KY Family Math Night Facilitator Guide

Spring 2020

Kentucky

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KCM KENTUCKY CENTER FOR MATHEMATICS

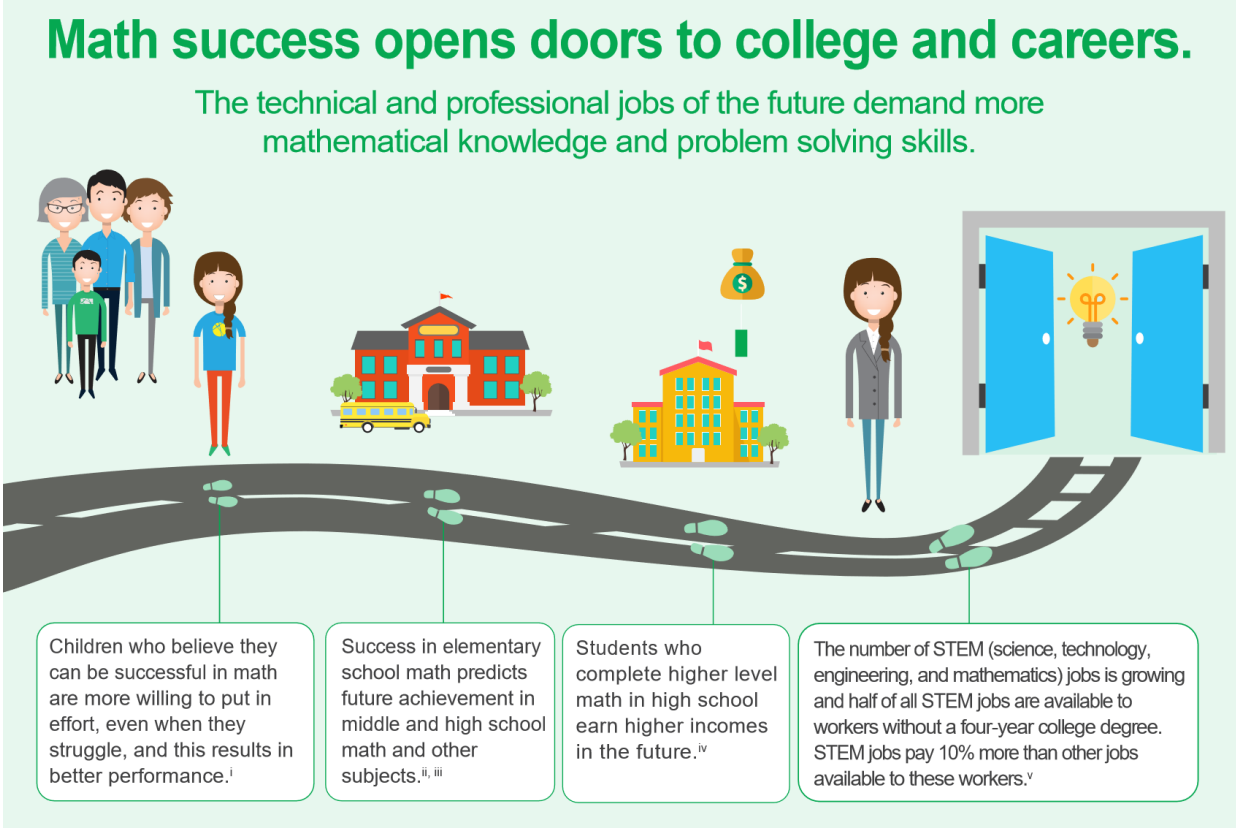
KENTUCKY COLLABORATIVE FOR FAMILIES AND SCHOOLS
Building a Groundswell for Excellent Education

Contents

Overview

Early mathematics achievement is associated with a number of success factors later in life such as getting better grades in middle school, increased likelihood of high school graduation, and better career opportunities. At community math nights, educators, children and family members can learn and talk about mathematics, helping family members participate in their child's learning and support their child's academic success.[1] Community math night activities can create a shared understanding of the math concepts and raise expectations for math knowledge and achievement, which promote children's success in school.[2]

The *Kentucky Family Math Night Facilitator Guide* provides all the instructions and materials needed for your family math night. The guide is organized by activity aligned to the *Kentucky Academic Standards for Mathematics*, including the purpose, a list of linked materials and facilitator instructions for each activity. As you review the guide, you'll learn about building a strong foundation for mathematics in elementary school, the value of engaging families in children's math learning and research-based instructional strategies that support mathematics learning.



[1] Garcia, E., & Weiss, E. (2017). *Education inequalities at the school starting gate: Gaps, trends, and strategies to address them*. Washington, DC: Economic Policy Institute

[2] DeFlorio, L., & Beliakoff, A. (2015). Socioeconomic status and preschoolers' mathematical knowledge: The contribution of home activities and parent beliefs. *Early Education and Development*, *26*(3), 319–341. https://eric.ed.gov/?id=EJ1053641

KY Family Math Night at a Glance

Complete the table below as an at-a-glance guide for your math night.

Date: **Location:**

Time	Activity	Location	Facilitator(s)
	Welcome and goals (15 min)		
	Math attitudes and growth mindset (15 min)		
	KY Standards Family Guides (10 mins)		
	Math Stations Introduction (80 mins)		
	Geometry (15 min)		
	Operations and Algebraic Thinking (15 min)		
	Numbers and Operations in Base 10 (15 min)		
	Measurement and Data (15 min)		
	Wrap-up (15 min)		

Materials at a Glance

Facilitation Materials

(In chronological order—found throughout facilitator guide)

- Slide deck to guide presentations
- Folder for each family containing:
  - KY Standards Family Guides
  - 4 raffle tickets
  - Feedback survey
  - “Supporting Your Child in Developing Math Skills for Future Success” infographic
- Stamps for tickets
- Geometry glossary poster
- Instructions for each station
- Handouts for parents/facilitators with questions to prompt students to explain what they’re doing, to scaffold the activity, and to prompt for additional solutions/strategies

Ideas for Raffle Prizes

- Book: Reese's Pieces Count by Fives
- Book: The Hershey's Kisses Addition
- Book: The Hershey's Kisses Subtraction Book
- Book: The Hershey's Milk Chocolate Multiplication Book

Welcome and Goals 15 minutes

Facilitator(s): _____

Purpose

Welcome families and present information on the importance of mathematics.

Materials

- Introduction slides
- Folder for each family containing:
  - KY Standards Family Guides
  - 4 raffle tickets
  - Feedback survey
  - "Supporting Your Child in Developing Math Skills for Future Success" infographic

Background

Early mathematics achievement is associated with a number of success factors later in life such as getting better grades in middle school, increased likelihood of high school graduation, and better career opportunities. At family math nights, educators, children, and family members can learn and talk about mathematics, helping family members participate in their child's learning and support their child's academic success.[3] Family math night activities can create a shared understanding of the math concepts and raise expectations for math knowledge and achievement, which promote success in school.[4]

Facilitator Notes

As families come into the event, give each family a number 1–4. These numbers will tell them which station to start with.

Welcome families, students, and other community members to the event.

Introduce yourself and what your role is and tell the participants that the activities will start when everyone is finishing dinner.

Announce that while the participants are enjoying dinner, you would like them to think about their math learning. Ask them to introduce themselves to the others at their table and say which of the books on the screen (slide 3) they think reflects them as a math learner. Read each of the book titles on the screen and ask them to discuss.

As families finish dinner, walk them through the agenda slide (slide 4), and let them know that you will get started in 5 minutes.

Now that families are focused on the presenter, begin with the question "Why math"? (slide 5). Follow the script on the slide.

Walk participants through the notes on why math is important and reference the infographic slides 6 and 7. Walk through each slide and narrate the text.

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[3] Garcia, E., & Weiss, E. (2017). *Education inequalities at the school starting gate: Gaps, trends, and strategies to address them*. Washington, DC: Economic Policy Institute

[4] DeFlorio, L., & Beliakoff, A. (2015). Socioeconomic status and preschoolers' mathematical knowledge: The contribution of home activities and parent beliefs. *Early Education and Development*, *26*(3), 319–341. https://eric.ed.gov/?id=EJ1053641

Math Attitudes and Growth Mindset 15 minutes

Facilitator(s): _____

Purpose

Engage families in understanding how a having growth mindset helps children succeed in math.

Materials

- Math attitudes slides

Background

Research suggests that math attitudes and math skills can be reciprocal—positive attitudes about math promote math achievement, which in turn encourages even more positive attitudes down the road.[5] However, adults often hold negative attitudes and beliefs about math. When family members say, “I don't like math,” they can affect children’s feelings about and success in math.[6]

Fortunately, there are ways family members and educators can help children develop positive math attitudes. One way is by building a growth mindset. Having a growth mindset means that a person believes that he/she can increase his/her knowledge with effort and hard work.[7] The math attitudes and growth mindset activity for this community math night highlights phrases family members may have used or describe how they may feel about math. The activity will have family members reflect on how they feel and talk about math with their children, encouraging a more positive attitude toward math.

Facilitator Notes

- Have math station facilitators or other teachers sit with participants while you pull up the “Math attitudes” (slide 8) and introduce the topic (notes on slide).
- Describe to families that adult reactions can impact their children’s math achievement (notes on slide 9).
- Present the difference between growth mindset and fixed mindset (slide 10) and walk through examples of feedback (slides 11-13).
- (Optional) Ask participants to share with an elbow partner about a time when they struggled with something but through hard work were able to increase their abilities and succeed.
- Remind participants that the take-home message about mindset is that adults can influence children’s attitudes and achievement in the area of mathematics (slide 14). It is better to praise children’s effort and problem solving rather than simply correct solutions or praise a child’s intelligence.

[5] Ma, X. (1997). Reciprocal relationships between attitude toward mathematics and achievement in mathematics. The Journal of Educational Research, 90(4), 221-229.

[6] Regional Education Laboratory, Northwest. (2017). Growth Mindset in Math. Presented to Washington STEM Partnership. Retrieved from https://ies.ed.gov/ncee/edlabs/regions/northwest/news/math-attitudes-training-series.asp

[7] Dweck, C. S. (2006). Mindset: The new psychology of success. New York, NY: Random House.

KY Standards Family Guides 15 minutes

Facilitator(s): _____

Purpose

Provide information and how to access the KY Standards Family Guides.

Materials

- KY Standards Family Guide slides and document

Background

The Kentucky Academic Standards (KAS) Family Guides have been developed to help families familiarize themselves with the content of each grade level's standards. Each guide contains a standards overview for Reading & Writing, Mathematics, Science and Social Studies.

This guide was made to help families understand the Kentucky Academic Standards and to show what children will learn by the end of kindergarten. This tool provides information about the key ideas and skills teachers will introduce in mathematics, reading and writing, science and social studies. It includes possible examples of what students will be asked to do in class, how to help your child at home, questions you can ask your kindergartner and questions families can ask their child's teacher.

This guide also was designed to help parents understand how they can work with teachers to support the learning happening in the classroom. When teachers and families work together to help students master Kentucky's academic standards, students can succeed by developing the skills they will need for life after graduation.

If you have questions about the information you receive tonight or if your child needs extra help, please contact your child's teacher.

Facilitator Notes

- Have families dig into the KY Standards Family Guides and explain the following sections are consistent within each content area (slides 15-17):
  - Overview
  - Example of your Child's Work at School
  - How to Help Your Child at Home
  - Questions You Can Ask Your Child
  - Questions You Can Ask Your Child's Teacher
- Show families how to access/subscribe to www.kystandards.org and ask if they have any questions about the resource.

Math Stations 1 hour, 15 minutes

Introduction to Stations 5 minutes

Facilitator(s): _____

Purpose

Provide instructions and norms for participating in the math stations.

Materials

- Math stations slides

Facilitator Notes

1. Tell participants they will visit stations around the room (slide 16) at each grade level. Let families know that each station will focus on a different area of math from grade level standards. When they complete a station, the station facilitator will stamp the ticket and the children can submit the tickets for the raffle.
2. Provide tips for family members on participating in the stations (slide 17).
3. When families come in, they should have received a number from 1 to 4, which will tell them which station to start at. If there are families with students in different grade bands, they can go to a couple of stations in one grade band room and then visit the other grade band room. Or, if they prefer, family members can split up with their children so that they can try out the activities in all corresponding grade levels.
4. Say that you will ring a bell every 15 minutes to remind them to go to the next station.
5. Direct them to their first station.
6. They should then return to the main room/gym/cafeteria for the wrap-up and raffle.

Station 1: Geometry

Facilitator(s): _____

Purpose

Families and children will engage in activities aligned with the Kentucky Academic Standards for geometry.

Materials

- Materials for each activity
- Geometry glossary poster
- Stamps for tickets

Facilitator Notes

- Direct families to the different tables, based on students' grade level.

When they are done with the activity at the table, stamp their tickets to enter the raffle.

Background

The geometry station activities use pattern blocks: geometric manipulatives that include an equilateral triangle (green), a 60-degree rhombus (blue), a 30-degree rhombus (yellow), a trapezoid (red), a hexagon (yellow) and a square (orange). Pattern blocks help students learn by building foundational understanding from concrete experiences before moving into abstract reasoning.[8] According to Stein & Bovalino,[9]

> Manipulatives can be important tools in helping students to think and reason in more meaningful ways. By giving students concrete ways to compare and operate on quantities, such manipulatives as pattern blocks, tiles, and cubes can contribute to the development of well-grounded, interconnected understandings of mathematical ideas.

You can use pattern blocks and three-dimensional figures with children to practice naming shapes, describing and comparing shape attributes and composing and decomposing shapes.[10] They are also a great tool for encouraging students to work collaboratively, verbalize mathematical thinking and discuss mathematical ideas and concepts.

[8] Heddens, J. W. (1986). Bridging the gap between the concrete and the abstract. *The Arithmetic Teacher*, *33*, 14–17. Reisman, F. K. (1982). *A guide to the diagnostic teaching of arithmetic (3rd ed.).* Columbus, OH: Merrill. Ross, R. & Kurtz, R. (1993). Making manipulatives work: A strategy for success. *The Arithmetic Teacher, 40*, 254–258.

[9] Stein, M. K., & Bovalino, J. W. (2001). Manipulatives: One piece of the puzzle. *Mathematics Teaching in Middle School*, *6*(6), 356–360.

[10] Reed, K. E., & Young, J. M. (2017). *Games for young mathematicians: About the math in pattern block puzzles*. Waltham, MA: Education Development Center, Inc. http://ym.edc.org/

Grades K–1: Fill in the Shapes

Facilitator(s): _____

Purpose

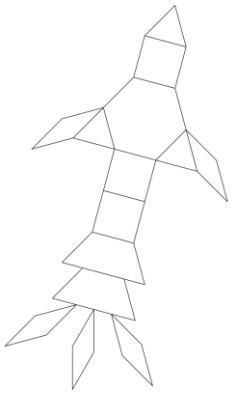
Students and families use pattern blocks to compose and decompose shapes and make composite shapes.

Materials

- Instructions and parent prompts page 28
- Printed outlines to be filled in with blocks pages 45-54
- A container of pattern blocks

Facilitator Notes

- Have students/families use pattern blocks to compose and decompose shapes and make composite shapes.
- Show parents how they can use the prompts, model asking questions (e.g., Can you fill in the same outline but with different shapes? Why?) and point out the geometry glossary poster.
- Model using the correct vocabulary for shapes, but do not correct families if they use color names instead.



Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.6 and MP.7

Kindergarten

Cluster: Analyze, compare, create and compose shapes.

KY.K.G.6 Compose simple shapes to form larger shapes.

First grade

Cluster: Reason with shapes and their attributes

KY.1.G.2 Compose shapes.

a. Compose two-dimensional shapes to create rectangles, squares, trapezoids, triangles, half-circles, quarter-circles and composite shapes to compose new shapes from the composite shapes.

b. Use 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 shapes.

