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Community Math Night Facilitators' Toolkit

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Community Math Night Facilitators' Toolkit

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The Community Math Night Facilitators' Toolkit is a detailed resource for elementary school educators to plan and implement a Community Math Night event. Community Math Nights use interactive math activities to engage families in building positive math attitudes, facilitate their participation in children's learning in grades K–5, and build a community of educators, students, families, and other caring adults. This toolkit includes planning and organizational resources, research findings on community engagement and math instruction strategies, and step-by-step instructions and printable materials for the interactive activities. It also includes a workbook that can be used as a professional learning resource on key math-learning research findings and how to apply them in practice.

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Purpose

Mastery of early math concepts is associated with such later achievements as middle school grades, high school graduation, and career opportunities (Garcia & Weiss, 2017). A Community Math Night—a two-hour extracurricular family engagement event—brings together educators, students, and their family members and caregivers to learn about, talk about, and have fun with math. At a math night, educators can reinforce positive math mindsets, help family members participate in their child's learning, and build a sense of community and partnership around math learning. The Community Math Night program helps schools and communities create a shared understanding of math concepts and raise expectations for math knowledge and achievement, both of which promote children's success in school (DeFlorio & Beliakoff, 2015).

Through purposeful planning, school and community leaders can leverage the Community Math Night program as one element of their approach to creating an environment brimming with excitement for math learning and supporting positive outcomes for all learners. The math night includes activities for students in K–1, 2–3, and 4–5 grade bands that reflect math standards from the National Council of Teachers of Mathematics,[1] Common Core State Standards,[2] and American Education Reaches Out (AERO) Common Core Plus Math Standards.[3]

The activities are organized into four math stations, where families rotate through and participate in a mix of age-appropriate activities. Participation can equip families and caregivers to support their children's cognitive development. The math night can also build and strengthen relationships among educators, children, their family members, and ideally, members of the broader school community who can support the Community Math Night program and communitywide efforts to strengthen elementary school students' success in rigorous and relevant math. This toolkit includes all the resources needed to host a math night—from learning, to planning, to leading an event.

Exhibit 1 presents an overview of key math night components, which include:

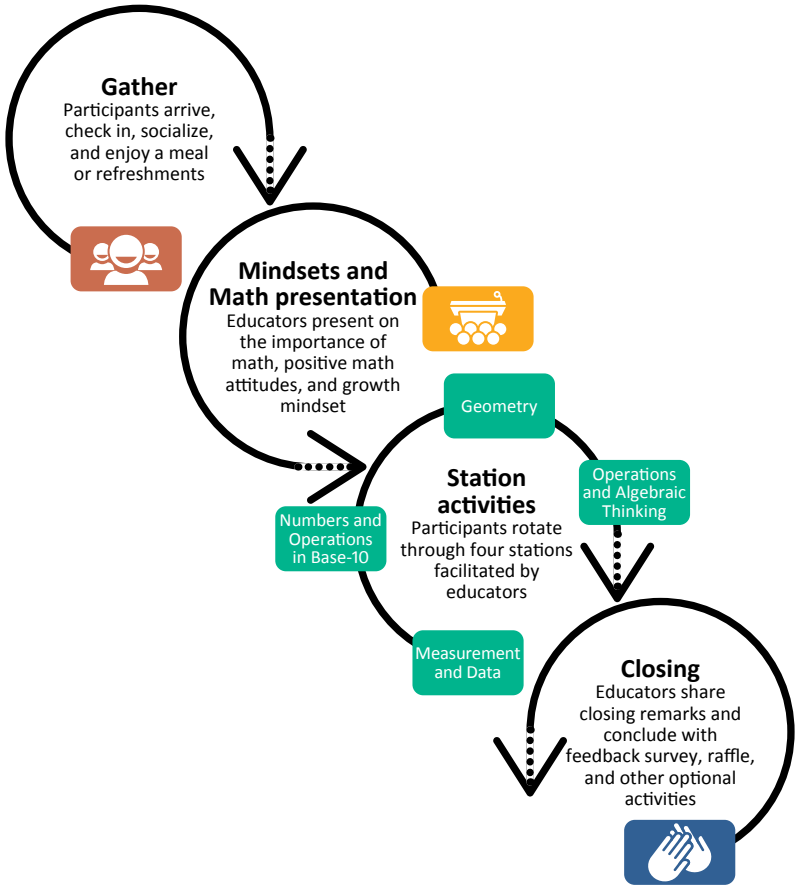
- A gathering activity, such as sharing a meal or refreshments, to build community and incentivize attendance by meeting a practical need for busy families.
- Mindsets and Math, a presentation on the importance of having a strong foundation in math and on how families, caregivers, and educators can support children's math success.
- Ten math activities divided into four stations, each focused on an overarching topic and offering activities or games differentiated by grade level. Participants rotate through all four stations.
- A closing session that might include a raffle to incentivize attendance and participation and provide time to elicit feedback about the experience.

1. The National Council of Teachers of Mathematics Principles and Standards and related resources are available at https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/.
2. To download the Common Core Mathematics Standards by grade and by domain, visit http://www.corestandards.org/Math/.
3. For information on the AERO Common Core Plus Math Standards, visit http://www.projectaero.org/.

With the resources provided, the users of this toolkit will:

- Learn key research underpinning the design of the Community Math Night program and reflect on how the research can be applied to their practice.
- Plan a math night with the help of templates, tools, checklists, and other practical resources.
- Lead a successful math night that includes opportunities for community building; discussion of key research on the importance of math, positive math attitudes, and growth mindset (the belief that people can increase their abilities through hard work and persistence); and engagement with grade-differentiated math station activities that build confidence and rapport among educators, students, families, and caregivers.

Exhibit 1. Key components of a Community Math Night



Toolkit overview

Imagine a school where math learning is characterized by rich experiences with math that promote high-level thinking rather than formulaic instruction. Further, imagine educators passionate about the possibility of changing students', parents', and even some of their own colleagues' minds about what math is and the importance of math in children's education.

What is involved

This toolkit is designed to empower teachers and supportive colleagues to plan and lead a Community Math Night program that demonstrates the power of partnership among schools, students, families, and caregivers. Research affirms that families are potent forces in children's lives (Harris et al., 2017; Weiss et al., 2009), and this toolkit aims to help schools put the research findings into practice by engaging families and caregivers in evidence-based practices. The toolkit also includes suggestions for involving the broader community in planning and executing a math night, giving the entire community a role to play in supporting positive interactions among students, families, caregivers, and educators and creating an opportunity for relationship- and community-building as well.

A Community Math Night is designed to help students embrace a positive attitude and a growth mindset about their math abilities and enjoy spending a few hours in rich, engaging, and relevant math activities that reflect evidence-based practices.[4] Ideally, the math night is not a "one-and-done" event but one element in a growing, evolving plan to achieve broader school goals. The math night can be a vehicle to build enthusiasm for math and family connections when held at regular intervals (once a year or semester). This toolkit includes strategies for gathering feedback to ensure that the Community Math Night program continuously improves to meet the needs of students and their families. The Bring it all together section of the toolkit includes additional tips and advice for collecting and incorporating feedback on the math night for planning future events and expanding family engagement efforts.

Teachers, school administrators, math specialists, and department or grade-level leads are the most likely users of this toolkit, although others with a vision for math and community engagement will find elements of it to be useful.

This *Community Math Night Facilitators' Toolkit* provides the background information, planning resources, instructions, and most of the materials needed to lead a math night at an elementary school for grades K–5.[5] Users should plan to begin the toolkit activities at least eight weeks before the desired date of the math night event.

4. The Community Math Night Professional Learning Workbook (appendix A) outlines the three key evidence-based practices underpinning math station activities in the effective practices for math instruction in elementary school section.
5. While this toolkit is designed for a K–5 elementary school, it could be adapted for a school with a different grade configuration. For example, in a K–2 school, teachers could use the activities designed for students at those grade levels only (K–1 and 2–3 grade bands) and omit the activities for students in the 4–5 grade band. If the school includes grades beyond K–5 (for example, preK or grade 6–8), additional activities could be incorporated into the math night.

The toolkit includes:

- Resources to support educators in understanding and reflecting on key research underlying the reasons why math, mindsets, families, and evidence-based instructional practices are key building blocks in supporting all learners' success. These resources will ensure a solid understanding of the big "whys" before leading a math night (in Section 1–Learn and appendix A). Exhibit 2 summarizes the three main sections of the toolkit.
- A step-by-step planning guide for the event logistics (in Section 2–Plan).
- Interactive, skill-building math activities across the K–5 grade span, reflective of typical grade content and practice standards (in Section 3–Lead).
- Other helpful resources, such as a budgeting tool, sample agenda, registration template, and more (appendixes B–I).

Exhibit 2. The three sections of the toolkit

Section 1–Learn

Provides background information and resources on essential ideas that are fundamental to holding a Community Math Night. Includes key research on the importance of math, as well as strategies for family engagement, development of growth mindset and positive math attitudes among students and families, and high-quality math instruction. (The Community Math Night Professional Learning Workbook in appendix A provides opportunities to reflect with colleagues on the research and apply research findings to practice.) Section 1–Learn also provides tips for reviewing and practicing the math night activities.

Ideally, the core planning team should plan to devote approximately six to eight hours to professional learning in this section. If time is short, teams should, at minimum, read and discuss the four research roundups.

Section 2–Plan

Helps school teams plan the math night. Includes resources to support logistical planning, considerations for engaging diverse partners and participants, and ideas for continuing family and community engagement beyond a math night event.

To fully coordinate with community partners and provide ample notice to families, Section 2–Plan will take approximately one to two hours per week for at least eight weeks to accomplish, and it can overlap with completion of Section 1–Learn.

Section 3–Lead

Contains the math night activities for families and children in grades K–5, accompanying instructions, and guidance to implement the core components of the Community Math Night program. The activities are designed to enrich, rather than replace, classroom instruction.

Section 3–Lead will be used on the night of the event and can be completed in about four hours, including setup and breakdown.

Who is involved

Forming a core planning team of four or more individuals can improve the success of the Community Math Night program. The core planning team is responsible for leading the planning and implementation of the event, while recognizing that it takes a village to make it happen.

The core planning team has the following responsibilities:

- Thoughtfully planning the math night activities based on student readiness, learning expectations, and family needs.
- Identifying and eliciting community support for the math night, which might include financial supports (for example, for the dinner or supplemental materials) and time from volunteers (for example, to set up and clean up).
- Scheduling the math night and coordinating the facilities and materials.
- Creating an awareness and communications campaign.
- Inviting all families, addressing potential barriers to participation, and designing the event to be culturally and linguistically inclusive.
- Facilitating the Mindsets and Math presentation and the 10 activities at the four math stations during the math night.
- Encouraging student, family, and community engagement in math activities after the event.

The Community Math Night **core planning team** consists of four or more individuals committed to planning and implementing an inclusive math night aligned to the needs of their school community. The planning team can use this toolkit to guide their own learning (Section 1–Learn and workbook), plan their school's math night (Section 2–Plan), and lead their school's math night (Section 3–Lead). Throughout the process the core planning team can identify and engage other school and community members to provide additional support for the CMN.

To be successful, the team will need to recruit other members of the school and community to help in many areas, from marketing the event to setting up and cleaning up. Exhibit 3 provides an overview of the groups that will help plan and execute the math night: the core planning team, other school staff, community stakeholders, and volunteers. Other school staff will help the core planning team organize and implement the event. Community stakeholders will help fund and promote the event.[6] Volunteers will lend a hand on the day of the event. This toolkit references these groups and describes their roles at different points in event planning.

To maximize the value of this toolkit and the Community Math Night program, core planning team members should be cognizant of state and local math standards for grades K–5, as well as the community context and school system resources. To facilitate connections, core

6. Many districts and schools have a specific process for screening and vetting school volunteers. Be sure to research and follow school and district guidelines when recruiting volunteers for the math night.

Exhibit 3. Community Math Night (CMN) planning roles

CMN core planning team	Other school staff
• Learn about the research and practice the activities • Plan CMN • Lead CMN	• Support CMN planning • Help implement CMN
Community stakeholders	**Volunteers**
• Help fund and promote CMN	• Help implement CMN

planning team members should be familiar with major local employers and business and nonprofit partners. Most important, core planning team members should know the characteristics of their students and families so as to design an event that reduces barriers and maximizes opportunities. For example, it would be helpful to have demographic information about students, such as racial/ethnic identity, multilingual fluency, immigrant or migrant status, eligibility for the National School Lunch Program, whether living in an intergenerational context or in foster care, and whether identified with specific learning disabilities or giftedness in math.

Core team members do not necessarily need prior experience hosting community or family engagement activities, but they should be prepared to welcome everyone in the school community and make the math night broadly accessible. This might include scaffolding and modifying activities for students with cognitive disabilities or translating for families who exclusively speak languages other than English.

Consider including educators or other school staff, family leaders, and community members who represent different grade levels and backgrounds on the core planning team so that planning reflects the needs and priorities of all learners and families. If the school has a math specialist, social worker, school counselor, or a family engagement specialist, try to include that individual on the core planning team. Ideally, include school leaders on the core planning team; at a minimum the core planning team should ensure that school leaders are well-informed and supportive of the plans for the Community Math Night program.

Ideally, the core planning team members would start with their own learning (Section 1–Learn) and then lead the planning and hosting activities as described in the toolkit. It is optimal to start practicing and planning the math night at least eight weeks before the event date. Core planning team members should expect to commit one to two hours a week to the Community Math Night program. Section 2–Plan provides more information about a suggested timeline for planning.

Section 1–Learn Understanding the Why and What of Community Math Nights

A Community Math Night brings educators, students, and their families and caregivers together to engage in entertaining, evidence-based math activities and create positive math experiences. These events invite all three stakeholder groups to see themselves as "math people" and thus help disrupt math phobias and anxiety and any negative messaging and mindsets around math.

The first step in planning an event is for the core planning team to learn about "why" math, mindsets, families, and evidence-based instruction together support success for all learners and to start practicing the "what" of activities designed to engage families in evidence-based math learning and build positive attitudes and growth mindset (the belief that people can increase their abilities through hard work and persistence). The learning phase involves reading and reflecting on relevant research and its application to classroom practice, as well as practicing the math station activities. While the resources in this section of the toolkit were designed for use by professional educators, all stakeholders can engage with the materials at their level of interest.

The Community Math Night Professional Learning Workbook in appendix A is an extensive resource to build knowledge and familiarity with the Community Math Night program content and activities. Using the workbook, the members of the core planning team will:

- Read and reflect on important research about the four key topics underlying the Community Math Night program.
- Review and practice the math night activities.

Read and reflect on the research

Understanding the research foundations for the Community Math Night program supports core planning team members' buy-in, increases their confidence when implementing the math night activities, and helps them connect the activities to their own beliefs and practice, which in turn, can strengthen their work with students and families beyond the event. The four topics that form the research base behind the Community Math Night program are:

- The importance of learning math for future success.
- Supporting equitable family engagement in math.
- Building a growth mindset and positive math attitudes.
- Effective practices for math instruction in elementary school.

Review exhibits 4 and 5 and preview the professional learning this toolkit offers. Exhibit 4 gives a high-level overview of the research behind the Community Math Night program, and exhibit 5 explains how the research is integrated into math night activities. Review and discuss these exhibits together with the core planning team and school leaders to build buy-in for the Community Math Night program. Then use the Community Math Night Professional Learning Workbook in appendix A for further professional learning on the research, with examples of how to apply the research in practice and questions that prompt reflection on related teaching practice. For each topic the workbook includes a curated list of additional resources for deeper study.

Consider devoting at least 30 minutes to review and discuss each of the four topics, for a total of 120 minutes. Keep the conversation productive by focusing on research and strategies that inform future progress. After the core planning team fully engages with the workbook, come back to the next part of Section 1–Learn, Review and practice Community Math Night activities.

Exhibit 4. Community Math Night foundations

Math, Mindset, and Family

The foundations for a Community Math Night

Math

Math education is critical

An early emphasis on math learning is one way to set children up for future success in school and life. Math skill mastery at an early age is a strong predictor of later achievement in math and other subjects. Student learning is greatest when activities and tasks encourage high-level thinking.

The Community Math Night (CMN) Mindsets and Math presentation highlights that math learning is critical for putting children on the path to success. The math station activities integrate evidence-based practices and include prompts for participants to encourage high-level thinking. *(Classens & Engel, 2013; Siegler et al., 2012)*

Mindset

Positive attitudes and a growth mindset can support math learning

Students who believe that they can be successful in math are more likely to put in effort, even when they struggle, and this can result in better performance. Adults can promote math learning by normalizing feelings about math, modeling positive math attitudes, and supporting development of a growth mindset.

The CMN Mindsets and Math presentation shares strategies for promoting positive math attitudes and a growth mindset, and the math activities foster engagement in math and support adults in positively participating in math teaching and learning. *(Epstein et al., 2018; Blackwell et al., 2007; Boaler, 2015; Dweck, 2008; Gunderson et al., 2018; Ma, 1997)*

Family

Families are essential partners

Family involvement is a strong predictor of school success, particularly for literacy and math skills. Well-designed parent-family-community partnerships that involve parents and family members in their children's learning are associated with increased student self-confidence and achievement generally and in math specifically.

The CMN is designed to be a welcoming and engaging opportunity for families—including all adult caregivers who make a difference in a child's life—to engage with educators, experience hands-on math learning, and build their capacity to support their child. Families are provided prompts and support from educators to engage in math learning in a low-stress, fun environment.

(Harris et al., 2017; U.S. Department of Health and Human Services, 2018; Weiss et al., 2009; Van Voorhis et al., 2013)

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Exhibit 5. Community Math Night evidence-based practices and application

Community Math Night station activities incorporate evidence-based instructional practices for learning math	
Instructional practice	**Research and Community Math Night application**
Real-world relevance Incorporate learning activities that build on what students know from everyday experiences to advance student acquisition of math concepts and skills.	Research shows that when math activities present problems or tasks in contexts that are personally and socially meaningful to students, such math activities can engage students, generate interest and curiosity, and build positive math attitudes (Clements, 2013; Frye et al., 2013). The Community Math Night incorporates activities such as games, distance measurements, and a simulated restaurant visit to help students connect math to everyday experiences.
Progression along a concrete–representational–abstract continuum Implement a three-step learning progression to help students solidify their understanding of math concepts.	Concrete–representational–abstract teaching methods for modeling math concepts start with concrete materials or manipulatives, progress to student-drawn representations, and then transition to number and symbol representations (Steedly et al., 2008). Manipulatives help children think and reason in meaningful ways and support interconnected understandings of math concepts (Stein & Bovalino, 2001). Math night activities incorporate pattern blocks, base-10 blocks, and familiar hands-on materials such as playing cards and string to help students visualize math concepts.
Development of fluency to support algebraic and higher-order mathematical thinking Build both conceptual and procedural fluency to help students gain the skill and experience needed to solve multistep and complex problems.	When discussing algebraic and higher-order mathematical thinking, researchers reference two types of fluency: conceptual and procedural. Conceptual fluency includes an understanding of place value and the relationships between the four math operations (Hiebert, 1984). Procedural fluency refers to the ability to apply math operations accurately, efficiently, and flexibly (National Council of Teachers of Mathematics, 2014). Conceptual and procedural fluency extend beyond speed and automaticity of basic facts and apply to all strands of math. Math night activities support development of both types of fluency by practicing math skills and applying math concepts in fun-filled ways.

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Review and practice Community Math Night activities

After building an understanding of the research underlying the Community Math Night program, the core planning team is ready to review and practice the math night activities, which were designed for a wide audience, using several sets of national standards. As part of the review process, the core planning team should consider any adaptations that might be necessary to ensure that the math night reflects the local context (local standards, culture, needs, and so on).

The math night activities include:

- The Mindsets and Math presentation, to kick off the event.
- Ten math activities divided into four stations. Each station focuses on one overarching math topic—Geometry, Operations and Algebraic Thinking, Numbers and Operations in Base-10, and Measurement and Data—and offers activities or prompts differentiated by grade level.
- An overview of activities and background information, including math standards, for each station.

To get started, the core planning team should spend time exploring the Mindsets and Math presentation and math station activities and materials. Schedule about two hours for all core planning team members to come together to practice working through the activities. Consider assigning one team member to lead the presentation and one to lead each station activity. The team might also want to assign a backup facilitator for each station activity. Each team member would then be responsible for preparing the station materials and leading the core planning team through the background information and learning goals and having the team practice each activity together. Team members should plan to spend 20–25 minutes on each math station activity to prepare materials and set up the stations. The amount of time needed to prepare each station will depend on the activities for that station. Preparation time will also depend on which materials are readily available and which materials have to be procured or created. Section 3–Lead contains the activity instructions, prompts, and facilitator guidance to help guide planning.

When practicing the math night activities, consider assigning team members to assume the perspectives of different participants, such as facilitator, family member, and student, to anticipate needs and brainstorm potential adaptations. If the core planning team includes family and student leaders, they might be able to provide some of this feedback; additionally, these prompts can help other team members consider the activities from these new perspectives as well:

- **Facilitator perspective:** consider what is needed to facilitate the activity. This might include support from additional volunteers or equipment, such as a table and chairs.
- **Family perspective:** consider what questions or concerns family members might have while engaging in this activity. Will they feel comfortable? Are they able to actively engage?

- **Student perspective:** consider whether the activity is fun and accessible given local students' levels of math proficiency. This might include looking for opportunities to differentiate levels of difficulty within activities or adding an extra challenge or element of competition.

After listening to the presentation and practicing each activity together, the core planning team should discuss potential adaptations or revisions to the activities. The facilitator notes include suggested scaffolding and challenges to support instructional differentiation; additional revisions might address student readiness, meeting state or local standards, strengthening alignment with typical classroom learning activities, or cultural responsiveness (see exhibit 6 for suggestions). You might also consider supplementing the activities to make them your own—or to make them speak to the context of your community. For example, a local community member could connect the concepts in the How Many of Me? station to the way measurements are used in his or her job.

Once the core planning team members decide who will lead each math activity station during the math night and who will be the backup facilitator, the core planning team should practice the activities several times. In this way, school staff on the core planning team will feel comfortable facilitating the station activities and answering questions that families might pose about the content.

It is optimal to start practicing and planning the math night at least eight weeks before the event date. All core planning team members should commit one to two hours a week to organizing the Community Math Night program and practicing the activities.

Exhibit 6. Review Community Math Night activities with a cultural lens

Consider reviewing each activity with a cultural lens.

Integrate examples and content from students' cultures. For example, Magic Squares are logic puzzles derived from the Chinese game Lo-Shu. If this is culturally relevant for your students, consider adding this as a bonus or take-home activity from one of the math night stations such as Operations and Algebraic Thinking. Oware is an African board game that promotes abstract reasoning. Consider having it available for families to play as they finish dinner or wait for formal activities to begin.

Help families develop positive attitudes about math and their racial/ethnic or cultural background. Consider integrating explicit examples of contributions and achievements in math by underrepresented groups in your Mindsets and Math presentation. For example, you can highlight work by Dorothy Vaughan, one of the women featured in the book and film *Hidden Figures*. Vaughan was an African American mathematician who did pioneering work on calculating flight paths and later taught herself and others computer programming to prepare for transitions in technology.

Promote equity by providing opportunities for families to share their own strategies and methods. The math station activities and family prompts provide opportunities for participants to discuss their thinking and how they problem solve. Consider how facilitators can best encourage families to participate and feel comfortable talking about math.

Source: Stemm, 2010.

Section 2–Plan
Get ready for your Community Math Night

This section of the toolkit focuses on plans for implementing a Community Math Night program, including logistics.

The section is organized around five planning milestones from start to finish (exhibit 7). Each stage includes guidance for planning the math night—including the people (who), tasks (what), location (where), and timing of activities (when)—to make the event successful. (See appendix C for the Community Math Night Action Planning Template, which aligns to the timetable in exhibit 7 and can be adapted and used during planning.)

Planning the math night can be fun and engaging. However, to reduce the stress of organizing the event, allow at least eight weeks of planning time. If the team is on a shorter timeline, pay close attention to the resources you have and prioritize your planning based on your event goals. For example, the team will want to prioritize plans for the math station activities over efforts to secure raffle prizes or to decorate the event space. Be prepared to be flexible with the schedule, and plan for contingencies. Allow extra time, if possible, for unexpected delays. Exhibit 8 summarizes key tasks for each planning stage.

Exhibit 7. Community Math Night planning timetable

Exhibit 8. Overview of Community Math Night planning stages

Who? The core planning team should use the toolkit to plan the Community Math Night and engage key stakeholders, including other school staff, community partners, and volunteers.

When and where? Start planning the math night about eight weeks before the event, and follow the timeline for each planning stage. Set aside time (one to two hours a week) and space to plan for a successful math night in a way that makes the most sense for the core planning team. If the planning team members already meet regularly (such as in department or committee meetings), consider repurposing some time for Community Math Night planning. For engaging others outside the core planning team, consider getting on the agenda of upcoming parent–teacher association or community–school advisory meetings.

What? Key tasks are shown here; more details are provided in the section that follows in the text.

Lay the foundation—8 weeks out

- ☐ Determine goals and strategies
- ☐ Select and confirm event date and time
- ☐ Review Community Math Night At-A-Glance
- ☐ Address possible barriers to participation
- ☐ Develop the initial budget
- ☐ Plan and coordinate refreshments

Coordinate personnel and resources—6 weeks out

- ☐ Confirm the event location, and begin to plan the event space
- ☐ Confirm the agenda, and plan for station activities
- ☐ Recruit volunteers
- ☐ Plan for translation needs
- ☐ Assess available materials for math station activities
- ☐ Set up event registration

Promote enthusiasm and participation—4 weeks out

- ☐ Develop your communications plan
- ☐ Create materials to get the word out
- ☐ Plan for inclusion and diversity
- ☐ Include digital and social media content
- ☐ Involve students
- ☐ Revisit the communications plan

Bring it all together—2 weeks out through day of event

Key tasks: 2 weeks out

- ☐ Stay organized
- ☐ Finalize your plan for the event space
- ☐ Practice math night activities
- ☐ Plan for collecting feedback
- ☐ Consider purchasing thank you gifts for volunteers

Key tasks: Day of event

- ☐ Set up
- ☐ Kick off and implement
- ☐ Tear down

Build on your success—within 1 week after the event

- ☐ Reflect as a team
- ☐ Build on your momentum

8 weeks out

Lay the foundation for a successful Community Math Night

At this stage in the planning, you will lay the groundwork for implementing the Community Math Night by setting goals and strategies for the event, developing a budget, and performing other critical tasks. Review exhibit 9 to help you get started.

Exhibit 9. Lay the foundation

Key tasks

- ☐ Determine goals and strategies.
- ☐ Select and confirm event date and time.
- ☐ Review Community Math Night At-A-Glance.
- ☐ Address possible barriers to participation.
- ☐ Develop the initial budget.
- ☐ Plan and coordinate refreshments.

Who

In the early stages of planning the math night, be sure to engage your school leaders. Discuss how school leaders can best support the event, including by participating on the core planning team. See exhibit 10 for ways school leaders can support the Community Math Night program.

Community Math Night core planning team

A group of four or more educators with knowledge of math standards and the school community should commit to leading the planning and implementation of the math night, with participation or endorsement from school leadership. The group also could include a family leader or other community representative, though the learning resources in the toolkit are designed specifically for professional educators.

Exhibit 10. How school leaders can support a Community Math Night

- Ensure that the event aligns with broader, schoolwide family engagement plans and strategies.
- Join the Community Math Night core planning team.
- Identify community partners.
- Communicate to community partners the critical role of families in supporting student math development.
- Promote the event to families.

Other school staff

You will likely need to engage additional educators and school staff to help execute specific aspects of your math night, including people who can reserve facility space, use technology and schoolwide messaging applications, and operate audiovisual equipment. These people can help with initial planning and support activities on the day of the event.

Community stakeholders

Consider possible roles for community stakeholders, such as donating food or raffle prizes, serving as trusted messengers to target populations, and broadly promoting the event. Think creatively about how to engage these groups throughout the lead-up to and during the event. For example, local restaurants donating food might also provide guest speakers to share details on how they use math in ordering supplies or developing a recipe. Reach out to these groups early in the planning process and build in ongoing checkpoints to keep them informed of new developments, such as changes in schedule or number of expected participants. See exhibit 11 for a sample email to contact a potential community partner for a donation.

Volunteers

At this early stage it is helpful for the core planning team to anticipate any additional support that might be needed at different phases of the event. For example, the team is likely to need help serving refreshments or cleaning up afterward. Taking time to map out those needs early on and engage volunteers will avoid last-minute scrambling or overworking the core planning team. Start thinking about how to recruit diverse staff or volunteers to help develop appropriate information materials for different groups in your school community.

Exhibit 11. Sample email soliciting a community partner donation

Greetings from <Name> Elementary School!

I hope this email finds you well at <Name of business>. We are planning a Community Math Night in March with the goal of connecting teachers, students, and family members around a shared meal and hands-on, fun math activities to promote positive math attitudes. We know that our community partners share our school's commitment to the importance of math, and we brainstormed some ways you might consider supporting this event:

- Speaking to students about how you use math in your day-to-day work.
- Providing food or meal-related supplies.
- Contributing a tax-deductible monetary donation.

We plan to recognize all of our community partners with an acknowledgement on the family handouts as a token of thanks. We appreciate your considering the opportunity for collaboration and hope to hear from you.

Sincerely,
<Name> on behalf of the <school name>'s Community Math Night Core Planning Team
<share multiple means of contact information>

What

Determine goals and strategies

After reviewing the research, the core planning team should clearly articulate goals, strategies, and outcomes for the math night. These goals, strategies, and outcomes should be well aligned so that they can be used to measure the event's success. Additionally, the goals should clearly align with broader school improvement goals.

To develop event goals, the team can integrate lessons from research discussed in appendix A that align with the needs of students and families in the local community. For example, in addition to setting attendance goals (number or percentage of students and families), you might want to specifically engage families that do not typically attend school events or to encourage families to actively participate at math station activities, rather than just observe.

