

Math Expressions VOCABULARY

As you teach this unit, emphasize understanding of these terms.

- addition
- subtraction
- partner
- equation
- match

See the Teacher Glossary.

Getting Ready to Teach Unit 4

Learning Path in the Common Core Standards

In this unit, children continue the study of the teen numbers and their structure as ten ones and more ones. The focus on working with and learning the partners of numbers from 2–10 helps children prepare to write and use equations to represent partner situations. They work within the context of a grocery store scene to make up and solve story problems and to sort and compare objects. In geometry, they learn to use attributes to identify three-dimensional shapes.

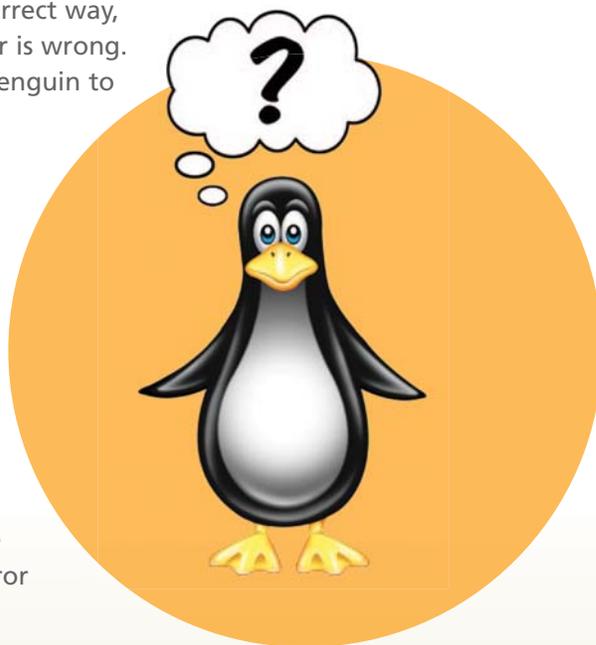
Help Students Avoid Common Errors

Math Expressions gives students opportunities to analyze and correct errors, explaining why the reasoning was flawed.

In this unit, we use Puzzled Penguin to show typical errors that children make. They enjoy teaching Puzzled Penguin the correct way, telling why this way is correct, and explaining why the error is wrong. The common errors are presented as letters from Puzzled Penguin to the children:

- ▶ **Lesson 1:** counting 14 instead of 15 cherries
- ▶ **Lesson 8:** incorrectly identifies partners for 10, writing $10 = 6 + 5$ and $10 = 3 + 6$
- ▶ **Lesson 17:** after subtracting, finds 3 as the answer for $4 + 1$ instead of finding $4 + 1 = 5$
- ▶ **Lesson 19:** incorrectly writing an equation for the partners of 6 as $6 = 4 - 2$ instead of $6 = 4 + 2$

In addition to Puzzled Penguin, other suggestions are listed in the Teacher Edition to help you watch for situations that may lead to common errors. As a part of the Unit Test Teacher Edition pages, you will find a common error and prescription listed for each test item.



Solve Story Problems

Lessons

1 4 6 10 15

Story Problems Children make up addition and subtraction story problems about buying and selling fruits and vegetables in a grocery store. These story problems should involve totals from 6–10. In Lesson 15, children make up stories for a context of their choice.

Represent the Situation Beginning in Lesson 6, children make simple math drawings to show an addition or subtraction situation and write the expression (or equation) represented by the drawing. As noted in the lessons, emphasize that drawings should be of simple objects that are easy to draw, such as circles, lines, or boxes.

As you record work with addition and subtraction situations, be sure that you write the equation (for example, $6 + 2 = 8$ or $7 - 3 = 4$), but do not expect that many children will be able to do this. During the research phase of this program, it was observed that writing a full equation is difficult for most kindergarteners when they begin using addition or subtraction to solve a problem, something that you have also probably observed. However, most children will be able to write the expression that describes the drawing and/or situation (for example, $6 + 2$ or $7 - 3$).

	Addition	Subtraction
Math Drawing	○○○○○○ ○○	○○○○○○ ○○
Equation	$6 + 2 = 8$	$7 - 3 = 4$

Support Subtraction Understanding Call attention to the connections between the partners of a number and the known and unknown addends in subtraction. For example, in $7 - 3 = 4$, the partners of 7 are 3 and 4.