Grades 2–3: Partitioning

Facilitator(s): _____

Purpose

Students and families use patty paper to partition rectangles in equal parts of a whole to develop foundations for fractions, area, volume, and geometry in later grades.

Materials

- Instructions and parent prompts page 29
- Square patty paper
- Colored pens

Facilitator Notes

- Give everyone a square and colored pen and have them create a design that splits the square in half.
- Have students and families exchange their design with one another. They must decide if they agree that the design splits the square in half. Encourage students to use color coding to prove that they have split the square in half.
- They can then talk through if they agree that the square has been split in half. If they need examples see https://bhi61nm2cr3mkdgk1dtaov18-wpengine.netdna-ssl.com/wp-content/uploads/2017/07/3-5-WIM-3-Halving.pdf
- Third grade students could work on partitioning their squares into halves, thirds, fourths, sixths, eighths. For example, students partition a shape into 6 parts with equal areas and describe the area of each part as 1/6 of the area of the shape.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP. 3, MP.5 and MP.6

Second grade:

Cluster: Reason with shapes and their attributes.

KY.2.G.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.

Third grade:

Cluster: Reason with shapes and their attributes.

KY.3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

Grade 4: Symmetric Mosaics

Facilitator(s): _____

Purpose

Students and 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

- Instructions and parent prompts page 30
- Handouts and pattern block key pages 55-61
- Container of pattern blocks
- Small mirrors
- Large paper cutout of the pattern blocks for folding (to show symmetry)

Facilitator Notes

1. Help families read the instructions and answer their questions.
2. Show parents how they can use the prompts, model asking questions, and point out the geometry glossary poster.
3. Model using the correct vocabulary for shapes, but do not correct families if they use color names instead.
4. Support students and families with the following prompts:
   - What is symmetry? (Point to the glossary; offer them a small mirror; have them fold a paper shape).
5. Encourage students and parents to express different reasons for how and why they created the mosaic the way they did.
6. Demonstrate how to use the mirrors to check for symmetry.
7. If applicable, explain that some shapes have rotational symmetry (a shape has rotational symmetry when it still looks the same after some rotation).

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.3, MP.6 and MP.7

Fourth grade:

Cluster: Draw and identify lines and angles and classify shapes by properties of their lines and angles.

KY.4.G.3 Identify lines of symmetry.

a. Recognize a line of symmetry for a two-dimensional figure.

b. Identify line-symmetric figures and draw lines of symmetry.

Grade 5: Battleship Using Grid Paper

Facilitator(s): _____

Purpose

The purpose of this task is to give students practice plotting points in the first quadrant of the coordinate plane and naming coordinates of points. It could be easily adapted to plotting points with negative coordinates for grades 6-8.

Materials

- Instructions and parent prompts pages 31-32
- grid paper
- colored pencils; some color for the ships and (for example) red for explosions on their ships and their enemy's ships. This is how they will keep track of what ordered pairs have been called.

Facilitator Notes

1. Students begin by folding the grid paper in half. They need to draw coordinate axes on both the top half and the bottom half and label the x and y axes with the numbers 1–10 on each axis. The students will need to draw in 5 ships on ordered pairs and label the ordered pairs. This game may need to be demonstrated for families or played in class beforehand.

   They should draw:

   - Two ships that are sitting on 2 ordered pairs,
   - One ship that is sitting on 3 ordered pairs,
   - One ship that is sitting on 4 ordered pairs, and
   - One ship sitting on 5 ordered pairs.

2. Remind them the bottom half has their boats and the top half has their opponent's boats.
3. Students and families play in pairs sitting opposite each other and take turns calling out ordered pairs.
4. Players should keep a list of the ordered pairs they call out written in (x,y) form on a piece of paper that both players can see so there is no disagreement later on about what has been called (it is common for students to transpose the coordinates).
5. Players are to mark the ordered pair they call out on the top coordinate plane. They should mark in black if they missed and red if they hit their opponent's boat. On the bottom half of the grid paper they are to color black for the ordered pairs their opponent calls out and color red for the ordered pairs that hit their ship.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.2 and MP.6

Fifth grade:

Cluster: Graph points on the coordinate plane to solve real-world and mathematical problems.
KY.5.G.1 Use a pair perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis and the second number indicates how far to travel in the direction of the second.

Station 2: Operations and Algebraic Thinking

Facilitator(s): _____

Purpose

Students and families engage in activities aligned with the Kentucky Academic Standards domain operations and algebraic thinking.

Materials

- Materials for each activity
- Calculators, pencils, erasers, and scratch paper
- Stamps for tickets

Background

The mathematics we teach from preschool to middle school forms the foundation for algebra. According to the National Mathematics Advisory Panel, the fundamentals of algebra are conceptual understanding, procedural skill and fluency, and application, and these three targets of the standards are mutually reinforcing, not competing.[11]

From an early age, children observe number patterns and relationships and use these observations to derive facts.[12] This understanding becomes the basis for arithmetic operations and number composition and builds a foundation for higher order mathematical thinking and algebra preparedness.[13] [14] The Operations and Algebraic Thinking station activities are designed to support students' conceptual understanding of numbers and operations to build fluency in arithmetic facts. Being "fluent" means students can flexibly choose among methods and strategies to solve real-life and mathematical problems, understand and explain their approaches and produce accurate answers efficiently. The activities in this station will allow students to work with numbers and operations in different ways, use strategies that support conceptual understanding and procedural skill/fluency and consider whether their solution is reasonable.

Facilitator Notes

- Direct families to the different stations, based on students' grade level.
- When they are done, stamp their tickets to enter the raffle.

[11] National Mathematics Advisory Panel. (2008*). Foundations for success: The final report of the National Mathematics Advisory Panel.* Washington, DC: U.S. Department of Education.

[12] Thompson, F. I. (Ed.). (2008). *Teaching and learning early number*. McGraw-Hill Education (UK).

[13] Boaler, J. (2015). Fluency without fear: Research evidence on the best ways to learn math facts. *Reflections*, *40*(2), 7–12.

[14] Woodward, J. (2006). Developing automaticity in multiplication facts: Integrating strategy instruction with timed practice drills. *Learning Disability Quarterly*, 29(4), 269–289.

Grades K–1: Flip the Cards Game[15]

Facilitator(s): _____

Purpose

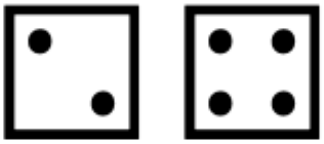
Students and families practice recognizing numbers/numerals, ordering numbers, and adding single digit numbers.

Materials

- Instructions and parent prompts page 33
- Cards with numbers and dice from 0–10 on page 62
- Dice

Facilitator Notes

- Help families read the instructions.
- Show parents how they can use the prompts and model asking questions.
- You may need to help the families be patient as the children lay out the cards in order or add the numbers.



Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP. 1, MP.2, MP.3 and MP.7

Kindergarten

Cluster: Understand addition as putting together and adding to and understand subtraction as taking apart and taking from.
KY.K.OA.3 Decompose numbers less than or equal to 10.
a. Decompose numbers into two groups in more than one way by using objects or drawings and record each decomposition by a drawing or equation.
b. Use objects or drawings to demonstrate equality as the balancing of quantities.

First grade

Cluster: Add and subtract within 20.
KY.1.OA.6 Add and subtract within 20.
a. Fluently add and subtract within 10.
b. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making 10; decomposing a number leading to a 10; using the relationship between addition and subtraction; creating equivalent but easier or known sums.

[15] Source: Abridged version of Two Numbers game, http://ym.edc.org/2numbers/

Grades 2–3: Many Ways of Counting

Facilitator(s): _____

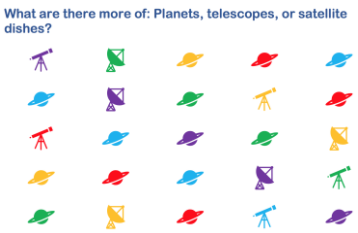
Purpose

Students and families use grouping strategies to find the total number of items on a variety of cards.

Materials

- Instructions and parent prompts page 34
- Counters to support grouping strategies
- Markers
- Blank index cards
- Cards with groups of items pages 63-68

Facilitator Notes



- Have each family take one of the cards and ask them to answer the prompt.
- Let families know there are many different strategies they can use to efficiently count the number of objects in the array, by grouping the items. They don't have to simply count one by one.
- Once they have tried several strategies, they should get a new array.
- Show parents how they can use the prompts and model asking questions.
- Listen to how they support their children in finding new counting strategies for each array.
- Offer counters if you see students having trouble or to support their grouping strategies.
- Offer hints if you think students are ready for more complex counting or grouping strategies.
- Support students if they seem ready to make their own array.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP. 2, MP.3, MP.7 and MP.8

Second grade

Cluster: Work with equal groups of objects to gain foundation for multiplication.

KY.2.OA.4 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.

Third grade

Cluster: Represent and solve problems involving multiplication and division.

KY.3.OA.1 Interpret and demonstrate products of whole numbers.

Grades 4–5: Make 24!

Facilitator(s): _____

Purpose

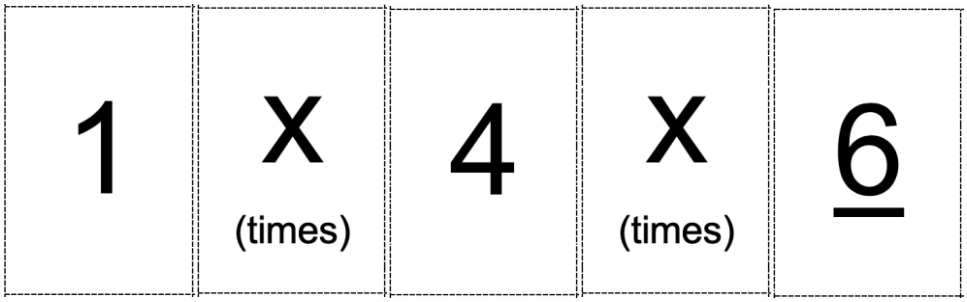
Students and families will play the game 24! in which they combine numbers and operations to see who can produce 24 with one or more operations.

Materials

- Instructions and parent prompts page 35
- Cards with numbers from 0–24 and the four operations pages 69-77
- Multiplication table
- Pencils, erasers, and scratch paper

Facilitator Notes

- Help families read the instructions,
- Show parents how they can use the prompts and model asking questions.
- You may need to offer an example for how to make number sentences that equal 24.



Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.1, MP.2, MP.6 and MP.7

Fourth grade

Cluster: Use the four operations with whole numbers to solve problems.

KY.4.OA.3 Solve multistep problems.
a. Perform operations in the conventional order when there are no parentheses to specify a particular order.
b. Solve multistep word problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computations and estimation strategies including rounding.

Fifth grade

Cluster: Write and interpret numerical expressions.

KY.5.OA.1 Use parentheses, brackets or braces in numerical expressions and evaluate expressions that include symbols.

Station 3: Numbers and Operations in Base 10

Facilitator(s): _____

Purpose

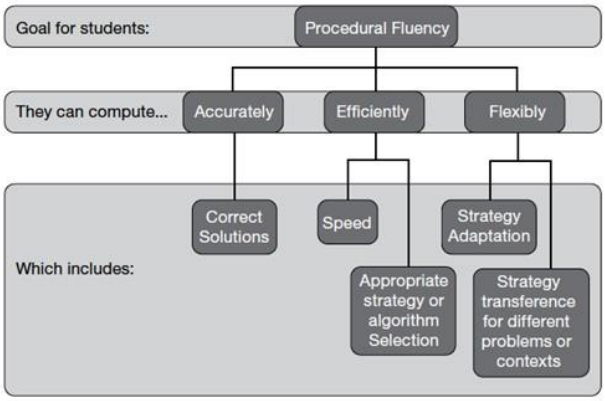
Students and families engage in activities aligned with the Kentucky Academic Standards domain numbers and operations in base 10.

Materials

- Materials for each activity
- Stamps for tickets

Background

The Numbers and Operations in Base 10 station activities develop place value understanding and build procedural skil/ fluency, both of which support students in solving multistep and complex problems, as such reasoning requires a high cognitive complexity and challenges working memory.[16] The National Council of Teachers of Mathematics defines computational fluency as the ability to apply procedures accurately, efficiently, flexibly and appropriately. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills. Students' ability to solve more complex application and modeling tasks is dependent on procedural skill and fluency.



Efficiency—carries out easily, keeps track of sub-problems and makes use of intermediate results to solve the problem.
Accuracy—produces the correct answer reliably.
Flexibility—knows more than one approach, chooses a viable strategy and uses one method to solve and another method to double check.
Appropriately—knows when to apply a particular procedure.

This definition of fluency emphasizes conceptual understanding of the base 10 system and a flexible use of strategies over memorization and recall. Studies find that place value instructional activities that emphasize conceptual problem-solving, rather than transmission of rules and procedures, support a stronger understanding of place value.[17]

[16] Star, J. R., Caronongan, P., Foegen, A., Furgeson, J., Keating, B., Larson, M. R., Lyskawa, J., ... Zbiek, R. M. (2015). *Teaching strategies for improving algebra knowledge in middle and high school students (NCEE 2014-4333).* Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U.S. Department of Education.

[17] Fuson, K., Wearne, D., Hiebert, J., Murray, H., Human, P., Olivier, A., ...Fennema, E. (1997). Children's conceptual structures for multidigit numbers and methods of multidigit addition and subtraction. *Journal for Research in Mathematics Education*, 130–162.

Facilitator Notes

- Direct families to the different stations, based on students' grade level.
- When they are done, stamp their tickets to enter the raffle.

Grades K–1: Race to 100 Game

Facilitator(s): _____

Purpose

Students and families practice composing and decomposing in base 10.

Materials

- Instructions and parent prompts page 36
- Base 10 blocks
- Dice
- Handout with questions to prompt students to explain what they're doing, to scaffold the activity, and to prompt for additional solutions/strategies

Facilitator Notes

- Help families read the instructions. Answer any questions to clarify the task.
- Show parents how they can use the prompts and model asking questions.
- If it comes up, use mathematically correct vocabulary such as "regrouping" or "trading" if you hear families use the terms "borrowing" and "carrying."
- Kindergarten students should stay within exchanging ones and tens.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP. 2, MP.5, MP.7, MP.8

Kindergarten:

Cluster: Working with numbers 11-19 to gain foundations for place value.

KY.K.NBT.1 Compose and decompose numbers from 11 to 19 using quantities (numbers with units) of ten ones and some further ones. Understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

First grade

Cluster: Understand place value.

KY.1.NBT.2 Understand the two-digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:
a. 10 can be thought of as a bundle of ten ones — called a "ten."
b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight or nine ones.
c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight or nine tens (and 0 ones).

Grades 2-3: Broken Calculator

Facilitator(s): _____

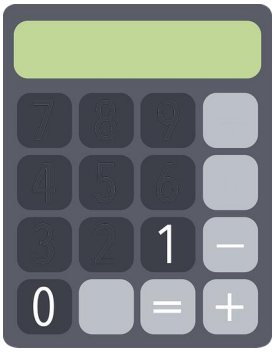
Purpose

Students and families create solutions to a variety of math challenges that require understanding of place value and the operations of addition and subtraction.

Materials

- Instructions and parent prompts page 37
- 4 four-operation calculators (add, subtract, multiply, divide) page 78
- Scratch paper and pencils

Background



Broken calculator was invented in the 1980s by Judah Schwartz (a Mathematics Education professor, then at MIT) to address an increasing worry among some math teachers that using calculators in math class would prevent students from developing their math facts. This game uses the calculator and flips the way questions are asked: Instead of asking what 5 x 8 is, it asks how you can get the product 40 by using different combinations of operations. The challenges in this math station were designed to engage students in practicing place value. There have been many versions of this broken calculator program, and you can find many of them online.[18]

Facilitator Notes

- Help families read the instructions.
- Grade 2 will need support with manipulatives since the range of numbers goes outside of 1,000.
- Show parents how they can use the prompts and model asking questions.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.1, MP.2 and MP.8

Second grade

Cluster: Use place value understanding and properties of operations to add and subtract.
KY.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations and/or the relationship between addition and subtraction.