The Community Math Night Action Planning Template in appendix C will help you document your goals and strategies and start your planning. Identifying goals and strategies for your math night can help the core planning team establish priorities for the event as a basis for making decisions if there are limited resources and time to plan and host the event (for example, planning for math stations is more important than securing raffle donations).

Now is also a good time to decide how to determine whether you have met your intended outcomes. One way to do this is an exit ticket that asks families a few questions to reflect on their experience. More information on developing an exit ticket and getting feedback on your event is in the Bring it all together section. Exhibit 12 contains example goals, strategies, success metrics, and outcomes.

Exhibit 12. Example Community Math Night goals, strategies, success metrics, and outcomes

Goal: Engage English learner students' families who do not traditionally attend school events.

Strategy: Teachers make personalized invitations for families and share Community Math Night flyers with community partners, students perform math song after meal, and school leaders raffle prizes.

Success metric: Registration and attendance data.

Outcomes: All English learner students' families will receive a personalized phone call from a teacher inviting them to the math night, 80 percent will register, and 65 percent will attend the event.

Goal: Encourage families to participate at math station activities, rather than just observe.

Strategy: Give family members a raffle ticket that becomes a valid raffle entry after every station is stamped. Families earn stamps by participating in a station activity.

Success metric: Count of stamps on raffle tickets or count of engaged visitors at each station activity.

Outcome: At least 75 percent of raffle tickets will have stamps from all four math stations.

Select and confirm event date and time

A major component of a successful math night is selecting a date and time that encourages broad participation from families at your school for the duration of the two-hour event. October or April is often a good time to host an event. Be sure to consider a date and time that:

- Allow for enough planning time—ideally at least eight weeks.
- Align with family work schedules and commute times and with local traffic patterns.
- Do not conflict with other potential community events and family commitments that take place in the evening (such as church nights, sports events, and middle school and high school events).
- Are concurrent with pickup time for school or after-care to maximize foot traffic and minimize the time families spend waiting for an event to start.
- Center on mealtime to incentivize attendance, build community, and meet a practical family need.
- Capitalize on other popular school activities, such as a book or science fair.
- Provide adequate time between other school events requiring family engagement.
- Do not conflict with the end of marking periods, parent–teacher conferences, or other times when teachers' workloads are higher than usual.
- Account for seasonal weather or other conditions that could affect health and safety and might dissuade attendance.

Given the importance of face-to-face interactions for community building and bringing students, family members, and educators together around engaging math activities, a live, in-person event is strongly recommended. If an in-person event is not possible, exhibit 13 provides an overview of considerations for planning a virtual or hybrid event if your community has ample internet accessibility, device availability, and family interest in such a format.

Exhibit 13. Considerations for hosting a virtual or hybrid event

- Consider which platforms (such as Zoom, Google Meet, Seesaw, Schoology) and tools (for example, Jamboard, Desmos) your students and families are comfortable using and how you might leverage the tools to host the math games.
- Explore virtual manipulatives such as pattern blocks, dice, base-10 blocks, and calculators, and consider making them available to families to support their math activity experience.
- Provide access to platforms and virtual materials before the event to give participants time to acquaint themselves with the platform and tools and avoid lost time due to technical difficulties.
- If using physical materials, arrange for families to pick up packets in ample time before the event.
- Staff each station adequately with at least two facilitators for each activity so that one can focus on the activity and engaging with families and one can help with questions about technology.
- Adapt activities for larger online groups. For example, split activity participants into smaller break out rooms.
- Monitor progress and participation remotely. Ideas include:
  - Using the chat feature for families to share their math thinking and solutions.
  - Inviting participants to unmute and explain their answers.
  - Asking participants to share their screen at the end of an activity to show the group their solution.
  - Embedding a virtual poll with a place for families to type in their solutions and strategies.
- Display family prompts and materials on screen simultaneously.
- If there are in-person components of a hybrid event, consider the need to provide a comfortable and distanced environment for attendees by limiting the number of participants at each station, setting up timed entry or rotation, and using large, open spaces.

Review Community Math Night At-A-Glance

The Community Math Night At-A-Glance resource provides an overview of the activities and agenda for your math night, including estimated times and staffing needs. The At-A-Glance can help you consider how the math night activities align with available space and resources at your school. Use the At-A-Glance to help you think through where each activity will take place and how participants will move from one activity to the next. For example, will you have families move through activities on a timed rotation or at their own pace? All math station activities are available in Section 3–Lead.

Address possible barriers to participation

Consider common barriers to family participation in school events, including the availability of transportation, childcare, and meals, as well as language barriers. Be creative in minimizing the transportation burden, such as providing vouchers for public transportation, running school buses to pick up interested families, and organizing carpools. For families with children too young to meaningfully participate in the math night activities, consider ways to provide childcare, such as having an afterschool program stay open an additional hour or

two to provide coverage or enlisting high school students seeking community service hours or individuals pursuing childcare credentialing. Community Math Night events often occur during mealtimes, so providing dinner or refreshments can encourage participation. Finally, consider ways to reach families for whom language barriers might be a concern, such as providing promotional materials and math night activities in multiple languages.

Develop the initial budget

Your budget will depend on the size of your event. Most schools can implement a math night on a limited budget, using existing school resources, volunteers, and donations to offset costs. The Community Math Night Budget Checklist Template in appendix D can identify initial costs and resources needed. Consider the supplies and resources you already have on hand or could repurpose to reduce costs. For example, you won't need a new set of math pattern blocks if you already have a set on hand. You can also repurpose classroom supplies, such as dry-erase markers and index cards. Potential sources of funding include donations from the community and parent–teacher associations, as well as math committee budgets. Donations from community businesses and organizations can help support the family dinner or raffle prizes. You might also consider consulting your Title I point of contact to inquire about funding for instructional materials and reasonable food costs.

Plan and coordinate refreshments

Serving food respectfully acknowledges the value of participants' time and attendance. If possible, offer substantial refreshments or even a simple meal as part of your math night. To help offset costs, you can solicit one or more local restaurants to donate all or part of the meal.

During the meal you can encourage families to talk about math by distributing index cards printed with amusing math challenges or math conversation starters such as "Tell me how you…," "Is there another way to solve…," "I can prove it by…," "I agree with you because…," "My first step was…," "I can add to that…," "I used this strategy…," "This makes sense because…". You can also tailor questions or facts to the meal you are serving. For example, if you are serving pizza, create index cards asking about the shape of the pizza, how many slices it takes to feed a family, or how many slices it takes to feed everyone attending the event.

Where and when

School and team meetings

Set aside time and space to lay the foundation for a successful math night. If you already meet regularly with members of the core planning team for other reasons, consider repurposing some of that time for planning and coordinating the math night. For example, consider using department or faculty meetings for regular check-ins with the core planning team. For engaging people outside the core planning team, try to get on the agenda of upcoming parent–teacher association or community–school advisory meetings.

6 weeks out

Coordinate personnel and resources

Recruiting other staff and volunteers and securing resources are key to a successful Community Math Night. At this stage in the planning, review the tasks associated with organizing the volunteers, materials, and other resources you will need to hold your event successfully. Exhibit 14 lists key tasks for this stage in your planning.

Exhibit 14. Coordinate personnel and resources

Key tasks

- ☐ Confirm the event location, and begin to plan the event space.
- ☐ Confirm the agenda, and plan for math station activities.
- ☐ Recruit volunteers.
- ☐ Plan for translation needs.
- ☐ Assess available materials for math station activities.
- ☐ Set up event registration.

Who

Community Math Night core planning team

The core planning team should continue to meet regularly to refine the agenda and activities, recruit additional volunteers, and set up registration. One-hour weekly check-ins are recommended to support continued planning.

Other school staff

Other school staff will participate as needed, consistent with their roles and responsibilities, such as the head custodian to advise on facility needs, the webmaster to post the event online, and classroom teachers to distribute flyers to their students.

Volunteers

A team of volunteers can help before, during, and after the math night. As you recruit volunteers, discuss options so people have discrete tasks, such as preparing materials before the event, greeting guests or serving the meal during the event, and cleaning up after the event. Recruit from an existing pool of parent volunteers, including members of the school's parent–teacher association, or seek out other community members to broaden your reach. For example, are there local employers or community colleges with a stake in supporting math in the community? If so, they might provide volunteers. The number of volunteers you will need will depend on the size of the event and the number of school staff available to help. Recruit enough volunteers so that teachers can focus on math activities and relationship building during the event rather than on other tasks. Consider identifying a member of the core planning team to liaise with volunteers and coordinate assigned tasks.

What

At this stage in planning, focus on identifying key tasks required to implement your event, aligning tasks to available personnel, and determining what other materials and resources you will need. Use the Community Math Night Action Planning Template in appendix C to lay out a timeline of tasks leading up to the event and to track their status.

Confirm the event location, and begin to plan the event space

Ensure that you have selected and reserved the location and space you will use to host your math night. Although school cafeterias and gymnasiums often provide the ideal space to host a math night, you can also consider other options such as large classrooms or hallways with good ventilation and space for movement. You might choose to keep age-band activities in a particular section of the school, with one activity to a room, to help with traffic and navigation in large school buildings. Or you might choose to organize activities by strand (for example, hosting all the measurement activities in one space and all the geometry activities in another space), to better meet the needs of families with children in different grades (instead of, for example, a circuit of activities for grade 1 students in one space and a circuit of activities for grade 5 students in another space).

You might also consider including options for outdoor activities that use spaces such as outdoor classrooms or courtyards, being mindful of challenges that different weather conditions might pose. Plan space to accommodate a full range of accessibility needs, from ensuring that aisles are wide enough for wheelchairs to confirming that any visuals and text on Mindsets and Math presentation slides are visible from all seats in the venue. At this phase, planning for your space can be preliminary, as you might need to adjust in light of attendance estimates from preregistration data.

Exhibit 15. Pre-event engagement ideas

To make the most of transition time between participants' arrival and the official start of the event, consider ways to meaningfully engage students and families, such as:

- Post a daily math story from BedtimeMath.org on the projection screen, and encourage families to solve the problems on paper provided on their tables.
- Estimate how many pizzas (or hot dogs, pounds of pasta—whatever is on the menu) it would take to feed everyone in the room! Closest guess wins a prize.
- Share your favorite number. Explain why. What numbers could result from combining your family members' favorite numbers using addition? Multiplication?

Confirm the agenda, and plan for station activities

Develop a detailed schedule that lays out the structure of the event and times for key activities. Ground your schedule around the time it will take for students and families to participate in the math station activities, then add other items including the Mindsets and Math presentation and meal/refreshments. To consider ways to engage families before the presentation begins, see exhibit 15.

To ensure that you have sufficient time for math station activities, decide where to locate each station, estimate the time needed for students and families to participate, and estimate the time needed to move between stations. Be

sure to include time at the end of the event for closing remarks and door prizes. Appendix E includes a sample agenda that can help you plan for the event.

When deciding on the location and set up of each math station activity, consider how to direct the flow of traffic to each station. Rather than relying too heavily on a preset structure, encourage families to move freely between stations, making choices about the order in which they complete stations and allowing time for organic community-building interactions. At large events, having a map of station locations or collecting tickets at each station can help with navigation and ensure that families visit all the stations.

Exhibit 16. Possible volunteer tasks

- Inventory, print, and organize event supplies.
- Prepare meals or refreshments.
- Set up/tear down event.
- Greet families.
- Provide translation services.
- Register/sign in families.
- Acquire donations.

Recruit volunteers

The types of tasks volunteers can handle will depend on the size and scope of the event but can range from helping with refreshments to organizing raffle donations. Consider attending parent–teacher association and service club meetings to recruit and coordinate volunteers. Exhibit 16 lists possible tasks for volunteers, and exhibit 17 is a sample email script to recruit volunteers.

Once you have recruited volunteers, consider organizing them by major function (such as soliciting donations, setting up, serving meals, and cleaning up) to align their experience and skill sets to event needs. For a large event, consider forming teams of volunteers and naming a lead volunteer for each task. Lead volunteers can work with a designated member of the

Exhibit 17. Sample email to recruit volunteers

Greetings from <Name> Elementary School!

I hope this email finds you well <add brief note to personalize a little more>. We are planning a Community Math Night on <date> with the goal of connecting teachers, students, and family members around a shared meal and hands-on, fun math activities to promote positive math attitudes. We need many volunteers to make this event a success and have brainstormed ways for interested folks to help, both ahead of time and on the night of the event:

- Solicit donations for door prizes and event materials [4–6 weeks leading up to the event].
- Inventory and organize event supplies [week of the event for 1–2 hours].
- Set up activities prior to the event [1–2 hours before the event].
- Staff registration table to welcome families [beginning 30 minutes before the event for 1 hour].
- Serve food [15 minutes before the event for 1 hour].
- Clean up/tear down [1 hour following the event].

If you are interested in helping with any of these tasks as a way to support our Community Math Night effort, please reach out to me so that I can connect you to next steps for joining our volunteer team. We appreciate your considering the opportunity and hope to hear from you.

Sincerely,
<Name> on behalf of the Community Math Night Core Planning Team
<share multiple means of contact information>

core planning team to assign volunteers to specific duties on the night of the event. For example, the lead volunteer can help organize the event setup and coordinate the team that executes this task on the day of the math night.

When working with volunteers, be sure to communicate responsibilities and expectations clearly; consider providing written descriptions of each volunteer's role or tasks. For example, for volunteers helping to tear down activity stations after the event, consider sharing information on school recycling policies and on storage of large cafeteria equipment. Appendix F includes a volunteer information template that you can use to provide volunteers with advance notice of event logistics, such as when to arrive on site, where to park, and how long volunteers should expect to stay. And always, in every communication, convey gratitude.

A word of caution

Please note, many districts and schools have a specific process for screening and vetting school volunteers. Be sure to research and follow your school and district guidelines when recruiting volunteers for your event.

Plan for translation needs

Consider what you will need to do to engage diverse families in your local community, such as providing translated materials or language support during the event, including sign language interpretation. School or district staff might be able to assist with translation, and high school or college students studying foreign languages or working toward a translation credential might welcome the opportunity to practice their skills and earn volunteer or credentialing hours. Begin thinking about an outreach and communications plan to ensure that you are reaching the entire school community.

Assess available materials for math station activities

Review the materials and supplies needed for the math station activities, and use the Budget Checklist Template in appendix D to inventory what is available and what needs to be purchased or donated. Consider whether you have enough supplies for the expected number of participants. In your estimates, include extra materials for families that might attend without having preregistered, and use the total number of students in a grade level as an upper bound when estimating the number of families that might attend. Review any preparation needed for each math station activity, such as items that need to be printed (see Handout Printing Guidance in appendix I), cut out, or laminated.

Set up event registration

Determine how you will handle registration for the math night. Options include traditional paper forms sent home through teachers, web-based forms, event registration platforms, or a combination. Create the necessary links and forms, and consider creating a QR code on paper forms to quickly direct families to math night information and registration. Asking

families to preregister, ideally 3–4 weeks out, can help you plan your space and budget for materials and other expenses. Preregistration will help you determine how large a space you will need for each grade-banded activity within the stations, as well as how much food to obtain and the best way to serve it. Monitor registration regularly, and adjust supply counts and purchases accordingly. Remember, not everyone who registers for your math night is likely to attend, and not everyone will preregister. Flexibility and reasonable estimation are key.

Appendix G includes a registration template that can be adapted for your event. Be sure that the registration method is accessible to all families and does not unintentionally limit participation. For example, online registration tools can be a convenient way for families to let you know they will attend; however, you will also want to provide an alternative method for families with limited Internet access, such as a call-in or paper-based process. Consider translating materials for families whose primary language is not English. In addition, set up an on-site registration process to collect data about the final attendees; streamline it (names, grades of children) to ensure that families who arrive at the event feel welcome and invited.

4 weeks out

Promote enthusiasm and participation

This section offers suggestions for promoting your Community Math Night program by building enthusiasm and attracting diverse students, families, and other caregivers. Exhibit 18 lists key tasks for this stage in your planning.

Exhibit 18. Promote enthusiasm and participation

Key tasks

- ☐ Develop your communications plan.
- ☐ Create materials to get the word out.
- ☐ Plan for inclusion and diversity.
- ☐ Include digital and social media content.
- ☐ Involve students.
- ☐ Revisit the communications plan.

Who

Community Math Night core planning team

The core planning team is responsible for developing a communications plan for the math night and getting the word out to the school community. When dividing up work within the core planning team, keep in mind team members' relevant skills or interests, such as an ability to craft catchy messaging or design eye-catching visual materials and expertise with social media.

Other teachers/school staff

Other teachers and staff, beyond the core planning team, can support the communications plan. For example, they can send home flyers and encourage participation by families that might not typically attend school events.

Community stakeholders

To ensure that all students and families feel welcome and comfortable attending the math night, publicize details about your event to a variety of groups. Consider nontraditional groups with an interest in promoting math or a growth mindset, such as local math or science clubs, as well as organizations that might already have established trusted relationships with families that you are trying to reach, such as local places of worship or nonprofit community organizations like your local Boys & Girls Club or YMCA.

Students

Consider ways to involve students in the promotion of the math night. For example:

- Ask students to submit artwork for flyers and posters to promote the event.
- Invite student clubs or groups to present a math demonstration (for example, robotics or destination imagination) or to welcome families at the door.
- Give students raffle tickets for every family member and friend they bring with them to the event to incentivize participation.

What

Develop a communications plan

Develop a communications plan to promote your math night, with strategies that are aligned with your event goals and desired outcomes. See the sample communications plan in exhibit 19 for ideas on messaging at different points leading up to the event. Note that different communities will have different standards and restrictions for community members who are not family members attending school events.

Exhibit 19. Sample communications plan for a Community Math Night

Timeframe	Channel	Sample message
4–6 weeks out	County/school web calendars and school website	Update event with description, registration links
4–6 weeks out	Schoolwide phone and email message, all-class newsletters	Save the date for math night, call for interested volunteers or sponsors
2 weeks out	All-class newsletters and teacher blogs, flyers around community	"Hope you're hungry and ready to stretch your brains at Community Math Night! Chance to win prizes."
1 week out	All-class newsletters and flyer included with report cards (if timing aligns)	"Can't wait to see you at this time next week at Community Math Night!"
Day before	Reminder flyers go home, text messages from teachers	"We hope to see you and your family at our Community Math Night event on Wednesday. FREE dinner will be served at 5, followed by fun games to support your child's growth in math."
Day of	Reminder robo-calls	Reminder: include a trivia question. "Come with the answer for a bonus entry to win prizes tonight at Community Math Night. Doors open at 5 for dinner!"

Create materials to get the word out

A well-promoted event will take advantage of all available avenues for sharing event details. To aid this process, consider developing an information flyer with key event details and strong visuals to capture attention, or sharing a sample text message with teachers to promote the event. Text messages, sent by classroom teachers, offer an opportunity to personalize invitations to families that might not typically attend school events. Exhibit 20 includes a sample text message that you can customize and share with teachers. Banners and other signage, placed strategically throughout the school campus and in the community when practical, can also promote your event. Remember to translate materials to ensure greater reach.

Exhibit 20. Sample text message

We hope to see you and your family at our Community Math Night event on Tuesday. FREE dinner will be served at 5, followed by fun games to play with your kids that also help them learn math. Please follow this link to register <insert link>. Let me know if you have any questions. – Mr. Merritt

Plan for inclusion and diversity

When planning your math night promotion materials and activities, be sure to consider how to include all families in your school community, especially those that typically do not attend

school events. Review all communications materials and key messages to ensure that the language is clear and accessible at a grade 8 reading level to maximize accessibility[7] and that materials reflect inclusivity and diversity. Use language that reflects a broad understanding of families and that welcomes diverse members of a student's home-support system. For example, use "families and caregivers" instead of "parents."

Consider promoting your event at local businesses or places of worship. Personal invitations extended during other social events or informal gatherings can also help all families feel welcome by reinforcing and expanding existing connections to the school community. Also, consider who in your school community already has trusted relationships with families, share the vision for the math night with them, and ask them to personally extend an invitation. An English language specialist, social worker, family engagement specialist, or the special education case manager might be best positioned to send invitations to all or select groups of families. This same concept applies in the broader community. Who are the trusted messengers in your broader community—what businesses, organizations, or nonprofits do families frequent?—with whom you might partner to circulate the event invitation? Consider using exhibit 4 and the Supporting Your Child in Developing Math Skills for Future Success infographic in communicating the vision of the Community Math Night program with trusted community messengers.

Include digital and social media promotion

Provide all teachers with coordinated statements about the math night based on your communications/messaging plan to add to their weekly newsletters, blogs, or other methods of delivering announcements (parent portal, app). Create an event on social media and encourage sharing and tagging within the school community.

Involve students

Think of ways to empower students in promoting the math night within their families. Consider establishing a theme—such as Math Olympics, Monster Measurement, or Shapes in Space—and have students create artwork that supports the theme and that can be displayed to parents. Or teach songs illustrating math concepts to each grade level and include a brief student performance during the meal. You can also find opportunities for students to demonstrate leadership during the event by greeting participants, distributing handouts, demonstrating math activities, and collecting raffle tickets for the drawing. In planning these occasions for students to practice leadership, take care to retain opportunities for students to fully engage with their own family members during the learning experiences, which is one of the critical components of the Community Math Night program.

Revisit the communications plan

Review your communications plan weekly to make any necessary adjustments to strategies for promoting the math night. For example, use your registration process to measure

7. Consider searching for a free online tool to check readability.

knowledge about and interest in the event. Low registration numbers close to your event date could mean that you need to promote the event more or promote it to different parts of your community. When revising your plan, consider input from key stakeholders, such as school leaders, your school's family engagement specialist, or your school district's communications team, to develop additional strategies to reach a wide audience of potential participants.

Where and when

Promote the Community Math Night within your school and to the entire community

Consider creative strategies and locations to engage diverse families and other local stakeholders, such as news/media, libraries, recreation centers, and other community hubs. These strategies are free or low-cost methods to engage hard-to-reach populations and expand promotion of the math night beyond the traditional populations who already attend school events.

2 weeks out through day of event

Bring it all together

At this stage in your planning, it is time to consider final details, turn your plans into action, and implement your Community Math Night. Review the key tasks for this stage in exhibit 21.

Exhibit 21. Bring it all together

Key tasks: 2 weeks out

- ☐ Stay organized.
- ☐ Finalize your plan for the event space.
- ☐ Practice math night activities.
- ☐ Plan for collecting feedback.
- ☐ Consider purchasing thank you gifts for volunteers.

Key tasks: Day of event

- ☐ Set up.
- ☐ Kick off and implement.
- ☐ Tear down.

Who

Community Math Night core planning team

In the lead-up to and during your event, most members of the core planning team will be busy facilitating math station activities or directing other key activities, such as the family meal. Review your staffing plans to be sure that you have adequate staff or volunteer coverage for each task. If you expect team members to assume more than one role at the event, consider options for backup coverage, as appropriate.

Other school staff

Confirm the availability of other school staff to participate during the math night.

Volunteers

Be sure that you have clearly communicated all responsibilities and expectations to volunteers, that all volunteers have the appropriate resources and information to execute their assigned responsibilities, and that each volunteer is comfortable with the assigned responsibilities on the day of the event. If possible, pair less experienced volunteers with people who volunteer at the school more often or with school staff to ensure that you are adequately supporting all volunteers in their roles. Exhibit 22 has additional tips for working with volunteers.

Exhibit 22. Volunteer tips

- Introduce key or lead volunteers to school staff.
- Follow all school guidelines for having volunteers on campus.
- Have a small thank you gift for volunteers that acknowledges their time and participation.

What

Stay organized

Exhibit 23. Community Math Night day of the event checklist

- ☐ Double-check all materials.
- ☐ Set up all station activities.
- ☐ Sort and prepare any take-home materials or resources.
- ☐ Place a greeter at the entrance to welcome families and ask them to sign in as they enter.

The last two weeks leading up to your event will be important for completing last-minute details. The math night will go more smoothly if you lay out a process for tracking activities and marking them off as they are completed. Communicate this progress regularly to your school leadership and head volunteers in the lead-up to and on the day of your math night. Use the Community Math Night Action Planning Template in appendix C to prioritize your work leading up to the event. Now is also a good time to revisit your material and printing needs. Allow sufficient time ahead of the event for ordering materials and prepping printed materials. See exhibit 23 for a checklist of key tasks to complete the day of your event.

Finalize your plan for the event space

Based on preregistration data, revisit the plan for the event space and ensure that the facilities you selected will work for the number of guests you anticipate. For instance, say that you planned to have one classroom for each station, with K–1, 2–3, and 3–5 grade-banded activities taking place in different corners. You might want to make an adjustment if you find that you have a large number of K–1 students preregistered for the event. One idea might be to give each K–1 grade-banded activity its own room next to the room where the 2–3 and 3–5 activities for each station could take place. This way, all station activities can be near each other, but K–1 students and families can spread out and have an entire room instead of crowding in one corner, waiting their turn and slowing the flow of the evening.

Practice Community Math Night activities

As suggested in Section 1–Learn, station facilitators should practice each activity with the final materials, ideally one more time in the two weeks before the math night. In addition to arranging for facilitators to practice the math activities, make time for the assigned speaker to practice the Mindsets and Math presentation.

Plan for collecting feedback

Consider asking students and families about their experience at the math night, to understand their perspectives, reflect on their opinions, and incorporate that knowledge into continuously improving such events. One way to do this is to use exit tickets, which are brief paper surveys that attendees drop off as they leave the event—a kind of ticket out the door. Exhibit 24 is a sample exit ticket. Consider printing paper survey questions on the back of math station location maps and strategically placing collection boxes near exits. Schedule time during the math night for families to complete their feedback and submit their exit ticket before they leave. Remember to have feedback forms available in the languages spoken by families at your school.

Exhibit 24. Sample exit ticket

Thank you for coming to Community Math Night!
Please share your thoughts to help us improve.

Choose the response that best describes your level of agreement with the following statement:

	Strongly disagree	Disagree	Agree	Strongly agree
I understand the role of positive math attitudes and growth mindset in supporting math learning.				
I actively engaged in the math station activities with my child.				
I learned new ways to support my child in learning math.				

What did you **enjoy** about your Community Math Night experience?

What new **strategies or ideas,** if any, did you learn from the Community Math Night?

What, if anything, was confusing or do you have **questions** about from the Community Math Night?

What **improvements,** if any, would you suggest for Community Math Nights in the future?

This approach to immediate feedback works well because attendees are already thinking about the event rather than trying to recall it later and finding time to respond. However, surveys after the event can provide insight into whether families are using the strategies and activities shared at the math night. You can collect feedback through formal mechanisms, but also through informal channels—in conversation, through social media, or as a discussion topic in your classroom the next morning.

Consider adding questions to this printable exit ticket that can inform your planning of future math nights or other engagement activities. For participating families, you might ask about event logistics (for example, Did the timing work for you? What could have made the evening better for you? Did serving a meal help you decide to come?). Consider surveying nonparticipating families with another feedback tool to determine why they did not attend.

For students you might include questions in the family exit ticket about favorite activities, how they felt about sharing their learning with their parents, their attitudes and confidence about math, and what changes they would like to see in the event.

As a gesture of goodwill and to demonstrate responsiveness, plan to follow up with your nonschool partners through phone calls, notes, or emails to thank them for their contributions and to ask how the event went from their perspective. For example, you might ask how you could have tweaked the event to maximize success in their view or what might be the next step in your partnership.

Plan to ask for specific feedback from teachers and staff who attended the event. They might have ideas about how to improve the event or about what resources they need to support a growth mindset and hands-on activities in their classrooms. Ask for constructive feedback from school leaders as well, since interacting with parents and the public is a key component of a school leader's role.

Set up

A major task on the day of the math night will be setting up the activities and space. As you get closer to the day of your event, consider the following:

- Revisit your plans for the layout of each math station activity, and make sure you have adequately planned for the number of expected participants.
- Plan for both the amount of space available to facilitate the activity and the amount of space during station transitions for families to interact with their children—and socially with other families.
- Consider locating all the math station activities in a large central location, such as the school gym or cafeteria, to help manage traffic to each station.
- If you decide to position your math stations throughout the school, provide a map of station locations or collect tickets at each station to help with navigation and ensure that families visit all the stations. If you have enough volunteers, consider posting staff at strategic spots to guide families from station to station.
- Don't forget the options presented by outdoor spaces—such as courtyards and outdoor learning classrooms.
- Plan space to accommodate a full range of accessibility needs, from ensuring wide aisles for wheelchairs to examining the space from different angles for slide visibility.
- If your math night includes virtual components or resources, test all platforms and resource links to ensure proper functionality.
- As part of your setup, consider technology needs (projector, screen, laptop, presentation file or Internet connection, microphone) for the Mindsets and Math presentation and closing remarks. In most cases a screen, projector, laptop (with connecting cables and power charger), speakers, and microphone are all the equipment that is required. For larger events consider a more elaborate setup, with a sound system capable of reaching a bigger, more widely dispersed audience. If audiovisual technology is not available, consider printing handouts for families.
- Assign staff or volunteers to organize and stock the materials for each math station activity ahead of the math night, and plan for restocking materials during the event, as needed. Include appropriate cleaning supplies to reduce the spread of germs from math manipulatives and obtain hand sanitizers and masks, as needed.
- Finally, remember to include preparation of any refreshments or meal you plan to provide as part of your event setup. Consider asking volunteers or school staff to lead this setup, as members of the core planning team are likely to be busy elsewhere.

Kick off and implement

The math night officially kicks off when the first guests arrive. Have a plan for welcoming families and students. You can post greeters at the entrance of the school to welcome guests. You can also use this opportunity to hand out agendas, event materials, or provide general instructions. Be mindful of health and safety guidelines related to group gathering and food serving.