Model subtraction in your drawings by drawing a long line through the objects taken away and point out that the line looks like a big subtraction sign. Children may use other methods that make sense to them, such as drawing a shorter line or an X through each object. Making a point of drawing the line through the first objects in the drawing prepares children for subtracting by counting on in Grade 1.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Kindergarten Students learn and use mathematical and non-mathematical language, especially when they make up problems and explain their representation and solution. The teacher can write expressions (e.g., $3 - 1$) to represent operations, as well as writing equations that represent the whole situation before the solution (e.g., $3 - 1 = \square$) or after (e.g., $3 - 1 = 2$). Expressions like $3 - 1$ or $2 + 1$ show the operation, and it is helpful for students to have experience just with the expression so they can conceptually chunk this part of an equation.

Lessons

2

4

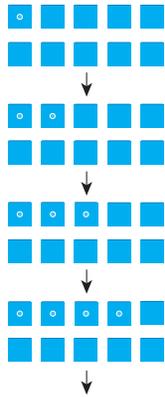
8

11

13

Partners of 10

With a Break-Apart Stick Finding partners of 10 prepares children for the Make a Ten subtraction strategy they will learn in Grade 1. Children use the Break-Apart Stick to find partners of 10. In a fun context of sleeping and waking bugs, children use the stick to break apart a 10 they have made with Square-Inch Tiles, either in 1 row of 10 or in 2 rows of 5. This activity helps children solidify subitizing skills. You record results on the board. Notice that the equation form you will use emphasizes that a number is broken apart into partners.



and so on

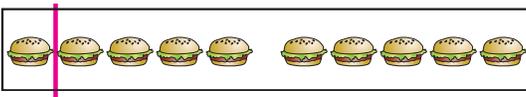
Bugs total	=	Bugs awake	+	Bugs sleeping
10	=	1	+	9
10	=	2	+	8
10	=	3	+	7
10	=	4	+	6
10	=	5	+	5
10	=	6	+	4
10	=	7	+	3
10	=	8	+	2
10	=	9	+	1

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON COUNTING AND CARDINALITY

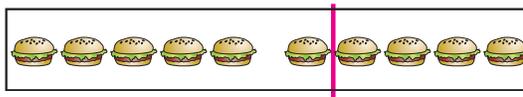
From subitizing to single-digit arithmetic fluency Perceptual subitizing develops into conceptual subitizing—recognizing that a collection of objects is composed of two subcollections and quickly combining their cardinalities to find the cardinality of the collection (e.g., seeing a set as two subsets of cardinality 2 and saying “four”).

With a Line Children move from using the manipulative with objects to finding partners of pictured objects. Instead of a Break-Apart Stick, they draw a line to separate a row of 10 objects into partners and then complete a partner equation for the partners they made.

Draw a line to show the **partners**. Write the partners.



$$10 = 1 + 9$$



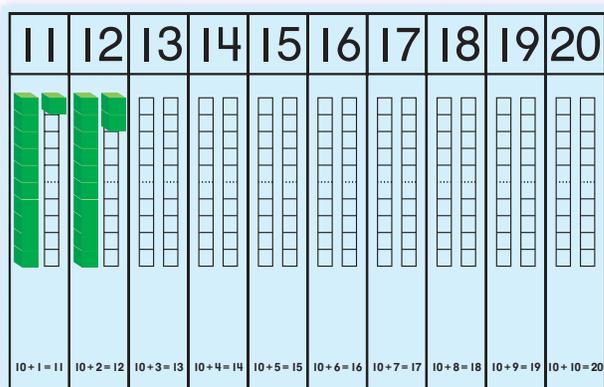
$$10 = 6 + 4$$

Teen Numbers as 10 Ones and Extra Ones

Lessons



Model Ten Ones and Extra Ones The models for this unit’s activities with teen numbers are 10-sticks and centimeter cubes. Children model the teen numbers using the 10-stick to represent the 10 ones part of the teen number and the cubes to represent the extra ones. As they model numbers on the 1–20 Board, they see how the numbers change as another one is added. This model helps children build the concept that the 1 in a teen number is not one, but is 10 ones. This fundamental concept gives the children a strong foundation on which they can build their place value concepts in later grades.



from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Work with numbers from 11 to 19 to gain foundations for place value Children use objects, math drawings, and equations to describe, explore, and explain how the “teen numbers,” the counting numbers from 11 through 19, are ten ones and some more ones. Children can count out a given teen number of objects, e.g., 12, and group the objects to see the ten ones and the two ones. It is also helpful to structure the ten ones into patterns that can be seen as ten objects, such as two fives.

Teen Equation Cards Children also use the 1–20 Board with the Teen Equation Cards. They match the cards to the columns on the board. The two sets of cards reinforce visually the relationship between the partners of a number and the addends that make that number as a total. So, for example, the children begin to see that $11 = 10 + 1$ and $10 + 1 = 11$.