Third grade

Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic. Note: A range of algorithms may be used.
KY.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations and/or the relationship between addition and subtraction.

[18] Source: http://faculty.salisbury.edu/~jabergner/Adept%20course/summer%2008/Number%20and%20OP%20Day%201/brokencalcarticle.pdf

Grades 4–5: Multiplication Card Game

Facilitator(s): _____

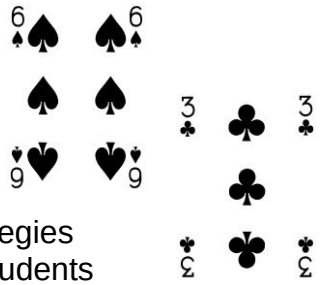
Purpose

Students and families practice building fluency with multiplication facts.

Materials

- Instructions and paren prompts page 38
- Deck of cards (without Queens and Kings)
- Scratch paper and pencils
- Multiplication table page 76

Facilitator Notes



- Help families read the instructions.
- Show parents how they can use the prompts and model asking questions.
- If students get stuck on a multiplication, suggest they use strategies based on number sense rather than the multiplication table. Students could also use manipulatives, for example bead racks and counters to represent equal groups.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.2, MP.5 and MP.7

Fourth grade

Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic.

KY.4.NBT.5 Multiply whole numbers

- Up to four-digit number by a one-digit number
- Two-digit number by two-digit number

Multiply using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models.

Fifth grade

Cluster: Perform operations with multi-digit whole numbers and with decimals to hundredths.
KY.5.NBT.5 Fluently multiply multi-digit whole numbers (not to exceed four-digit by two-digit multiplication) using an algorithm.

Station 4: Measurement and Data

Facilitator(s): _____

Purpose

Students and families engage in activities aligned with the Kentucky Academic Standards for Mathematics domain measurement and data.

Materials

- Materials for each station
- Stamps for tickets
- Measuring tools

Background

Measurement is a key competency in the development of mathematical and scientific thinking from preK through middle school and is fundamental to STEM education.[19] Through completing measurement tasks, children learn to compare magnitudes and observe changes, and these skills bridge the areas of number sense and geometry[20]. The Measurement and Data station activities are designed to build measurement competencies through real-world tasks. Math tasks that present problems or tasks in contexts that are personally and socially meaningful to students are most effective for engaging them and generating interest and curiosity in the tasks. Developing connections between mathematics and the real world is a strategy that can be particularly effective for students who are underperforming or are generally underrepresented in STEM.[21] Given that measurement tasks such as cooking or building are pervasive in our everyday lives, the strategy of using real-world context and application is especially effective.

Facilitator Notes

- Direct families to the different stations, based on students' grade level.
- When they are done, stamp their passports to enter the raffle.

[19] Barrett, J. E., Clements, D. H., & Sarama, J. (Eds.). (2017). *Children's measurement: A longitudinal study of children's knowledge and learning of length, area, and volume*. National Council of Teachers of Mathematics, Inc.

[20] Sarama, J., & Clements, D. H. (2009). *Early childhood mathematics education research: Learning trajectories for young children*. Routledge.

[21] National Council of Teachers of Mathematics. (2014). *Principles to action: Ensuring mathematical success for all*. Reston, VA: National Council of Teachers of Mathematics.

Grades K–2: No-Bake Playdough

Facilitator(s): _____

Purpose

Students and families will compare and use different measuring tools as they put together ingredients to make playdough.

Materials

- Instructions and parent prompts page 39
- Multiple measuring cup and tablespoon sizes
- Ingredients for playdough

Facilitator Notes

- Support parents as they go through the activity, particularly when they order the tools they will use for measuring (spoons and cups) by size.
- Show parents how they can use the prompts and model asking questions, such as “How do you know that the tablespoon is bigger than the half tablespoon?” (e.g., because I see the half spoon looks smaller, or because I can use two half tablespoons to fill up one tablespoon).
- This recipe may not work exactly as intended, as it depends on the ingredients. If the playdough doesn’t come out just right, help them by measuring small quantities of oil and water (don’t just add splashes of the wet ingredients). That way, the families can suggest changes to the recipe for the next person.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.1, MP.5 and MP.6, MP.8

Kindergarten

Cluster: Describe and compare measurable attributes.

KY.K.MD.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.

First grade

Cluster: Reason with shapes and their attributes.

KY.1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths and quarters, and use the phrases half of, fourth of and quarter of. Describe the whole as two of or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Second grade

Cluster: Reason with shapes and their attributes.

KY.2.G.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

Grades 3-5: No-Bake Playdough

Facilitator(s): _____

Purpose

Students and families will build up the right amount of ingredients for their playdough recipes by using smaller measuring tools (i.e., they will need to use ¼ cups to build up 1 cup of flour).

Materials

- Instructions and paren prompts page 40
- Multiple measuring cup and tablespoon sizes
- Ingredients for playdough
- Paper and pencil for calculations

Facilitator Notes

- Support families as they go through the activity, particularly when they are building up the total amounts of ingredients with the smaller measuring tools.
- Show parents how they can use the prompts and model asking questions, such as "How will you know that you have the right amount of flour for this recipe?" (e.g., because I know that four $\frac{1}{4}$ are one cup).
- This recipe may not work exactly as intended, as it depends on the ingredients. If the playdough doesn't come out just right, help them by measuring small quantities of oil and water (don't just add splashes of the wet ingredients). That way, the families can suggest changes to the recipe for the next person.

Kentucky Academic Standards

Students have the opportunity to engage with the Standards for Mathematical Practices:
MP.1, MP.5 and MP.6, MP.8

Third grade

Cluster: Solve problems involving measurement and estimation of intervals of time, liquid volumes and masses of objects.

KY.3.MD.2 Measure and solve problems involving mass and liquid volume. a. Measure and estimate masses and liquid volumes of objects using standard units of grams (g), kilograms (kg) and liters (L). b. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

Fourth grade

Cluster: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

KY.4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects and money.

a. Solve measurement problems involving whole number, simple fractions or decimals.

b. Solve problems that require converting a given measurement from a larger unit to a smaller unit within a common measurement system, such as 2 km = 2,000 m.

c. Visually display measurement quantities using representations such as number lines that feature a measurement scale.

Fifth grade

Cluster: Convert like measurement units within a given measurement system.

KY.5.MD.1 Convert among different size measurement units (mass, weight, liquid volume, length, time) within one system of units (metric
system, U.S. standard system and time).

Wrap-up and Next Steps 15 minutes

Facilitator(s): _____

Purpose

Conclude the KY family math night.

Materials

- Feedback survey
- Raffle tickets

Facilitator Notes

- Thank participants for engaging in the activities.
- Explain that there are many activities family and community members can participate in with children outside school to encourage interest in math and support learning. A few examples are:
  - For young children, 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.
  - Read picture books about math.

For more examples for each grade level, please see KY Standards Family Guides https://kystandards.org/standards-family-guides/.

Distribute the feedback survey to participants and instruct them on where to return it. Provide 5 minutes for participants to complete the survey before announcing raffle winners. Call out raffle winners and distribute prizes.

Station Handouts

The following sheets will be pre-printed for the workshop. They should be printed in card stock or laminated.

Grades K-1 Fill in the Shapes

Instructions

1. Grab an outline.
2. Use the pattern blocks to fill in the outline.
3. For fun, take the same outline as your partner and see how you fill it out differently.

Players:
One or more.

Goal:
Fill in the shapes.

Family Prompts

Ask any of the following questions as you read the instructions and play the game:

- 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 with other shapes?

Grades 2-3: Partitioning

Instructions

Players:
One or more.

Goal:
Be the player who describes the fractional piece.

1. Give everyone a square and have them fold the paper to create a design that splits the square in half.
2. Have students and families exchange their design with one another.
3. They must decide if they agree that the design splits the square in half. Encourage students to use color coding to prove that they have split the square in half.
4. They can then talk through if they agree that the square has been split in half.
5. Third grade students could work on partitioning their squares into halves, thirds, fourths, sixths, eighths. For example, students partition a shape into 6 parts with equal areas and describe the area of each part as 1/6 of the area of the shape.

Family Prompts

Ask any of the following questions as you read the instructions and play the game:

- How can we partition the rectangle into halves, thirds, fourths?
- What fractional part is colored? How do you know? Justify and explain your thinking.
- Can you think of a different way to partition the rectangle into equal parts of the whole?
- Let's play again.

Grade 4: 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 **2 pattern blocks.**
3. Repeat 2 more times, taking 2 pattern blocks each time.
4. Make a design with all your shapes.
   Try to have at least one line of symmetry.
   A line of symmetry is the 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. For fun, use the same blocks and try a new design.

Family Prompts

Ask any of the following questions as you read the instructions and play the game:

- What is the name of this shape? (Possible responses: parallelogram, hexagon, quadrilateral, triangle, trapezoid)
- How do you know if this shape has a line of symmetry? Show me.
- Is there another line of symmetry?
- Do you want to try another design?
- Let's play again.

Grade 5: Battleship

Instructions

Players:
Two players.

Goal:
Hit the other player's ship.

1. Folding the grid paper in half.
2. Draw coordinate axes on both the top half and the bottom half and label the x and y axes with the numbers 1–10 on each axis.
3. Each player will need to draw in 5 ships on ordered pairs and label the ordered pairs. They should draw:
    - Two ships that are sitting on 2 ordered pairs,
    - One ship that is sitting on 3 ordered pairs,
    - One ship that is sitting on 4 ordered pairs, and
    - One ship sitting on 5 ordered pairs.
4. Remind them the bottom half has their boats or (Navy) and the top half has their opponent's boats.
5. Play in pairs sitting opposite each other and take turns calling out ordered pairs.
6. Players should keep a list of the ordered pairs they call out written in (x,y) form on a piece of paper that both players can see so there is no disagreement later on about what has been called (it is common for students to transpose the coordinates).
7. Players mark the ordered pair they call out on the top coordinate plane. They should mark in black if they missed and red if they hit their opponent's boat. On the bottom half of the grid paper they are to color black for the ordered pairs their opponent calls out and color red for the ordered pairs that hit their ship.

Family Prompts

Ask any of the following questions as you read the instructions and play the game:

- When you plot your points how do you use the x and y axis?
- How did you choose your coordinates?
- Do you want to play again?

Grades K-1: Flip the Card Game

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 person goes first.
3. During your turn, roll a pair of dice.
4. Flip one or two cards: You can use each of the numbers rolled on the dice or the sum of the numbers. For example, if you roll a 5 and 2, you can flip the 7 or the 5 and 2.
5. If you roll **doubles**, flip over the zero. If you have already flipped the zero, 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, you have to flip them back.

Family Prompts

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

- Help your children as they place the cards in order, but don't do it for them.
- Help your children use the rolls strategically. For example, if they roll a 2 and 4 ask: Do you want to flip over the 2 and 4 or the 6?
- Ask: What roll do you hope you get?
- Ask: Who do you think is going to turn over all their cards first?

Grades 2-3: Many Ways of Counting

Instructions

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.

Players:
One or more.

Goal:
Use different strategies to count.

Family Prompts

As you read the instructions and play the game:

- Ask your children **first** for the answer.
- Ask them to explain how they got their answers.
- Ask them how else they could figure it out.
- Share how you counted so that you can compare strategies.
- Some children will simply count each item, and that's OK.
- Encourage children to group, so they don't have to count each item.
- Use the dry erase markers to explain your grouping strategies or help count the objects.

Grades 4-5: Make 24!

Instructions

1. Shuffle the deck of number cards and deal five number cards to each player.
2. Place the cards face up so everyone can see each other's cards.
3. Set the remaining cards in the center. Set the operations cards in center face up.
4. On your turn, use your cards to make 24 by using any operations cards you need: You can add, subtract, multiply, and divide as many times as you need.
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.

Players:
Two or more.

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

Scoring

Use 5 cards: 10 points

Use 2–4 cards: 5 points

Use 1 card: 1 point

Family Prompts

As you read the instructions and play the game:

- Help deal the cards.
- Let your children lead, if they are having trouble try using bead racks and counters to solve the problem.
- It's OK to help them or have them help you if you are stuck (or pretend to be stuck).

K-1: Race to 100 Game

Instructions

Players:
Two or more.

Goal:
Earn enough 10's and 1's units to exchange for a 100

1. Players take turns rolling two dice.
2. At the start of a turn, roll a pair of dice.
3. Add the dots and collect that number of units.
4. When you get 10 units, you can exchange them for a 10 bar.
5. If you **roll a double**, you get a free 10 bar along with the sum of the roll.
6. When you have ten 10 bars, exchange them for a 100 square and win.

Family Prompts

As you read the instructions and play the game:

- Help your children when they get 10 or more units so they can exchange them for a 10 bar.
- This game helps children understand the base 10 system we use for counting.
- Ask them to play again if the game is short.

Grades 2-3: Broken Calculator

Instructions

1. In this game, you pretend that certain keys on the calculator don't work and solve math problems that way.
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! :)

Players:
One or more.

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

Family Prompts

As you read the instructions and play the game:

- Be patient with your children and yourself.
- If your children are stuck, offer hints like: Can you combine the 1 and 0 in a way to help you? What operation can we use?
- Ask your children to share their solutions and then ask the questions in the game.
- Ask them if they can do it another way.

Grades 4-5: Multiplication Card Game

Instructions

1. Set the deck face down in the middle of the table.
2. Each player takes two cards and multiplies the numbers on the cards.
3. All players then say the product (the result of the multiplication) out loud.
4. The player with the largest product wins.
5. The winner takes all the cards.
6. If a player gives the wrong product, he/she loses the hand.
7. If the products are the same, the cards stay on the table and the players do another round.
8. The game is over when all the cards are used. The player with the most cards wins.

Players: Two to four players.

Goal:
Have the greater product of the two cards.

Jacks=0 Aces=1

Family Prompts

As you read the instructions and play the game:

- Shuffle the cards.
- If your children get stuck on a multiplication, give them some time and tools like the multiplication table to find the right product.

K-2: No-Bake Playdough
Instructions

Materials

Ingredients	Tools
Water: $\frac{1}{2}$ cup	Big bowl
Food coloring: 5–10 drops	Small bowl
Cooking oil: 1 tablespoon	Measuring cups
Salt: $\frac{1}{4}$ cup	Measuring spoons
Flour: 1 cup	Wooden spoon for mixing

Recipe

1. Measure and pour the wet ingredients (water, food coloring and oil) into the **small** mixing bowl.
2. Measure the dry ingredients (flour and salt) into the **large** bowl and mix them together.
3. Add the wet ingredients into the dry ingredients. Start mixing.
4. If the mixture is still dry, add $\frac{1}{2}$ tablespoon of oil at a time.
5. Pour the mixed ingredients onto the table and knead the ingredients together until a soft dough is formed.
6. If you want to bring it home, place the dough in a resealable plastic bag to keep fresh.

Family Prompts

As you read the instructions and make the recipe together:

- Examine the tools you have.
- Order the measuring tools by size (smallest to largest or the other way around).
- Discuss the difference between 1 cup and 1 tablespoon. Which is bigger? How do you know?
- Let your children do the scooping and measuring. Show them how level off their measurements for accuracy.