Tear down

Just as with set up and kick off, you should plan how you will close out the event and return the space to its previous condition. Consider reconvening participants in a common space at the end of the event for closing activities and to ensure that everyone leaves the event in a timely fashion. Consult your school facilities manager to understand all requirements for hosting an event after school hours. Important points of discussion include how to return all equipment to its proper location and how to clean and lock up the building once all guests leave.

Where and when

Planning meetings

Use weekly planning meetings with the core planning team to track progress toward achieving goals and accomplishing tasks, with more frequent check-ins in the two weeks leading up to the event.

You might also want to hold a larger meeting with other school staff or volunteers assigned to lead key tasks, coordinate activities across roles, and ensure that everyone understands the expectations and schedule. The meeting for staff can take place before or after school or during a faculty meeting close to the date of the math night.

For community volunteers, consider working around their schedules and minimizing their burden by holding the meeting immediately before their volunteer shift on the day of the math night.

Within 1 week after the event

Build on your success

Exhibit 25. Build on your success

Key tasks

☐ Reflect as a team.

☐ Build on your momentum.

The event is over. First, take a breath and congratulate yourself and your team for implementing the Community Math Night program. Reflect on how far you have come and on all that you have accomplished as a core planning team! Pausing to examine the feedback, celebrate, express thanks, reflect, and evaluate how you might build on your success will help you sustain momentum and begin to shift your thinking toward continuous improvement for future events. Schools should use the Community Math Night program as an element in a broader strategy to engage families and build enthusiasm for math. Individual school plans will vary, with math nights being used once, twice, or more often in a given school year. Exhibit 25 lists key tasks to help build on the success of your math night.

Who

Community Math Night core planning team

Although the event is over, the initiative might just be starting! Re-engage the core planning team to review feedback and reflect on what you have accomplished. Consider whom else to engage (volunteers, other school staff, participants) to provide additional insights, build on momentum from the event, and ultimately move closer to achieving longer-term school-wide goals for math teaching, learning, and family and community support.

What

Reflect as a team

After gathering feedback from your stakeholders, appoint someone to collect, collate, and categorize the feedback data and plan a review with your core planning team. Write down reflections and lessons within a week following the math night so you don't forget the details and rich learning you gained in this process. Use the reflections to plan for additional math nights, as well as other family engagement efforts at the school. When reflecting as a team, consider the following questions:

- **Event:** Where did you land in relation to your goals? Did the strategies employed help you reach your goals? How did the families, students, teachers, and community members feel about the event?
- **Registration data:** Who registered but did not attend? Who attended but did not register?

- **Attendance patterns:** Look for patterns by grade level, classroom, demographic characteristics, transportation/distance to and from school, and more. What adjustments to the plan are needed to increase inclusivity (for example, changes to communications and messaging, time of the event, location)?
- **Planning and organization:** How did the event flow and work logistically? What might you change next time? Did you have enough volunteers to staff the event? Did you have enough supplies?

Create a file with your notes and reflections so that you have a record of details and lessons for the next math night.

Build on momentum

Remember that, ideally, the Community Math Night program is not a "one-and-done" event but one element in a growing, evolving plan to achieve broader school goals. Exhibit 26 provides tips for sustaining momentum with families. Think about how you can build on the enthusiasm generated by the math night. Consider:

- How might offering multiple math nights each year, such as one per semester, for multiple years, integrate the experience into school culture?
- How can career-exploration activities throughout the school year make explicit connections to real-world math?
- How could the math night structure integrate social-emotional learning; social, emotional, and academic development; and skill-building around the 16 habits of mind (Kallick & Costa, n.d.) for families and students?
- How might you focus a future math night on individual math content strands, grade bands, or problem-solving or math discourse goals?

Exhibit 26. Tips to sustain momentum with families

- Include family discussion prompts in teacher newsletters.
- Ask parents to submit pictures/videos of math night games in action at home for entry into a contest.
- Encourage playing a math game as an alternative homework choice.
- For families that did not attend math night: Consider demonstrating the activities they missed on video and posting the video on the school website or other social media platforms.

- How does a math night fit into a broader strategy to build enthusiasm for math, positive attitudes for learning and the growth mindset, or sustained partnerships with families?
- How can you encourage use of the strategies introduced at the math night on a more regular basis with families? In classrooms?
- Are there existing structures into which you could infuse the spirit of the Community Math Night program? How might you reconnect educators, students, and their families around fun, engaging math experiences that build confidence and positivity? Might this become an element of orientation, back-to-school night, or parent–teacher or student-led conferences?
- How does daily classroom math instruction align with the engaging, hands-on activities featured at the math night? What support do teachers need to move in this direction?

- How are teachers at your school building connections to developing a growth mindset in classroom practice? How are they engaging families on a consistent basis?
- Based on patterns in K–5 student data, which math skills or content strands need bolstering, and how might you refocus a math night and curate station activities to drill deeper into this area of need?

The Teacher Reflection and Assessment Guide in appendix H will help connect the math night to classroom practice. The guide is designed to help all teachers, not just the core planning team, reflect on and assess their level of confidence with implementing the evidence-based instructional practices that help students develop their knowledge, skills, and attitudes about learning math so as to maintain that momentum.

Teachers can submit their reflections to the core planning team, and a summary of the data can be shared with school leaders to inform professional development needs.

Supporting a growth mindset and high-quality math instruction all year long

YouCubed.org is a great resource to explore as a starting point for supporting teachers after a Community Math Night. This website offers math-specific resources for building a growth mindset (the belief that people can increase their abilities through hard work and persistence), such as classroom posters and videos, teaching examples, cross-curricular lessons, apps and games, parent resources, research, and more!

Where and when

In faculty meetings, in classrooms, at home, in the community, and elsewhere

As a core planning team, reflect on ways to build on your success and spread the vision for high-quality math instruction, growth mindset, and community engagement beyond your core planning team. Some ideas:

- Share the Mindsets and Math presentation with all teachers and staff, so that all adults in the school understand the importance of modeling and promoting growth mindset throughout the day.
- Share Section 1–Learn of the toolkit with the broader faculty, particularly the Understanding the "why" section of the Community Math Night Professional Learning Workbook in appendix A, and use the discussion questions in professional learning communities.
- Provide teachers with copies of the math activities relevant to their grade band that they can incorporate into math stations and center times.
- Share short tutorial next-step videos for parents to continue to engage their children in math conversations at home, and push the videos out through newsletters, social media, the school website, and other means. For example, tutorial videos can be found at http://youcubed.org/week-inspirational-math.

- Ask to make a presentation to the school board, board of supervisors, community groups, potential funders, and professional conferences to share the vision for the Community Math Night program, as well as your experience, lessons learned, and the value added through the event. Consider using images and infographics in the toolkit to support your presentation, such as the infographic, exhibit 4, Community Math Nights foundations.

Section 3–Lead Your Community Math Night from start to finish

Welcome to your Community Math Night

This section contains the activity instructions, prompts, and facilitator guidance needed to implement a Community Math Night program from start to finish, including:

- *Mindsets and Math*, an opening presentation for the math night.
- *Ten math activities divided into four stations.* Each station focuses on an overarching math topic—Geometry, Operations and Algebraic Thinking, Numbers and Operations in Base-10, and Measurement and Data—and offers activities or prompts differentiated by grade band (K–1, 2–3, and 4–5), so that students can engage with activities designed for their grade band. The math activities are interactive, hands-on, and adaptable, so younger and older siblings can participate as they are able. The family prompts also include ways to scaffold and challenge, which can help include siblings who are above or below the target age range.
- *Facilitator guides for the activities and background information for each station.* The facilitator guides include the goal of each math activity, recommended grade levels, a materials list, instructions, family prompts to help participants support a math dialogue, facilitator notes, and academic standards related to the activities. Facilitators should study the guide for their assigned math station in order to help participants engage with the activities.

Printable materials for each station (activity handouts, instructions, and family prompts) are in appendix I.

Community Math Night outline

Begin your math night with the Mindsets and Math presentation, which discusses the importance of a strong foundation in math and explains how families and teachers can support children's math success. After the presentation, participants will rotate through the four topically organized math stations: Geometry, Operations and Algebraic Thinking, Numbers and Operations in Base-10, and Measurement and Data. Having the math stations organized by topic enables families with students at multiple grade levels to remain together while participating in developmentally appropriate activities.

Most families can complete one station in approximately 15 minutes, plus 5 minutes for transitioning from one station to the next. However, a free-flowing schedule with scaffolded supports will allow families to spend as little or as much time as needed to fully engage with an activity, provide time for organic relationship-building conversations, and reduce traffic between math stations, because participants will be transitioning at different times.

Scaffolded supports to help ensure that students and families engage with every station could include audible song reminders over the intercom system at 15- to 20-minute intervals, raffle tickets that are stamped after a station is completed in order to be entered into the raffle, and maps of the building with the station layout.

See the Community Math Night At-A-Glance in exhibit 27 for an overview of activities, timing, and staffing recommendations.

Exhibit 27. Community Math Night At-A-Glance

Activity	Estimated time	Recommended staffing
Mindsets and Math presentation	15 minutes	Two facilitators lead the presentation while the other facilitators sit with attendees to support turn-and-talk discussions.
Station 1: Geometry • **Activity 1a:** Fill the Shapes; recommended for students in grades K–1 • **Activity 1b:** Hexagon Challenge; recommended for students in grade 2–3 • **Activity 1c:** Symmetric Mosaics; recommended for students in grade 4–5	15 minutes	Two teacher facilitators and one volunteer (three total) per five families attending (10–15 attendees). Staff will answer questions and help participants engage with the activities, as needed.
Station 2: Operations and Algebraic Thinking • **Activity 2a:** Flip the Cards; recommended for students in grades K–1 • **Activity 2b:** Many Ways of Counting; recommended for students in grade 2–3 • **Activity 2c:** Game of 24; recommended for students in grade 4–5	15 minutes	Two teacher facilitators and one volunteer (three total) per five families attending (10–15 participants). Staff will answer questions and help participants engage with the activities, as needed.
Station 3: Numbers and Operations in Base-10 • **Activity 3a:** Race to 100; recommended for students in grades K–1 • **Activity 3b:** Broken Calculator; recommended for students in grade 2–3 • **Activity 3c:** Dinner Time; recommended for students in grade 4–5	15 minutes	Two teacher facilitators and one volunteer (three total) per five families attending (10–15 participants). Staff will answer questions and help participants engage with the activities, as needed.
Station 4: Measurement and Data • **Activity 4:** How Many of Me? Includes one activity with family prompts differentiated for students in grades K–1, 2–3, and 4–5.	15 minutes	Two teacher facilitators and one volunteer (three total) per five families attending (10–15 participants). Staff will answer questions and help participants engage with the activities, as needed.
Closing remarks, raffle, and dismissal	10 minutes	One facilitator leads the closing remarks while the other facilitators engage with attendees.

Math standards related to activities

Each math station activity identifies related math content standards drawn from three organizations to help determine whether the activities are appropriate for your students. Because each activity spans multiple grade levels and because student readiness for an activity can be affected by whether the math night is conducted early or late in the school year, the planned activities can be adjusted to better reflect typical classroom learning activities.

The math night activities also support math process standards and engage students in the math practice that teachers strive to develop in students, such as making sense of problems, applying quantitative and abstract reasoning, and attending to precision.

It is important to acknowledge that the math station activities do not reflect the full scope of the related standards and might not reflect the adopted standards for every state; students might need additional instruction and practice to reach proficiency. See exhibit 28 to review the standards that apply to the knowledge, skill, and problem-solving practices advanced by the math station activities.

Exhibit 28. Math standards advanced by station activities

Source	Description
Common Core State Standards for Mathematics, 2010, http://www.corestandards.org	Provides a coherent sample of K–12 math standards from which state and local education agencies can create their own math standards
American Education Reaches Out (AERO) Common Core Plus Math, 2015, http://www.projectaero.org	Developed to support American-sponsored overseas schools, these standards identify the intended depth of knowledge in addition to math content
National Council of Teachers of Mathematics (NCTM), Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics, 2006, https://www.nctm.org	Developed to help math educators in grades K–8 provide greater coherence in math learning across grade levels

Mindsets and Math presentation

> **Tip!**
>
> Review the section on building a growth mindset and positive math attitudes in appendix A prior to the math night to build your understanding of the importance of positive math attitudes and a growth mindset.
>
> Help your attendees contextualize any past conversations that reflected a fixed mindset and minimize guilt so that they can embrace a growth mindset and encourage their children to persist through learning challenges. For example, "We've all made statements that might have reflected a fixed mindset, but we can change those statements to be more positive."

The Mindsets and Math presentation helps math night participants understand the importance of a strong foundation in math and the role of families and educators in supporting children's math success. The presentation focuses on the way adults talk about math and how that can influence children's attitudes and achievement. The presentation offers examples of how to model positive math attitudes and promote a growth mindset—the belief that people can increase their abilities through hard work and persistence. The concept of a growth mindset might be new to families.

The slides and accompanying script of the presentation can be shared at the beginning of the math night to prepare families to participate in the math station activities and to support and encourage each other throughout the night. If the math night includes food, you might want to begin this presentation after the meal. Or you might set up the presentation as a separate math station with games related to developing a positive math attitude and a growth mindset. A copy of the slides is available for download as a supplemental resource to this toolkit.

Facilitators should note the following:

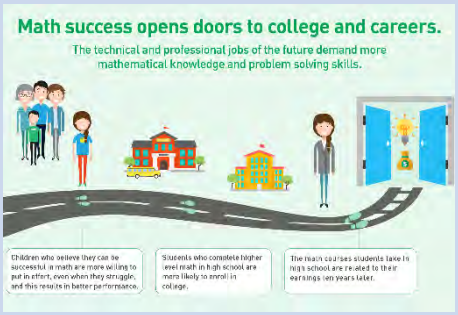
- Allocate about 18 minutes for the Mindsets and Math presentation (exhibit 29).
- Identify one or two facilitators or school leaders who are comfortable speaking to community groups and families to lead the presentation.
- Tailor the presentation to your math night, but hit all the key points. To help attendees better understand growth mindset, consider engaging them in a quick activity. Facilitators can demonstrate a complex clapping sequence and ask attendees to replicate the pattern. As attendees work with a partner to copy the pattern, facilitators can provide feedback that reflects the growth mindset.
- Consider complementing the slide that discusses how power of "yet" ("I can't do this task *yet*") can help students persist in their efforts to achieve a goal by sharing, at some point

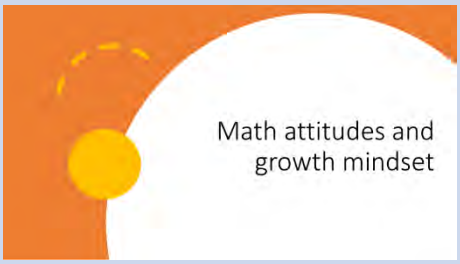
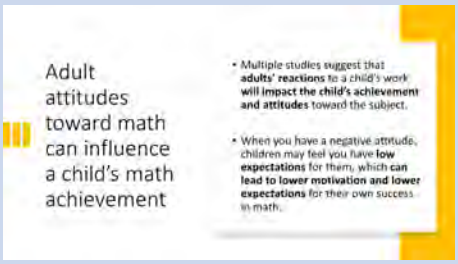
> **Resource highlight**
>
> The presentation features images from the Regional Educational Laboratory Appalachia infographic Supporting Your Child in Developing Math Skills for Future Success. Consider handing out copies of the infographic to families as a take-home reference.

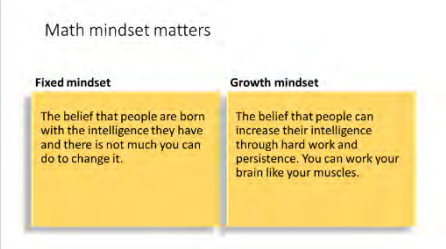
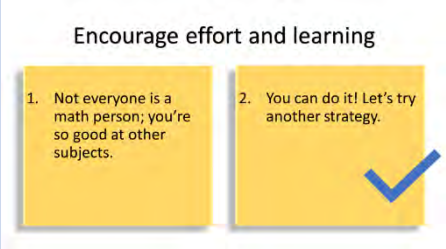
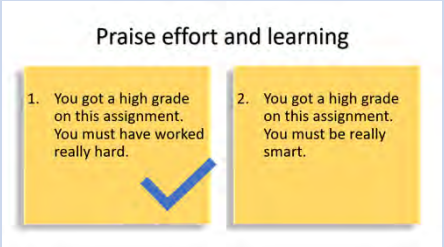
during the math night, the *Sesame Street* song and video that entertainingly conveys this message.

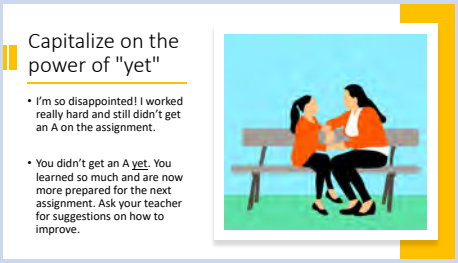
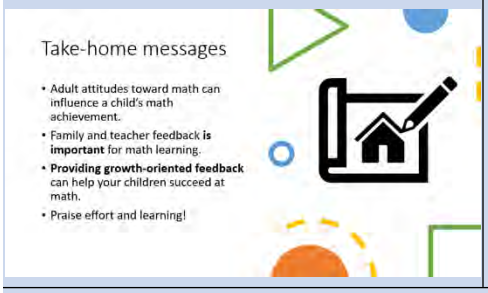
- During the presentation, have other facilitators sit with participants and encourage them to share ideas during the turn-and-talk activities.
- At the conclusion of the presentation, encourage attendees to participate in each math station and explain how to rotate through the math station activities. If you are holding a raffle at the end of the event, remind attendees to have their math station participation cards stamped at each station to make them eligible for the raffle.

Exhibit 29. Mindsets and Math presentation

Slide	Suggested script
	Welcome families, staff, and community members. (1 minute)
	**Key point:** A strong foundation in math is important for students' success in school and in life. **Recommended script:** In the past, math was often taught as a set of rules to follow. That's not what math really is, or how we teach it today. Math is about puzzling over quantitative problems, trying multiple strategies, and finding solutions. Having a strong foundation in math is particularly important for students' success in school and in life. (1 minute)
	**Key points:** Students who do well in math at the elementary school level tend to perform better in math at the middle and high school levels and in other subjects. Taking advanced math courses can lead to higher incomes and more job opportunities. **Recommended script:** Research demonstrates that children who believe that they can be successful in math tend to persist when challenged by a math problem, which in turn leads to better math performance. Students who perform better in math in elementary school are more likely to succeed in middle school and high school, in math and in other subjects. Taking advanced math courses in high school can lead to higher incomes and greater opportunities in a growing number of jobs. (2 minutes)

Slide	Suggested script
	**Key points:** Families are natural math role models for their children and can help children develop positive attitudes for learning math. We want all families to understand the importance of math and feel comfortable and confident in supporting their children in learning math. **Recommended script:** As families engage in home activities like cooking, grocery shopping, gardening, and woodworking, they serve as natural math role models and can invalidate stereotypes about who is good at math. Families can also model positive math attitudes and encourage children to try new strategies, persist through challenges, and seek help if needed. So tonight, we want you to understand the importance of math and feel comfortable and confident in supporting your children in learning math. (2 minutes)
	**Recommended script:** Before we get into the math activities, we think it is important to talk a bit more about how attitudes toward math can influence math learning. (1 minute)
	**Key points:** Research has found that an adult's reactions to a child's work will affect the child's achievement and attitudes toward the subject. To help children develop positive attitudes toward math and to motivate them to learn math, adults should communicate their confidence in children as math learners, reinforcing their belief that all children can learn math. **Recommended script:** When students are learning math, how we talk to them about math really matters. Research has found that an adult's reactions to a child's work will affect the child's achievement and attitudes toward the subject. For example, if a child is learning something new in math and asks an adult for help, some adults might react by saying that they're not good at math or that they don't know how to do the "new math." While they might feel that way, it is important for them to think about what this communicates to the child. If the adult family member does not react positively, how can we expect the child to react positively? In addition to paying attention to how we react when children ask for help with their work, we need to pay attention to how we communicate our expectations of them. When a child is struggling with math, a parent or teacher might try to comfort the student instead of offering strategies that help them succeed in math. For instance, take the phrase we might all have heard: "I'm not a math person, but I did all right." This communicates that you have low expectations of students in math, so why should the student try harder? Families can use phrases like "I know this is hard; maybe you can try another way to solve the problem?" or "I know this is hard, but you are learning something new, and sometimes that takes a lot of work." (3 minutes)

Slide	Suggested script
	**Key points:** Demonstrating a growth mindset, the belief that people can achieve more through hard work, can help children persist through learning challenges and recognize that anyone can learn math with the right support. **Recommended script:** When we are working with children on math, it is important to think about our attitudes and how we feel about math. We categorize these attitudes in two ways: a fixed mindset and a growth mindset. When someone has a fixed mindset, they believe that their accomplishments are based on natural intelligence—something that they are born with—and that their successes are made with little to no effort. People just are the way they are. Successful people are born to be successful. Math people are born to be math people. You are a math person, or you aren't. With a growth mindset, people believe that they have the ability to make gains through hard work. While intelligence and natural strengths can play a part, success is mainly a result of hard work, good strategies, and time spent working on a task or subject. Successful people are not born; they are made. Often, adults talk about the ability to learn math as something that is fixed or unchangeable in a child, possibly using phrases that *sound* nice, such as "You completed that problem because you are really smart," or "You're good at so many other things, maybe math just isn't your subject." However, these phrases are *not* a good way to encourage young children. They promote a fixed mindset. Instead, try saying things such as, "You completed the most difficult problem; I bet you worked really hard at it," or "I know you are struggling with math; maybe you need to try a new strategy to get better." These phrases promote a growth mindset. The main message is that we want to praise children's persistence and hard work in learning and to recognize that anyone can be a math person with the right support. (3 minutes)
	**Key point:** Adults can help children develop a growth mindset for learning math through the words and phrases they use. **Recommended script:** Now let's look at some different phrases. Read each phrase on the screen and discuss it with the person next to you. Which one promotes a growth mindset? It is important to notice the different strategies children are using to solve problems. You can ask questions such as: • What problem-solving skills did you use for this problem? Can you try a different strategy? • On a scale of 1 to 10, with 10 being the hardest you've ever tried to do something, how much effort did you put into this task? (1 minute)
	**Key point:** Help children recognize the connection between hard work and positive outcomes. **Recommended script:** Let's discuss these two phrases. They are more alike than the last two. Discuss with your neighbor: Which one do you think praises effort? We should all tell our children that they are smart, but to emphasize a growth mindset, we want to make sure that we also praise effort and hard work. Again, you can expand how you talk about your child's effort to include questions such as "What do you think? Did you work hard?" (1 minute)

Slide	Suggested script
	**Key points:** When children work hard and don't achieve their desired goal, remind them of the power of "yet." Children might not have reached their goal "yet," but their efforts are bringing them closer to their goal. Discuss the conversation between the parent and child shown on the slide and then share the message below. **Recommended script:** All of us have experienced times when we worked hard to achieve a goal and still fell short of the goal. It can be disappointing and can shake a person's confidence. When your children experience disappointing outcomes, even when they have worked hard, help them capitalize on the power of "yet," reminding them to think about the progress they've made and about how to improve (ask for help, do extra practice, try another study strategy). Helping children develop resilience when faced with disappointments provides life lessons beyond the classroom. (2 minutes)
	**Key point:** Share the take-home messages on the slide. (1 minute)

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Facilitator guide to station 1: Geometry

Station overview

The Geometry station includes three activities:

- **Activity 1a:** Fill the Shapes, recommended for children in grades K–1.
- **Activity 1b:** Hexagon Challenge, recommended for children in grade 2–3.
- **Activity 1c:** Symmetric Mosaics, recommended for children in grade 4–5.

Read the background information below and then explore each activity.

Background

Starting in preschool, children begin to recognize and name shapes in the world around them. By playing with building blocks, drawing, and completing puzzles, children become increasingly aware of the attributes of shapes and the similarities and differences among them. Informal and formal activities help children compare different shapes (for example, triangles have three sides and rectangles have four) and then compose and decompose shapes (for example, combining two congruent squares creates a rectangle). Understanding the attributes of shapes and composite shapes lays the foundation for more advanced geometry.

To support students in developing these critical understandings, the Geometry station activities use pattern blocks, three-dimensional geometric manipulatives that represent two-dimensional shapes. Manipulatives include an equilateral triangle, a 60-degree rhombus, a 30-degree rhombus, a regular trapezoid, a regular hexagon, and a square.

Pattern blocks help build children's foundational knowledge by giving them concrete ways to compare and manipulate shapes before moving on to abstract reasoning (Stein & Bovalino, 2001). For example, pattern blocks can help children discover that reorienting shapes does not change their critical attributes: a triangle flipped on its side is still a triangle. Educators and families can use pattern blocks with children to practice naming shapes, describing and comparing shape attributes, and composing and decomposing shapes (Reed & Young, 2017). They are also a great tool for encouraging students to work collaboratively, verbalize mathematical thinking, and discuss mathematical ideas and concepts.

Activity 1a, Fill the Shapes, helps students think flexibly about shape as they fill in geometric outlines of familiar animals using pattern blocks. Participants identify the pattern blocks by geometric name and compose and decompose shapes (for example, one hexagon takes the same space as two trapezoids or six triangles) to look for multiple ways to fill in the animal outlines.

Activity 1b, Hexagon Challenge, helps students represent a fractional part of a whole. Participants use a hexagon pattern block to represent "one whole" and then find what fractional part is represented by smaller pattern blocks such as trapezoids and triangles. They are challenged to fill in a large hexagon outline in halves, thirds, and fourths.

Activity 1c, Symmetric Mosaics, is a game-based activity using pattern blocks that asks participants to create new shapes containing one or more lines of symmetry. To add challenge, participants roll dice to identify which pattern blocks they must use to create their shapes and form lines of symmetry.

Resource highlight

Interested in learning more about research-based strategies for teaching geometry? This Regional Educational Laboratory Central video focuses on actionable strategies for teaching shapes and space to young children, such as engaging in shape walks and using examples.

Take-home activity idea

A tangram is an ancient Chinese puzzle that promotes math learning and encourages creativity. It consists of seven geometric pieces that form a square and can be rearranged to create a multitude of shapes. Because of its simple design, a tangram offers an engaging, low-cost take-home activity for families. Free templates for tangram pieces and puzzles can be accessed online, and one template could be printed on cardstock and given to families. Additionally, there are books and videos that tell the story of how tangrams began that can help build enthusiasm for creating tangram designs.

Activity 1a: Fill the Shapes

Goal

Families use pattern blocks to compose and decompose shapes and make composite shapes.

Recommended grade levels

Kindergarten–grade 1.

Materials in toolkit

- Instructions and family prompts.
- Printed outlines to be filled in with blocks.
- Geometry glossary.

Materials to gather

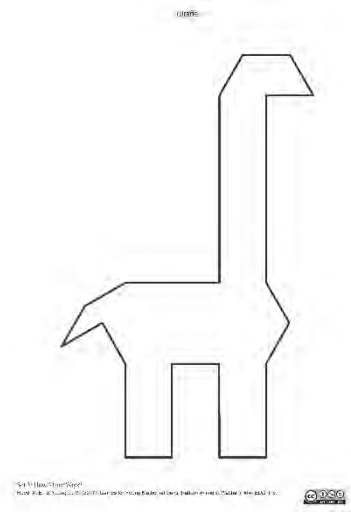
- A container of pattern blocks.

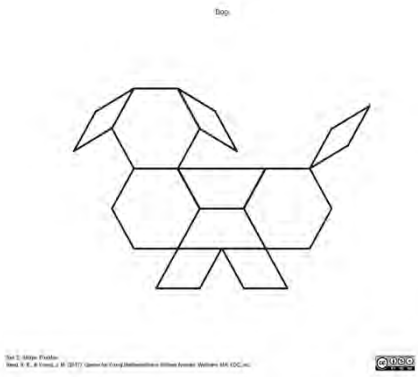
Activity instructions

1. Select an outline. Easier outlines are scaffolded with the inside component shapes drawn, while more challenging outlines have no inside component shapes drawn.

2. Use the pattern blocks to fill in the outline.

3. For fun, take the same outline as someone else and see how you can fill it out differently.





Family prompts

- What shape is this? (Point to any of the pattern block shapes.)
- How many sides does it have? How many corners?
- How many [triangles, hexagons, parallelograms, trapezoids] are there in this drawing?
- Can you use other shapes to fill in the [hexagon, square, trapezoid]?
- How many other ways can we fill in this outline? Or how many shapes can be replaced by other shapes?

Facilitator notes

- Show families how they can use the prompts, model asking questions (for example, "Can you fill in the same outline but with different shapes?" "Why?") and point out the location of the geometry glossary poster or handout for easy reference.
- If students or families identify a shape by its color, do not correct them, but rather provide positive reinforcement and introduce the shape name as well: "Yes, that shape *is* yellow, and it's called a hexagon."
- If you are integrating technology into your math stations, the Math Learning Center offers virtual pattern blocks that families can use to complete the activity.
- **To scaffold,** begin with a geometric outline that shows individual pattern shapes within the figure.
- **To add challenge,** complete an outline with the fewest possible pattern blocks.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.K.G.B.6/ AERO.K.G.6 DOK 2,3: Compose simple shapes to form larger shapes. For example, "Can you join these two triangles with full sides touching to make a rectangle?"

CCSS.MATH.CONTENT.1.G.A.2/ AERO.1.G.2 DOK 2,3: Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. Note: Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Recognize, name, build, draw, compare, and sort two-dimensional shapes.

Investigate and predict the results of putting together and taking apart two-dimensional shapes.

Recognize and represent shapes from different perspectives.

Describe attributes and parts of two-dimensional figures.

Activity 1b: Hexagon Challenge

Goal

Families use pattern blocks to partition a hexagon using different shapes.

Materials in toolkit

- Instructions and family prompts.
- Geometry glossary.
- Hexagon board.