$11 = 10 + 1$

Set A

$10 + 1 = 11$

Set B

The idea that the total can be on either the right or the left side of an equation supports a concept of equality that is important for children's understanding of algebra.

Teen Number Book As a summarizing activity for the work with teen numbers, children will draw models for the teen numbers on separate pages in the Teen Number Book. After children complete pages for all the teen numbers, they will make covers for the books and assemble them. You can then staple the pages together for each child. Think of ways to use the Teen Number Book in activities for a few days so children know that their work produced something useful. Then have children take the books home to share with their families.

from **THE PROGRESSIONS FOR
THE COMMON CORE STATE
STANDARDS ON OPERATIONS
AND ALGEBRAIC THINKING**

Work with numbers from 11 to 19 to gain foundations for place value The numerals 11, 12, 13, ..., 19 need special attention for children to understand them. The first nine numerals 1, 2, 3, ..., 9 and 0 are essentially arbitrary marks. These same marks are used again to represent larger numbers. Children need to learn the differences in the ways these marks are used. For example, initially, a numeral such as 16 looks like "one, six," not "1 ten and 6 ones."



Partners of Numbers 2–10 and Equations

Lessons

$$2 - 7 \quad 8$$

$$11 - 13 \quad 15 - 19$$

Knowing partners of numbers through 5 helps children learn to add and subtract within 5. Working with partners of teen numbers and numbers through 10 helps children build subitizing skills and begin to represent addition and subtraction situations with expressions and equations. In this unit, children continue activities from earlier units and build on what they know to carry out new activities.

Math Mountains A new model for addition and subtraction situations is introduced in Lesson 8. The Math Mountain is a powerful visual representation that relates addition and subtraction and will be used in later grades as well as in kindergarten.

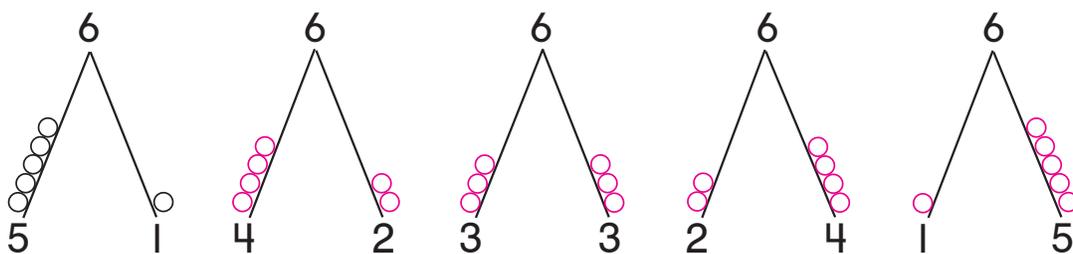
For kindergarten children, the model begins with an imaginative context, Tiny Tumblers who live on Math Mountains. The number of Tiny Tumblers who live on a Math Mountain is the same as the number at the top of the Math Mountain. The numbers of Tiny Tumblers who play on the two sides of a Math Mountain must add to the number at the top of the mountain, but different numbers of tumblers may be on the sides.

Children will draw the Tiny Tumblers as circles on the sides of Math Mountains on their Student Activity Book pages. The Tiny Tumblers on each side of a Math Mountain represent the partners of the number at the top of the Math Mountain.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Kindergarten Put Together/Take Apart situations with Both Addends Unknown play an important role in Kindergarten because they allow students to explore various compositions that make each number. ... Students can find patterns in all of the decompositions of a given number and eventually summarize these patterns for several numbers.

Draw Tiny Tumblers on the Math Mountains.



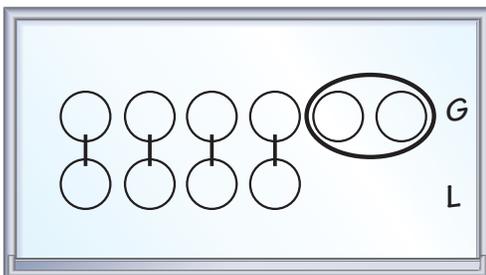
Equations Children build algebraic concepts as they work with partners, both of numbers 2–10 and teen numbers. They complete equations for break-apart activities, first by writing the partners in answer boxes, next by writing the total in an answer box, and finally by writing a full equation for a partner situation.

