Using Hands-On Activities, Games, and Literacy Connections to Reach Diverse Student Needs

BOOST Conference April 30, 2011 9:15am-11:15am

Agenda

Using Hands-On Activities, Games, and Literacy Connections to Reach Diverse Student Needs

I. The Problem

II. The Solution
   A. Linking objectives, tests, and instruction
   B. The three stages of learning
   C. Scaffolding logical structures
   D. Teaching conceptual underpinnings

III. Hand-On Activities

IV. Conclusion

Number Sense

Objective: To order the numbers 1 to 10.

Materials: Interlocking cubes, number stair, Numeral Cards 1-10, cubes and margarine tubs

Read to Me
One Bear with Bees in His Hair, Wood, Jakki
Fish Eyes, Ehlert, Lois
One Gorilla, Morozumi, Atsuko
Ten Flashing Fireflies, Sturges, Philomon (Activity 75)

1 Introductory Activity

Review: Towers of 1 More

On page 58, children used the pattern of "1 more" to make towers for the numbers 1 to 5. On this page, the activity is continued for the numbers 6 through 10. If available, a plastic number stair should be used at the end of the activity to store the towers.

In an earlier chapter, we built towers to 5 following a special pattern. The special pattern was that each new tower was made by matching the old tower and making the new tower 1 story more. Today we continue the activity and make towers up to 10 stories. First, build a tower 1 story high. Now, build a new tower by matching your old tower and making the new tower 1 story more. (Repeat 9 times.)

Now, build a new tower by matching your old tower and making the new tower 1 story more. How many stories are in your tower? (10)

Touch your shortest tower and say aloud the number of stories. Count the number of stories in each tower from your shortest tower to your tallest tower. (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

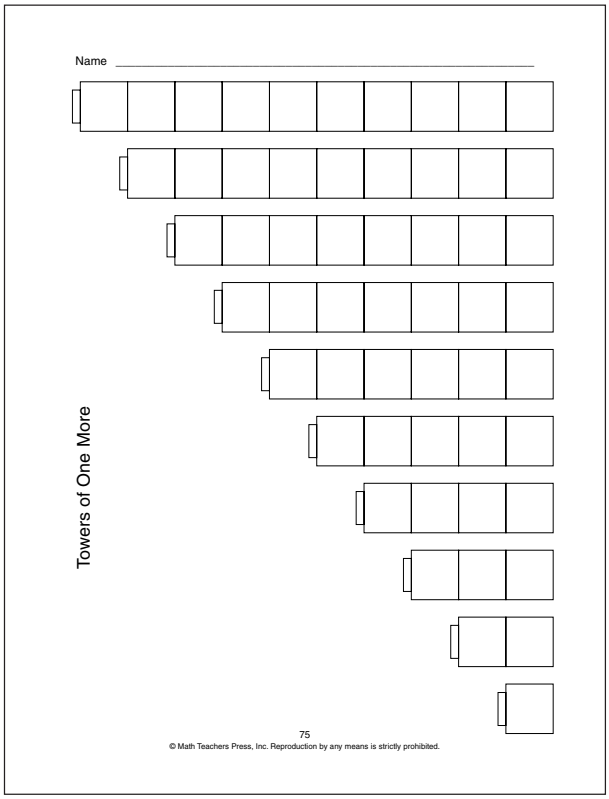
Counting from a Tower

After children can touch and count from 1 to 10, have them begin to count forward from a number.

Today we are going to count up to 10, starting from a tower other than the 1 tower. Touch your 2 tower. Count aloud from 2 to 10. (3, 4, 5, 6, 7, 8, 9, 10) Remind the children that they should not say aloud the tower they are starting from; rather, they are to count forward from that tower. This activity of counting from a number is an important readiness activity for success with addition where students should learn to count up from a number rather than having to count by ones from 1 to the number.

2 Connections Activity

Place your towers on the matching picture. Color the pictures of cubes the same color as the cubes in your tower. Write the number of stories in each tower inside the highest cube of each tower.



3 Follow-Up Activities

A STAIRCASE OF TOWERS

This game is for 2 children. Each pair will need 100 interlocking cubes and 2 sets of numeral cards 1-10. Shuffle the cards and place them face down between the 2 players. Players take turns selecting a card and building a tower to match the number selected. After each play, the card is returned to the bottom of the deck.

The object of the game is to build the towers from 1 to 10 in order. The first player to complete the staircase is the winner. If a card is selected for a tower the child has already built, the child loses that turn. After all cards have been selected once, the cards in the pile may be shuffled and used again.

ONE MORE

Hide from 1 to 9 cubes in random order under margarine tubs. Hold up 1 tub and ask the students to write the number of cubes they see under the tub.

Place 1 more cube under the tub. Ask the students to write the number of cubes under the tub now. Lift up the tub. Ask a volunteer to count the cubes. If children make a mistake, have them erase their answer and write the correct answer.

Number Sense
Read To Me Activity

Book: *Ten Flashing Fireflies* by Philemon Sturges

Summary: A young boy is proud of having caught a jar full of fireflies which seems to him like owning a piece of moonlight.

Activity: Use this story to introduce the "Towers of One More" activity. Give each student ten interlocking cubes and tell them that these will be their "fireflies." As you read the story have them show the number of fireflies that they have caught. Before you turn each page to find the number, have them add one cube to their tower and tell how many fireflies they have as one is added each time. Students will delight in being able to check their answers by reading the next page in the story.

Objective:

To explore and name base ten blocks. To match the blocks with their place value names.

Materials:

Base ten blocks, Place Value Mats (Masters 1 and 2)

Note: Before class, make copies of Master 20 (Vocabulary Cards). Make copies of Master 21 (My Math Glossary) and distribute to each student.