Materials to gather

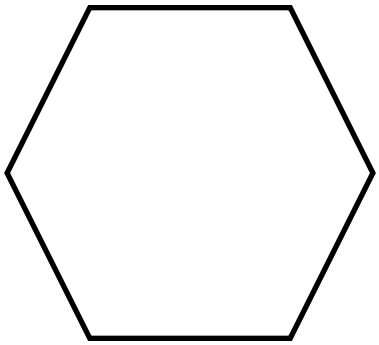
- A container of pattern blocks.

Recommended grade levels

Grade 2–3.

Activity instructions

1. Grab a hexagon pattern block; how can you make a hexagon using the other shapes?
   a. How many trapezoids make a hexagon? What part of the hexagon is one trapezoid?
   b. How many rhombuses make a hexagon? What part of the hexagon is one rhombus?
   c. How many triangles make a hexagon? What part of the hexagon is one triangle?
2. Challenge:
   a. Who can fill the hexagon board using the most possible pattern blocks?
   b. Who can fill the hexagon board using the fewest possible pattern blocks?
   c. Who can split the hexagon board into halves using pattern blocks first? Into thirds? Fourths?



Family prompts

- What is the name of this shape (for each pattern block)?
- Fill in the blank:
  - If 2 trapezoids make a hexagon, then a trapezoid is ½ a hexagon.
  - If 3 rhombuses make a hexagon, then a rhombus is _____ a hexagon.
  - If 6 triangles make a hexagon, then a triangle is _____ a hexagon.
- Can you think of a different way to partition the hexagon into equal parts?

Facilitator notes

- Show families how they can use the prompts, model asking questions, and point out the Geometry Glossary poster or handout for easy reference.
- Model using the correct vocabulary for shapes, but do not correct families if they use color names instead.
- Encourage families to use different pattern blocks to partition the hexagon.
- **To scaffold,** start with one hexagon pattern block and identify other pattern blocks that can be arranged to make a regular hexagon of the same size. Remind participants to create a hexagon using only one type of pattern block (for example, all trapezoids, all triangles) so they may more readily discuss fractional parts of a whole.
- **To add challenge,** build a regular hexagon with a combination of pattern blocks (for example, one trapezoid and three triangles or two rhombuses and two triangles). As participants discuss fractional parts of the hexagon, they will be challenged to think flexibly about what fractional part of the whole hexagon is represented by each type of pattern block.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.2.G.A.3/ AERO.2.G.3 DOK 2,3: Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

CCSS.MATH.CONTENT.3.G.A.2/AERO. 3.G.2 DOK 1,2: Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Investigate, describe, and reason about the results of subdividing, combining, and transforming shapes.

Activity 1c: Symmetric Mosaics

Goal

Families make a mosaic using pairs of pattern blocks, paying attention to the different attributes of the mosaics, such as the number of parallel and perpendicular lines, types of angles, and lines of symmetry.

Materials in toolkit

- Instructions and family prompts.
- Pattern block key.
- Geometry glossary.

Materials to gather

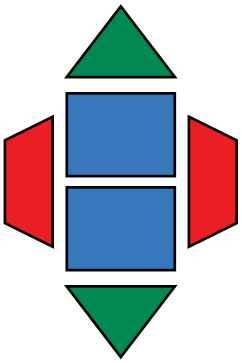
- A container of pattern blocks.
- Small mirrors.
- Dice.

Recommended grade levels

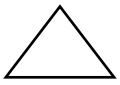
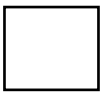
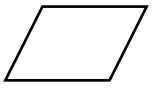
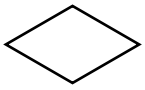
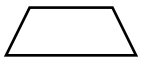
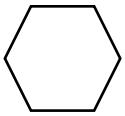
Grades 4–5.

Activity instructions

1. Roll a die.
2. Find the number in the pattern block key, and take two pattern blocks.
3. Repeat two more times, taking two pattern blocks each time.
4. Make a design with all your shapes that has at least one line of symmetry. A line of symmetry is a line that divides the design into two identical parts.
5. Count the number of lines of symmetry. Whoever has more lines of symmetry wins.
6. Use the same blocks and try a new design.



The pattern block key

If you roll a…	1	2	3	4	5	6
Take 2…						

Family prompts

- What is the name of this shape? (Possible responses: parallelogram, hexagon, quadrilateral, triangle, trapezoid.)
- Which shapes can be classified as quadrilaterals (having four sides)? How do you know?
- Which shapes can be classified as parallelograms (having two pairs of parallel sides—sides that keep the same distance apart)? How do you know?
- How do you know if this shape has a line of symmetry? Show me.
- Is there another line of symmetry?

Facilitator notes

- Show families how they can use the prompts, model asking questions, and point out the Geometry Glossary poster or handout.
- Model using the correct vocabulary for shapes, but do not correct families if they use color names instead.
- Encourage families to express different reasons for how and why they created the mosaic the way they did.
- Demonstrate how to use a mirror to check for symmetry.
- **To scaffold,** identify the lines of symmetry found in individual pattern blocks. This may be done prior to starting the game or as participants roll the die to select pattern blocks. If needed, use mirrors to check for symmetry.
- **To add challenge,** explain that some shapes have rotational symmetry (rotational symmetry is when a shape still looks the same after some rotation). Encourage participants to compose a shape that shows rotational symmetry.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.4.G.A.3/ AERO. 4.G.3 DOK 1: Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

CCSS.MATH.CONTENT.5.G.B.3: Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

AERO. 5.G.4 DOK 1,2: Classify two-dimensional figures in a hierarchy based on properties.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Identify and describe line and rotational symmetry in two-dimensional shapes and designs.

Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.

Facilitator guide to station 2: Operations and Algebraic Thinking

Station overview

The Operations and Algebraic Thinking station includes three activities:

- **Activity 2a:** Flip the Cards, recommended for children in grades K–1.
- **Activity 2b:** Many Ways of Counting, recommended for children in grade 2–3.
- **Activity 2c:** Game of 24, recommended for children in grade 4–5.

Read the background information below and then explore each activity.

Background

From an early age, children observe number patterns and relationships and use these observations to build conceptual understanding (Reed & Young, 2017). This understanding becomes the basis for arithmetic operations and number composition. With practice, children develop fluency in applying operations and can apply them accurately, efficiently, and in different contexts (National Council of Teachers of Mathematics, 2014b). Conceptual understanding and computational fluency support children in solving problems. These three fundamentals—conceptual understanding, computational fluency, and problem-solving skills—are mutually reinforcing and together promote algebra preparedness (Boaler & Confer, 2015; National Mathematics Advisory Panel, 2008; Woodward, 2006).

Conceptual understanding, computational fluency, and problem-solving skills form the fundamentals of algebra.

- *Conceptual understanding* is an understanding of mathematical concepts, operations, and relations.
- *Computational fluency* is the skill to apply procedures accurately, efficiently, and flexibly.
- *Problem solving* is the ability to express and solve math problems and the capacity to reflect, explain, and justify the strategy and solution mathematically.

The Operations and Algebraic Thinking station activities support students' conceptual understanding of numbers and operations and build fluency in applying arithmetic procedures. The activities prompt students to work with numbers and operations in different ways, use strategies that support conceptual understanding and fluency, and reflect on their methods and solutions.

Activity 2a, Flip the Cards, is a game-based activity that helps students think flexibly about the numbers 1–10. Activity participants use dice, number cards, addition, and strategy to reach the goal of being the player to flip over the final number card.

Activity 2b, Many Ways of Counting, helps students identify patterns and use grouping strategies to efficiently count items. Participants discuss their counting approaches, identify multiple ways to count the same array, and then create a new array of their own for others to count.

Activity 2c, Game of 24, builds fluency by using up to five number cards and one or more operations cards to reach a total of 24. Participants use their knowledge of factors and basic fact families to devise their strategies.

Activity 2a: Flip the Cards

Goal

Families practice using number words, counting, and adding single-digit numbers.

Materials in toolkit

- Instructions and family prompts.
- Flip the Cards deck (consider laminating the cards).

Materials to gather

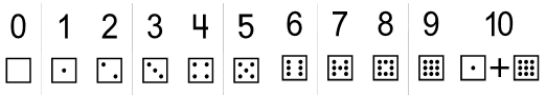
- Dice.

Recommended grade levels

Grades K–1.

Activity instructions

1. Place the cards 0–10 face up, in order, in front of all the players.

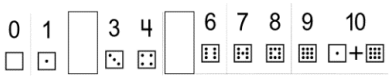


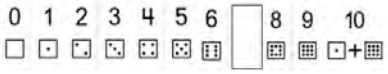
2. The youngest player goes first.

3. During your turn, roll a pair of dice.

4. Flip a card face down for each number rolled on the dice or for the sum of the numbers rolled. If you cannot flip any cards, take a single extra turn.

   Example. You roll a 2 and 5, flip the 2 and 5 cards face down or flip the 7 card (2+5) face down.





5. If you roll doubles (two of the same number), flip the 0 card face down. If you have already flipped the 0, take an extra turn.

6. Whoever turns over the last card wins.

7. For fun, you can make new rules before a new game. For example, if you roll numbers that have already been flipped face down, you have to flip them face up again.

Family prompts

- Help your child place the cards in order, but don't do it for your child.
- Help your child use the roll of the dice strategically. For example, if the dice show a 2 and a 4, ask, "Do you want to flip over the 2 and the 4 or 6?"
- Ask your child: "What roll or rolls do you hope you get? Why?"
- Start with just the cards numbered 1–6 for a child who needs a little more support.

Facilitator notes

- Show families how they can use the prompts, and model asking questions.
- If needed, encourage patience as the children lay out the cards in order or add the numbers.
- Tell families that it is okay for the children to use their fingers to add their dice rolls.
- **To scaffold,** use the cards numbered 1–6 and use just one die.
- **To add challenge,** use subtraction to combine the numbers rolled to flip cards.
- For a variation on the game (and if there are enough materials), suggest that players use their own deck and whoever turns over all the cards first wins.
- If the budget and time allow, consider printing these card decks on cardstock and laminating the cards so the materials last longer.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.K.OA.A.3./AERO.K.OA.3.DOK 2.3: Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

CCSS.MATH.CONTENT.K.OA.A.4/AERO.K.OA.4.DOK 2: For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

CCSS.MATH.CONTENT.K.OA.A.5/AERO.K.OA.5.DOK 1: Fluently add and subtract within 5.

CCSS.MATH.CONTENT.1.OA.A.1/AERO.1.OA.1.DOK 2: Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers.

Develop fluency with basic number combinations for addition and subtraction.

Understand the effects of adding and subtracting whole numbers.

Activity 2b: Many Ways of Counting

Materials in toolkit

- Instructions and family prompts.
- Counting cards (consider laminating the cards).

Materials to gather

- Blank index cards.
- Markers and/or stickers.

Goal

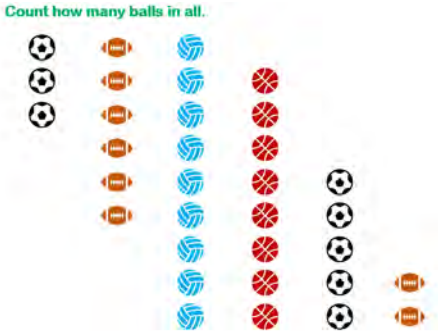
Families use grouping strategies to find the total number of items on a variety of cards.

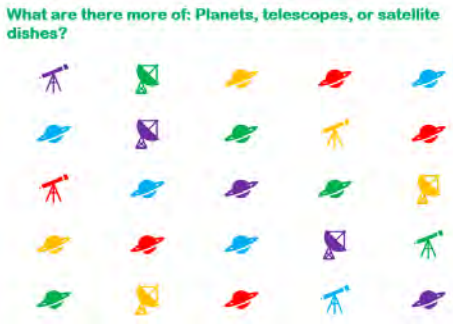
Recommended grade levels

Grades 2–3.

Activity instructions

1. Take one counting card and respond to the prompt.
2. All players explain how they know they got the right answer.
3. See if there is another way of grouping the items to double-check your answer.
4. For fun, create a new counting card for other players to count.





Family prompts

- Ask your child to explain how they got the answers.
- Ask your child another way to figure it out.
- Share how you counted so that you can compare strategies with your child.
- It is okay if your child simply counts each item.
- Encourage your child to group items so they don't have to count each item.

Facilitator notes

- Let families know that there are many different strategies that they can use to efficiently count the number of objects in the array, by grouping the items. They do not have to simply count one by one.
- Once they have tried several strategies, they should select a different counting card and respond to the prompt.
- Show families how they can use the prompts, and model asking questions.
- **To scaffold,** laminate some or all of these cards so that students can use dry-erase markers to help organize and communicate their grouping strategies; offer hints to help students recognize more complex counting or grouping strategies.
- **To add challenge,** provide participants with blank cards so they can create their own arrangements and question prompts.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.2.OA.C.4/ AERO.2.OA.4.DOK 2: Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

CCSS.MATH.CONTENT.3.OA.A.1/ AERO.3.OA.1.DOK 1,2: Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7.

CCSS.MATH.CONTENT.3.OA.A.3/ AERO.3.OA.3.DOK 1,2: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Develop and use strategies for whole-number computations, with a focus on addition and subtraction.

Understand various meanings of multiplication and division.

Understand the meanings of multiplication and division of whole numbers through the use of representations (e.g., equal-sized groups, arrays, area models, and equal "jumps" on number lines for multiplication, and successive subtraction, partitioning, and sharing for division). Relate multiplication and division as inverse operations.

Activity 2c: Game of 24

Goal

Families will combine numbers and operations to see who can produce 24 with one or more operations.

Materials in toolkit

- Instructions and family prompts.
- Game of 24 deck.

Materials to gather

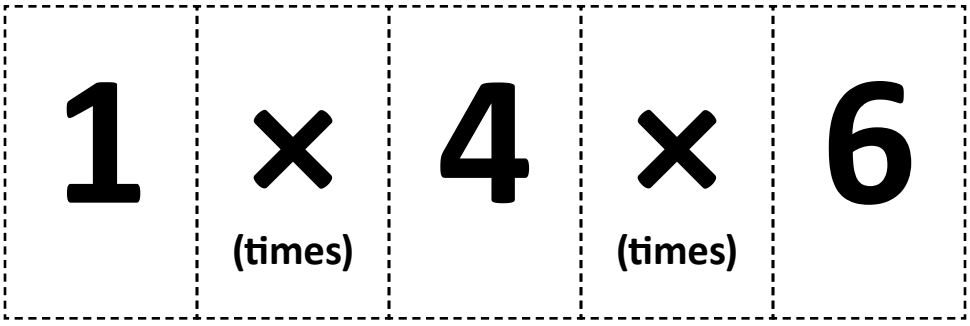
- Paper for scorekeeping.

Recommended grade levels

Grades 4–5.

Activity instructions

1. Shuffle the deck of number cards, and deal five cards to each player.
2. Place the cards face up so that everyone can see everyone else's cards.
3. Set the remaining cards in the center face down. Set the operations cards in the center face up.
4. On your turn, use as many of your number cards as possible to make 24 by using any operations cards you need. You can add, subtract, multiply, and divide as many times as you need. Once you make 24, record your score based on the scoring rules and return your used cards to the bottom of the number deck. Draw enough cards from the top of the deck so that you have five cards once again.



5. If you can't make 24, you can exchange one or more number cards and wait until the next turn.
6. The person with the most points at the end of the round (when all the number cards have been used) wins.

Scoring

- Use five number cards: 10 points.
- Use two to four number cards: 5 points.
- Use one number card: 1 point.

Family prompts

- Help deal the cards.
- Let your child lead, but offer hints if you see that your child is stuck—for example, remind your child of the factors of 24 (whole numbers that divide 24 evenly such as 2 and 12 or 3 and 8).
- Encourage your child to look for ways to group numbers. For example, a child might first group 3 and 1 (3 + 1) and then multiply the sum by 6 to form the number sentence (3 + 1) × 6 = 24. Here's another grouping example to help you think of options: (9 – 1) × (2 + 1) = 24.
- It is okay to help your child or for your child to help you if you are stuck (or pretend to be stuck).

Facilitator notes

- Show families how they can use the prompts, and model asking questions.
- You may need to offer other examples of how to make number sentences that equal 24.
- **To scaffold,** prepare a card that shows the factor pairs of 24 (1 × 24, 2 × 12, 3 × 8, 4 × 6), and provide this card to students who might need reminders. Offer other examples for how to make number sentences that equal 24.
- **To add challenge,** encourage players to identify ways to use more cards with each turn.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.4.OA.B.4/ AERO. 4.OA.4.DOK 1: Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

CCSS.MATH.CONTENT.5.OA.A.2/ AERO. 5.OA.2.DOK 1,2: Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as [2 × (8 + 7)]. Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

Identify and use relationships between operations, such as division as the inverse of multiplication, to solve problems.

Facilitator guide to station 3: Numbers and Operations in Base-10

Station overview

The Numbers and Operations in Base-10 station includes three activities:

- **Activity 3a:** Race to 100, recommended for children in grades K–1.
- **Activity 3b:** Broken Calculator, recommended for children in grade 2–3.
- **Activity 3c:** Dinner Time, recommended for children in grade 4–5.

Read the background information below and then explore each activity.

Background

Developing a strong understanding of the base-10 number system (the standard, everyday number system using the 10 digits from 0 to 9) and place value helps students perform operations with fluency and then solve multistep and complex problems (Star et al., 2015). The activities in the Numbers and Operations in Base-10 station emphasize conceptual problem solving, rather than rules and procedures, to support a stronger understanding of place value and promote fluency with operations.

Activity 3a, Race to 100, uses place-value blocks to support students' thinking and reasoning using concrete tools. Base-10 or place-value blocks are three-dimensional blocks that represent different place values of numbers; a set includes individual units (ones place), ten units in a rod (tens place), ten rods placed side by side in a flat square (hundreds place), and ten flat squares piled on top of each other to form a cube (thousands place). These blocks help children visualize numbers, think and reason in meaningful ways, and support interconnected understandings of math concepts. They also help students verbalize mathematical thinking and work collaboratively (Stein & Bovalino, 2001).

Activity 3b, Broken Calculator, is a version of the "broken calculator problem" invented in the 1980s by Judah Schwartz (n.d.) to address some math teachers' worry that using calculators in math class would prevent students from developing computational fluency. The activity was designed to engage students in practicing place value and performing operations by thinking critically about different operations and number combinations (Collison et al., 2006).

Activity 3c, Dinner Time, is designed to build fluency in comparing and performing operations with decimals in a real-world context. Math problems entailing contexts that are personally or socially meaningful to students (for example, dining at a restaurant) are effective for generating interest and engagement. Developing connections between math and the real world is a strategy that can be particularly effective for students who are underperforming or are generally underrepresented in science, technology, engineering, and mathematics (STEM; National Council of Teachers of Mathematics, 2014a).

Activity 3a: Race to 100

Materials in toolkit

- Instructions and family prompts.

Materials to gather

- Base-10 blocks.
- Dice.

Goal

Families practice combining and recombining in base-10.

Recommended grade levels

Grades K–1.

Activity instructions

1. At the start of a turn, roll a pair of dice.
2. Add the dots (or pips), and collect that number of units.
3. When you get 10 units, you can exchange them for a 10-rod.
4. If you roll a double (two of the same number), you get a free 10-rod along with the sum of the roll.
5. When you have ten 10-rods, exchange them for a 100-flat square to win.

Family prompts

- Ask your child throughout the game whether they have 10 or more units and can exchange them for a 10-rod.
- Ask your child throughout the game how many units they have in total. Then, ask which player is closest to 100.

Facilitator notes

- Show families how they can use the prompts and model asking questions.
- If you hear families use the terms "borrowing" and "carrying," rephrase with the mathematical vocabulary that you use in class, such as "regrouping" or "trading."
- **To scaffold,** use Unifix cubes (colorful, interlocking cube blocks) to help participants build a 10-rod. Constructing the 10-rod from individual units can help participants build a mental model of place value.
- **To add challenge,** allow participants to use three dice throughout the game or for a few rolls during the game.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.K.NBT.A.1/AERO.K.NBT.1.DOK 2: Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

CCSS.MATH.CONTENT.1.NBT.B.2/AERO.1.NBT.2.DOK 2: Understand the two digits of a two-digit number represent amounts of tens and ones.

CCSS.MATH.CONTENT.1.NBT.C.4/ AERO.1.NBT.4.DOK 1,2,3: Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones, and sometimes it is necessary to compose a ten.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Compare and order whole numbers (at least to 100) to develop an understanding of and solve problems involving the relative sizes of these numbers. Recognize whole numbers between 10 and 100 in terms of groups of tens and ones (especially recognizing the numbers 11 to 19 as one group of ten and a particular numbers of ones).

Understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations.

Understand the effects of adding and subtracting whole numbers.

Activity 3b: Broken Calculator

Goal

Families use place value, addition, and subtraction to create solutions to math challenges with various restrictions.

Materials in toolkit

- Instructions and family prompts.

Materials to gather

- Four-operation calculators (add, subtract, multiply, divide).

Recommended grade levels

Grades 2–3.

Activity instructions

1. In this game, you try to reach the goal number while pretending that certain keys on the calculator don't work.

2. Why didn't we provide answers? Because there are so many! Plus, once you get one answer, you'll see that you were correct or incorrect immediately on the calculator. If by some chance you didn't find one correct path, then try again—that's why you have a calculator!

Where's the 1?

Restriction: The #1 key is broken!

Goal: We need to make the number 11 show up on the calculator screen.

1. Explain your strategy.
2. How many moves did it take you?
3. Can you do it in fewer moves? More?
4. Is there a different operation you can use?

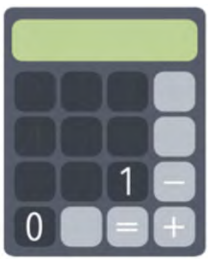
Now try 111. Then 1,111.

Year of birth

Restriction: The only keys that work are 1, 0, +,-, =

Goal: Can you get the display to show the four-digit year of your birth? (e.g., 1990, 2011)

1. Explain your strategy.
2. How many moves did it take you?
3. Can you do it in fewer moves? More?
4. Can you get the display to show your parents' years of birth?
5. Explain your strategy. Did you use the same strategy or a different one?
6. How many moves did it take you?
7. Can you do it in fewer moves? More?



Family prompts

- Try different options, and be patient with your child and with yourself if you don't get to the goal number quickly.
- Ask your child to share solutions and then to ask the questions in the game.
- Ask whether your child can do it another way.
- If your child reaches a solution quickly, try to display another family member's birth year (for example, aunt's, uncle's, grandparent's).

Facilitator notes

- Show families how they can use the prompts and model asking questions.
- **To scaffold,** provide options for using numbers in the hundreds.
- **To add challenge,** ask participants to complete the activity in fewer moves or come up with their own broken calculator problem.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.2.NBT.B.5/AERO.2.NBT.5.DOK 1,2: Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

CCSS.MATH.CONTENT.3.NBT.A.2/AERO. 3.NBT.2.DOK 1,2: Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Develop fluency with efficient procedures, including standard algorithms, for adding and subtracting whole numbers, understand why the procedures work (on the basis of place value and properties of operations), and use them to solve problems (place value to 1000).

Understand place value of numbers up to 10,000 in various contexts. Apply this understanding to the task of representing numbers in different equivalent forms (e.g., expanded notation).

Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.

Activity 3c: Dinner Time

Goal

Families perform operations with decimals to budget for a family meal at a restaurant.

Recommended grade levels

Grades 4–5.

Materials in toolkit

- Instructions and family prompts.
- Menus and meals.
- Budget planning handout.
- Plate handout.

Materials to gather (optional)

- Four-operation calculators (add, subtract, multiply, divide).
- Menus from local restaurants.

Activity instructions

1. Each family determines a budget for the meal and records it on the budget sheet. The budget might be based on the number of family members dining out and what is a realistic amount for their family to spend.

2. Each family member reviews the menus, records his or her selection (number and item) on a plate, and totals the cost for his or her individual meal. Remember to include entrées, any additional sides, and beverages in the total.

3. Record the cost of each family member's meal on the budget sheet, and total the cost for the family.

4. Did you stay within budget? How much money is left?

5. Suppose you want to go for ice cream after dinner. Will there be enough money left for ice cream? If not, how might you adjust your dinner choices to budget for ice cream?

Activity 3c: Main Street Café

Item #	Burgers, Tacos, Wraps, and Sandwiches
1	Cheeseburger with lettuce and tomato (served with fries) $6.50
2	Bacon burger with lettuce and tomato (served with fries) $7.50
3	Grilled chicken sandwich with lettuce and tomato (served with fries) $7.25
4	2 Chicken tacos with guacamole, rice, and refried beans $7.45
5	2 Beef tacos with rice and refried beans $6.80
6	2 Fish tacos with rice and refried beans $7.50
7	Mediterranean veggie wrap (spinach, cucumbers, hummus, red onions, olives, feta cheese) $6.50
8	Southwest chicken wrap (grilled chicken, lettuce, cheese, onions, and ranch dressing) $7.25
9	Turkey club sandwich with lettuce, cheese, and tomato (served with fries) $8
10	Bacon, lettuce, and tomato (BLT) toasted sandwich (served with fries) $6.50
11	Grilled cheese sandwich with a cup of tomato soup $6
12	PBJ - Peanut butter and jelly sandwich served with a banana $5

Item #	Salads
13	Beef taco salad – includes crispy taco bowl, lettuce, cheese, corn, sour cream, guacamole, and your choice of dressing $9.25
14	Veggie mix salad – includes spring mix greens, broccoli, cucumber, cauliflower, tomato, chickpeas, and your choice of dressing $8.20
15	Lettuce wedge with blue cheese dressing $7.25
---	**Sides**
16	Fries: $1.50
17	Onion rings: $2
18	Potato salad: $2.50
19	Cole slaw: $2.50
20	Applesauce: $1.50
21	Fresh fruit: $1
	Beverages
22	Sodas: (diet or regular) $2
23	Lemonade: small $2
24	Tea: small $2
25	Milk: $1.50
26	Water: free

Activity 3c: Dinner Time Budget Planning

1. How many family members plan to dine out? _____
2. What is your family's budget for the meal? _____
   You may choose any items on the menu, but total cost must remain within the budget.

Family member	Selection (sandwich, side, and/or beverage)	Cost
	Meal Total Cost	
	Difference from budget	

Activity 3c: Dinner Time

Family prompts

- Encourage your child to estimate costs prior to selecting menu items.
- About how much should an individual meal cost if each family member has an equal share of the budget? (Estimate to whole-dollar amounts.)
- About how much money should be estimated for beverages?
- Discuss family meal selections. Which is highest in cost? Which is lowest?
- Encourage your child to consider menu options to remain within budget.
- Although taxes and a server's tip are not included in this activity, you might want to discuss these costs with your child.

Facilitator notes

- Show families how they can use the prompts and model asking questions.
- Encourage families to use different operations as appropriate; for example, use multiplication if you are ordering several beverages of the same cost; use addition if you are totaling several meals of different costs.
- **To scaffold,** start with a budget for no more than two family members.
- **To add challenge,** restrict the budget to $20 and tell students they must set aside $3 for a tip, and $2 for taxes. Ask students to determine the food and beverage options for two people with a budget of $20 that allows for a tip and taxes.

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.4.MD.A.2/AERO. 4.MD.2.DOK 1,2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit.

CCSS.MATH.CONTENT.5.NBT.B.7/AERO. 5.NBT.7.DOK 1,2,3: Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Understand decimal notation as an extension of the base-10 system of writing whole numbers that is useful for representing more numbers, including numbers between 0 and 1, between 1 and 2, and so on.

Develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience.

Apply understandings of decimal models, place value, and properties to add and subtract decimals.

Facilitator guide to station 4: Measurement and Data

Station overview

The Measurement and Data station includes one activity with family prompts differentiated for students in grades K–1, 2–3, and 4–5. Read the background information below and then explore the activity.

Background

Measurement is a key competency in the development of mathematical and scientific thinking from preschool through middle school and is fundamental to STEM education (Barrett et al., 2017). By completing measurement tasks, children learn to compare magnitudes and observe changes, and these skills bridge the areas of number sense and geometry (Sarama & Clements, 2009).

The Measurement and Data activity engages students in measuring distances around the room, solving measurement problems, and discussing their reasoning. These tasks promote mathematical reasoning and problem solving and allow multiple entry points for student learning. The use of mathematical tools such as rulers, tape measures, and metersticks is key to building conceptual understanding of measurement (Hiebert, 1984) and supports students' thinking and problem-solving abilities (National Council of Teachers of Mathematics, 2014a). Families and their children can practice measurement by measuring objects around the home and by involving children in crafts or hobbies (such as sewing or woodworking) that involve measurement.

At the Measurement and Data math station, kindergarten and grade 1 students build their understanding of length by measuring with an informal unit, a string length representing the height of one student. Participants estimate how many string lengths it takes to reach across the room and then measure this distance by laying their string end to end across the floor.

Grade 2 and 3 students compare the lengths of two informal units: a string length representing the height of one student and a string length representing the height of another family member. Using both informal units, they estimate and measure the distance across the room and discuss how the results differ.

Grade 4 and 5 students transition from using informal units—a string length representing the height of someone—to the formal units of feet and meters. They discuss the advantages of each unit and measure the room's length using multiple tools.

Resource highlight

Interested in learning more about research-based strategies for teaching measurement? This Regional Educational Laboratory Central video shares informal and formal measurement strategies that build young children's conceptual understanding of measurement and early data-use skills.

Activity 4: How many of me?

Goal

Families measure various objects to answer the question "How many of me does it take to measure _____?"

Materials in toolkit

- Instructions and family prompts.
- Measurement reference sheet.

Materials to gather

- 2- to 3-inch-wide grosgrain ribbons in different colors.
- Scissors.
- 1-foot rulers.
- Zippered plastic bags to store ribbon for children to take home
- Meterstick.
- Scratch paper.