Grades 3-5: Building up Ingredients for Playdough

Instructions

Materials

Ingredients	Tools
Water: $\frac{1}{2}$ cup	Big bowl
Food coloring: 10+ drops	Small bowl
Cooking oil: 1 tablespoon	$\frac{1}{4}$ cup
Salt: $\frac{1}{4}$ cup	$\frac{1}{4}$ and $\frac{1}{2}$ tablespoons
Flour: 1 cup	Wooden spoon for mixing

Recipe

1. Measure and pour the wet ingredients (water, food coloring and oil) into the **small** mixing bowl.
2. Measure the dry ingredients (flour and salt) into the **large** bowl and mix them together.
3. Add the wet ingredients into the dry ingredients. Start mixing.
4. If the mixture is still dry, add $\frac{1}{2}$ tablespoon of oil at a time.
5. Pour the mixed ingredients onto the table and knead the ingredients together until a soft dough is formed.
6. If you want to bring it home, place the dough in a resealable plastic bag to keep fresh.

Family Prompts

As you read the instructions and make the recipe together:

- Examine the tools you have.
- **Notice that you don't have tools that are the exact size of the recipe.**
- Discuss how you can make 1 cup of flour with the tools you have.
- Let your students do the scooping and measuring. Show them how not to overfill their measurements for accuracy.

Welcome and Goals

Supporting Your Child in Developing Math Skills For Future Success

Math success opens doors to college and careers.

The technical and professional jobs of the future demand more mathematical knowledge and problem solving skills.

Children who believe they can be successful in math are more willing to put in effort, even when they struggle, and this results in better performance.[i]

Success in elementary school math predicts future achievement in middle and high school math and other subjects.[ii, iii]

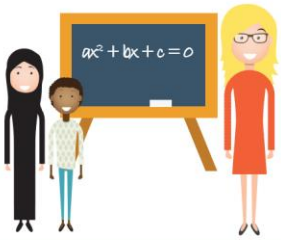
Students who complete higher level math in high school earn higher incomes in the future.[iv]

The number of STEM (science, technology, engineering, and mathematics) jobs is growing and half of all STEM jobs are available to workers without a four-year college degree. STEM jobs pay 10% more than other jobs available to these workers.[v]

Families can support children in developing math skills for the future by[iv]:

praising effort and modeling positive math attitudes.

encouraging children to seek help and try new strategies when they are stuck.



confronting stereotypes about who is good at math.

i Boaler, J. (2015). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching. San Francisco, CA: John Wiley & Sons.

ii Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record, 115*(6), 1–29. http://eric.ed.gov/?id=EJ1020177

iii Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., ... & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science, 23*(7), 691–697.

iv Achieve, Inc. (2006). Closing the expectations gap: An annual 50-state progress report on the alignment of high school policies with the demands of college and work. Washington, DC: Author.

v Rothwell, J. (2013). The Hidden STEM Economy. Brookings Institution: Washington, DC.

iv Epstein, J.L. (2001). School, family, and community partnerships [1st ed.]. Boulder, CO: Westview Press.

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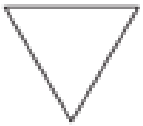
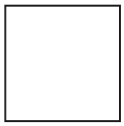
Geometry Glossary



Count the sides and the corners.

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

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



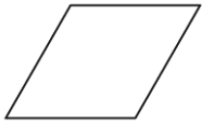
Count the sides and the corners.

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, count the corners.

If there are four, 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, count the angles.

If there are four, it is a quadrilateral.

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

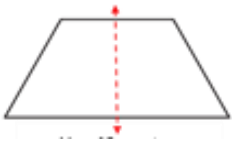
Does it have only one pair of parallel sides? Yes? Then it is a trapezoid.

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

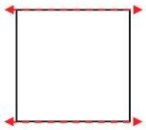
Count the sides, count the angles.

If there are six, it is a hexagon!

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

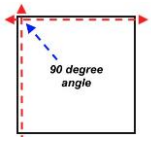


When you fold a shape on a line of symmetry, the two parts match up exactly.



If two lines don't cross and they seem like 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 cross once 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.

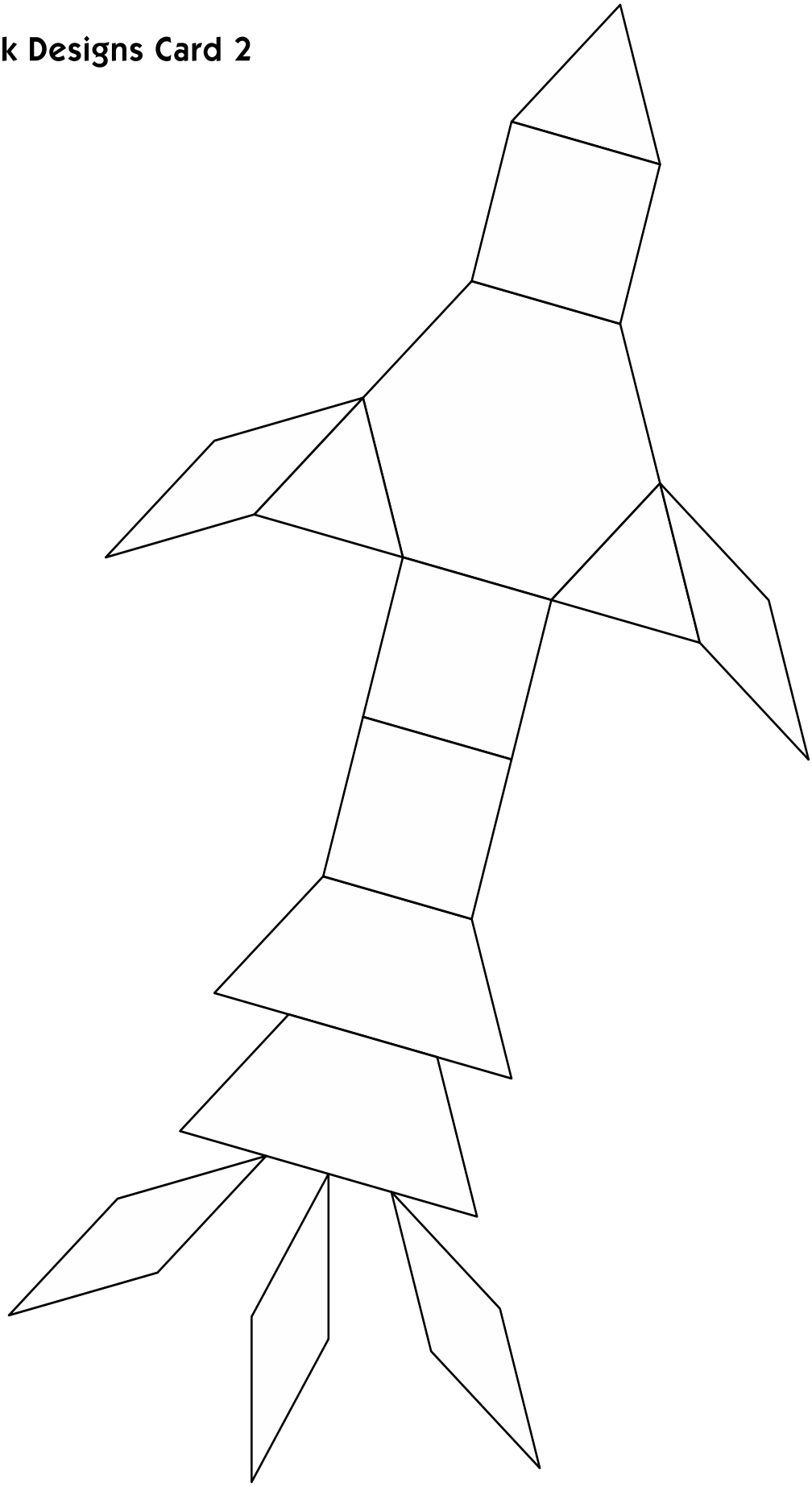
KY Standards Family Guides

The following KY Standards Family Guides will be printed for the workshop, as they require downloading and printing from www.kystandards.org.

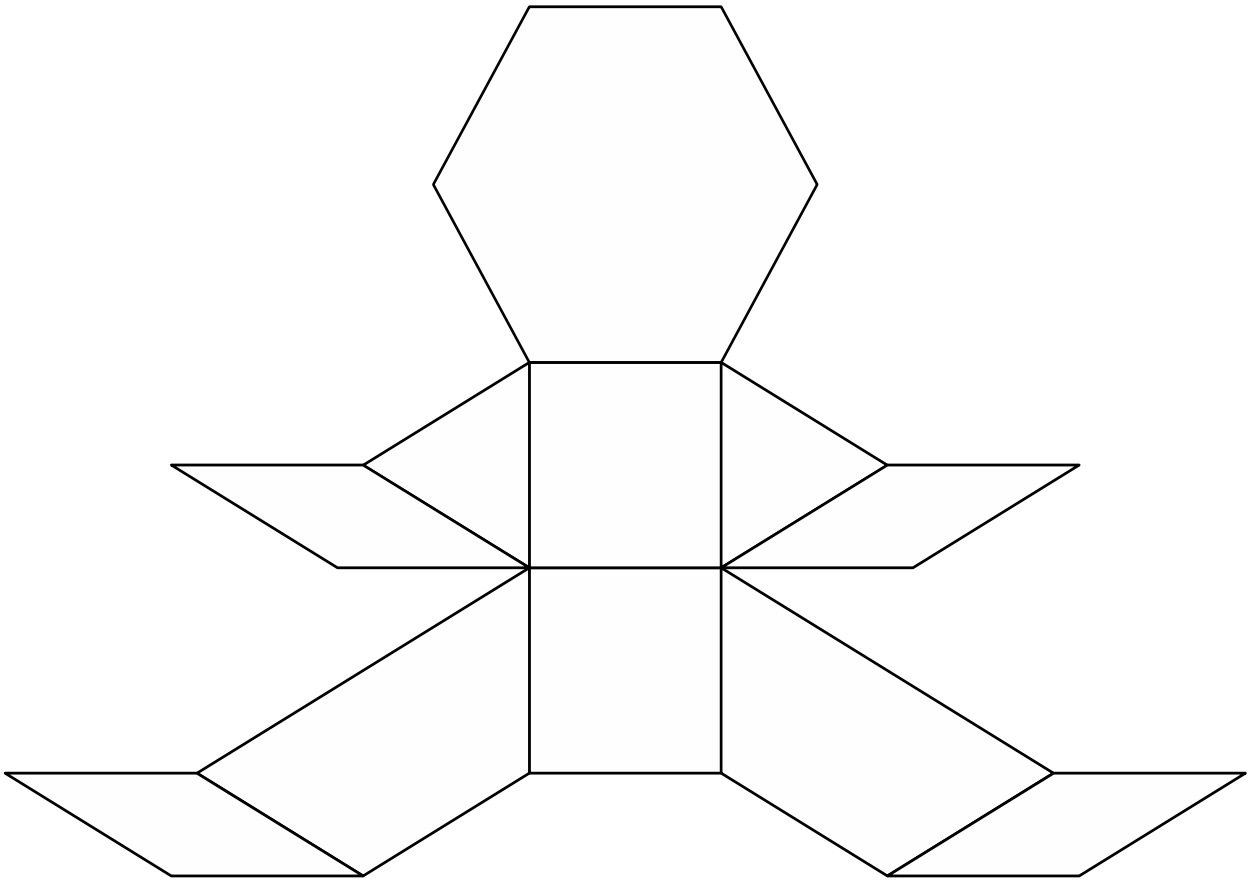
Table Materials

The following handouts will be printed for the workshop, as they require special instructions for printing and cutting and color