Sorting, Comparing, and Ordering

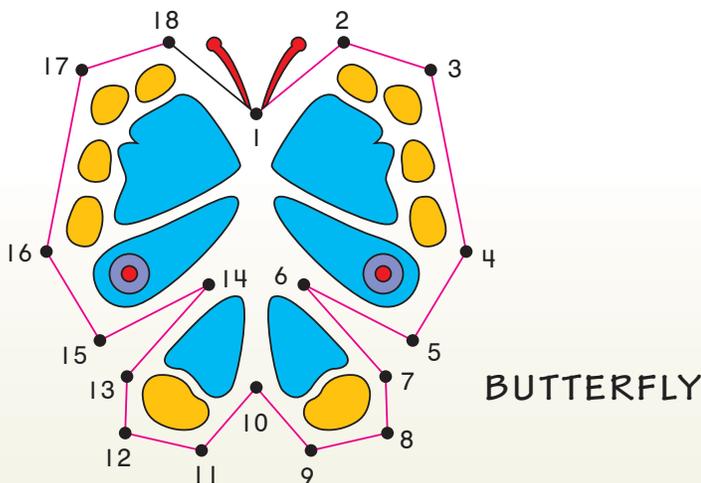
Lessons

1 **6** **9** **12** **13**

Sorting and Comparing Objects Children sort the fruits and vegetables from the Grocery Store scenario by attributes. They first compare by counting two groups of objects to determine which group is greater or less. They also learn to compare amounts by drawing lines to match objects. They then record the results of the matching with a G for “greater than” or an L for “less than.”



Dot-to-Dot Picture Finding numbers in order to complete a dot-to-dot picture can be an enjoyable way for children to demonstrate their proficiency with the count sequence and for you to informally assess this skill. You may want to write the name of the object on the board when most children have finished so that children who can print may label their pictures.



from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON COUNTING AND CARDINALITY

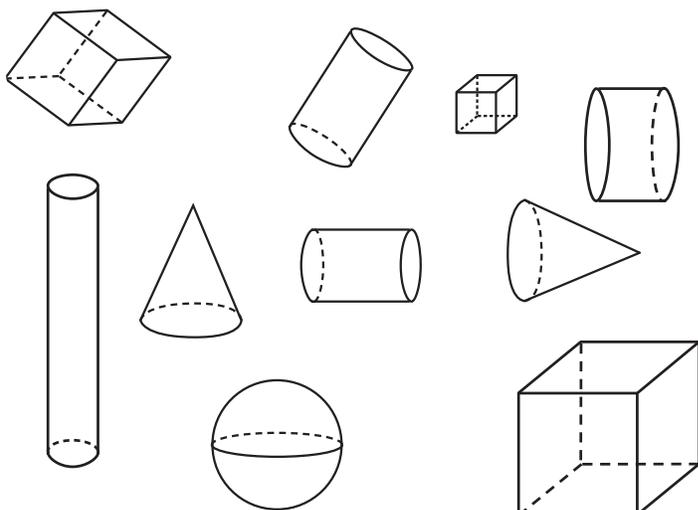
From comparison by matching to comparison by numbers to comparison involving adding and subtracting The standards about comparing numbers focus on students identifying which of two groups has more than (or fewer than, or the same amount as) the other. Students first learn to match the objects in the two groups to see if there are any extra and then to count the objects in each group and use their knowledge of the count sequence to decide which number is greater than the other (the number farther along in the count sequence).

Attributes of Three-Dimensional Shapes

Lessons

9 **14** **21** **22**

Among the Geometry skills in the Kindergarten Common Core State Standards are identifying and describing shapes, correctly naming shapes, and describing relative positions of objects. The lessons in this unit focus on these skills as they relate to three-dimensional objects, including cubes, cylinders, and cones.



Lessons

3 **12** **15** **17**

Path to Fluency

The Common Core State Standards require that kindergarten children fluently add and subtract within 5. One way to acquire this fluency is with persistent practice. The *Path to Fluency* exercise sets on Student Activity Book pages in these lessons provide practice with addition and subtraction within 5 to help children achieve this goal.

$$3 - 2 = \boxed{1} \quad 5 - 5 = \boxed{0} \quad 2 - 2 = \boxed{0}$$

$$4 - 1 = \boxed{3} \quad 4 - 3 = \boxed{1} \quad 3 - 1 = \boxed{2}$$

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON OPERATIONS AND ALGEBRAIC THINKING

Working within 10 Later in the year, students solve addition and subtraction equations for numbers within 5, for example, $2 + 1 = \square$ or $3 - 1 = \square$, while still connecting these equations to situations verbally or with drawings. Experience with decompositions of numbers and with Add To and Take From situations enables students to begin to fluently add and subtract within 5.