Recommended grade levels

Grades K–5.

Activity instructions

1. Cut a piece of ribbon equal in length to the height of your child.
2. You will call the length of ribbon by the name of the person whose height you used. For example, the ribbon cut to match the height of a child named Jacob is called "a Jacob."
3. Use the prompts and the ribbon to measure different dimensions around the room.

Family prompts

Grades K–1

- What are some things in this room you could measure with your ribbon?
- Let's use the length of your ribbon to measure the length of the room or the bleachers. First, let's estimate. How many "Jacobs" do you think it will take to equal the length of the room? How many "Jacobs" does another family member think it will take?
- Next, use the ribbon to count how many "Jacobs" would fit across the room. Whose guess was closer?
- Which side of the room do you think is longer? How could we measure to find out?
- Use the ribbon to measure the width of the room.
- Now that you've measured the length and width of the room or bleachers, make a guess about how many "Jacobs" it would take to equal the height of the room. How did you make your guess?

Grades 2–3

- Use your ribbon to measure the length of the room in "Jacobs."
- Cut a piece of different colored ribbon equal in length to the height of a different family member, and call it by the name of the person whose height you used; for example, the ribbon cut to match the height of Grandma is called "a Grandma."

- Which do you think will be greater, the number of "Jacobs" needed to measure the length of the room or the number of "Grandmas"? Why?
- Check your prediction: use the ribbon to measure the length of the room in "Grandmas."
- Compare the results to your prediction. Is anything surprising?
- Discuss why the number of "Jacobs" is different from the number of "Grandmas."

If there is time remaining:

- How could we figure out the perimeter? (The perimeter is the total length around the room where the wall meets the floor.)
- Would you rather measure in "Jacobs" or "Grandmas"? Why?
- Measure the width of the room. Then add length + width + length + width to calculate the perimeter.

Grades 4–5

- Use your ribbon to measure the length of the room in "Jacobs."
- Which is longer, an inch or a foot? Allow your child to look at a ruler, yardstick, or tape measure to decide.
- **Estimate:** About how long is a "Jacob" in inches?
- Measure your ribbon in inches.
- Can you calculate the length of your ribbon in feet now that you know it in inches? Measure your ribbon in feet to check.
- Which is longer, a meter or a centimeter? Allow your child to look at a meterstick or tape measure to decide.
- **Estimate:** About how long is a "Jacob" in centimeters?
- Measure your ribbon in centimeters and meters.
- Can you use the length of the room in "Jacobs" to calculate the length of the room in feet?
- Which do you think will be greater, the height of the room or the length? Why?

Facilitator notes

- Show families how they can use the prompts and model asking questions.
- Point out how families can use the markings or tile pattern on the floor to help them measure a straight line across the room or how they can line up their measuring tool next to the wall or bleachers to measure length or width.
- Model using mathematical vocabulary such as "length," but do not correct families if they use descriptive phrases instead.
- As you circulate, look to see that students are using their measuring tools correctly (lining them up end to end with no gaps or overlaps, starting at 0 on rulers, measuring straight across the room, and so on). Help families choose appropriate tools and units to measure, as needed.
- **To scaffold,** measure the height of a stuffed animal such as a teddy bear and use the "teddy bear" length to predict the length of a table; measure the length in "teddy bears." Starting with a shorter length and using a raised surface (such as a book or a table) may help participants refine their measuring strategy.
- **To add challenge,** help participants generalize their experience with this measurement activity. Ask, "What do you notice when a longer unit is used to measure the length of a room? A shorter unit? Why might standard units of measurement (for example, one inch, one foot, one centimeter, one meter) be useful?"

Related standards

Common Core State Standard (CCSS)–Math and American Education Reaches Out (AERO) Standards

CCSS.MATH.CONTENT.K.MD.A.1/AERO.K.MD.1.DOK 2: Describe measurable attributes of objects, such as length or weight, and describe several measurable attributes of a single object.

CCSS.MATH.CONTENT.K.MD.A.2/AERO.K.MD.2.DOK 2: Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.

CCSS.MATH.CONTENT.1.MD.A.1/AERO.1.MD.1.DOK 2,3: Order three objects by length and compare the lengths of two objects indirectly by using a third object.

CCSS.MATH.CONTENT.1.MD.A.2/AERO.1.MD.2.DOK 1,2: Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Instructional Note: Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.

CCSS.MATH.CONTENT.2.MD.A.1/AERO.2.MD.1.DOK 1: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, metersticks, and measuring tapes.

CCSS.MATH.CONTENT.2.MD.A.2/AERO.2.MD.2.DOK 2,3: Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

CCSS.MATH.CONTENT.3.MD.D.8/AERO.3.MD.8.DOK 1,2: Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

CCSS.MATH.CONTENT.4.MD.A.1/AERO. 4.MD.1.DOK 1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4-ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...

CCSS.MATH.CONTENT.4.MD.A.2/AERO. 4.MD.2.DOK 1,2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

CCSS.MATH.CONTENT.5.MD.A.1/AERO. 5.MD.1.DOK 1,2: Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multistep, real-world problems.

National Council of Teachers of Mathematics (NCTM) Related Standards from PreK–8 Curriculum Focal Points

Recognize the attributes of length, volume, weight, and area.

Use measurable attributes, such as length or weight, to solve problems by comparing and ordering objects. Compare the lengths of two objects both directly (by comparing them with each other) and indirectly (by comparing both with a third object).

Compare and order objects according to their attributes (length, weight, etc.).

Understand how to measure using nonstandard and standard units.

Select an appropriate unit and tool for the attribute being measured.

Measure with multiple copies of units of the same size, such as paper clips laid end to end.

Develop an understanding of perimeter as a measurable attribute and select appropriate units, strategies, and tools to solve problems involving perimeter.

Select and use benchmarks to estimate measurements.

Carry out simple unit conversions, such as from centimeters to meters, within a system of measurement.

Select and apply appropriate standard units and tools to measure length, area, volume, and weight.

Closing remarks

Conclude the math night by thanking participants for attending and encouraging each family to complete the exit ticket and provide feedback. Below is some content that you might want to share as part of your closing remarks.

- Reiterate some of the key points from the Mindsets and Math presentation about modeling positive math attitudes and promoting a growth mindset.
- Share tips for encouraging interest in math and supporting learning outside of school. Here are a few examples:
  - Count objects around the house and ask, “How many in all?”
  - Talk about and compare shapes of everyday objects.
  - Use spatial language (under, over, higher, lower, closer, farther).
  - Play card games and board games that require math, including ones you make yourself.
  - Involve children in everyday measurement activities, such as baking.
  - Read books about math or ask math questions when reading books.
  - Talk about jobs that use math.
- Share information with families about the next opportunity for community engagement. Have a science fair coming up? Be prepared to provide details and ask families to save the date.
- Talk about how families can continue to engage in math learning at the school, for example, by volunteering in the classroom.

Facilitator notes

- Assign one facilitator to lead the closing remarks.
- If you included a door-prize drawing or raffle as part of the event to incentivize attendance and full participation, collect exit tickets before announcing winners to increase the response rate.
- Linger near the exit to offer personal goodbyes to families as they leave or to answer any questions.
- Celebrate your success with your colleagues.

Regional Educational Laboratory Appalachia

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Appendix A. Community Math Night Professional Learning Workbook

This workbook is a companion to the *Community Math Night Facilitators' Toolkit,* a comprehensive resource for elementary school educators to plan and implement a Community Math Night.

IES Institute of Education Sciences

NOVEMBER 2021

Contents

Understanding the "why" of Community Math Nights

A Community Math Night brings together educators, students, and their families to learn about, talk about, and have fun with math; reinforce positive math mindsets; and help family members participate in their child's learning. The Community Math Night program helps schools and communities create a shared understanding of math concepts and raise expectations for math knowledge and achievement, both of which promote children's success in school (DeFlorio & Beliakoff, 2015).

The content and activities in the *Community Math Night Facilitators' Toolkit* are based on key research related to supporting student success in math. Understanding the research foundations for the Community Math Night program can help educators feel confident about hosting a math night and implementing math night activities. A stronger understanding of the "why" behind the Community Math Night program can also help educators connect the math night activities to their own beliefs and practices, which in turn can strengthen their work with students and families beyond the event.

This workbook is designed as a professional learning resource for educators and other school staff, though other stakeholders may engage as they have interest. The workbook pairs with Section 1–Learn of the toolkit and includes important research on four key topics that form the basis of the Community Math Night program:

- The importance of learning math for future success.
- Supporting equitable family engagement in math.
- Building a growth mindset and positive math attitudes.
- Effective practices for math instruction in elementary school.

The workbook describes the research base and then provides examples of how to apply the evidence in practice. The workbook also includes questions prompting users to reflect on related teaching practice and to use while planning and implementing a math night. For each topic the workbook also includes a curated list of additional resources for deeper study.

Using this workbook

Below are considerations for a Community Math Night core planning team using this document for professional learning:

- **Frame the purpose.** Ensure that individuals understand that developing awareness and familiarity with the research underlying math night activities will help them reframe their own math mindsets in preparation for leading a school in implementing a successful event. The workbook is designed to help educators use research to reflect on their own mindsets, approach to math instruction, and family engagement.

- **Dedicate time.** Schedule dedicated time to review the topic summaries and address the Reflect and share questions together as a core planning team, and with other educators and school staff if possible. The team may choose to appoint a leader for the learning sessions or rotate leadership roles by topic.

  A team should spend approximately 30 minutes to review and discuss each topic summary. The team can review all four topics during one long meeting (approximately two hours) or review one topic at a time during four shorter meetings or as part of other scheduled meetings (for example, during staff or department meetings). Consider asking team members to read and review the topic summaries before the meeting, to save time. Also consider inviting to the meetings other members of the school staff who would benefit from this information, such as school leaders. Including school leaders and other educators can build momentum and enthusiasm for the Community Math Night program as well as for ongoing math professional learning.

- **Provide sufficient time and space for all participants to think and share.** When discussing the Reflect and share questions, provide time for educators to gather their thoughts before sharing.
  - Consider a think-pair-share strategy, or provide a minute before discussing each question for team members to jot down a few thoughts.
  - Try to be comfortable with a bit of silence or lulls in conversation while participants are digesting information.
  - Include all team members in the discussion. Consider rotating who shares first for each question or more actively engaging team members who are less likely to speak up.

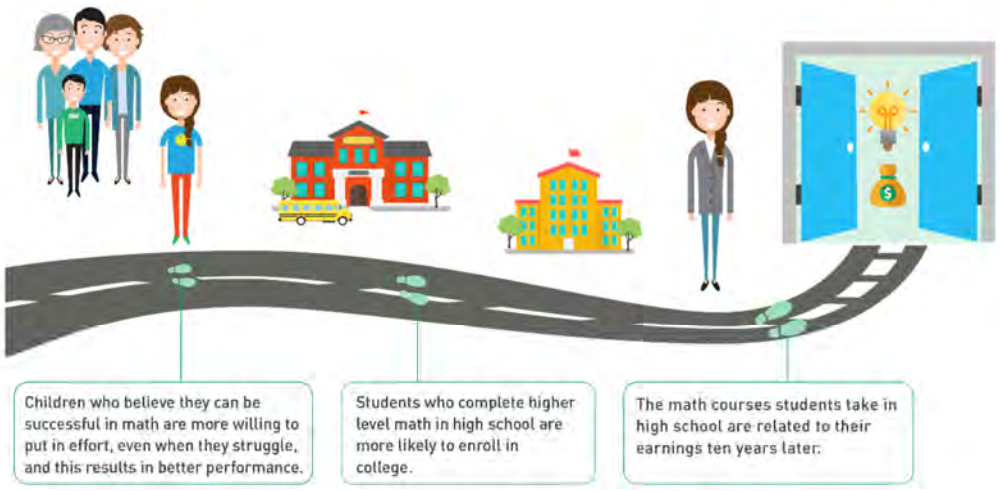
- **Keep the conversation focused and productive.** If conversation turns to negative experiences and you sense that educators are venting more than sharing and learning, try to refocus the conversation on the goal of supporting the Community Math Night program and how the research can inform future progress.

The importance of learning math for future success

Research roundup

An early emphasis on math is one way to set children up for future success in school and life; hosting a math night can help communicate this message to families and the broader community.

- Mastery of math skills at an early age is a strong predictor of later achievement in math and other subjects. For example, kindergartners' math skills (such as understanding quantity and one-to-one correspondence, comparing measurable attributes such as length and width, and classifying objects into given categories) can predict math, reading, and science achievement and the likelihood of grade retention in grade 8 (Claessens & Engel, 2013).
- Similarly, students' knowledge of fractions and division in elementary school is a predictor of their high school achievement in algebra, regardless of factors such as family income or education (Siegler et al., 2012). This suggests that having a strong foundation in math can help put all learners on the path to academic success.



- Research tells us that student learning is greatest when activities and tasks encourage high-level thinking and least when tasks are procedural (Boaler & Staples, 2008; Van de Walle, 2004). Thus, teachers should plan learning activities that balance procedural skill development (for example, acquisition of basic number facts, proficiency with math procedures—add, subtract, multiply, divide) with higher-level problem solving (math tasks that provide intellectual challenge and enhance math understanding; National Council of Teachers of Mathematics, 2014c).

Higher-level math courses lead to future success

- Taking higher-level math courses in high school has positive effects on students' math achievement and college enrollment, particularly for students from low socioeconomic backgrounds (Byun et al., 2015).

- Economists have found that the math courses students take in high school are strongly related to their earnings 10 years later, regardless of the person's race/ethnicity, gender, family characteristics, college major, or occupation (Rose & Betts, 2004).
- One explanation for the link between math learning and progress in areas beyond traditional math fields is that learning math promotes habits of mind or critical thinking skills —such as understanding patterns and relationships and striving for accuracy—that can be applied to solving problems in other disciplines (Cuoco et al., 1996).

Application to practice

Explain your thinking

When students verbalize their mathematical thought processes, teachers gain insight into students' conceptual understanding, and students gain confidence and build computational fluency, which supports skill mastery and sets students on a path to academic success. While the math night activities, with proper facilitation, offer opportunities for students and families to verbalize their math thinking, this concept of math talk could be integrated into classroom instruction as well. This can be done in many ways. One structure to reveal the value of explaining one's thinking about math is the math clinic, highlighted in this video from Edutopia. Math clinics push students' conceptual understanding of math through read-alouds, conversation prompts, and symbolic representations. You can lead math clinics for different size groups (small, large, or one-on-one) and various formats such as read-aloud, games, diagrams, and pictorial representations.

Source: Edutopia 2020. Edutopia® and Lucas Education Research™ are trademarks or registered trademarks of the George Lucas Educational Foundation.

Discuss with your colleagues

What is your reaction to the video? How can you ensure that your facilitation of activities during the math night encourages math talk? And beyond a math night, how can you embed the spirit of math clinics, where students have opportunities to explain their thinking, into your instruction and class routines? Use the box below to record discussion points.

Reflect and share

Discuss with your colleagues

1. What are your key takeaways on the connection between developing early math skills and practices and students' future success in secondary school and beyond?

2. How does having a strong foundation in math open doors for students from different backgrounds?

3. How does the research align with or differ from your own experience as a math learner? As an educator? How does it align with your goals for students?

4. What do you want families to understand about the connection between early math skills and academic and life success?

Learn more

- Supporting Your Child in Developing Math Skills for Future Success. This infographic from Regional Educational Laboratory (REL) Appalachia (n.d.) displays research findings on the importance of math success from elementary school to college and careers. It helps family members understand how math learning influences their child's future and provides simple ways that they can encourage positive math attitudes and learning.
- Using Math Talk to Support Learning. This short video from the Center for Early Childhood Education (2013) at Eastern Connecticut State University presents researchers discussing the importance of early math learning interspersed with clips of teachers engaging students in math learning through play.
- Building Educators' Understanding of Early Mathematics to Promote Students' Later Mathematics Success. This webpage (Regional Educational Laboratory West, n.d.) offers resources, including webinar recordings, discussion guides, and PowerPoint presentations from in-person and web-based events hosted by REL West. The content focuses on the foundational preK–grade 2 math knowledge and skills necessary for students to achieve mastery of the Common Core State Standards and meet with success across grade levels.
- The Institute for Habits of Mind. This infographic from the Institute for Habits of Mind (Kallick & Costa, n.d.) elaborates on the 16 habits that characterize problem-solving behavior and shows how to incorporate them into teaching and learning.

Supporting equitable family engagement in math

Research roundup

Engaging families in their children's math education validates them as partners in learning and contributes strategic benefits for students. Educators are experts in their content and pedagogy, and parents are experts in their children. By partnering, families and educators can leverage their strengths for maximum benefits to students. Events such as a math night offer an engaging opportunity to establish or cement family–educator partnerships.

Why engage families? Research affirms that families are powerful partners to support learning.

- More than four decades of evidence confirm the family's powerful influence on children's development. Family involvement is a strong predictor of school success (Harris et al., 2017; Weiss et al., 2009), particularly with literacy and math skills (Van Voorhis et al., 2013).
- Well-designed parent–family–community partnerships that involve parents and family members in their children's learning are associated with increased student self-confidence and achievement generally and in math specifically (Epstein et al., 2018).
- Urban youth identified their family members (parents, siblings) as providing them with the greatest amount of support throughout their schooling (emotional encouragement, academic assistance, and college preparation help; Vega et al., 2015).

Engaging in extracurricular math activities can help students' math development.

- Out-of-school-time family math activities, in which teachers, students, and families learn and talk about math together, can be one avenue to develop partnerships and can generate families' high expectations for their children's math learning (DeFlorio & Beliakoff, 2015; Meyer, 1996).
- Home-based activities, such as playing number board games, have been shown to improve the foundational math skills of economically disadvantaged students (Siegler & Ramani, 2008). Parents and students engaging in math-focused activities together is strongly and positively related to math achievement test scores in elementary and secondary grades (Sheldon & Epstein, 2005).

Traditional barriers to family engagement can be addressed with a holistic, strengths-based approach that recognizes and builds on positive attributes rather than focuses on potential deficits.

Holistic strategies for overcoming barriers to family engagement—among educators, in classrooms, with family members, and in the broader community—are listed below.

Among educators

- Develop self-awareness of negative biases about families and of assumptions that families have "problems" that the school needs to "fix." Instead, focus on families' strengths that you can leverage to support students' success (Kim, 2009).
- Internalize strengths-based attitudes and develop communication skills that allow you to convey positive assumptions to family members. See the Application to practice section for examples.
- Recognize the many ways that families can offer support to their children (such as providing emotional encouragement) that may not look like traditional family involvement (such as volunteering in the classroom), and acknowledge these strengths to parents as important in meeting students' needs (Vega et al., 2015).

In classrooms

- Invite the knowledge and perspectives of culturally diverse families to create respectful, engaging learning environments that empower students' identities as learners (Ishimaru et al., 2015). Strategies include inviting students to present and share cultural heritage such as traditions or favorite foods, noting math in the recipes (Scott, 2016) and integrating family interviews, lived histories (plotting events on timelines, calculating elapsed time in years), and folktales (which often incorporate counting, patterns, and repetition) into the curriculum (Eisenbach et al., 2016).
- Connect in-school math activities to everyday family routines and culture (Harris et al., 2017). Examples include investigating symmetry through traditional quilting, analyzing patterns in Navajo rug weaving, beading, and exploring measurement and fractions through family recipes.

With family members:

- Consider and minimize logistical challenges posed by many family engagement events (Koonce & Harper, 2005), which can make attendance challenging for some families because of work commitments and transportation difficulties.
- Consider strategies for eliminating barriers (transportation, scheduling, meeting locations) to attendance and increasing family participation.
- Communicate respect in every way possible: in written communications to families, spoken language at school and community gatherings, and nonverbal body language. Many parents have powerful, negative memories of their school experiences, and some may feel that school staff view them negatively (Koonce & Harper, 2005). Specifically, members of historically underrepresented groups often report feeling unwelcome, disrespected, and devalued when visiting their child's school (Morton, 2017). Thus, they might be reluctant to engage with teachers in full partnerships or to attend school events. Remember that by making families feel valued and respected, educators are helping to build a powerful partnership that benefits everyone—particularly students (Morton, 2017).

- Create a culture of partnership, openness, and hospitality at your school to help parents overcome any negative school experiences by promoting ongoing family engagement through frequent oral and written communication, home visits, and open houses. Establish and build trust for long-term relationships. See a math night event as but one element of a comprehensive plan to build relationships through sustained, positive, welcoming, affirming communication that builds trust.
- Engage parents and focus on shared goals for their children's success, building their capacity to support their children's learning, and develop relationships for the long term, beyond just a one-hour positive interaction.

In the broader community

- Build rapport and long-term connections with trusted partners such as nonprofits (Boys & Girls Club, YMCA); faith communities (churches, temples, mosques); and advocacy organizations committed to supporting families in your community (Jordan & Wilson, 2017; Latunde, 2016). These groups interact with students and families in nonacademic settings and can help educators serve families in holistic ways.
- Tailor outreach and partnership strategies to better engage underrepresented families in supportive programming. See Promote enthusiasm and participation in Section 2–Plan for sample strategies.
- Encourage and incentivize students (for example, through contests) to communicate positive math attitudes to friends and parents through social media and other Internet platforms (Latunde & Clark-Louque, 2016).
- Think about family involvement within the context of a linked system of other learning supports for a child's school success—and build such a linked system, including the school, community, families, and educators—so that "if one type of support falters, others hold strong" (Weiss et al., 2009, p. 16).

Application to practice

Adopting and internalizing strengths-based attitudes toward family engagement

To meaningfully lead and support a Community Math Night, it is critical for educators to examine their beliefs and biases to ensure that they are operating from a strengths-based approach. That requires educators to meet students and families where they are along their own education paths and build on the positive attributes they bring to the math night. This approach differs from operating from a deficit approach, which views families as having problems that the school needs to solve or fix. For some, this is a significant shift in perspective.

Practice can be helpful in promoting this switch. Examine exhibit A1 on strengths-based attitudes about family engagement from U.S. Department of Health and Human Services (2018).

Exhibit A1. Strengths-based attitudes toward family engagement

Strength-based attitudes	Description
All families have strengths.	Each child and family has unique strengths that can be the foundation of our discussions and partnership. Always start with strengths, even when there are challenges
Families are the first and most important teachers of their children.	Families are the most important constant in children's lives, and children's healthy development relies on sensitive and nurturing interactions within the family and the community.
Families are our partners and have a critical role in their child's development.	Families make choices every day that affect a child's development and learning. These choices are rooted in their belief systems and cultural identities.
Families have expertise about their child and their family.	Families understand their children best and make decisions for their children's well-being. When families share what they know, children, families, and providers benefit.
Families' contributions are important and valuable	Being open to families' suggestions and requests helps us do our best on behalf of their children

Source: U.S. Department of Health and Human Services, 2018.

Keep the strengths-based attitudes and descriptions in mind as you complete a practice activity.

Below is a conversation between an educator and a family member. Read the conversation and look for evidence of strengths-based attitudes in their dialogue.

> **Educator:** Thank you for meeting with me today to talk about Zara. Is there anything you would like to share with me about her so that I can get to know her better?
>
> **Family member:** She is very quiet and shy in a large group, but she's not quiet once she trusts you. She loves music and math.
>
> **Educator:** That's very helpful to know. Thank you for sharing that with me. I've conducted some initial assessments and I'll share the educational plan I've developed for her based on the results.

Family member: OK.

Educator: <Teacher shares results and plan> I will need your help to reinforce this plan and partner with me and Zara to make it successful. Do you have any questions or objections to what I've laid out here today?

Family member: No, I don't think so. You are the teacher, so I guess you know what to do.

Educator: Great. I'll let you know if there's anything else you should know as the year moves on. Thanks for taking the time to come in today.

Family member: Thank you. Take care.

How could the educator's communication be adjusted to reflect more of a strengths-based attitude?

Let's debrief. The educator reflects a strengths-based attitude by thanking the family member for taking time to meet, asking the family to share, and valuing what was shared. Also, the educator views the family member as a partner in implementing a plan for the child.

The educator could improve communication of a strengths-based attitude toward the family member by sharing strengths, asking the family member for observations of what occurs at home, co-developing a plan with the family member, communicating clearly that the family member is a valued and critical partner—not just someone who should receive a memo with updates as needed.

How might you rescript the exchange to better reflect strengths-based attitudes?

To make this challenge more real, consider pulling out a recent parent newsletter or correspondence you have written and examining it through the same lens, without judgment, but with mindfulness and reflection. This could be a starting point for goal setting if a strengths-based communication change is in order.

Reflect and share

Discuss with your colleagues

1. What are your key takeaways from the research on the benefits or added value of involving family members in children's math education versus only working with children during instructional time?

2. How does the research align with your own experience of involving families in the educational process?

3. According to a recent qualitative research study, urban youth identified their family members (for example, parents, siblings) as providing them with the greatest amount of support throughout their schooling (emotional encouragement, academic assistance, and college preparation help; Vega et al., 2015), while other research suggests educators perceive a lack of parental involvement. How can these two findings be reconciled? What are some implications for how educators can expand their thinking about family involvement?

4. In what ways do you already partner with families in their children's education? Is math education a part of these efforts, or is it an area in which you have room to grow?

5. Assess your awareness of and sensitivity to reasons that family members might hesitate to engage in school-based math activities. To what degree can you continue to build awareness, and how might you tailor your efforts to engage families accordingly? *Example: What methods of communication might you use? What kinds of key messages might you try to communicate to build trust?*

Learn more

General family engagement resources

- Critical Practices for Anti-bias Education: Family and Community Engagement. Produced by Learning for Justice (n.d.), a project of the Southern Poverty Law Center, this professional development guide details critical practices of anti-bias education that address assumptions or stereotypes.
- Strategies for Equitable Family Engagement. Funded by the U.S. Department of Education, this document (State Support Network, 2018) is organized around five categories of equitable family engagement strategies and includes rich examples of school system implementation from across the country.
- The National Center for Family and Community Connections with Schools. This organization's website (n.d.) shares research-based information and resources that can effectively connect schools, families, and communities. The center highlights community connections that directly affect student achievement in reading and math as well as connections that contribute to students' overall success.
- Toolkit of Resources for Engaging Families and the Community as Partners in Education Part 1: Building an Understanding of Family and Community Engagement. This REL Pacific toolkit (Garcia et al., 2016) provides resources for school staff to build relationships with families and community members and to support family well-being, strong parent–child relationships, and students' ongoing learning and development.

Math-specific family engagement resources

- Teaching Math to Young Children for Families and Caregivers. This REL Central website (n.d.b), developed in partnership with REL Appalachia and REL Northwest, includes videos and activities to help families support children as they practice math skills at home.
- Formula for Success: Engaging Families in Early Math Learning. This publication from the Global Family Research Project (2017) is a compilation of articles that offer important lessons about family engagement for children's learning of math anywhere and anytime.
- Family and Caregiver Activity to Support Young Math Learners' Understanding of Fractions. Families and caregivers can use this activity resource from REL West (2020b) to help young children in grade 2–4 practice sharing cookies to learn about fractions.
- Encouraging Girls in Math and Science: Three Powerful Female Role Models. To promote positive views about women in math and science, this activity from REL West (2020a), geared toward families and caregivers for use with children in grade 3–8, features three female role models who have made important contributions to math and computer science.

Building a growth mindset and positive math attitudes

Research roundup

The Community Math Night emphasizes that building a growth mindset and positive math attitudes for math learning can have immense implications for students' performance and academic path—now and into the future.

Power of caring adults

The power of a caring adult in the life of a child cannot be overstated. Developmental research suggests that the presence of one or more caring adults in a child's life—whether a family member, teacher, or other community member—can increase the chances that the child will flourish in adulthood (Murphey et al., 2013). Given the extraordinary position of influence these trusted adults hold in shaping the trajectory of children in their care, it is important to develop a sense of mindfulness and awareness of messages, both direct and indirect, intentional and unintentional, that adults send and children receive. Messages about math are one such area.

Math anxiety

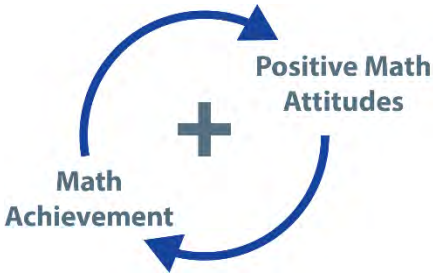
One study of math attitudes found that over 90 percent of Americans report some level of math anxiety (Blazer, 2011). Many of us have received negative messages about math, and these messages and beliefs can affect success in math (Chang & Beilock, 2016). We live in a culture where it is oddly socially acceptable to say "I'm not a math person" or "I'm not good at math." Even many preschool and elementary teachers hold this attitude. Math anxiety has been documented in children as young as first graders (Ramirez et al., 2013). Math anxiety interrupts working memory, which keeps even strong students from using complex problem-solving strategies, thus negatively affecting their math performance (Ramirez et al., 2016). And a 2015 study found an association between the math anxiety level of a parent who helped a child with math homework and their child's math outcomes in early elementary grades (Maloney et al., 2015).

Overcoming anxiety with a growth mindset

The good news is that math attitudes and beliefs can change and that teachers and family members, as natural role models and teachers for children, can promote positive attitudes toward learning and support student achievement in math (Epstein et al., 2018). In fact, the negative impact of parents' math anxiety can be counteracted by normalizing feelings about math (Boaler, 2015).

How can students and families experiencing math anxiety and other negative feelings toward math begin to change course? One way is by building an understanding of the growth mindset. People tend to believe that math ability is fixed (Boaler, 2015). With a fixed mindset, you either are a math person or you are not. In contrast, a person with a growth mindset believes that intellectual abilities can be increased with effort (Dweck, 2006). With this perspective, growth and change are possible. To clarify, embracing a growth mindset doesn't mean that there are no challenges or that change is simple, but rather a growth mindset introduces "the power of yet" (as in "I can't do this *yet*"), which unveils "a path into the future that creates persistence" (Dweck, 2014, 05:16). Helping children develop resilience when faced with disappointments provides life lessons beyond the classroom.