Pattern Block Designs Card 2

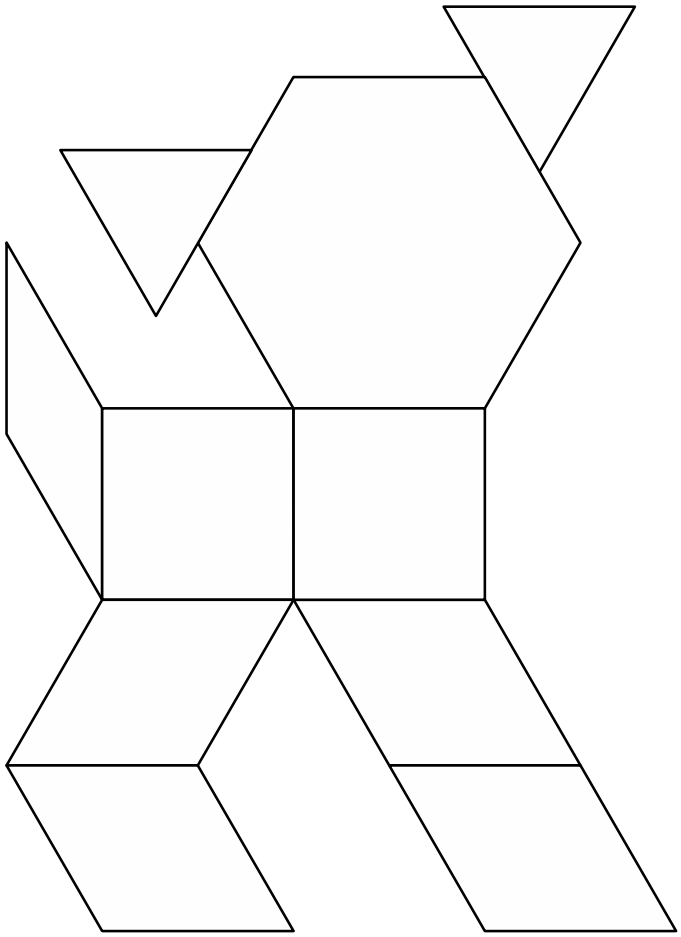


Pattern Block Designs Card 3



block baby

Pattern Block Designs Card 4

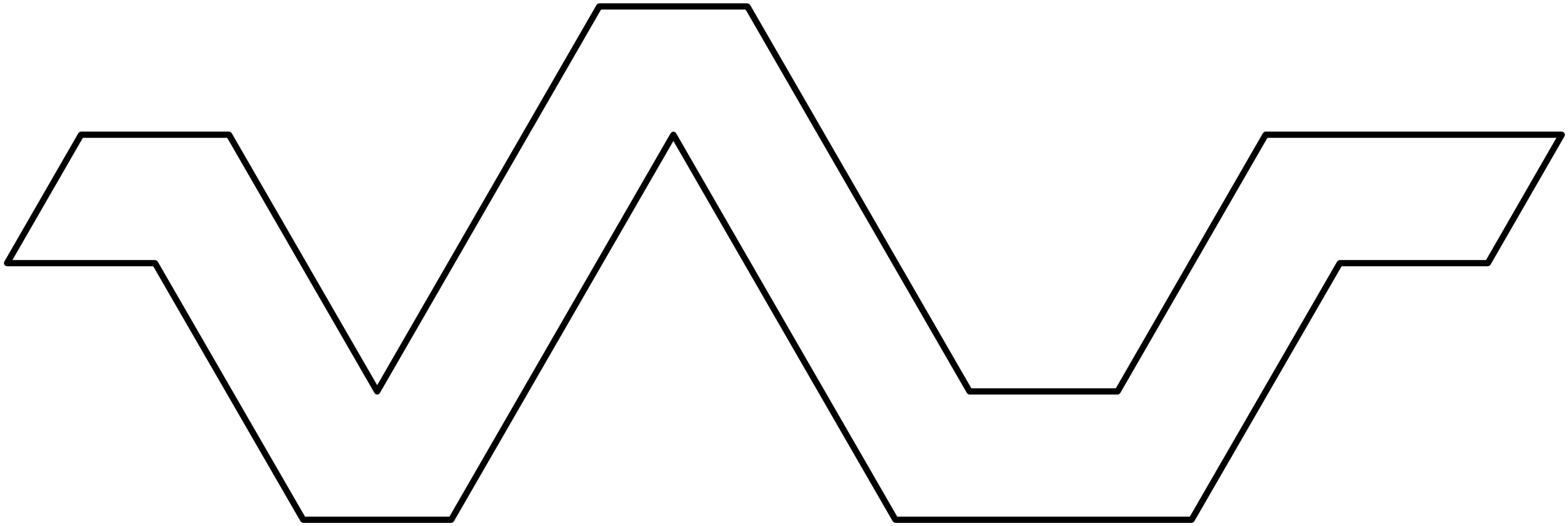


perky pattern puppy

© The Math Learning Center

Snake

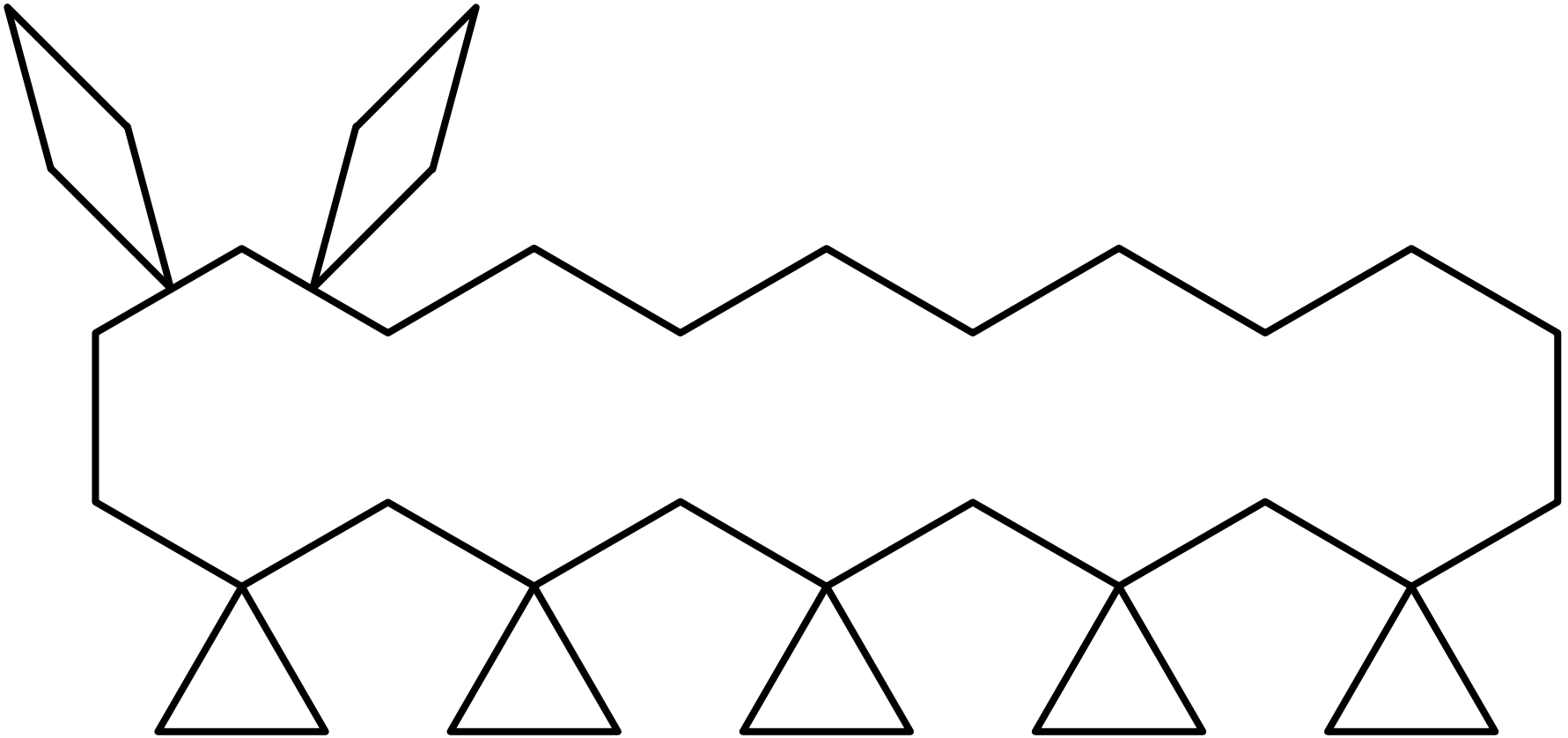
Table Materials



Reed, K. E., & Young, J. M. (2017). Games for Young Mathematicians: Pattern Animals. Waltham, MA: EDC, Inc.

CC BY NC ND

Caterpillar



Reed, K. E., & Young, J. M. (2017). Games for Young Mathematicians: Pattern Animals. Waltham, MA: EDC, Inc.

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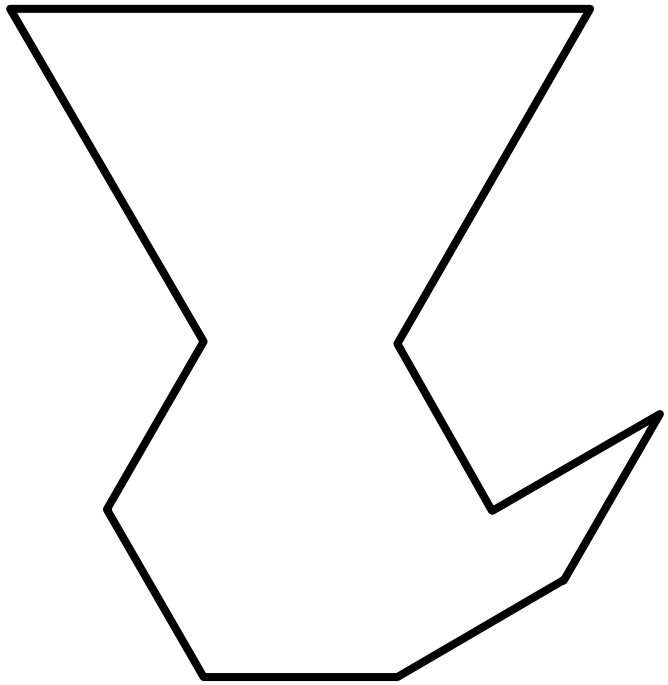

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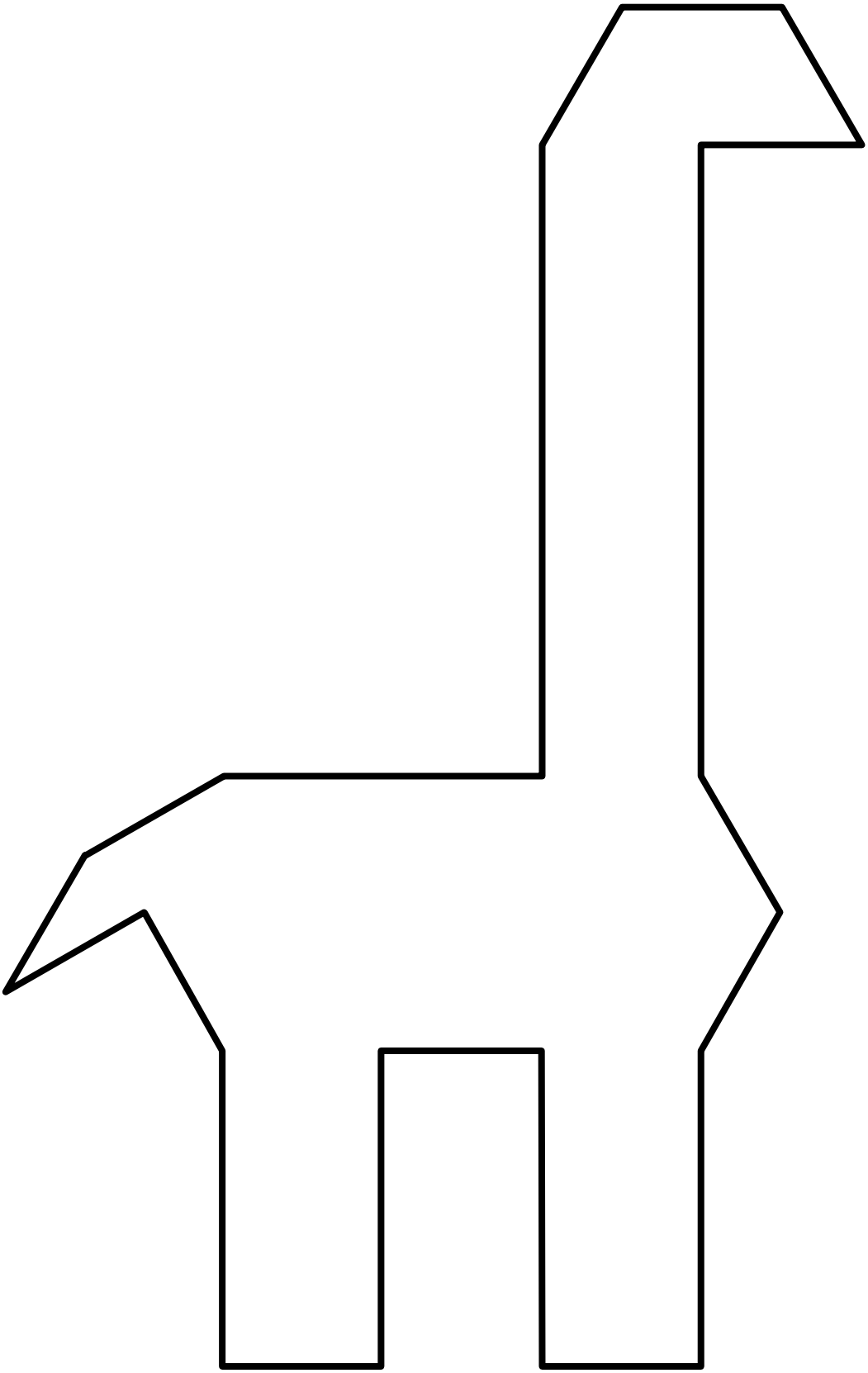

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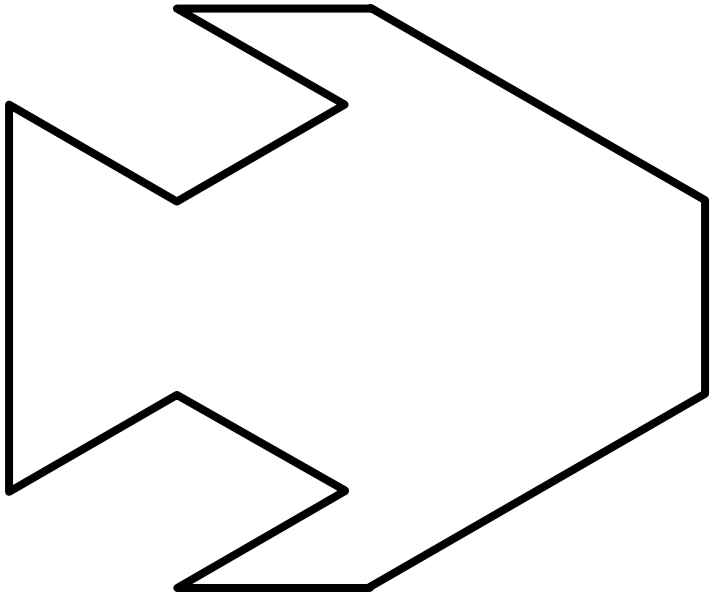

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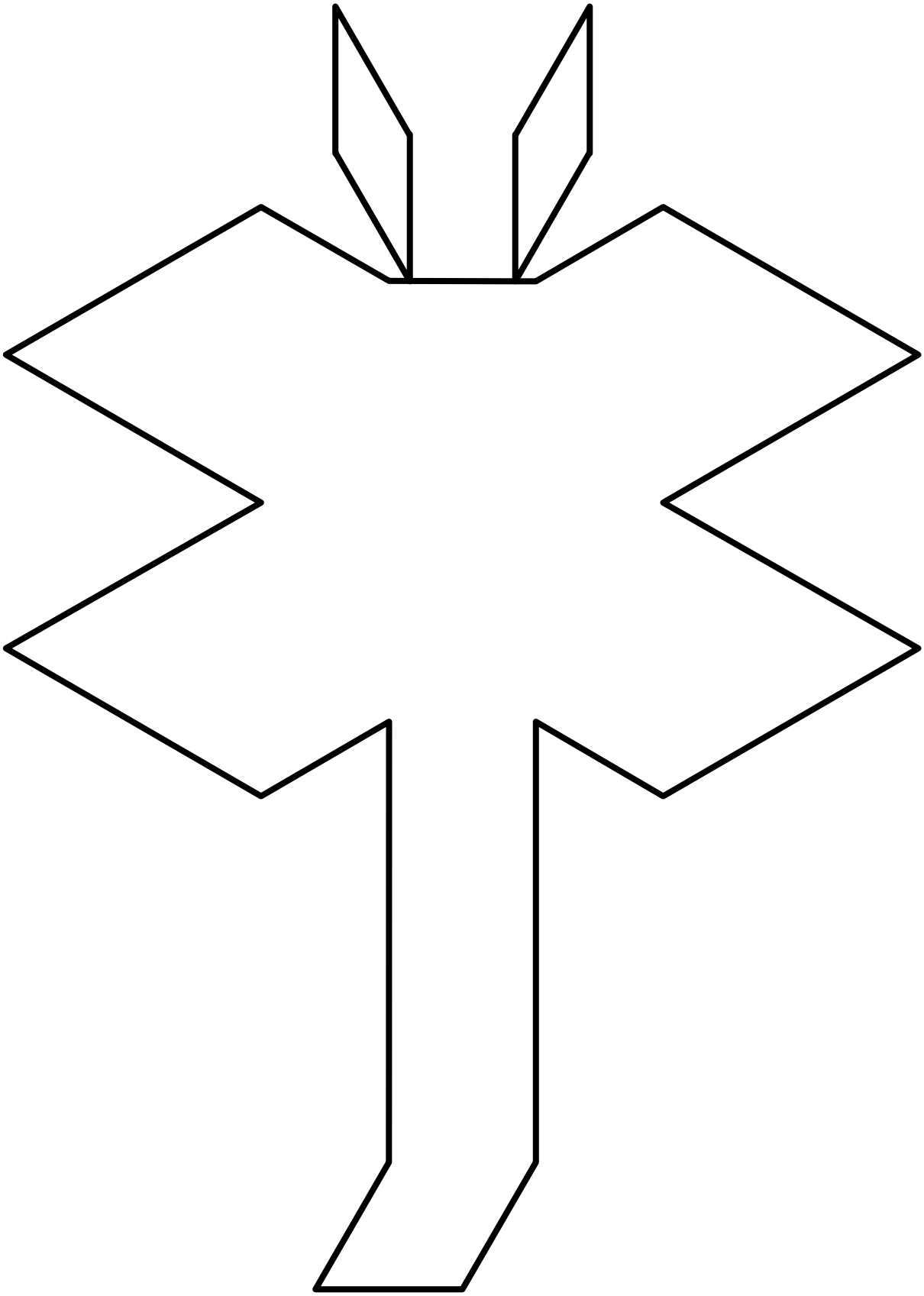
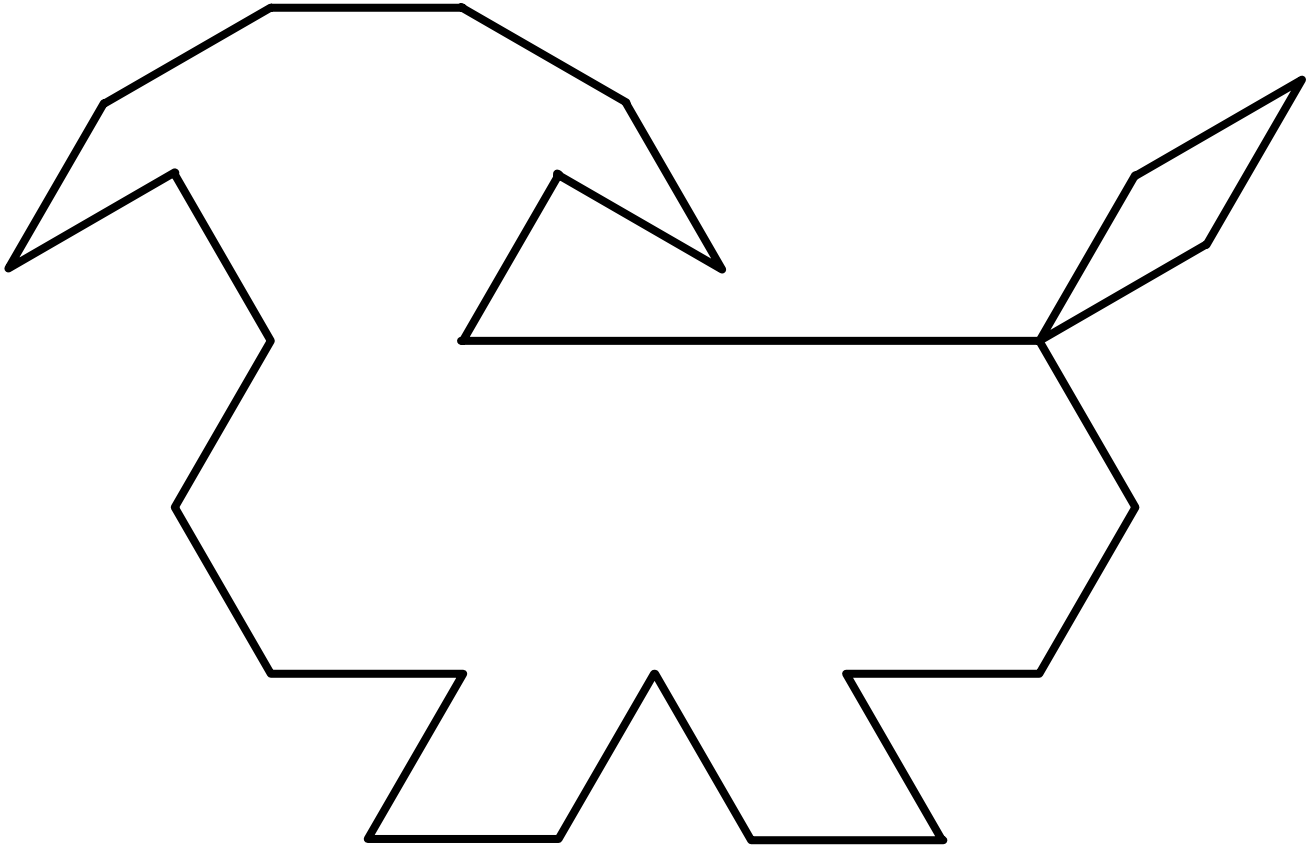


