

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 5

Learning Path in the Common Core Standards

In this unit, children continue to work with teen numbers and to create and solve story problems involving contexts chosen by the children. Work with partners of numbers 2–10 and teen numbers culminates in children writing equations to represent partner situations and in comparing a number as greater than or less than another number and showing how to make equal groups. In measurement, they have hands-on experiences comparing lengths, heights, weights, and capacities.

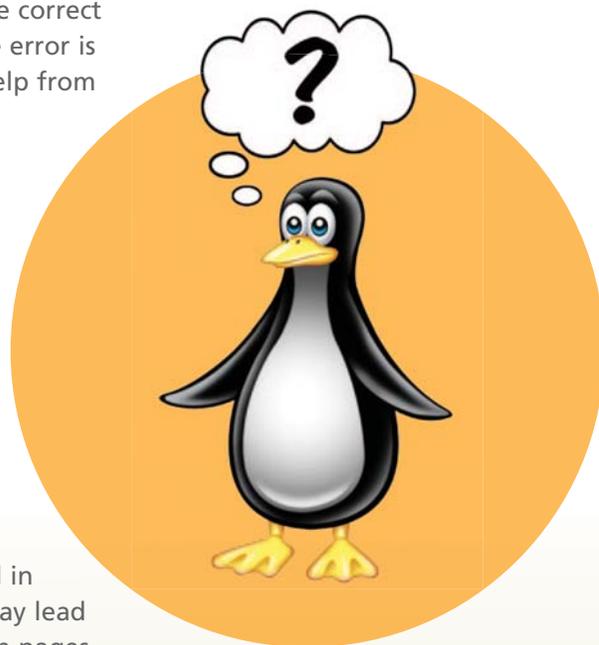
Help Students Avoid Common Errors

Math Expressions gives children 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. Children 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 requests for help from Puzzled Penguin to the children:

- ▶ **Lesson 2:** writing 14, 17, and 19 with transposed digits as 41, 71, and 91
- ▶ **Lesson 6:** reading the equation for 15 in the *Hiding Zero Game* incorrectly
- ▶ **Lesson 16:** writing that 8 is Greater than 10 and 10 is Less than 8; writing that 7 is Less than 5 and 5 is Greater than 7
- ▶ **Lesson 17:** in comparing 6 and 4 writing that 6 is Less than 4; in comparing 6 and 8 writing that 6 is Greater than 8

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.



Lessons

1 4 6 10 16 19

Story Problems

Create Story Problems Children make up their own addition and subtraction story problems—in Lesson 1 about situations in *Anno's Counting Book* and in later lessons about any situation they choose. At first, let children use numbers for adding and subtracting within 5, but encourage them as you move through the unit to use numbers for adding and subtracting within 10.

Solve Story Problems Guide children to begin to analyze story situations by asking them to restate a problem using other words. This will help them build their math language skills. As before, children may use drawings, expressions, or equations to solve problems. In this unit, use Math Talk to discuss story problem solutions (see the discussion of Math Talk below).

These activities are designed to help the class work toward Math Talk Level 2, although some children may still be at Level 1. Encourage children who may be reluctant to share their ideas to ask a question or to comment on something that someone else said.

Math Talk In the NSF research project that led to the development of *Math Expressions*, much work was done with helping teachers and children build learning communities within their classrooms. An important aspect of doing this is Math Talk. The researchers found three levels of Math Talk that go beyond the usual classroom routine of children simply solving problems and giving answers and the teacher asking questions and offering explanations. Although an example is given for Level 3, it is not expected that kindergarten classes will reach this level very often.

Math Talk Level 1: A child briefly explains his or her thinking to others. The teacher helps children listen to and help others, models fuller explaining and questioning by others, and briefly probes and extends children's ideas.

Example Story Problem: 2 kittens sit in the window. 1 more kitten jumps up to join them. How many kittens are in the window now?

Who can tell us how many kittens are in the window?

Billy: There are 3 kittens.

How do you know?

Billy: I know that 2 and 1 more is 3.

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.

Who found a different way to answer the question?

Lucy: I made a drawing with 2 circles and 1 circle, and then counted the circles to find 3.

Math Talk Level 2: A child gives a fuller explanation and answers questions from other children. The teacher helps children listen to and ask good questions, models full explaining and questioning (especially for new topics), and probes more deeply to help children compare and contrast methods.

Example Story Problem:

Snow has 8 marbles and 2 boxes. How many marbles can she put in each box?

How can we find the answer to this problem?

Ruth: We can draw the boxes and then draw marbles in the boxes. But what I don't know is if there should be the same number in each box.

Jake: Is this a problem that has more than one answer?

Why do you ask that, Jake?

Jake: Because I know more than 1 way to break apart 8.

Ruth: If we break apart 8, we can make a list of the ways. Do you think that is what we are supposed to do?

Nancy: I think so, because we have been learning about break-aparts.

Ruth: And it does not say the boxes have to be the same.

What is one way to start the list?

Caleb: Let's start with 1 and 7, and then change by 1 more each time.