Power of positive math attitudes



Unsurprisingly, students who have embraced a growth mindset tend to persist and perform better (Blackwell et al., 2007; Dweck, 2008).

Additional research suggests that math attitudes and math skills have a reciprocal relationship—positive attitudes about math promote math achievement, which in turn fosters even more positive attitudes (Gunderson et al., 2018; Ma, 1997)—and this is true as early as grade 1 and 2 (Dweck, 2008). Think of math attitudes as creating a virtuous cycle of positivity that continues to yield benefits for children.

Math night activities include opportunities for families to reflect on how they feel and talk about math with their children and to build an understanding of the growth mindset and the role of positive math attitudes in supporting children's math learning. See appendix B for a handout that you can share with families at your math night.

Application to practice

Brainstorming ways to teach brain plasticity and the power of "yet"

Consider ways to demonstrate the growth mindset and the power of "yet" to families and students using either a math or a non-math activity. This can take place in an activity station during the math night, for the whole group as part of the Mindsets and Math presentation, or as a follow-up in classrooms. Here are a few ideas:

- Write statements that demonstrate growth or fixed mindsets on index cards and have students sort them accordingly. Here is an example of a statement sort activity available online.
- Read a children's picture book featuring a character who struggles, persists, and overcomes a challenge or masters a skill, such as *Brave Irene* by William Steig (1988). Introduce the power of "yet" to students as a preservation technique that the book character employs to keep from becoming discouraged.

- Lead a brainstorming session and record thoughts using words and pictures of what the growth mindset looks, sounds, and feels like. Consider using a "Looks like, feels like, sounds like" graphic organizer.

Which activity resonates with you? How might you adjust or tweak it to make it work for your students? What other ideas come to mind?

Reflect and share

Discuss with your colleagues

1. What are your key takeaways about the importance of positive attitudes toward math for parents and students?

2. How does the research align with or differ from your own experiences surrounding math attitudes—either on a personal level or with your students?

3. To what degree are you familiar with the fixed mindset versus growth mindset dichotomy? Have you ever discussed the growth mindset with your students? If so, what was their reaction? If not, how might you explain it to them and help more students embrace a growth mindset?

4. How might embracing a growth mindset change the way you relate to students? The way you deliver instruction? The way you assess learning? The way you encourage students?

Learn more

- How You Can Be Good at Math, and Other Surprising Facts about Learning. This video (TEDx Talks, 2016) features Dr. Jo Boaler, a Stanford professor of math education, who shares brain research showing that everyone can be good at math with the right teaching and messages. Boaler highlights a successful pathway for teachers' approaches to teaching math, focusing on positive, growth mindset messaging.
- Youcubed. This webpage (Stanford Graduate School of Education, n.d.) offers resources that support math success through growth mindset and innovative teaching practices—such as classroom posters and videos, teaching examples, cross-curricular lessons, apps and games, parent resources, and research.
- Young Mathematicians. This webpage (n.d.) offers resources for fostering a growth mindset classroom culture, including positive mathematical mindsets. Resources include videos, books, and articles.
- Mindset Kit. This website (The Project for Education Research that Scales, n.d.) presents a free set of online lessons and practices for teachers, parents, and mentors that foster and support students' growth mindset.

Effective practices for math instruction in elementary school

Research roundup

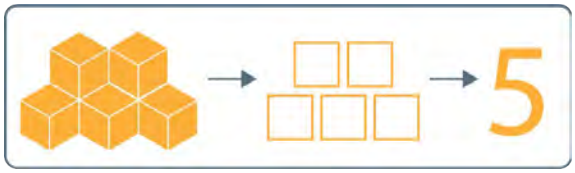
The evidence-based instructional practices and Community Math Night activities highlighted in this toolkit reflect real-world relevance, progression along a concrete–representational–abstract continuum, and the development of fluency.

Real-world relevance

Effective K–5 math activities focus on the meaningful learning of math skills and concepts by building on what students know from their everyday experiences. Research shows that math tasks that present problems in personally and socially meaningful contexts (for example, estimating/measuring distance, area, or volume or using money) are effective for engaging students, generating interest and curiosity, and building positive math attitudes (Clements, 2013; Frye et al., 2013). During math night activities, children describe their mathematical thinking in informal and formal ways and use concrete tools, like counters or other manipulatives, to represent math ideas. Developing connections between math and the real world can be particularly effective for students who are underperforming in STEM fields (National Council of Teachers of Mathematics, 2014a).

Progression along a concrete–representational–abstract continuum

Methods for teaching math along a concrete–representational–abstract continuum begin by modeling math concepts using concrete materials (for example, buttons, blocks, string, and manipulatives); followed by a pictorial representation, such as shading an equivalent part of a whole; and then using abstract symbols, such as numbers or notation. These teaching methods are particularly successful for struggling students (Steedly et al., 2008). For this strategy to be effective, students must engage physically with the manipulatives, which helps them form a mental image of the concept. Manipulatives help children think and reason in meaningful ways and support interconnected understandings of math concepts (Stein & Bovalino, 2001). Practice with concrete objects prepares students to represent their mental image in pictures and abstract symbols.



Using the resources in the toolkit, teachers can help children relate their use of concrete materials to more formal math vocabulary and symbols by using activity prompts (questions to ask children during the activity) and resources and supports (for example, a picture glossary; Stein & Bovalino, 2001).

Development of fluency to support algebraic and higher-order mathematical thinking

Researchers reference two types of fluency when discussing algebraic and higher-order mathematical thinking. The first type, conceptual fluency or "number sense," includes an understanding of place value and the relationships between the four operations (add, subtract, multiply, divide; Hiebert, 1984). The second type, procedural fluency, is described by the National Council of Teachers of Mathematics (2014b, p. 1) as "the ability to apply procedures accurately, efficiently, and flexibly; to transfer procedures to different problems and contexts; to build or modify procedures from other procedures; and to recognize when one strategy or procedure is more appropriate to apply than another." Conceptual and procedural fluency extend beyond speed and automaticity of basic facts and apply to all strands of math. The foundations of these fluencies are laid in grades K–5.

Conceptual and procedural fluency are building blocks for algebra. According to a report from the National Mathematics Advisory Panel (2008), the critical foundations of algebra comprise three clusters of concepts and skills. These are:

- *Fluency with whole numbers:* number sense; place value; building and breaking down numbers through operations; commutative, associative, and distributive properties; automatic recall of math facts and fluency with algorithms; estimation.
- *Fluency with fractions:* locating positive and negative fractions on a number line; comparing and moving between fractions, decimals, and percentages; estimating size; using operations with fractions; applying real-world use of fractions such as rates, proportions, and probability.
- *Aspects of geometry and measurement:* identifying properties of similar triangles; identifying properties of two-dimensional and three-dimensional shapes using formulas for perimeter, area, volume, and surface area; finding unknown values for lengths, angles, and areas.

Engaging with math night activities allows students to work with numbers and operations in different ways, to use diverse strategies, and to consider how their problem-solving approach differs from or is similar to that of others, supporting the co-development of conceptual and procedural fluency (Gersten et al., 2009).

Building both conceptual and procedural fluency helps students gain the skill and experience needed to solve multistep and complex problems, which become increasingly prevalent in upper-level math courses. By building a firm conceptual foundation for students now, educators set the stage for students' later success. In short, sound instructional practices now yield great benefits later.

Application to practice

Like many of the learning experiences you plan for your students, the math station activities in this toolkit reflect the three evidence-based practices described in this section.

Real-world relevance

These activities portray math learning in real-world activities so that students can perceive their learning as relevant and useful. The following two activities can spur math-rich conversations and inspire families to bring math into their daily interactions.

- Dinner Time, a grade 4–5 activity, is set in a café. Families determine a budget for dining out and then strive to stay within their budget as they select menu items.
- How Many of Me?, an activity differentiated across K–5, engages families in measuring the dimensions of a room based on nontraditional units. Students make predictions about distance, practice their measuring skills, and compare the nontraditional units to traditional ones.

Progression along a concrete–representational–abstract continuum

Multiple math station activities employ manipulatives to help students build their conceptual understanding of shapes and numbers. All three Geometry math station activities and a K–1 activity in the Number and Operations in Base-10 station uses base-10 blocks:

- Fill the Shapes.
- Hexagon Challenge.
- Symmetric Mosaics.
- Race to 100.

As students manipulate concrete items, they build mental models that help them transfer these concepts to pictorial representations and symbols.

Development of fluency to support algebraic and higher-order mathematical thinking

These math station activities support students' conceptual understanding of numbers and operations and build fluency in applying arithmetic procedures. The activities prompt students to work with numbers and operations in different ways, use strategies that support conceptual understanding and fluency, and reflect on their methods and solutions.

- Flip the Cards, a grade K–1 activity, is designed to promote fluency and flexibility of addition facts with sums up to 20 or less and their related subtraction inverses (such as 6 + 8 = 14 so 14 – 8 = 6).

- Many Ways of Counting, a grade 2–3 activity, asks families to determine the number of various items in an array. The arrays vary from simple to challenging and allow families to arrive at solutions in multiple ways.
- Game of 24, a grade 4–5 activity, asks families to select and apply a combination of the four operations (addition, subtraction, multiplication, and division) to reach 24 with up to five number cards.

The core planning team should take time to work through all the station activities in their meetings both to better prepare for the event itself and to begin to see the connections between the evidence-based practices and the activity designs.

Reflect and share

Discuss with your colleagues

1. What are your key takeaways about the recommended math strategies in recent research?

2. When you hear about the strength of the research showing that students' math foundations in elementary school predict math achievement in high school, how do you respond?

3. How does the research align with or differ from your own instructional practices?

4. As you reflect on these strategies, which of these is an area of strength in your instruction? Why? What might be an area for professional growth? Why?

5. As you reflect on your curriculum, what opportunities can you provide for authentic problem solving? How might such opportunities help students engage in their math learning?

Learn more

- Teaching Math to Young Children. This What Works Clearinghouse practice guide (Frye, et al., 2013) offers five recommendations for teaching math to children in preschool, pre-kindergarten, and kindergarten. Each recommendation includes implementation steps and solutions for common roadblocks.
- Early Childhood Math Videos. This webpage from REL Central (n.d.a) shares a series of videos that focus on actionable strategies to increase the quality of math instruction in the early school years by providing recommendations that address implementation steps and common roadblocks experienced by early learners.
- What Works Clearinghouse: What Works in Math. This webpage (What Works Clearinghouse, n.d.) features practice guides, interventions, reports, and videos that support effective math instruction in K–12.
- Effective Mathematics Teaching Practices: National Council of Teachers of Mathematics. This resource (PDF) from the National Council of Teachers of Mathematics (2014a) highlights eight teaching practices described as components of effective math lessons.
- Standards for Mathematical Practice: Common Core State Standards. These standards (Common Core State Standards Initiative, n.d.) describe types of expertise that teachers at all grade levels should seek to develop in their students.

Appendix B. Community Math Night Parent Handout Template

The parent handout includes key takeaways from the Community Math Night related to math, mindset, and family engagement—specifically, what families should keep in mind and ideas to implement to maximize the impact of the event beyond one night.

You might also decide to send home the infographic Supporting Your Child in Developing Math Skills for Future Success, which was shared as part of the Mindsets and Math presentation, along with a customized version of the Community Math Night Key Takeaways Handout template. Staff and volunteers can distribute the handouts at the end of the evening, as families complete their exit tickets.

To update the Community Math Night Key Takeaways Handout template, consider:

- Listing community resources, including enrichment opportunities in math such as science, technology, engineering, and math (STEM) camps and classes.
- Focusing the handout and resources on areas in need of improvement based on benchmark data or developing grade level–specific handouts with tailored recommendations and resources.
- Providing links to a TED talk on growth mindset for adults and for students.
- Sharing a shortened link to a family survey if you are interested in collecting more information about perceptions or impacts of the math night after the event.
- Providing contact information for a math leader in the school in case families want to follow up.

[SCHOOL NAME]
Community Math Night Key Takeaways

THANK YOU for taking time to come to our Community Math Night and support your child's math learning journey. We enjoyed the chance to connect with you and share our love of math!

Big ideas to remember

- A strong foundation in math is important for students' future success in school and life.
- Families are natural role models and can help children develop positive attitudes toward math.
- Communicate confidence in your children as math learners. With proper support, everyone can learn math.
- Develop and promote a growth mindset. Recognize and praise effort and hard work, and remember the power of "yet" ("I have not met this goal *yet,* but I will!).

How you can support at home

[Share tips for encouraging interest in math and supporting learning outside of school. A few examples are provided below.]

- Count objects around the house and ask, "How many in all?"
- Talk about and compare shapes of everyday objects.
- Use spatial language (under, over, higher, lower, closer, farther).
- Play card games and board games that require math, including ones you make yourself.
- Involve children in everyday measurement activities, such as baking.
- Read books about math or ask math questions when reading books.
- Talk about jobs that use math.

Resources you'll love

[Share a few websites, podcasts, and videos, with shortened URLs if this is printed.]

Next steps at school

[Share the next opportunity for community engagement. Have a science fair coming up? Be prepared to provide details, and ask families to save the date. Talk about how families can continue to engage in math learning at the school, for example, by volunteering in the classroom.]

Appendix C. Community Math Night Action Planning Template

Use this template to outline and develop a comprehensive plan for the Community Math Night (CMN) at your school. See Exhibit 12 in the toolkit for sample goals and strategies.

CMN date	Day [MM/DD/YYYY]
CMN start and end times	Start: End:
CMN goals (specific benchmarks for measuring the success of the event)	Goal: Goal:
CMN strategies (specific ideas for accomplishing CMN goals	Strategy: Strategy:

Task	Personnel	Notes	Status (pending/ completed; date)
Example: Plan and coordinate dinner	*Ms. Fernandez, lead* *6 volunteers*	*Coordinate with the Parent–Teacher Association president to have volunteers serve hot dogs, hamburgers, chips, fruit salad, and drinks. Coordinate food order with facility manager by 2/21.*	*Completed, 2/15/21*
Lay the foundation—8 weeks out			
Form your Community Math Night core planning team (at least four teachers/leaders)			
Complete the Community Math Night Professional Learning Workbook			
Practice the math night activities			
Determine goals and strategies			
Select and confirm event logistics (date, time, location)			
Address possible barriers to participation			
Develop the initial budget			
Plan and coordinate refreshments			
Additional task			
Additional task			
Coordinate personnel and resources—6 weeks out			
Confirm the event location, and begin to plan the event space			
Develop agenda, and organize station activities			
Assess available materials for math station activities			
Identify strategies to help overcome barriers to family participation (for example, help with transportation or childcare)			

Task	Personnel	Notes	Status (pending/ completed; date)
Plan for translation needs			
Recruit additional volunteers, as needed (to support setup/dinner/ cleanup)			
Set up event registration			
Begin promoting event			
Additional task			
Additional task			
Promote enthusiasm and participation—4 weeks out			
Develop and revisit your communications plan			
Create outreach materials (flyers, newsletter, others)			
Plan for inclusion and diversity in communication and outreach (for example, translating materials, sharing with trusted community messengers)			
Develop digital and social media posts/content			
Consider ways to involve students			
Additional task			
Additional task			
Bring it all together—2 weeks out through day of event			
Finalize your plan for the event space			
Sort and prepare materials for each math station			

Task	Personnel	Notes	Status (pending/ completed; date)
Print handouts, station prompts and exit tickets (or prepare another plan for collecting feedback)			
Develop list of materials and printing needs			
Develop list of equipment and technology needs (for example, projector, screen, extension cords)			
Train facilitator team members on math station activities, and practice activities			
Confirm volunteer assignments, and provide final instructions			
Prep checklist for day of the event			
Consider purchasing thank you gifts for volunteers			
Set up, and provide volunteers with instructions			
Kick off and implement			
Tear down			
Additional task			
Additional task			
Build on your success—within 1 week after the event			
Reflect as a team			
Develop family engagement follow-up based on feedback			
Engage with teachers to connect math night activities to classroom practice			
Additional task			

Appendix D. Community Math Night Budget Checklist Template

Use this template to inventory available resources at your school and to develop an initial budget for your Community Math Night event.

Item	Description	Quantity	Supplies on hand	Secure donation	Needed purchases	Completed
Refreshments						
Example: Meal	*Pasta and salad*	*150 people*	*No*	*Yes*	*No*	*Yes*
Beverages						
Paperware and utensils						
Serving dishes						
Ice						
Materials						
Pattern blocks	Activities 1a, 1b, 1c					
Small mirrors	Activity 1c					
Dice	Activities 1c, 2a, 3a					
Dry-erase markers	Activity 2b					
Index cards	Activity 2b					
Stickers	Activity 2b					
Paper for scorekeeping	Activity 2c					
Base-10 blocks	Activity 3a					
Four-operation calculators (add, subtract, multiply, divide)	Activities 3b, 3c					
Menus from local restaurants	Activity 3c					
2- to 3-inch-wide grosgrain ribbons in different colors	Activity 4					
Scissors	Activity 4					
1-foot rulers	Activity 4					
Meterstick	Activity 4					
Scratch paper	Activity 4					
Zippered plastic bags	Activity 4					
Stamps	All stations					
Raffle prizes	Closing remarks					

Appendix E. Community Math Night Agenda Template

The agenda template can help to organize the timing and sequencing of events for your Community Math Night.

Activity	Timeline	Leader	Materials	Logistics
Lobby open for registration (example)	*10 minutes*	*Ms. Jones*	*Sign-in sheets* *Math activity station map*	*Set up sign in table by 5:00 PM* *Station greeters by main entrance*
Dinner	*30 minutes*			
Welcome and Mindsets and Math presentation	*15 minutes*			
Math station activities	*15 minutes*			
Awarding of raffle or door prize Exit ticket and closing remarks	*15 minutes*			
Cleanup	*30 minutes*			

Appendix F.
Community Math Night
Volunteer Information Template

Use this template to communicate key details to volunteers before the Community Math Night. Create a separate information sheet for each type of volunteer assisting with the math night program. For example, create a sheet for your setup crew and a sheet for your breakdown crew, as the details will vary.

Insert QR code here to direct volunteers to an online registration form

[SCHOOL NAME] Community Math Night Volunteer Information Sheet

Thank you for volunteering at [SCHOOL NAME]'s Community Math Night. Your assistance is essential for a successful event. Please review the information below for additional details on your volunteer role and event logistics.

Community Math Night event date/time:	
Requested volunteer arrival time:	Anticipated task completion time:
Location:	
Parking instructions:	
Task description and key instructions: *(Example: Assist with event setup)*	
If you have any questions or concerns, please contact:	
Volunteer contact name:	
Volunteer contact telephone number:	

Appendix G. Community Math Night Registration Template

Use this template to develop a registration event form for a Community Math Night at your school.

Insert QR code here to direct families to more information or online registration

[SCHOOL NAME] Community Math Night Registration Form

[DAY, MONTH, YEAR, 0:00 a.m. – 0:00 p.m.]

- Preregistration is highly recommended, but registration will be available at the door.
- Complete the registration form below [or register online at: online registration link] by [DAY, MONTH, YEAR].
- We welcome all [SCHOOL NAME] students, their family members, and caregivers at this event. If you have any questions, please call [SCHOOL CONTACT NAME] at [(XXX)-XXX-XXXX].

- Detach and Return Form -

Parent or guardian name:		Number of family members attending:
Parent or guardian phone number:		
Student(s) name(s)	**Grade**	**Teacher**

Appendix H. Community Math Night Teacher Reflection and Assessment Guide

The *Community Math Night Facilitators' Toolkit* describes evidence-based instructional practices that help students develop their knowledge, skills, and attitudes for learning math. Reflect on your current pedagogy to assess your level of confidence with implementing these practices, and consider next steps for ongoing improvement.

What is my confidence level with implementing these practices consistently and with confidence? Reflect on your practice and indicate which instructional practices are areas of strengths and which are opportunities for ongoing improvement.

Instructional practice	Confidence level	
	An area of strength	An opportunity for ongoing improvement
Explicitly teach students about a growth mindset		
Model positive math attitudes and growth mindset with students		
Model positive math attitudes and growth mindset when interacting with families		
Help students connect their math work to real-world activities		
Intentionally implement the concrete–representational–abstract continuum to help students build conceptual understanding		
Provide engaging activities for students to build fluency with math procedures		

- What supports do you need to build your confidence with these practices?

- What next steps will you take to build your skill set for implementing these practices?

Appendix I. Community Math Night Activity Instructions, Prompts, and Handouts

This appendix contains detailed information for each of the math station activities outlined in the toolkit, including the instructions and prompts for each activity, copies of parent handouts, and guidance for printing.

Organization of the appendix

For printing ease, this appendix is organized by station as follows:

- **Activity instructions and prompts.** Print enough single-sided copies for each activity. You do not need to print one page per participant, just enough for the number of families expected during a single rotation. Consider laminating or printing on cardstock for dura bility throughout the evening.
- **Activity handouts.** The number of copies will vary by anticipated number of participants/ families and activity. Consider laminating or printing some handouts on cardstock for durability throughout the evening. Use the table below to help you think through printing and production needs.

Handout printing guidance

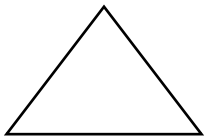
Station/activity	Handout	Recommended Format	Copies
Geometry			
	Geometry Glossary	One page, front and back	At least one copy per activity; consider creating as a poster
1a	Fill in the Shapes outlines	One per page, single-sided	2–3 outlines per participant during a single rotation
1b	Hexagon Challenge	One page, single-sided	1 per activity participant during a single rotation
1c	Pattern Block Key	Three per page, single-sided	3 keys available to reference
Operations and Algebraic Thinking			
2a	Flip the Cards	One page, single-sided; cut into playing cards	1 set of cards per 2–4 participants during a single rotation
2b	Many Ways of Counting cards	Two per page, single-sided	If laminating/providing dry-erase markers, 3–4 cards per family during a single rotation. If not laminating, print 3–4 cards per family
2c	Game of 24	One page, single-sided; cut into playing cards	1 set of cards per 4 participants during a single rotation

Station/activity	Handout	Recommended Format	Copies
Numbers and Operations in Base-10			
3b	Broken Calculator	Two per page, single-sided	1 of each problem per family during a single rotation
3c	Menu	One page, single-sided	1 of each per family during a single rotation
	Budget Sheet	One page, single-sided	1 of each per participating family
	Empty Plates	One page, single-sided; cut plates separately	1 plate for each family member to record and total meal selections
Measurement and Data			
	Measurement reference sheet	One page, single-sided	Several copies available at station; consider creating as a poster
Mindsets and Math presentation	Parent handout: Supporting Your Child in Developing Math Skills for Future Success	Two pages, double-sided	1 of each per participating family
Closing			
	Exit ticket	One page, single-sided	1 of each per participating family

Station 1. Printable materials

Please refer to pages I-1 and I-2 for printing guidance on these materials.

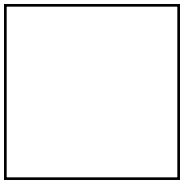
Station 1. Geometry Glossary



Count the sides and the corners of the shape.

If there are three of each, it is a triangle.

If the sides are all the same length, then it is an equilateral triangle.



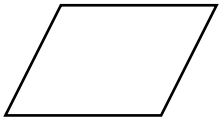
Count the sides and the corners of the shape.

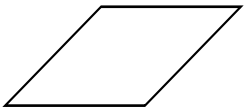
If there are four of each, it is a quadrilateral.

If it has two pairs of parallel sides, then it is a parallelogram.

If it also has four equal angles, then it is a rectangle.

If the sides are also all the same length, then it is a square.





Count the sides and the corners of the shape.

If there are four of each, it is a quadrilateral.

If it has two pairs of parallel sides, then it is a parallelogram.

Are the four angles equal? No? Then, it is not a rectangle.

Are the sides the same length? Yes? Then it is a rhombus.

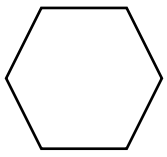
Count the sides and the angles of the shape.

If there are four of each, it is a quadrilateral.

Does it have two pairs of parallel sides? Yes? Then it's a parallelogram.

Does it have only one pair of parallel sides? Yes? Then it is a trapezoid.

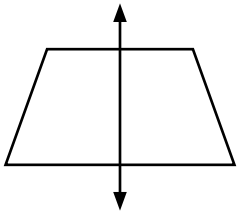
This is a special case called an isosceles trapezoid because the angles at the base are the same measurement.



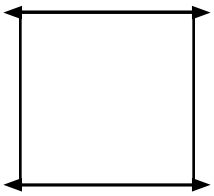
Count the sides and the angles of the shape.

If there are six of each, it is a hexagon.

If the sides are equal in length, it's a regular hexagon.

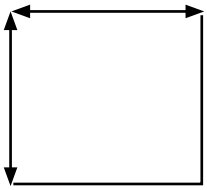


When you fold a shape on a line of symmetry, the two parts match up exactly.



If two lines don't cross and they seem as though they'll never meet, then they are parallel.

(You can also say two lines are parallel if the lines are always the same distance apart, no matter where you measure.)



If two lines meet and they make a "perfect corner," we call that a right angle or a 90-degree angle.

We can also say that those two lines are perpendicular to each other.

Activity 1a. Fill in the Shapes instructions

1. Select an **outline.**

2. Use the pattern blocks to fill in the outline.

3. For fun, take the same outline as someone else and see how you can fill it out differently.

Players:
One or more

Goal:
Fill in the shapes

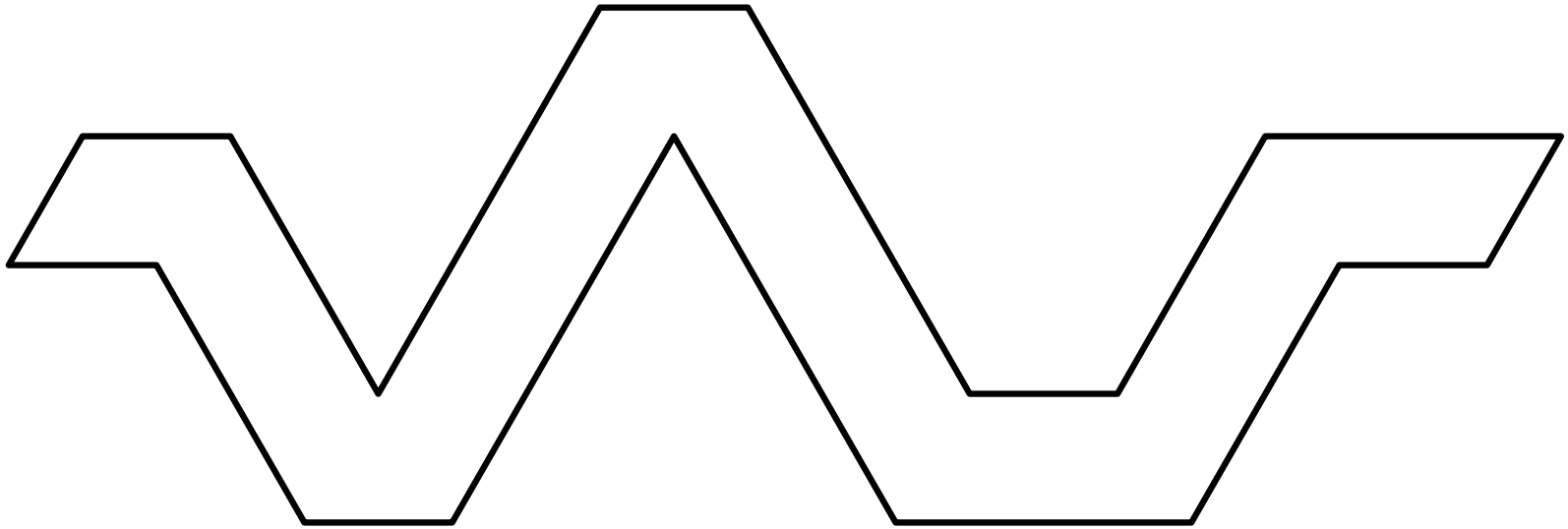
Activity 1a. Fill in the Shapes family prompts

Ask your child any of the following questions:

- What is the name of this shape? (Point to any of the pattern block shapes.)
- How many sides does it have? How many corners?
- How many [triangles, hexagons, parallelograms, trapezoids] are there in this drawing?
- Can you use other shapes to fill in the [hexagon, square, trapezoid]?
- How many other ways can you fill in this outline? Or how many shapes can you replace with other shapes?

Activity 1a. Fill in the Shapes handouts

Snake



Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals*. Education Development Center, Inc.

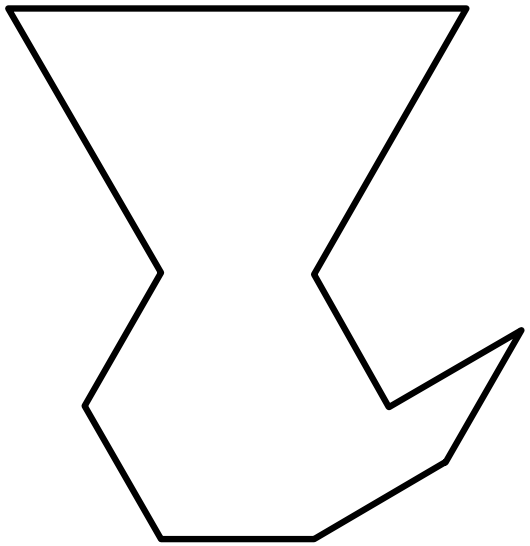
Caterpillar

Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals*. Education Development Center, Inc.