Reed, K. E., & Young, J. M. (2017). Games for Young Mathematicians: Pattern Animals. Waltham, MA: EDC, Inc.

Dog



Reed, K. E., & Young, J. M. (2017). Games for Young Mathematicians: Pattern Animals. Waltham, MA: EDC, Inc.

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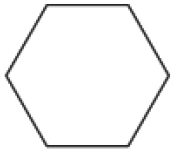
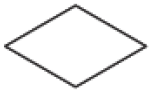
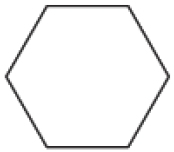
Player

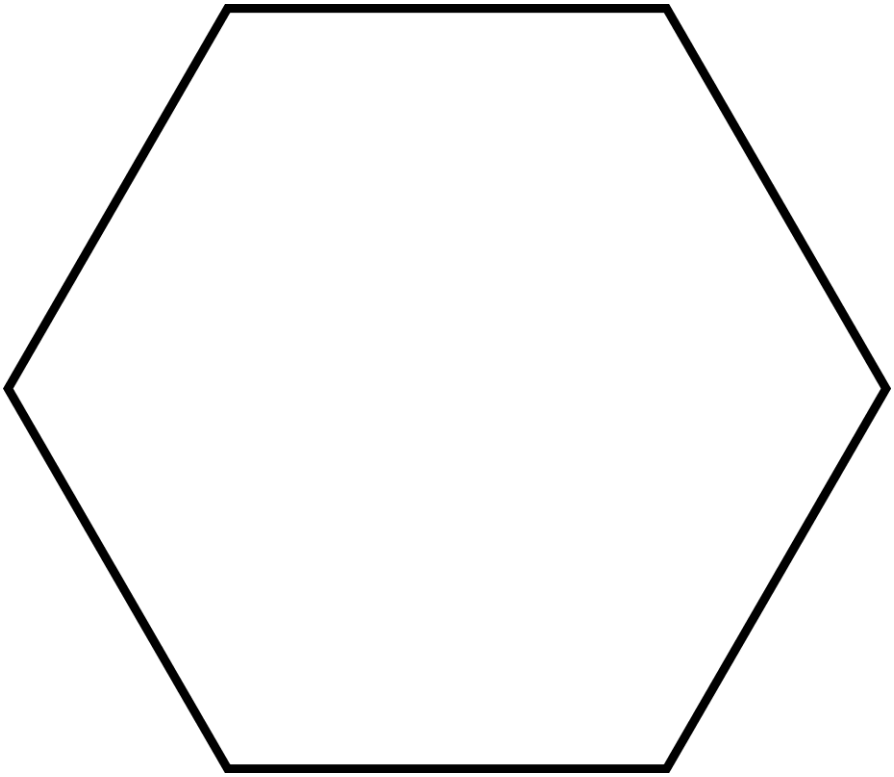
Lines of symmetry	

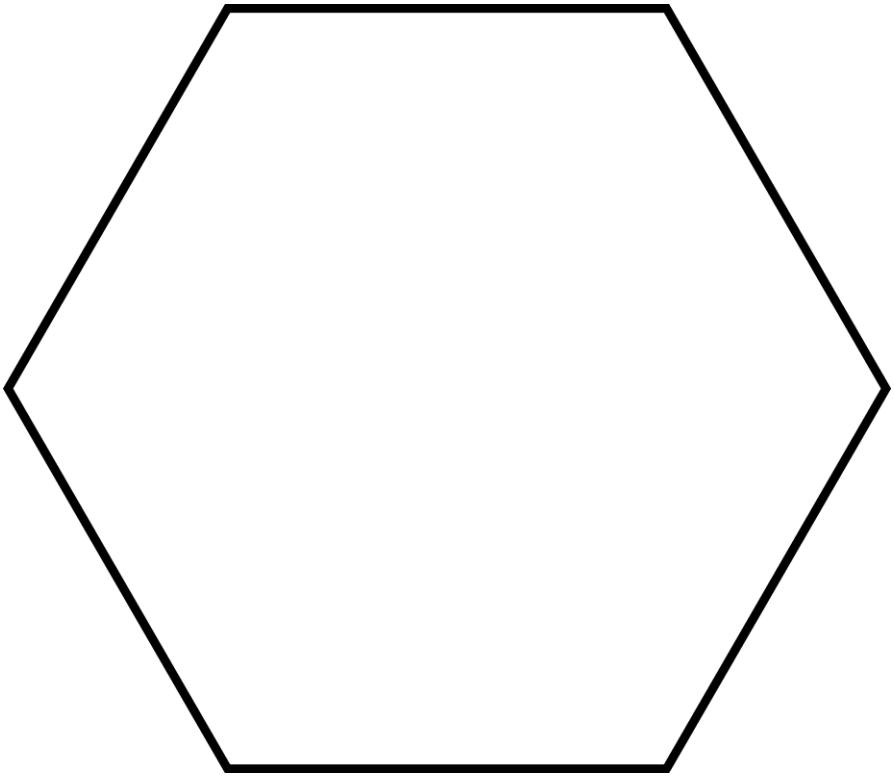
Pattern Block Key

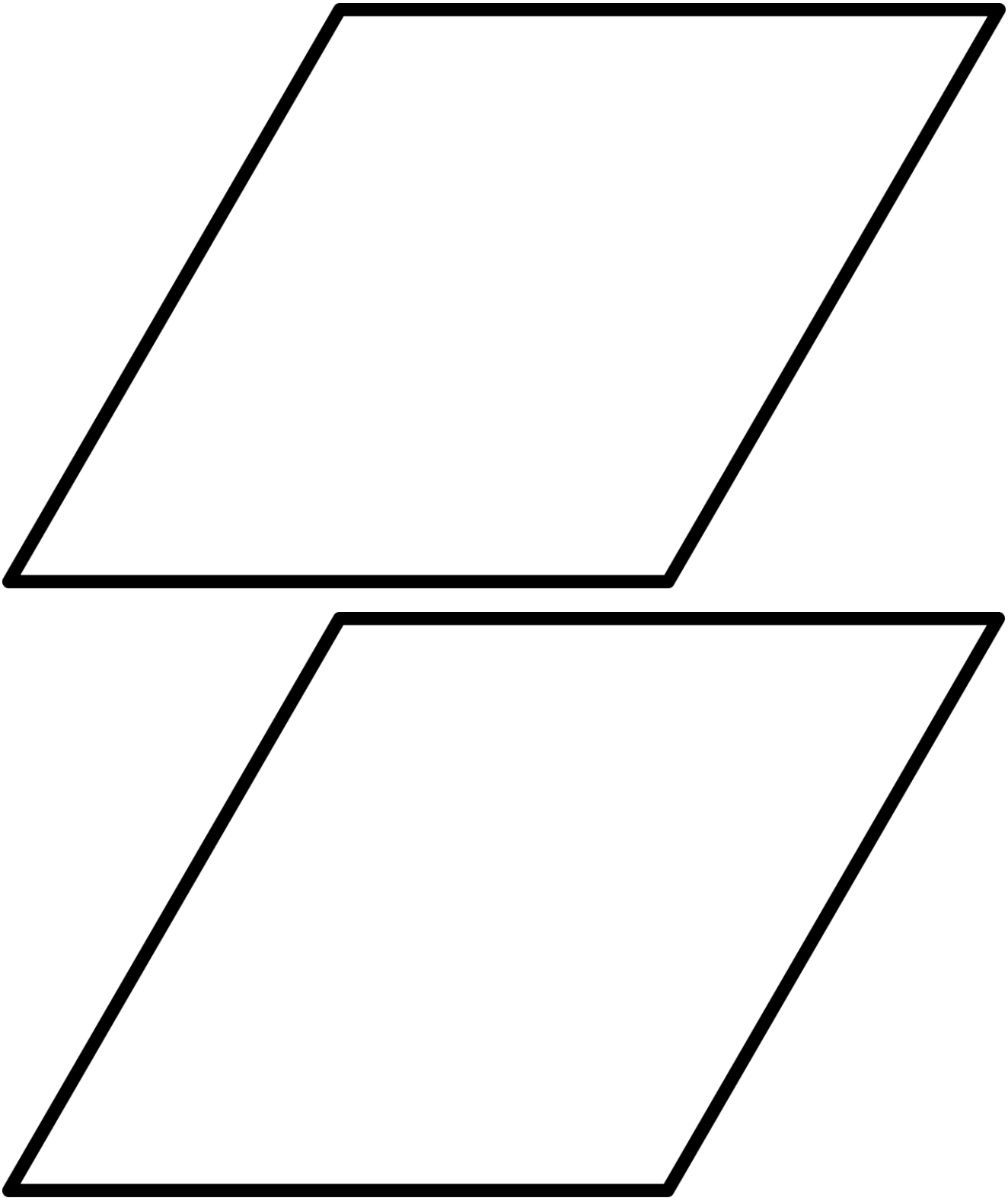
Number rolled	1	2	3	4	5	6
Take two of this block.						

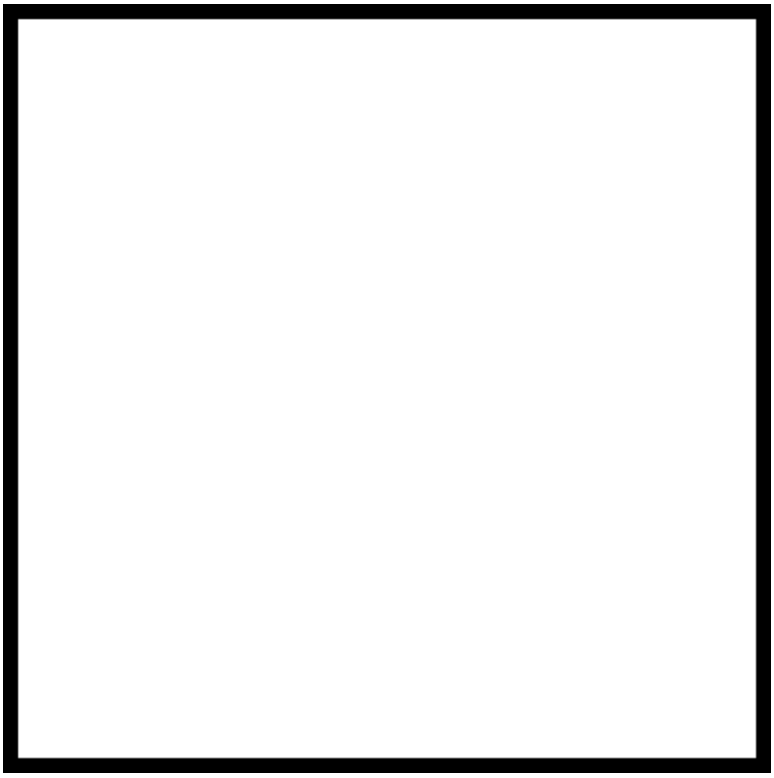
Pattern Block Key

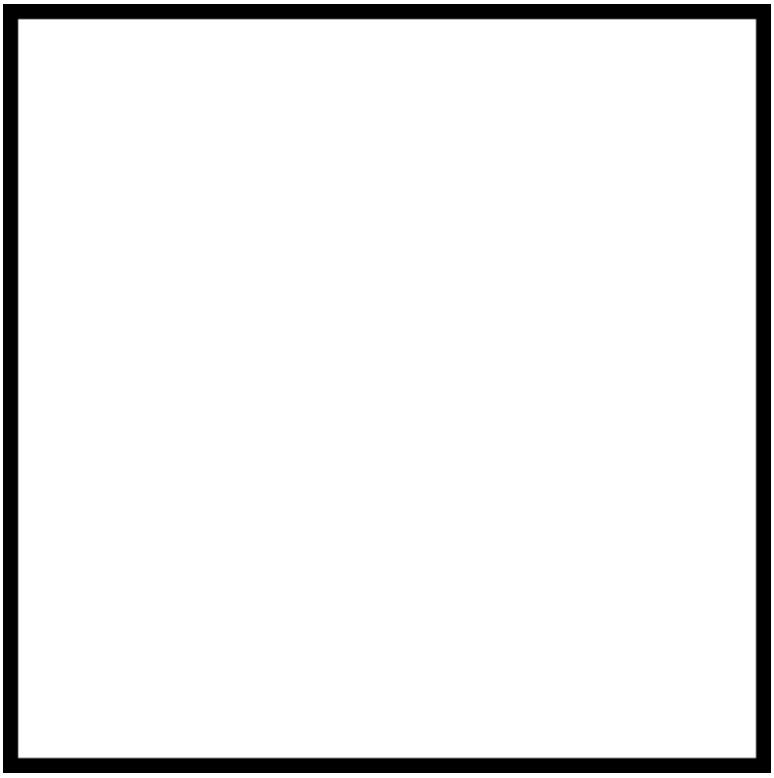
Number rolled	1	2	3	4	5	6
Take two of this block.						