Nancy: I agree with Caleb.

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.

Math Talk Level 3: The explaining child manages the questioning and justifying. Children assist each other in understanding and correcting errors and in explaining more fully. The teacher monitors and assists and extends only as needed.

Example Story Problem:

Joe ate 4 green grapes and 5 purple grapes. How many grapes did he eat?

Who will show us how to find the answer?

Julia: I know that green grapes and purple grapes are both grapes, so I have to add $4 + 5$. I know that is 9, so the answer is 9 grapes. I also made a drawing to be sure I was right. Here is my drawing.

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  ○ ○ ○ ○

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Bob: I think your answer is right, but your drawing only shows 8. You need to fix your drawing.

Nancy: Yes, when I count your circles, you are showing $4 + 4$. So, draw another circle.

How can we be sure that we make the right drawing?

Julia: I should have checked my drawing to be sure I made $4 + 5$. So we should always check what we do.

Nancy: We need to count each thing when we make drawings. We have to be sure and not guess that it looks right.

MATH TALK is important not only for discussing solutions to story problems but also for any kind of mathematical thinking children do, such as explaining why each number in the count sequence is 1 more than the number before it, how to use a drawing to subtract, or how to put two right triangles together to make a rectangle.



Lessons

1 3 - 12 15

17 - 20

Teen Numbers as Ten Ones and More Ones

As in earlier units, children spend much time building their concepts of teen numbers as ten ones and more ones. This strong foundation will help them with place value concepts in Grade 1, where they will learn that 10 ones are the same as 1 ten and that tens are used to build 2-digit numbers.

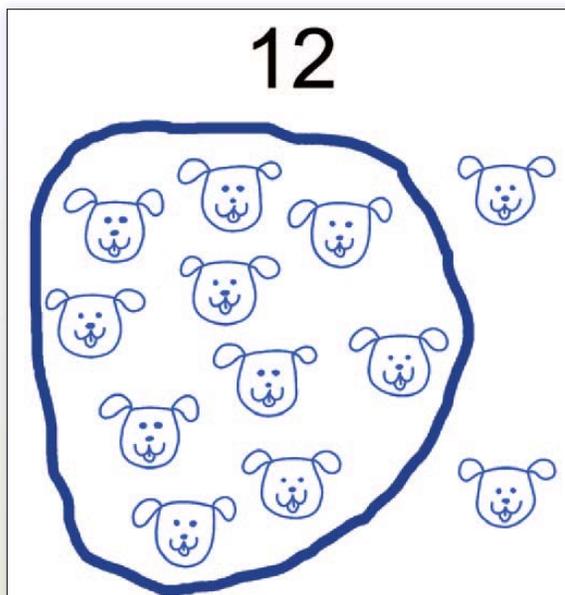
Draw Ten Ones and More Ones In this unit, children make drawings of teen numbers, first with pictures of objects and later with circles or dots to represent ones.

Use Models Children use these models from earlier units for activities with teen numbers: Number Tiles, 1–20 Board with 10-sticks and centimeter cubes, and counters. With all these models, children form teen numbers with a 10 ones part and a more ones part. As they model numbers in order, they see that each number is 1 more than the number before it.

Teen Number Book Children make another Teen Number Book for this unit. On the page for each teen number, they draw that many objects and circle ten of the objects so that the number is represented as ten ones and more ones. After children complete all the pages for the Teen Number Book, they will assemble the pages for you to staple together.

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

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.



Hiding Zero Game This game is designed to help children see the ten in teen numbers. As children work in pairs, they first form the teen numbers on the *Hiding Zero* Gameboards by covering the zero in the 10 with the appropriate Number Tile for a given teen number.

$$14 = 1 \overset{4}{\square} + \square$$

$$15 = 1 \overset{5}{\square} + \square$$

Then children visualize how a teen number is composed of 10 ones and more ones as they move the Number Tile to complete the teen number partner equation. They reinforce their understanding with verbalization by reading the equation and reciting what each part of the teen number represents.

$$14 = 10 + \overset{4}{\square}$$

$$15 = 10 + \overset{5}{\square}$$

Lessons

2

13

14

23

Counting

Children continue to practice counting numbers in this unit. They now count by ones and by tens to 100. Keeping the Night Sky Display posted gives the children continual reference to the visual representations of 100 as 10 groups of ten ones and of all the possible partners of 10.

The Night Sky

The Night Sky display consists of 10 groups of 10 stars each, arranged in a 4x3 grid. The stars are purple and yellow, and the groups are arranged in a way that demonstrates various ways to count 100 objects. The groups are arranged in a way that demonstrates various ways to count 100 objects.

Children's earlier work with counting, especially with counting to 20, has prepared them for the repetition of digits in each of the different "tens" decades. Continue to emphasize the nature of the count sequence—that each number is 1 greater than the one before it and that each time a new decade number is made and named, the digits from 1 through 9 replace the zero in the decade number to form the next nine numbers that lead to the next decade number.

