step 4. Ask students to share what they notice about the number sequence. Write down their observations.

14	15
16	17
18	19
20	21
22	23
24	25
26	27
28	29
30	31
32	33
34	35

Prompts and Questions

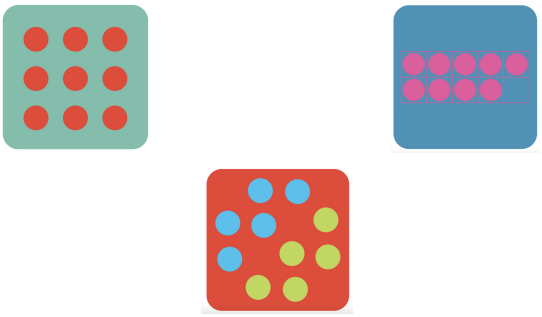
- Try to predict what I'll write next.
- Let's count all the numbers together.
- Take a moment to look at these numbers. What do you notice?
- What do you wonder about these numbers, that you might not know yet?

Tips for the Classroom

1. There may be some very interesting patterns that emerge in the chart. Some may be correct, some incorrect. Most important is to write students' comments down as clearly as you can, making notes/circles/arrows on the numbers if that helps.

2. Students might comment on first digits, last digits, digit sums, columns, rows, diagonals, or any other pattern. Prepare to be surprised!

Dot Memory



Materials and Prep
Tiny Polka Dot cards

How to Play
Use 2 complete suits, from 0 to 10. Arrange cards face down in rows. Players take turns flipping up 2 cards at a time. If the cards have the same numbers, keep them. If not, turn them back face down. The winner is the player with the most cards at the end.

Launch
Choose a volunteer for a demonstration game, and explain the rules while you demonstrate play. Choose two suits, mix them up and deal them out face down in a grid. Then begin playing.

Play the Demo game until everyone in the class is clear on the rules–you probably won't need to play the whole game. Then let students play each other in pairs or trios.

Work
Circulate to support students as they play. You can adjust the suits students play with so they're using different representations of numbers between games.

Tips for the Classroom
1. The game is more fun if you're using an even number of suits, so every card gets taken in the end.
2. For a greater challenge, play Dot Fives, where the pairs of cards sum to 5.
3. If students aren't ready for Dot Memory, play Match the Dots with cards arranged face up.

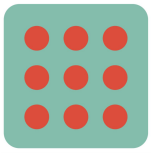
Launch Key Points
- This should go quickly, since many students will be familiar with some version of memory already.
- Demonstrate several different strategies for counting the dots on your cards, and emphasize ways to make sure you count accurately (holding a finger on the starting dot, counting in an organized way, etc).

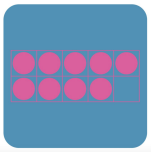
Prompts and Questions
- How do you know those two cards have the same number of dots?
- I have a card with six dots. Have you seen a card that matches it?
- Are you sure those two cards are the same? Let's count together.

Closer

Share two Dot cards with nine dots in different arrangements, and one Dot card with ten dots. Ask students which two cards have the same number.

Let students think on their own, and then share which two cards have the same number and how they counted/added the dots.





Prompts and Questions

- How did you count or add?
- If you use a different strategy to add, will you get the same totals?

Choice Time

- 1-2 Nim
- Pattern Block Fill-Ins
- Block Free Play
- Challenge Problems