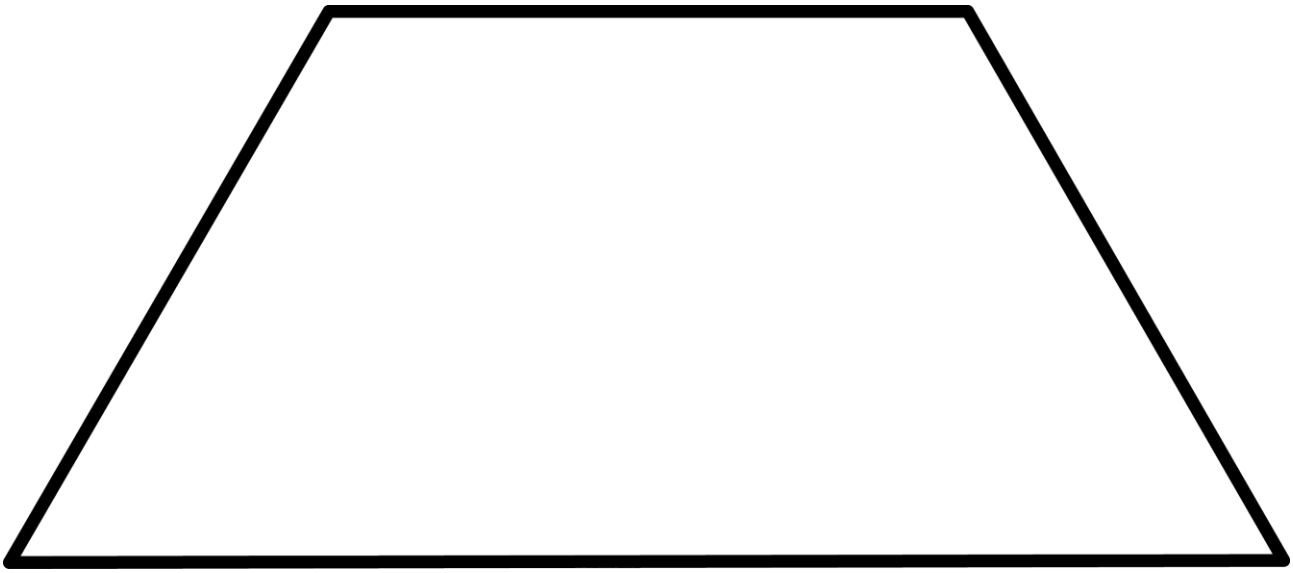


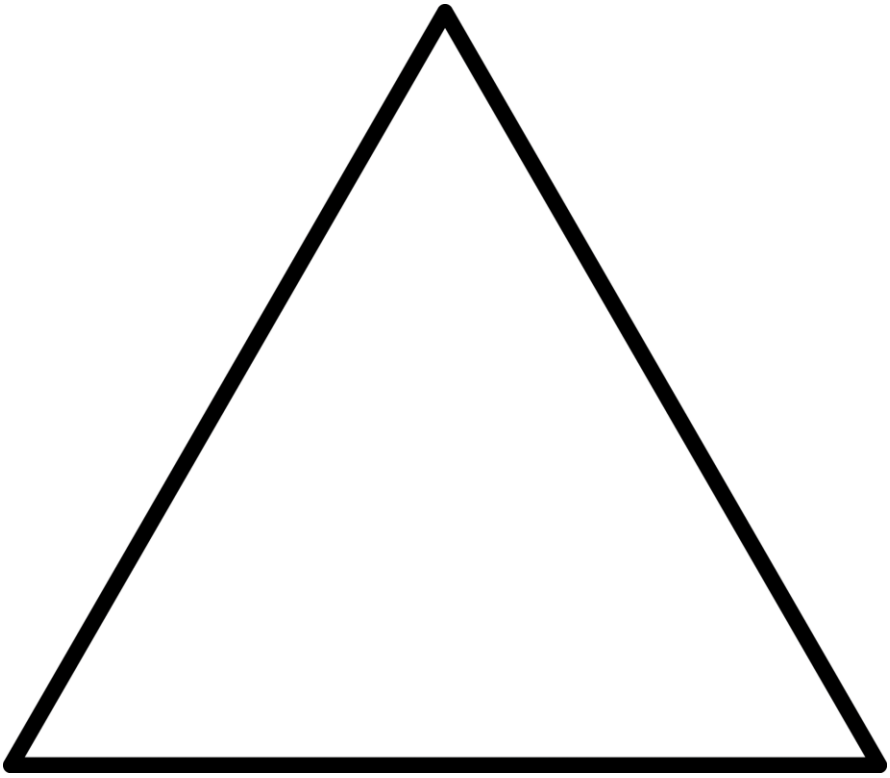


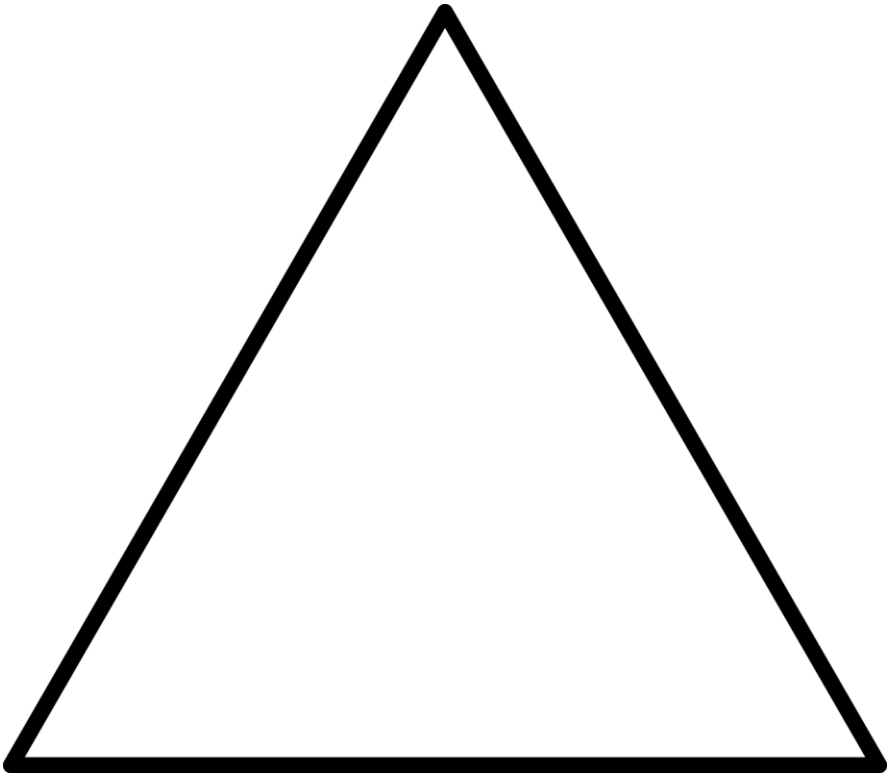


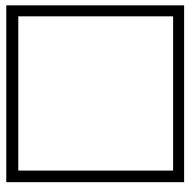
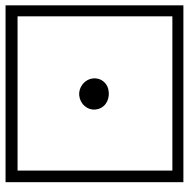
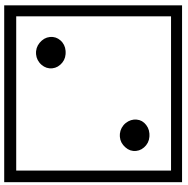
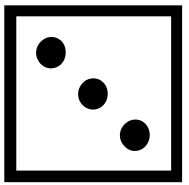
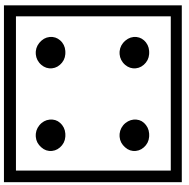
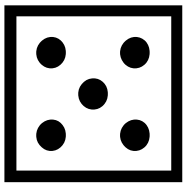
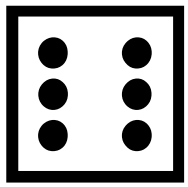
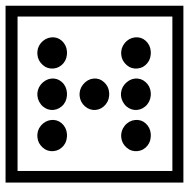
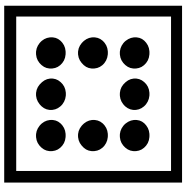
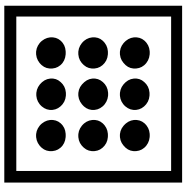
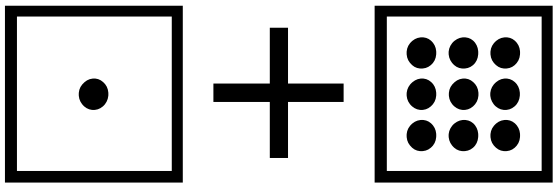




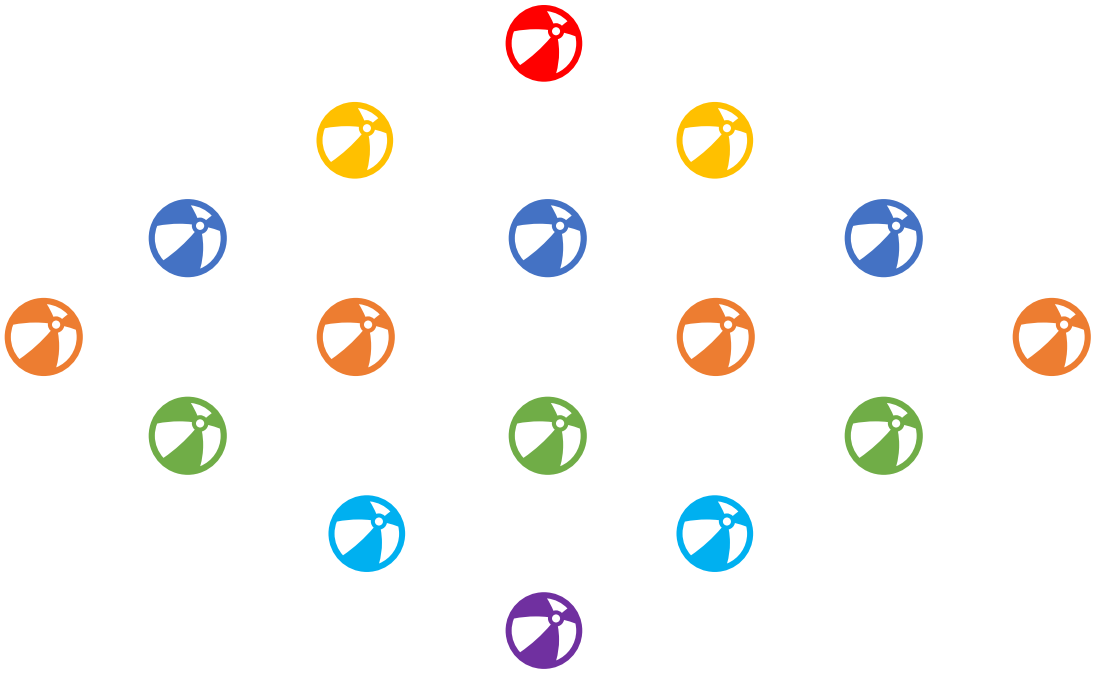






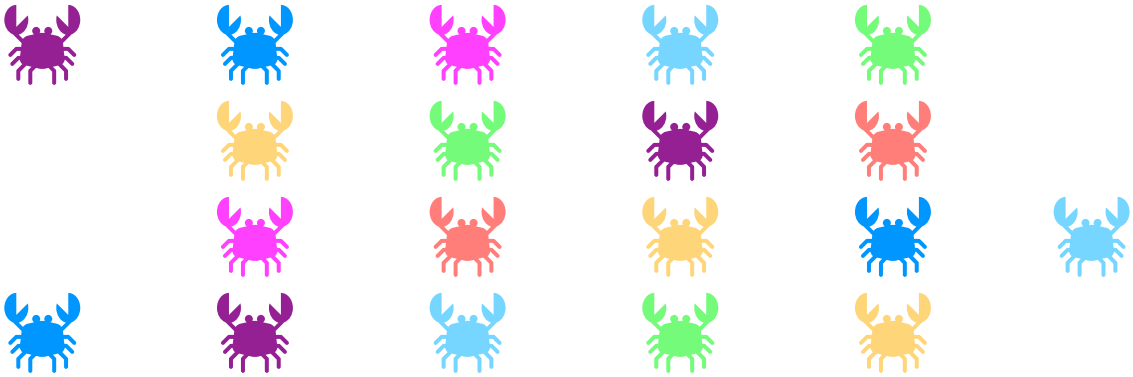
0 	1 	2 	3 	4 	5 
6 	7 	8 	9 	10 	

How many balls in the playground?

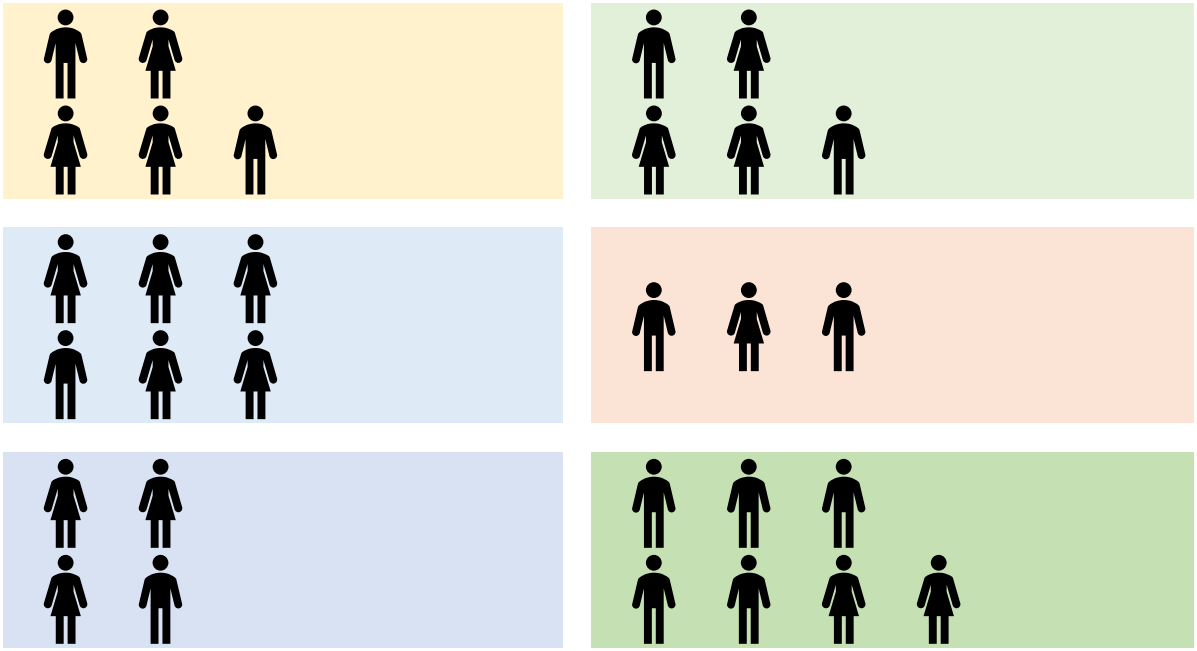


How many owls in the barn?

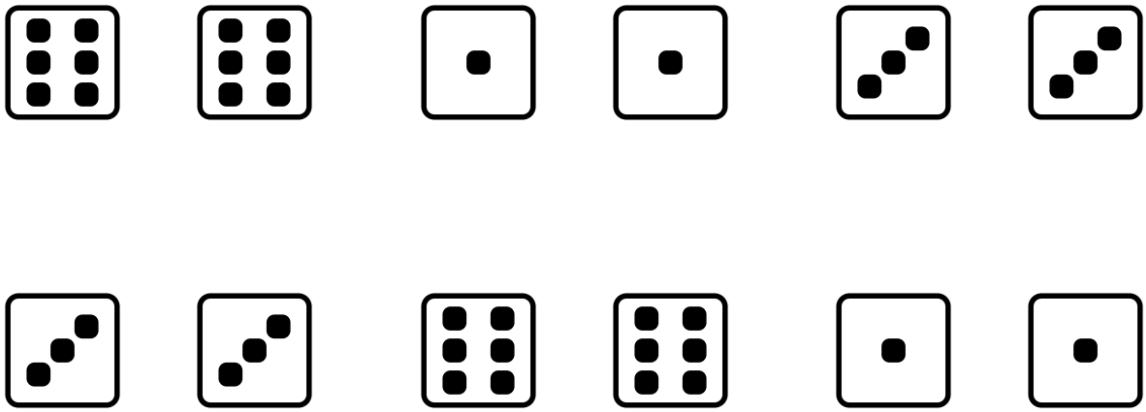
How many crawfish do you see?