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

From saying the counting words to counting out objects Counting objects arranged in a line is easiest; with more practice, students learn to count objects in more difficult arrangements, such as rectangular arrays (they need to ensure they reach every row or column and do not repeat rows or columns).

Lessons

2

4

8

11

13

18

Partners and Equations

Finger Wiggles for Partners of 10 This activity uses a kinesthetic approach to support children’s learning of the partners of 10. Using all the senses helps children cement their learning of these fundamental relationships of numbers.

Equations Children will complete or write equations for the partners of numbers through 10 and for the partners of teen numbers where one partner is 10. This is a big step for kindergarten children. Not all children will be ready to do this at the same time. Some children may still write expressions, but encourage all children to use the models on their Student Activity Book pages to write equations.

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”).

10 = 1 + 9

10 = 6 + 4

10 = 2 + 8

10 = 7 + 3

Unknown Partners Children will use the Tiny Tumblers on the Math Mountains model to find an unknown partner, given a number at the top of the Math Mountain and one partner. Children may have different strategies for doing this, so encourage discussion.

Draw **Tiny Tumblers** on each **Math Mountain** and write the partner.

5 + 4 + 3 + 2 + 1 +

Switch Partners Informal exposure to the Commutative Property of Addition takes place as children explore switching the partners and observing whether there is a change in the total. They learn that the partners can be in either order and the total remains the same. There is no need to use the term *commutative property* with kindergarten children or to expect them to use the relationship.

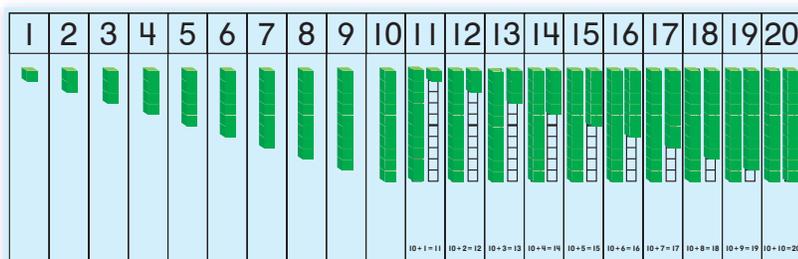
10

| | |
|--------------------------|--------------------------|
| <p><u>10 = 9 + 1</u></p> | <p><u>10 = 1 + 9</u></p> |
| <p><u>10 = 8 + 2</u></p> | <p><u>10 = 2 + 8</u></p> |

Lessons

5 **7** **15****Numbers 1–20**

Model Numbers Children use the 1–20 Board with 10-sticks and centimeter cubes to model all the numbers from 1 through 20. They observe how the numbers change and how arrangements of the digits repeat. As in earlier units, children model the teen numbers using a 10-stick to show 10 ones and cubes to show more ones.



Understanding how the numbers change from 1 through 20 adds to the strong foundation children are building for place value concepts in later grades.

Lessons

7 **9** **12** **13** **15** **18****Path to Fluency**

Because the Common Core State Standards require that children fluently add and subtract within 5 by the end of kindergarten, this unit continues to include practice sets designed to help children acquire this fluency. As in earlier units, the *Path to Fluency* exercise sets provide practice with addition and subtraction within 5 to help children achieve this goal.

| | | |
|---------------------|---------------------|---------------------|
| $2 + 1 = \boxed{3}$ | $3 + 1 = \boxed{4}$ | $2 + 2 = \boxed{4}$ |
| $2 + 3 = \boxed{5}$ | $1 + 3 = \boxed{4}$ | $3 + 2 = \boxed{5}$ |

from THE PROGRESSIONS FOR THE COMMON CORE STATE STANDARDS ON NUMBER AND OPERATIONS IN BASE TEN

Work with numbers from 11 to 19 to gain foundations for place value 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.

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

Working within 10. Experience with decompositions of numbers and with Add To and Take From situations enables students to begin to fluently add and subtract within 5.

Lessons

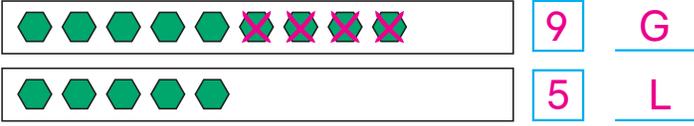
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17

20

Compare Numbers

Comparing Children know how to compare two sets of objects by counting or by matching. In Unit 4, they learned to add objects to the group with fewer objects to make equal groups. In this unit they will continue to add objects to make equal groups but will also learn to subtract objects to make equal groups. It is important for children to see that they can use either process to produce equal groups.

5. 

In this unit as in Unit 4, children will use *G* for *Greater than* and *L* for *Less than*. They will use the mathematical symbols $>$, $<$, and $=$ for recording comparisons in Grade 1.

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.

Lessons

21

22

23

Measurement

The Kindergarten Common Core State Standards for Measurement say that children will describe and compare measurable attributes. These lessons engage children in hands-on activities in measuring and comparing lengths, heights, weights, and capacities. By measuring and comparing real objects rather than pictures, children gain a truer sense of the measurable attribute.