Caterpillar

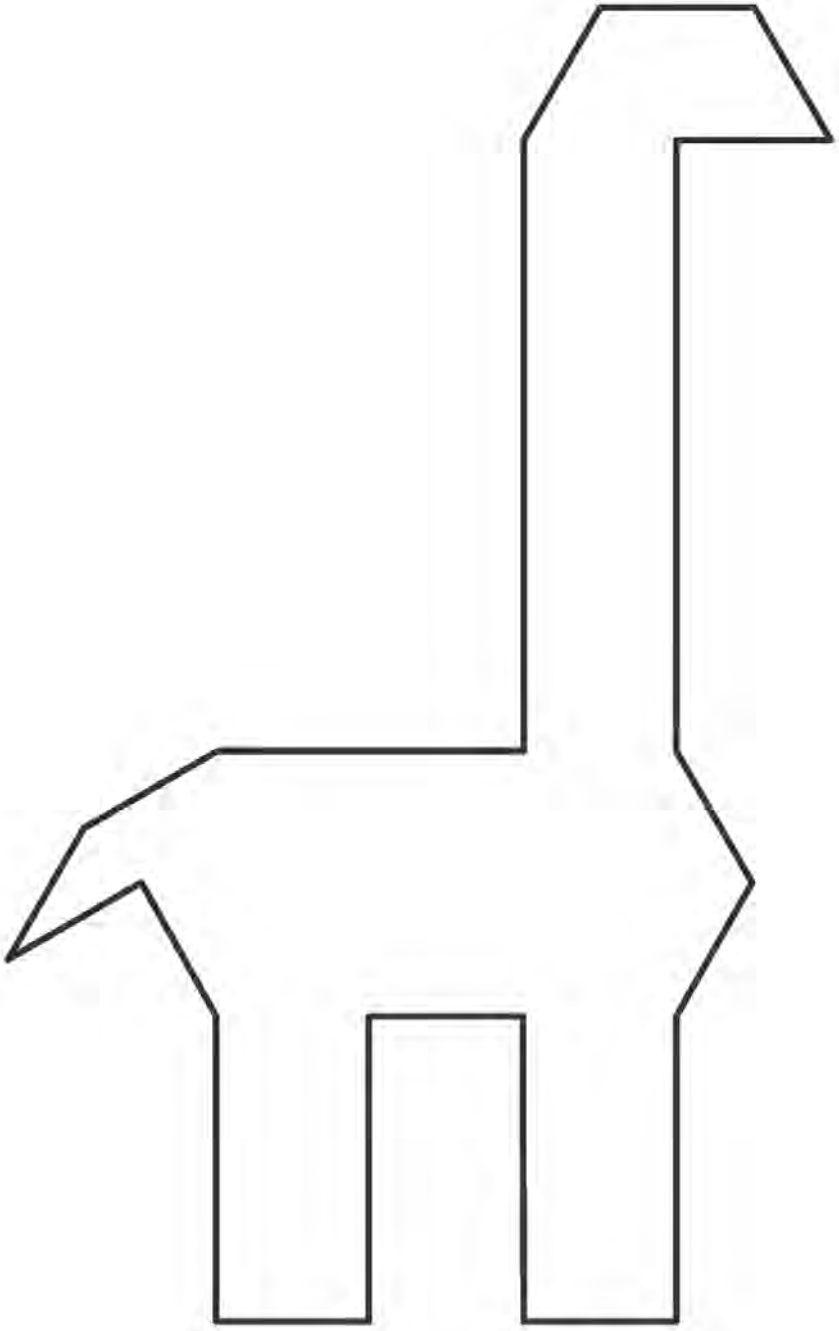
Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals*. Education Development Center, Inc.

Cat



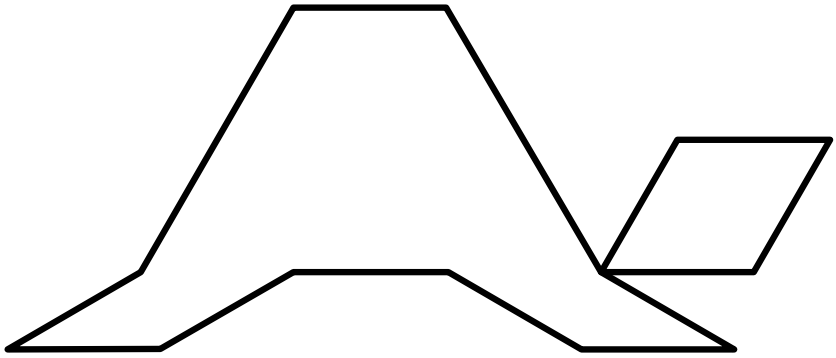
Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals*. Education Development Center, Inc.

Giraffe



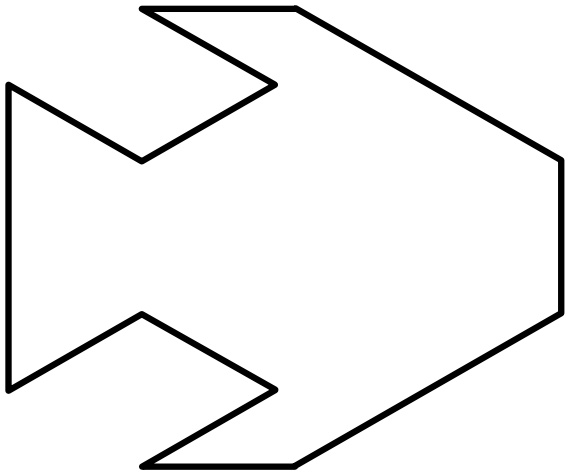
Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals.* Education Development Center, Inc.

Turtle

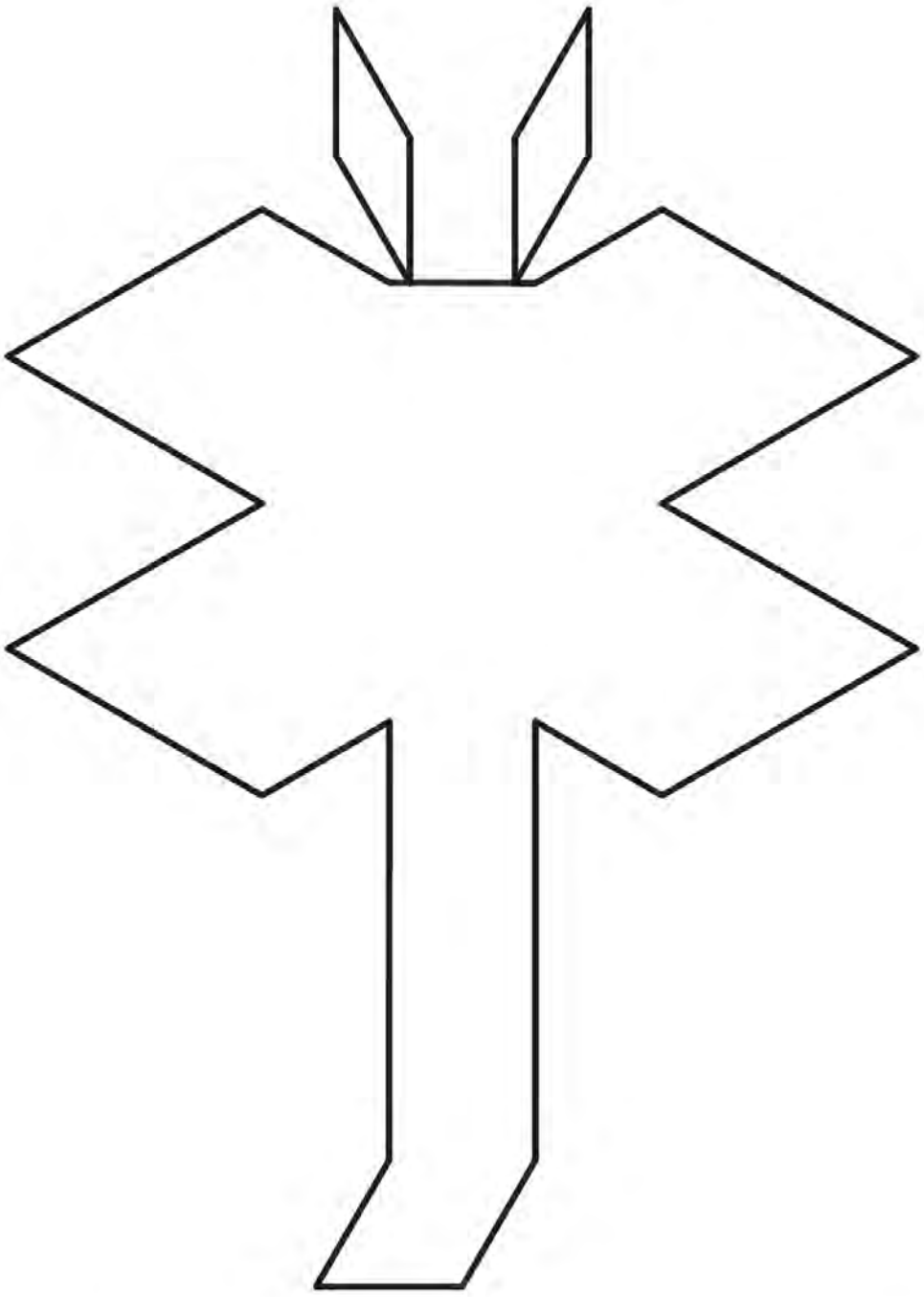


Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals.* Education Development Center, Inc.

Fish



Dragonfly



Set 3: How Many Ways?
Reed, K. E., & Young, J. M. (2017). *Games for mathematicians: Pattern animals.* Education Development Center, Inc.

Dog

Dog

Activity 1b. Hexagon Challenge instructions

Players:
One or more

Goal:
Complete the challenges by partitioning a hexagon

1. Grab a hexagon pattern block; how can you make a hexagon using the other shapes?

   a. How many trapezoids make a hexagon? What part of the hexagon is one trapezoid?

   b. How many blue rhombuses make a hexagon? What part of the hexagon is one blue rhombus?

   c. How many triangles make a hexagon? What part of the hexagon is one triangle?

2. Challenge:

   a. Who can fill the hexagon board using the most possible pattern blocks?

   b. Who can fill the hexagon board using the fewest possible pattern blocks?

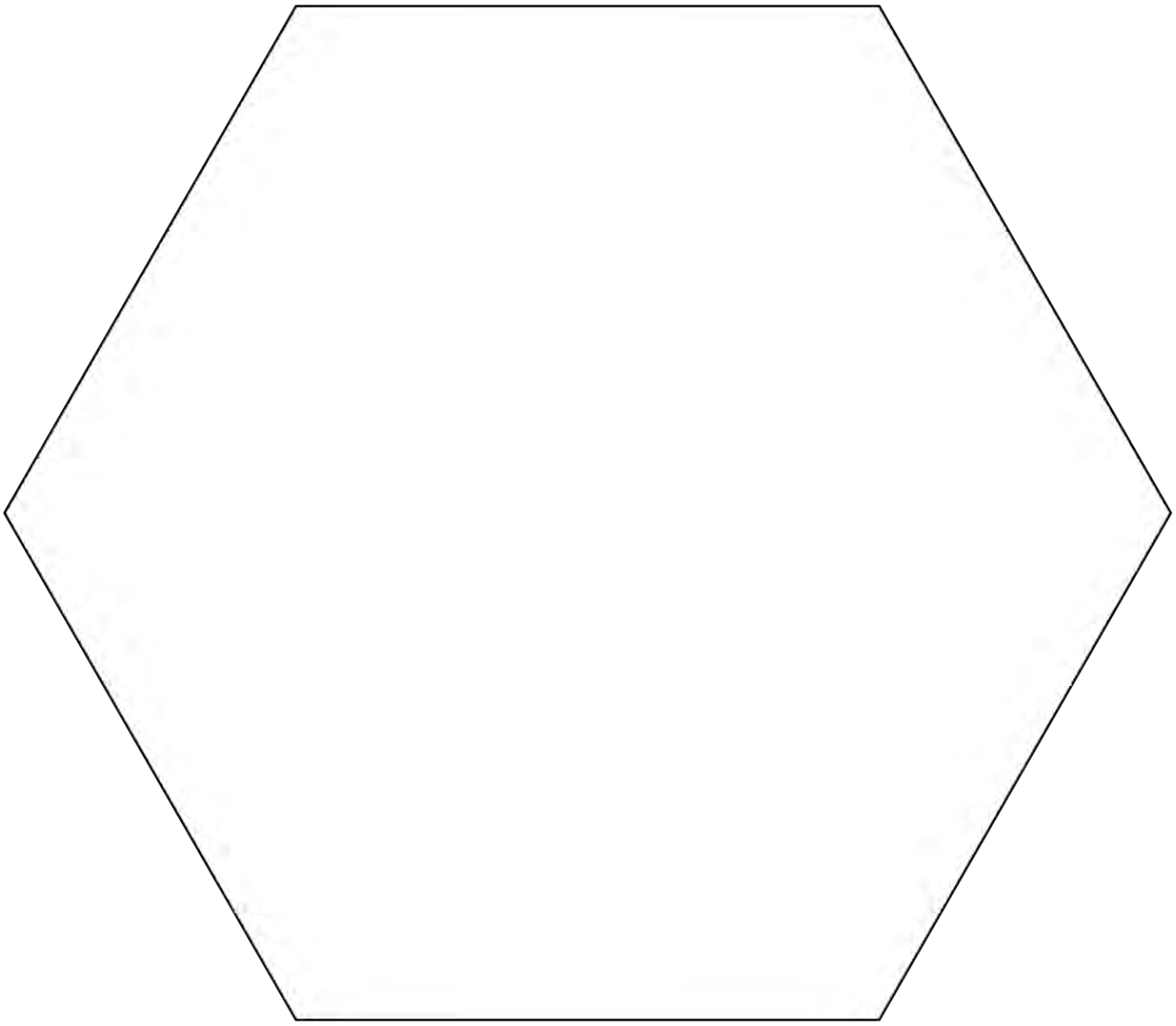
   c. Who can be the first to split the hexagon board into halves using pattern blocks? Into thirds? Fourths?

Activity 1b. Hexagon Challenge family prompts

Ask your child any of the following questions:

- What is the name of this shape (for each pattern block)?
- Fill in the blank:
    - If 2 trapezoids make a hexagon, then a trapezoid is ½ a hexagon.
    - If 3 rhombuses make a hexagon, then a rhombus is _____ a hexagon.
    - If 6 triangles make a hexagon, then a triangle is _____ a hexagon.
- Can you think of a different way to partition the hexagon into equal parts?

Activity 1b. Hexagon Challenge handout



Activity 1c. Symmetric Mosaics instructions

Players:
One or more

Goal:
Make the most lines of symmetry

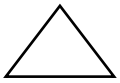
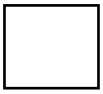
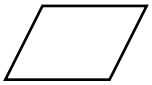
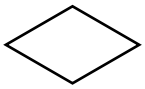
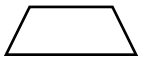
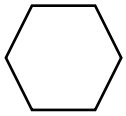
1. Roll the die.
2. Find the number in the pattern block key, and take two pattern blocks.
3. Repeat two more times, taking two pattern blocks each time.
4. Make a design with all your shapes that has at least one line of symmetry. A line of symmetry is a line that divides the design into two identical parts.
5. Count the number of lines of symmetry. Whoever has more lines of symmetry wins.
6. Use the same blocks and try a new design.

Activity 1c. Symmetric Mosaics family prompts

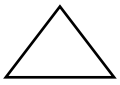
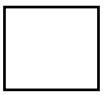
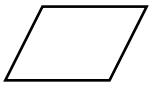
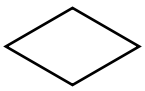
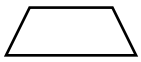
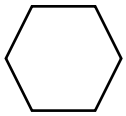
Ask your child any of the following questions:

- What is the name of this shape? (Possible responses: parallelogram, hexagon, quadrilateral, triangle, trapezoid)
- Which shapes can be classified as quadrilaterals (having four sides)? How do you know?
- Which shapes can be classified as parallelograms (having two pairs of parallel sides—sides that keep the same distance apart)? How do you know?
- How do you know if this shape has a line of symmetry? Show me.
- Is there another line of symmetry?

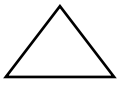
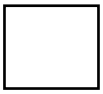
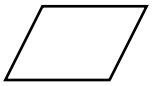
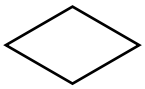
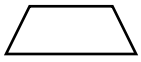
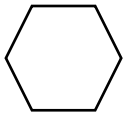
Activity 1c. Pattern block key handouts

If you roll a…	1	2	3	4	5	6
Take 2…						

Activity 1c. Pattern block key

If you roll a…	1	2	3	4	5	6
Take 2…						

Activity 1c. Pattern block key

If you roll a…	1	2	3	4	5	6
Take 2…						

Station 2. Printable materials

Please refer to pages I-1 and I-2 for printing guidance on these materials.

Activity 2a. Flip the Cards instructions

Players:
One or more

Goal:
Flip all cards over

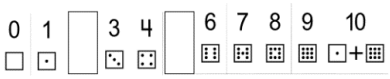
1. Place the cards 0–10 face up, in order, in front of all the players.

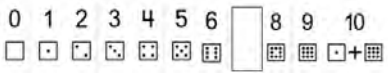
2. The youngest player goes first.

3. During your turn, roll a pair of dice.

4. Flip a card face down for each number rolled on the dice or for the sum of the numbers rolled. If you cannot flip any cards, take a single extra turn

Example. You roll a 2 and 5, flip the 2 and 5 cards face down or flip the 7 card (2 + 5) face down.





5. If you roll doubles (two of the same number), flip the 0 card face down. If you have already flipped the 0, take an extra turn.

6. Whoever turns over the last card wins.

7. For fun, you can make new rules before a new game. For example, if you roll numbers that have already been flipped face down, you have to flip them face up again.

Activity 2a. Flip the Cards family prompts

Here are some suggestions for you as you play the game:

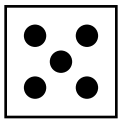
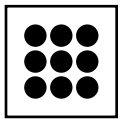
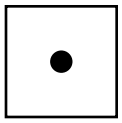
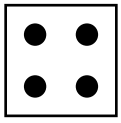
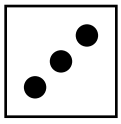
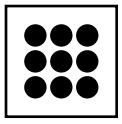
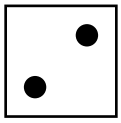
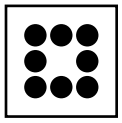
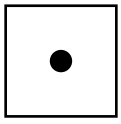
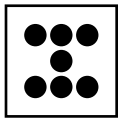
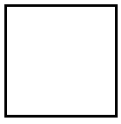
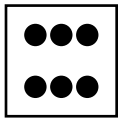
- Help your child place the cards in order, but don't do it for your child.

- Help your child use the roll of the dice strategically. For example, if the dice show a 2 and 4, ask, "Do you want to flip over the 2 and 4 or the 6?"

- Ask your child: "What roll or rolls do you hope you get? Why?"

- Start with just the cards numbered 1–6 for a child who needs a little more support.

Activity 2a. Flip the Cards handout

5 	10 +  
4 	
3 	9 
2 	8 
1 	7 
0 	6 

Activity 2b. Many Ways of Counting instructions

Players:
One or more

Goal:
Use different strategies to count

1. Take one card and respond to the prompt.
2. All players explain how they know they got the right answer.
3. See if there is another way of grouping the items to double-check your answer.
4. For fun, create a new card for other players to count.

Activity 2b. Many Ways of Counting family prompts

As you engage in the activity:

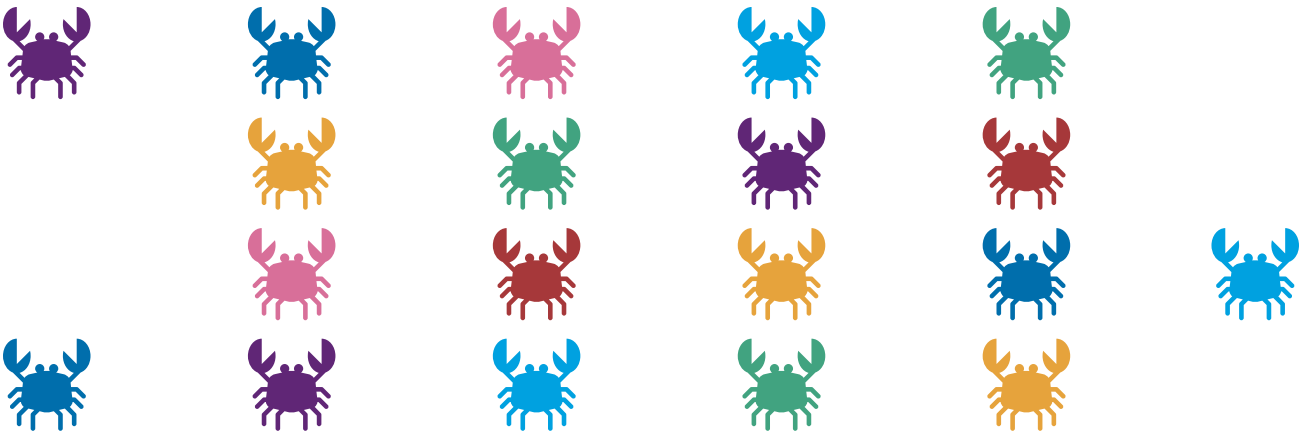
- Ask your child to explain how they got the answers.
- Ask your child another way to figure it out.
- Share how you counted so that you can compare strategies with your child.
- It is okay if your child simply counts each item.
- Encourage your child to group items so they don't have to count each item.

Activity 2b. Many Ways of Counting handouts

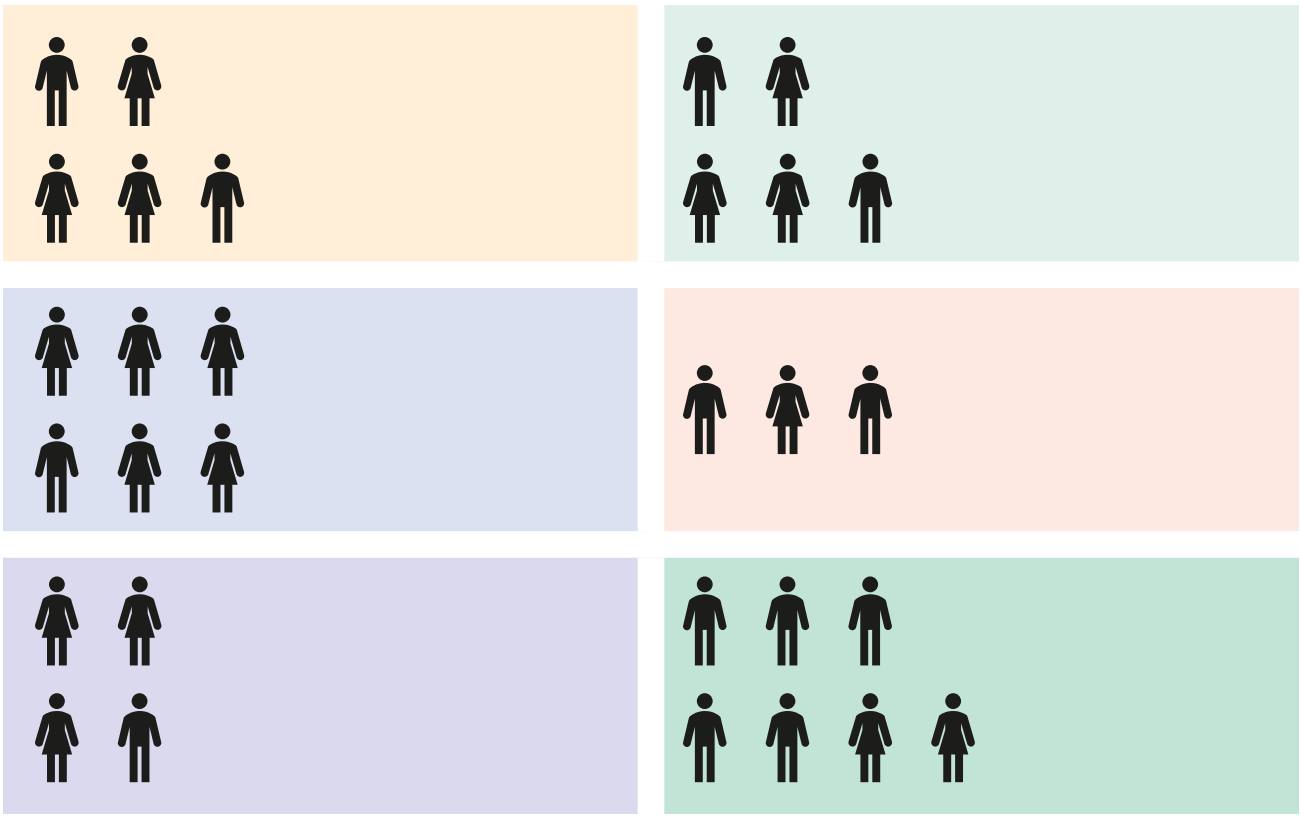
Activity 2b. How many balls in the playground?

Activity 2b. How many owls in the barn?

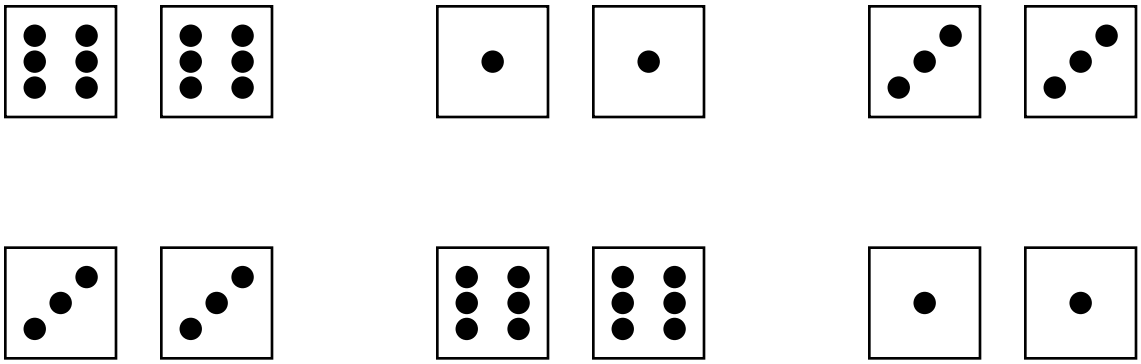
Activity 2b. How many crabs do you see?



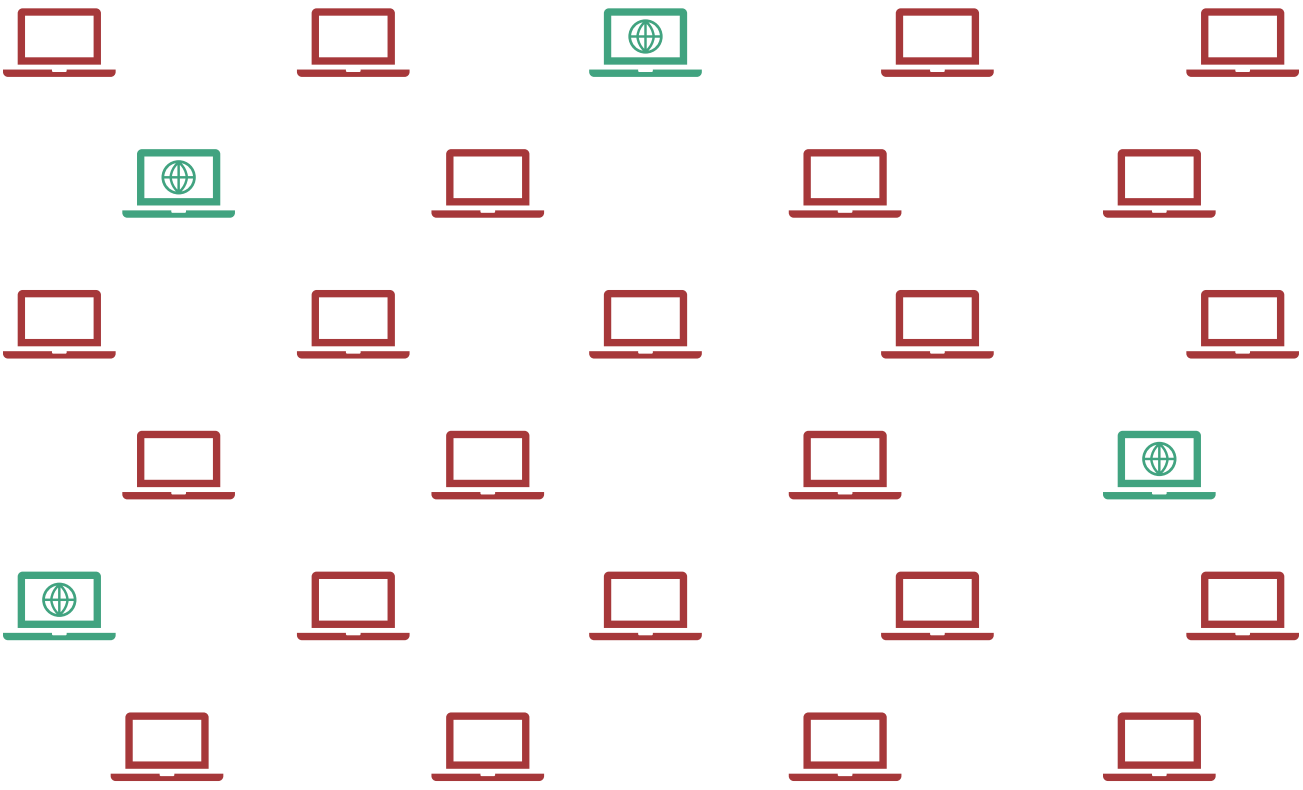
Activity 2b. How many people work in this building?