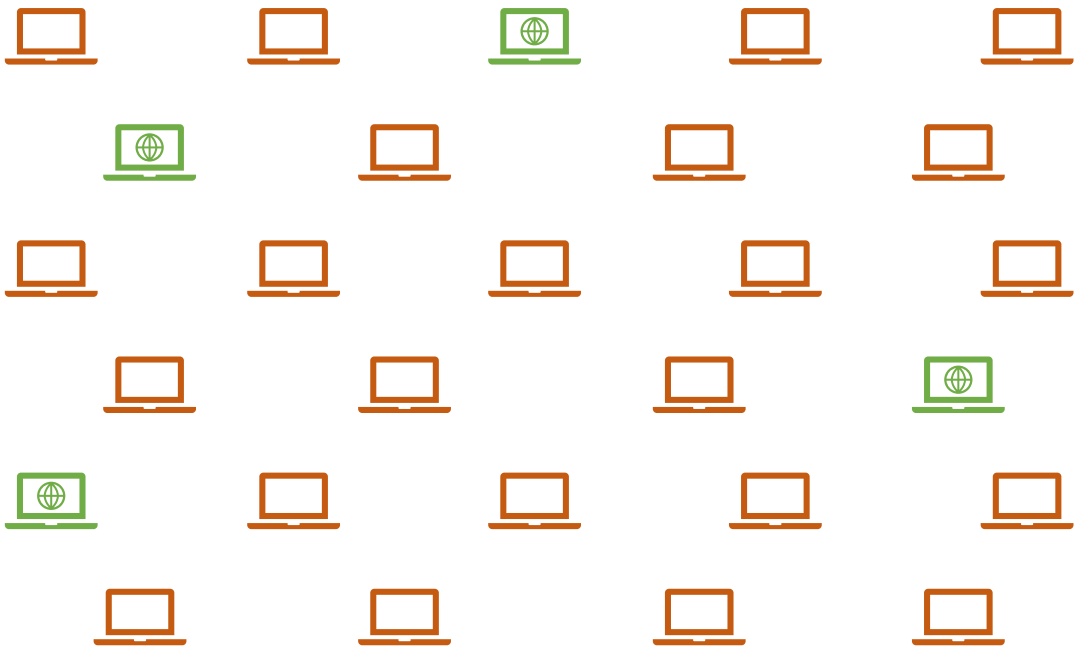
How many people work in this building?



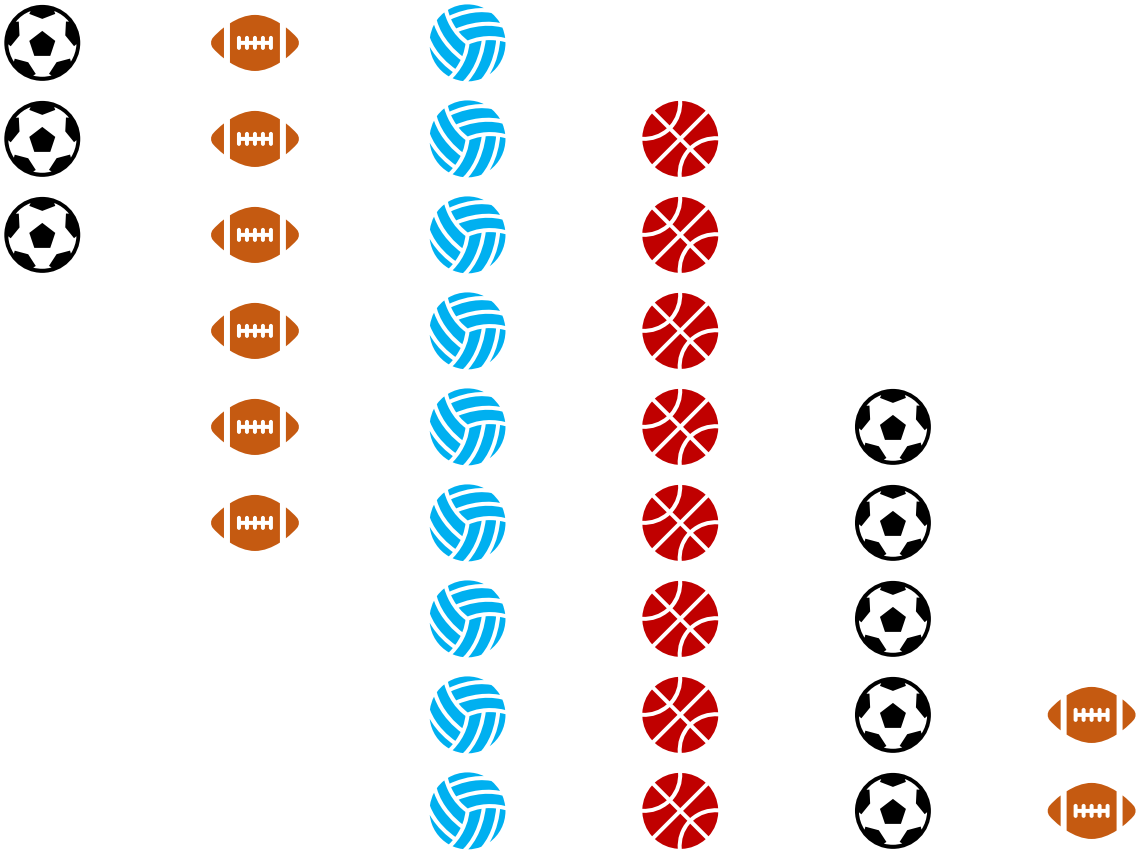
How many dots do you see?



How many computers are turned off (the dark red ones)?



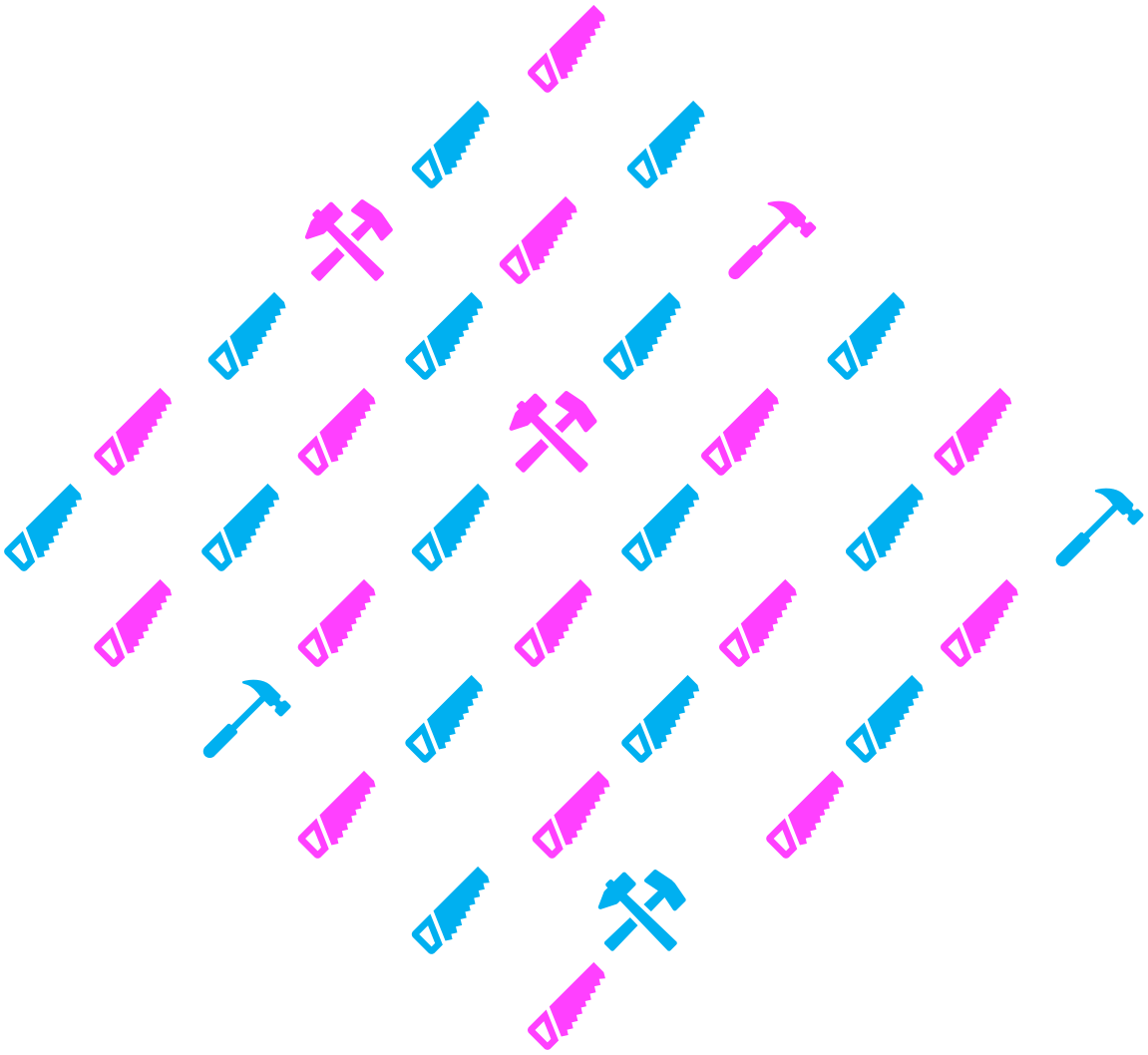
Count how many balls in all.



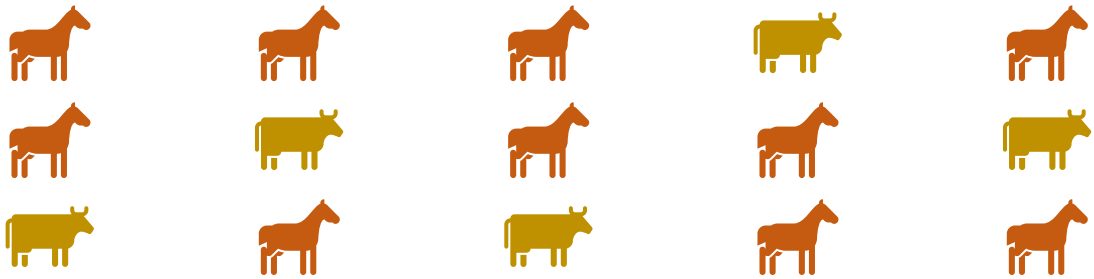
How many days has the sun shone in the past few weeks?

Sun	Mon	Tue	Wed	Thu	Fri	Sat

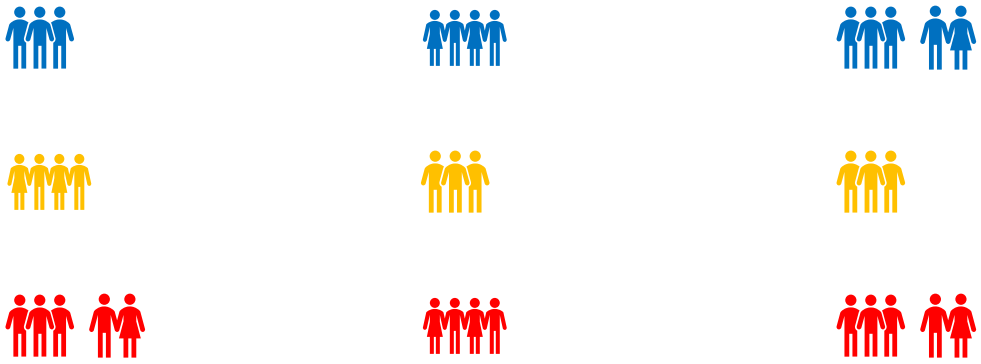
Count the saws we will find in this bunch.



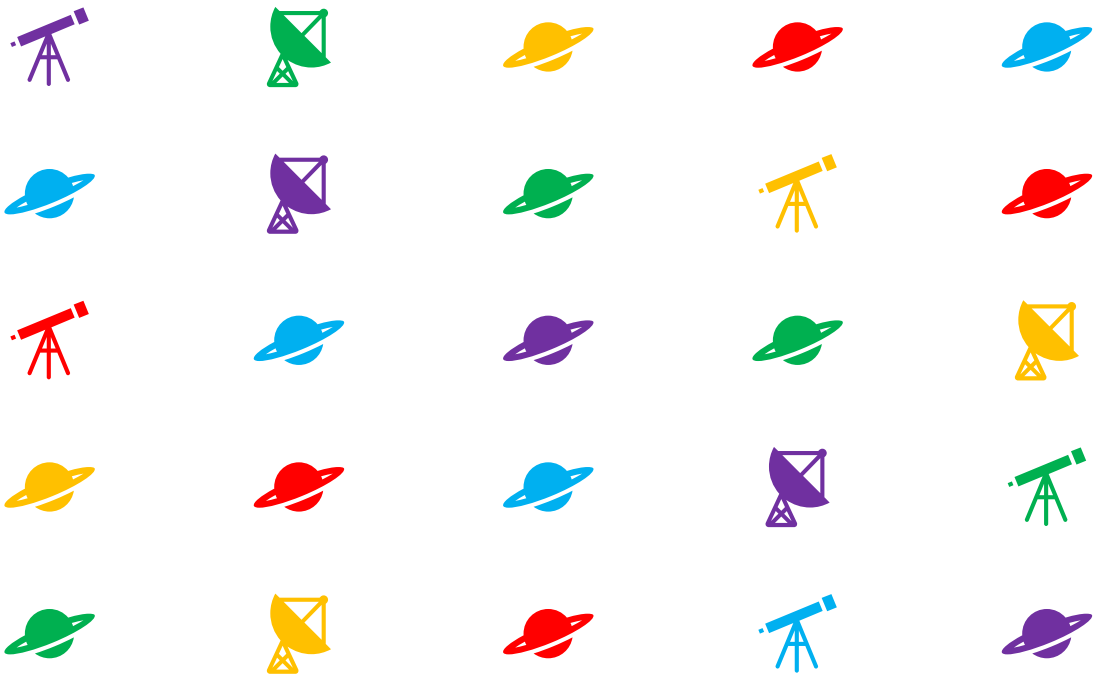
How many cows? How many horses? How many in all?



Count the people in this crowd.



What are there more of: Planets, telescopes, or satellite dishes?



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)
X (times)	X (times)	X (times)	X (times)
÷ (divided by)	÷ (divided by)	÷ (divided by)	÷ (divided by)

Multiplication Table

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Make 24! Score Cards

Scoring

Use 5 cards: 10 points

Use 2–4 cards: 5 points

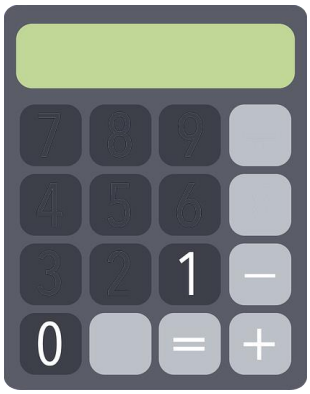
Use 1 card: 1 point

Player 1 Total score=	Player 2 Total score=
Player 3 Total score=	Player 4 Total score=

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' year 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?



Where's the 1?

Restriction: The #1 key is broken!
Goal: We need to make the number 1,111 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?

Raffle Tickets

Student Name:			
Station 1:	Station 2	Station 3	Station 4

Student Name:			
Station 1:	Station 2	Station 3	Station 4

Student Name:			
Station 1:	Station 2	Station 3	Station 4

Student Name:			
Station 1:	Station 2	Station 3	Station 4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