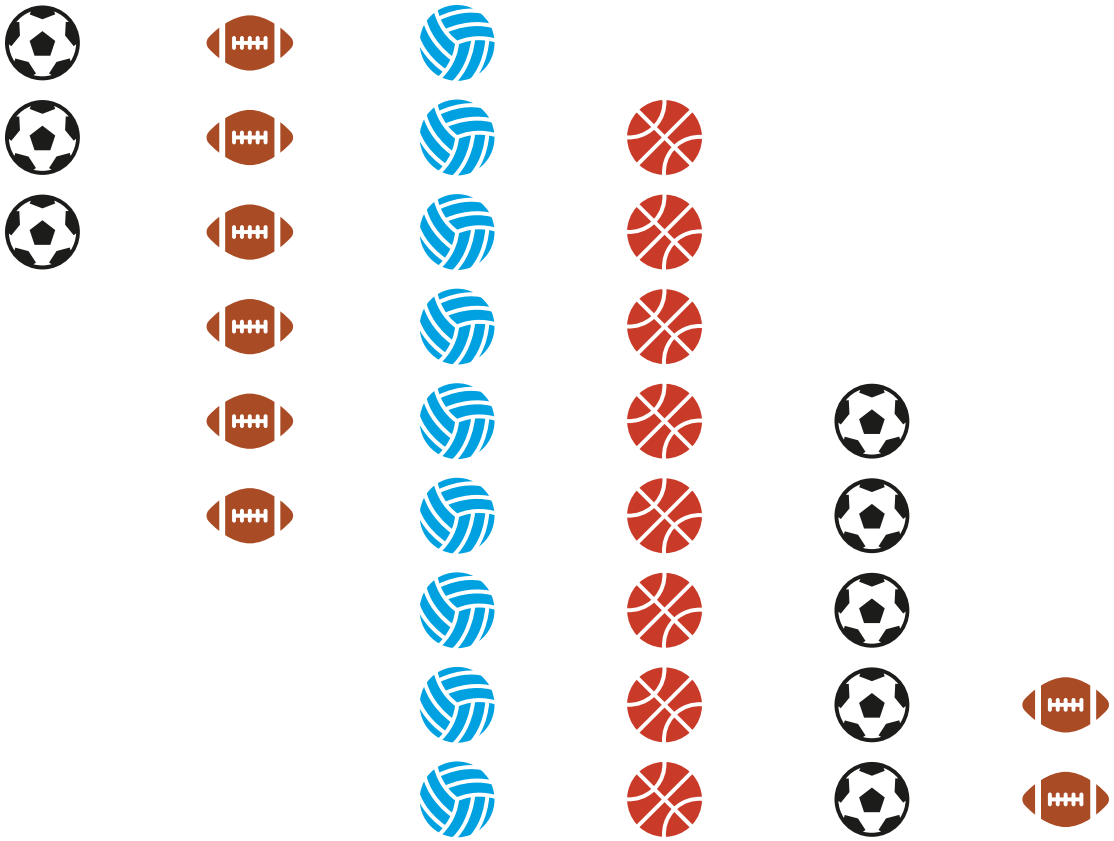
Activity 2b. How many dots (pips) do you see?



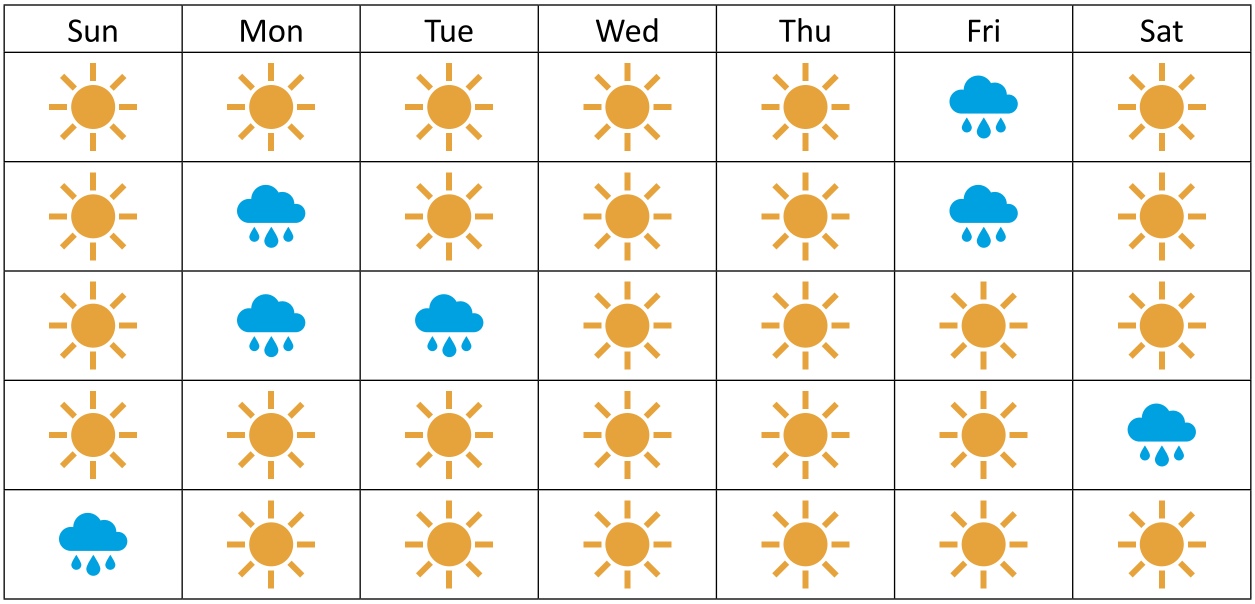
Activity 2b. How many computers are turned off (the dark red ones)?



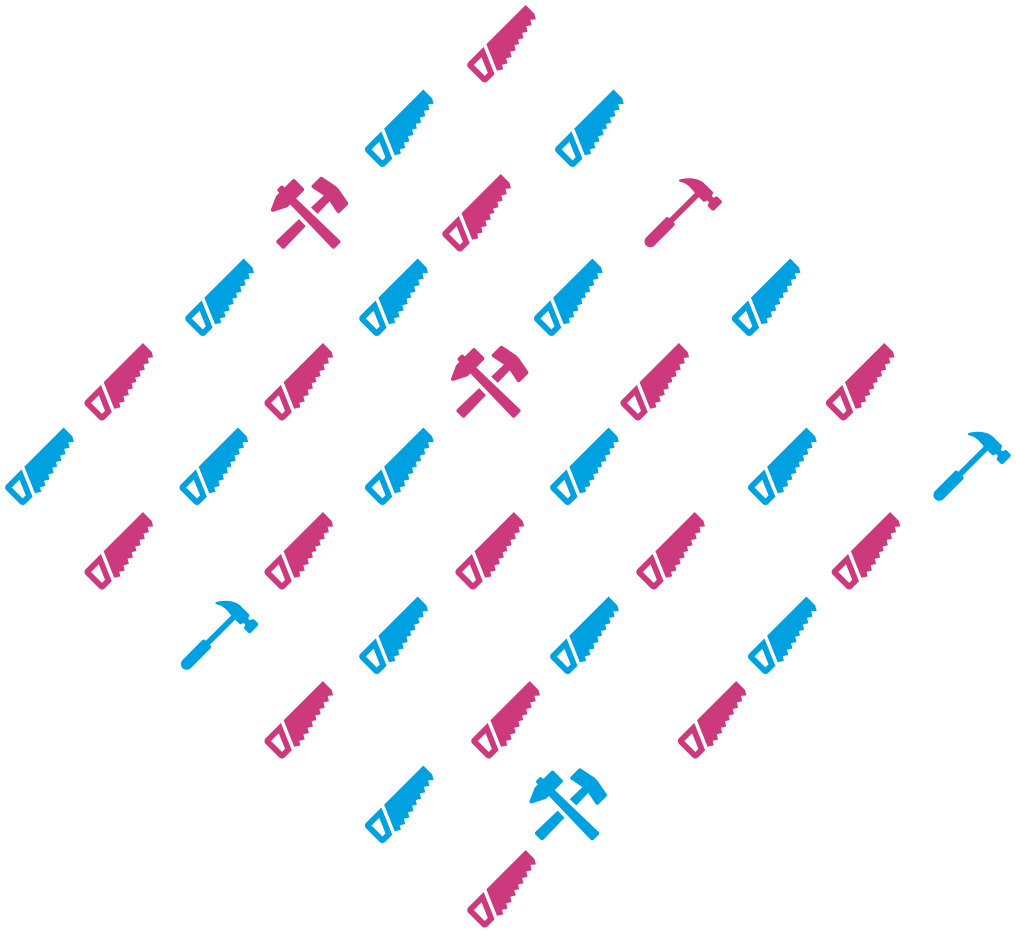
Activity 2b. How many balls in all?



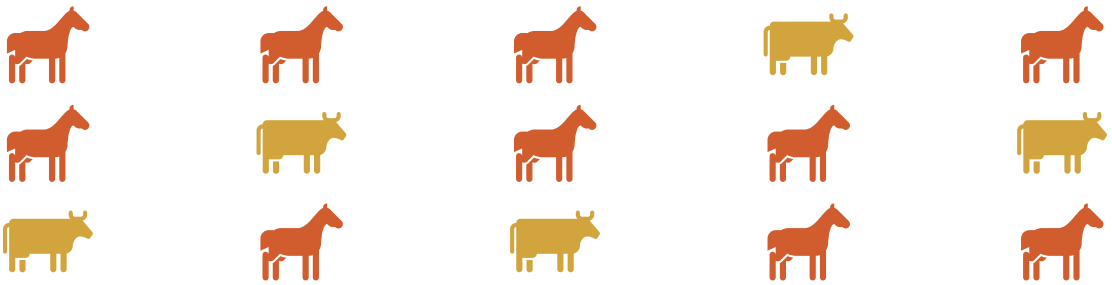
Activity 2b. How many days has the sun shone in the past few weeks?



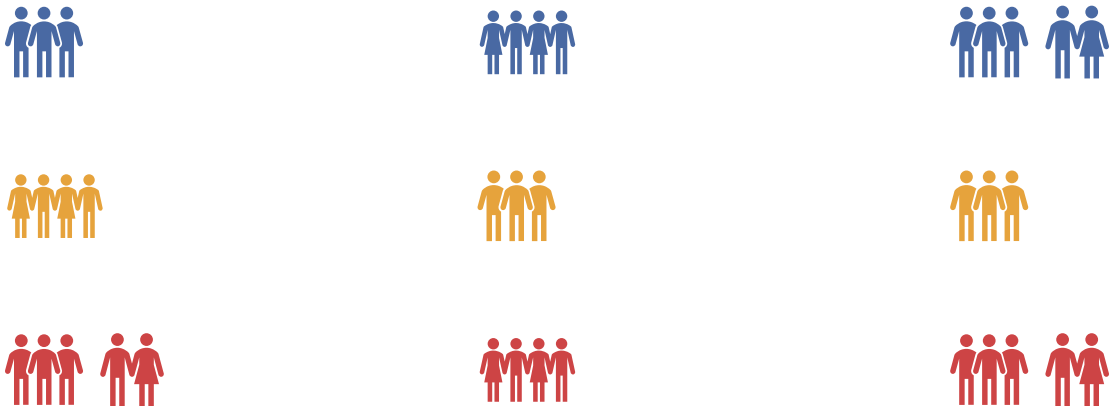
Activity 2b. How many saws in this bunch?



Activity 2b. How many cows? How many horses? How many animals in all?



Activity 2b. How many people in this crowd?



Activity 2b. What are there more of: planets, telescopes, or satellite dishes?

Activity 2c. Game of 24 instructions

Players:
Two or more

Goal:
Make 24 using the numbers you have in your hand

1. Shuffle the deck of number cards, and deal five cards to each player.

2. Place the cards face up so that everyone can see everyone else's cards.

3. Set the remaining cards in the center face down. Set the operations cards in the center face up.

Scoring

Use five number cards: 10 points

Use two to four number cards: 5 points

Use one number card: 1 point

4. On your turn, use as many of your number cards as possible to make 24 by using any operations cards you need. You can add, subtract, multiply, and divide as many times as you need. Once you make 24, record your score based on the scoring rules and return your used cards to the bottom of the number deck. Draw enough cards from the top of the deck so that you have five cards once again.

5. If you can't make 24, you can exchange one or more number cards and wait until the next turn.

6. The person with the most points at the end of the round (when all the number cards have been used) wins.

Activity 2c. Game of 24 family prompts

As you read the instructions and play the game:

- Help deal the cards.

- Let your child lead, but offer hints if you see that your child is stuck—for example, remind your child of the factors of 24 (whole numbers that divide 24 evenly such as 2 and 12 or 3 and 8).

- Encourage your child to look for ways to group numbers. For example, a child might first group 3 and 1 (3 + 1) and then multiply the sum by 6 to form the number sentence $(3 + 1) \times 6 = 24$. Here's another grouping example to help you think of options: $(9 – 1) \times (2 + 1) = 24$.

- It is okay to help your child or have your child help you if you are stuck (or pretend to be stuck).

Activity 2c. Game of 24 handouts

0	0	0	0
1	1	1	1
2	2	2	2

3	3	3	3
4	4	4	4
5	5	5	5

6	6	6	6
7	7	7	7
8	8	8	8

9	9	9	9
10	10	10	10
11	11	11	11

12	12	12	12
13	14	15	16
17	18	19	20

20	20	20	21
22	23	24	24
+ (plus)	+ (plus)	+ (plus)	+ (plus)

− (minus)	− (minus)	− (minus)	− (minus)
× (times)	× (times)	× (times)	× (times)
÷ (divided by)	÷ (divided by)	÷ (divided by)	÷ (divided by)

Station 3. Printable materials

Please refer to pages I-1 and I-2 for printing guidance on these materials.

Activity 3a. Race to 100 instructions

Players:
Two or more

Goal:
Earn enough 10-unit rods to exchange for a 100-unit flat square

1. At the start of a turn, roll a pair of dice.
2. Add the dots (or pips), and collect that number of units.
3. When you get 10 units, you can exchange them for a 10-rod.
4. If you roll a double (two of the same number), you get a free 10-rod along with the sum of the roll.
5. When you have ten 10-rods, exchange them for a 100-flat square to win.

Activity 3a. Race to 100 family prompts

As you read the instructions and play the game:

- Ask your child throughout the game whether they have 10 or more units and can exchange them for a 10-rod.

- Ask your child throughout the game how many units they have in total. Then, ask which player is closest to 100.

Activity 3b. Broken Calculator instructions

1. In this game, you try to reach the goal number while pretending that certain keys on the calculator don't work.

2. Why didn't we provide answers? Because there are so many! Plus, once you get one answer, you'll see that you were correct or incorrect immediately on the calculator. If by chance you didn't find one correct path, then try again—that's why you have a calculator!

Players:
One or more

Goal:
Make various numbers on a calculator without using certain keys

Activity 3b. Broken Calculator family prompts

As you engage in the activity:

- Try different options, and be patient with your child and yourself if you don't get to the goal number quickly.

- Ask your child to share solutions and then to ask the questions in the game.

- Ask whether your child can do it another way.

- If your child reaches a solution quickly, try to display another family member's birth year (for example, aunt's, uncle's, grandparent's).

Activity 3b. Broken Calculator handout

Where's the 1?

Restriction: The #1 key is broken!
Goal: We need to make the number 11 show up on the calculator screen.

1. Explain your strategy.
2. How many moves did it take you?
3. Can you do it in fewer moves? More?
4. Is there a different operation you can use?

Now try 111. Then 1,111.

Year of birth

Restriction: The only keys that work are 1, 0, +, –, =
Goal: Can you get the display to show the four-digit year of your birth? (for example, 1990, 2011)

1. Explain your strategy.
2. How many moves did it take you?
3. Can you do it in fewer moves? More?
4. Can you get the display to show your parents' years of birth?
5. Explain your strategy. Did you use the same strategy or a different one?
6. How many moves did it take you?
7. Can you do it in fewer moves? More?

Activity 3c. Dinner Time instructions

Players: One or more

Goal:
Budget for a family meal

1. Each family determines a budget for the meal and records it on the budget sheet. The budget might be based on the number of family members dining out and what is a realistic amount for their family to spend.

2. Each family member reviews the menus, records his or her selection (number and item) on a plate, and totals the cost for his or her individual meal. Remember to include entrées, any additional sides, and beverages in the total.

3. Record the cost of each family member's meal on the budget sheet, and total the cost for the family.

4. Did you stay within budget? How much money is left?

5. Suppose you want to go for ice cream after dinner. Will there be enough money left for ice cream? If not, how might you adjust your dinner choices to budget for ice cream?

Activity 3c. Dinner Time family prompts

As you engage in the activity:

- Encourage your child to estimate costs before selecting menu items.
- About how much should an individual meal cost if each family member has an equal share of the budget? (Estimate to whole-dollar amounts.)
- About how much money should you estimate for beverages?
- Discuss family meal selections. Which item is highest in cost? Which is lowest?
- Encourage your child to consider various menu options to remain within budget.
- Although taxes and a server's tip are not included in this activity, you might want to discuss these costs with your child.

Activity 3c. Dinner Time menu handout

Main Street Café

Item #	Burgers, Tacos, Wraps, and Sandwiches
1 	Cheeseburger with lettuce and tomato (served with fries) $6.50
2	Bacon burger with lettuce and tomato (served with fries) $7.50
3	Grilled chicken sandwich with lettuce and tomato (served with fries) $7.25
4 	2 Chicken tacos with guacamole, rice, and refried beans $7.45
5	2 Beef tacos with rice and refried beans $6.80
6	2 Fish tacos with rice and refried beans $7.50
7 	Mediterranean veggie wrap (spinach, cucumbers, hummus, red onions, olives, feta cheese) $6.50
8	Southwest chicken wrap (grilled chicken, lettuce, cheese, onions, and ranch dressing) $7.25
9 	Turkey club sandwich with lettuce, cheese, and tomato (served with fries) $8
10	Bacon, lettuce, and tomato (BLT) toasted sandwich (served with fries) $6.50
11	Grilled cheese sandwich with a cup of tomato soup $6

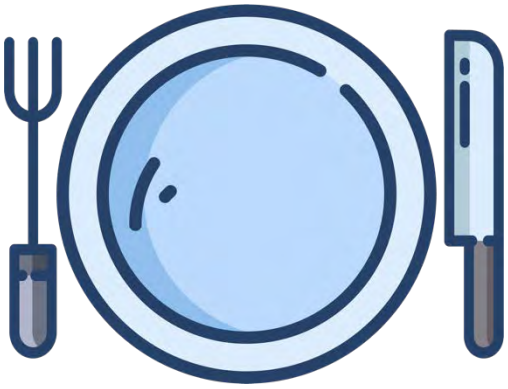
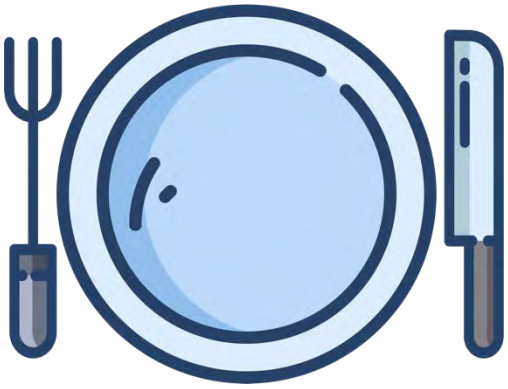
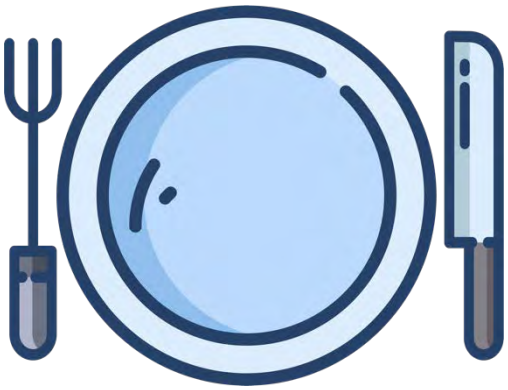
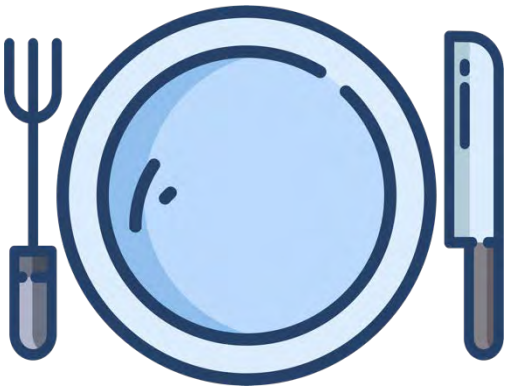
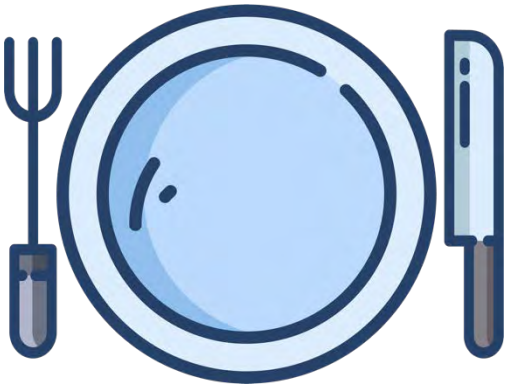
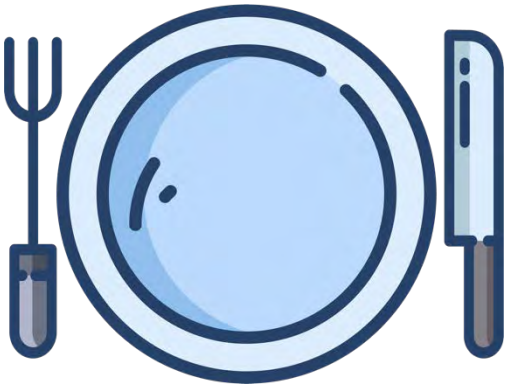
Item #	Salads
12	PBJ—Peanut butter and jelly sandwich served with a banana $5
13 	Beef taco salad—includes crispy taco bowl, lettuce, cheese, corn, sour cream, guacamole, and your choice of dressing $9.25
14	Veggie mix salad – includes spring mix greens, broccoli, cucumber, cauliflower, tomato, chickpeas, and your choice of dressing $8.20
15	Lettuce wedge with blue cheese dressing $7.25
	**Sides**
16	Fries: $1.50
17	Onion rings: $2
18 19	Potato salad: $2.50 Cole slaw: $2.50
20 21	Applesauce: $1.50 Fresh fruit: $1
	**Beverages**
22 23 24	Sodas: (diet or regular) $2 Lemonade: small $2 Tea: small $2
25	Milk: $1.50
26	Water: free

Activity 3c. Dinner Time budget planning handout

- How many family members plan to dine out? _____
- What is your family's budget for the meal? _____
- You may choose any items on the menu, but the total cost must remain within the budget.

Family member	Selection (sandwich, side, beverage)	Cost
	Meal total cost	
	Difference from budget	

Activity 3c. Dinner Time empty plates handout

Station 4. Printable Materials

Please refer to pages I-1 and I-2 for printing guidance on these materials.

Station 4. How Many of Me? instructions

1. Cut a piece of ribbon equal in length to the height of your child.

2. You will call the length of ribbon by the name of the person whose height you used. For example, the ribbon cut to match the height of Jacob is called a “Jacob.”

3. Use the prompts and the ribbon to measure different dimensions around the room.

Station 4. How Many of Me?
Family prompts grades K–1

1. What are some things in this room that you could measure with your ribbon?

2. Let's use the length of your ribbon to measure the length of the room or the bleachers. First, let's estimate. How many "Jacobs" do you think it will take to equal the length of the room? How many "Jacobs" does another family member think it will take?

3. Next, use the ribbon to count how many "Jacobs" would fit across the room. Whose guess was closer?

4. Which side of the room do you think is longer? How could we measure to find out?

5. Use the ribbon to measure the width of the room.

6. Now that you've measured the length and width of the room, make a guess about how many "Jacobs" it would take to equal the height of the room. How did you make your guess?

Station 4: How Many of Me?
Family prompts grade 2–3

1. Use your ribbon to measure the length of the room in "Jacobs."

2. Cut a piece of different colored ribbon equal in length to the height of a different family member, and call it by the name of the person whose height you used; for example, the ribbon cut to match the height of Grandma is called "a Grandma."

3. Which do you think will be greater: the number of "Jacobs" needed to measure the length of the room or the number of "Grandmas"? Why?

4. Check your prediction: use the ribbon to measure the length of the room in "Grandmas."

5. Compare the results to your prediction. Is anything surprising?

6. Discuss why the number of "Jacobs" is different from the number of "Grandmas."

7. If time remains:

    a. How could we figure out the perimeter? (The perimeter is the total length around the room where the wall meets the floor.)

    b. Would you rather measure in "Jacobs" or "Grandmas"? Why?

    c. Measure the width of the room. Then add length + width + length + width to calculate the perimeter.

Station 4. How Many of Me?
Family prompts grade 4–5

1. Use your ribbon to measure the length of the room in “Jacobs.”

2. Which is longer: an inch or a foot? Allow your child to look at a ruler, yardstick, or tape measure to decide.

3. Estimate: About how long is a “Jacob” in inches?

4. Measure your ribbon in inches.

5. Can you calculate the length of your ribbon in feet now that you know it in inches? Measure your ribbon in feet to check.

6. Which is longer: a meter or a centimeter? Allow your child to look at a meterstick or tape measure to decide.

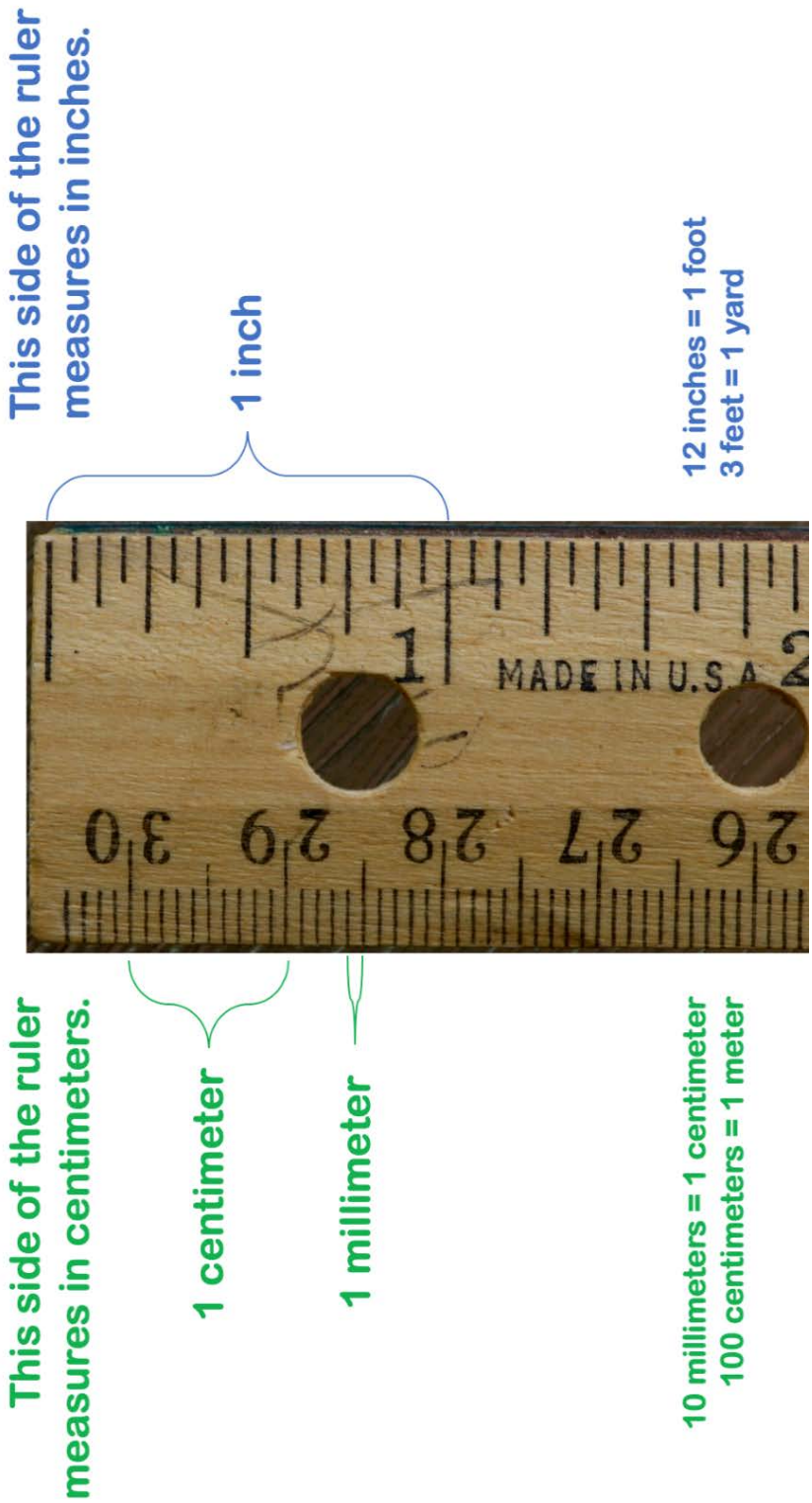
7. Estimate: About how long is a “Jacob” in centimeters?

8. Measure your ribbon in centimeters and meters.

9. Can you use the length of the room in “Jacobs” to calculate the length of the room in feet?

10. Which do you think will be greater: the height of the room or the length? Why?

Measurement reference sheet



Printable exit ticket

Core planning teams can customize the sample exit ticket to collect feedback on their Community Math Night program.

Thank you for coming to Community Math Night!
Please share your thoughts to help us improve.

Choose the response that best describes your level of agreement with the following statement:

	Strongly disagree	Disagree	Agree	Strongly agree
I understand the role of positive math attitudes and growth mindset in supporting math learning.				
I actively engaged in the math station activities with my child.				
I learned new ways to support my child in learning math.				

What did you **enjoy** about your Community Math Night experience?

What new **strategies or ideas,** if any, did you learn from the Community Math Night?

What, if anything, was confusing or do you have **questions** about from the Community Math Night?

What **improvements,** if any, would you suggest for Community Math Nights in the future?

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