Vocabulary:

different, place value names, same

Read to Me

One Hundred Is a Family, Ryan, Pam Munoz (Activity 2)

Introductory Activities

Introducing Base Ten Blocks

The main reason students make errors with whole number algorithms is that they do not understand multi-digit numeration. They do not know that 43 means 4 tens and 3 ones or 40 + 3.

Base ten blocks are ideal for teaching numeration concepts because students can see the abstract concept of place value each time they pick up a block. One tens block is always seen both as 1 ten and 10 ones.

Each pair or small group should have 20 ones blocks, 10 tens blocks, 10 hundreds blocks, and a place value mat.

Explain the benefits and proper use of manipulatives. Set ground rules for using them and discuss take-out and clean-up routines.

We are going to begin using base ten blocks. See what you can discover about your blocks. Allow exploratory time. Students might make buildings, roads and parking ramps.

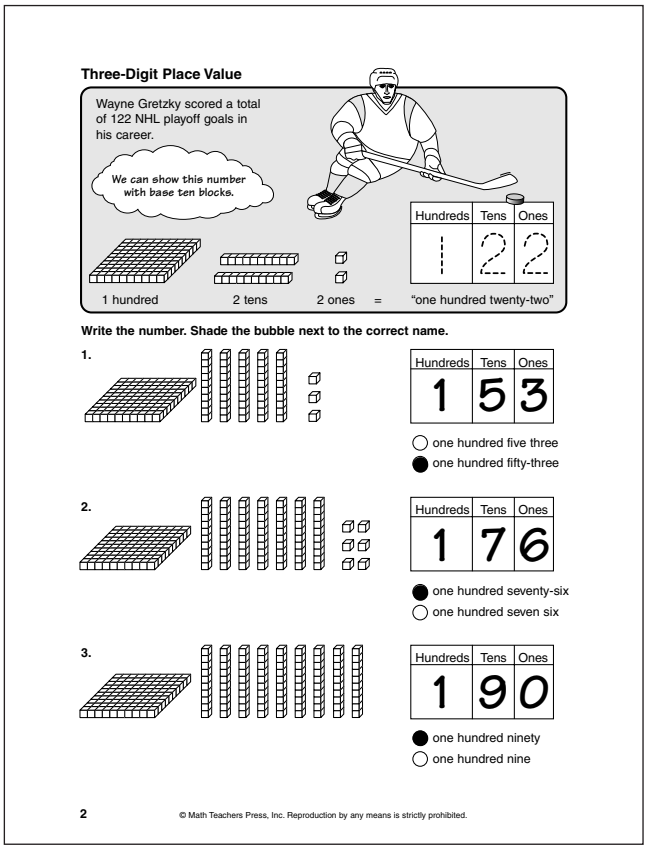
Encourage students to look for patterns. **We can find important patterns if we ask ourselves how these blocks are the *same,* or alike, and how they are *different*, or not alike.**

Write 2 columns on the board:

How are the blocks the same?
How are the blocks different?

What is one way the blocks are the same? (e.g., same material) After a period of time, ask students to share.

Same	Different
made of wood	sizes
natural color	shapes
points & corners	volumes
solids	weight
made of 1 cm cubes	
10 of 1 block = 1 of the next larger block	



How many different sizes do you have? (3) **Put 1 of each size in front of you. We call the smallest block the "ones" or "units" block. How many ones does it take to make the next-sized block?** (10) **We name this block the "tens" or "long" block.**

How many of the ones blocks are the same as the largest block? (100) **We name this block the "hundreds" or "flat" block.**

The words "ones," "tens," and "hundreds" are *place value names*.

Display 1 hundred, 2 tens, 5 ones. Place the blocks correctly on a Place Value Mat. Then say the words for the blocks, **one hundred twenty-five.**

About This Page

Work through the example together. **Look at problem 1. What blocks are shown?** (1 hundred, 5 tens, 3 ones) **Write the number in the correct place on the chart.** (153)

To say this number aloud, touch the biggest block and say its value. (100) **Now touch the next biggest blocks and say their value.** (50) **Then touch the smallest blocks and say their value**. (3) **Now say the number together as you touch the blocks.** (one hundred fifty-three)

Have students complete problems 2 and 3 on their own or with a partner.

Objective:
To build models and draw pictures of numerals. To write numbers in expanded notation.

Materials:
Base ten blocks, Place Value Mats (Masters 1 and 2), 6-sided dice

Vocabulary: expanded notation

Read to Me

Amazing and Incredible Counting Stories, Grover, Max (Activity 4)

Introductory Activities

Matching Models, Pictures and Numerals

Students develop a deeper understanding of multi-digit numeration when they see numbers represented in different ways. In this activity, students will match numbers to blocks, words, pictures and expanded notation. Each small group of students will need 20 ones blocks, 10 tens blocks and 10 hundreds blocks. Provide practice with the following activities:

1. Writing numerals from blocks.
   Display 3 hundreds, 5 tens, 4 ones. Ask students to say the words for the blocks and then write the numbers for the blocks. (three hundred fifty-four)

2. Building blocks from numerals.
   Write a 3-digit numeral on the board. Ask students to explain what each digit in the numeral means. Ask how to read this number. Then ask them to build the number with base ten blocks on Place Value Mats. This activity can be practiced in pairs.

3. Building blocks and writing numerals from an oral presentation.
   Say a 3-digit numeral. Students build the number with base ten blocks and then record it.

4. Drawing pictures from numerals.
   Write a numeral on the board. Have students draw a picture, using small squares for hundreds, vertical lines for tens and dots for ones.

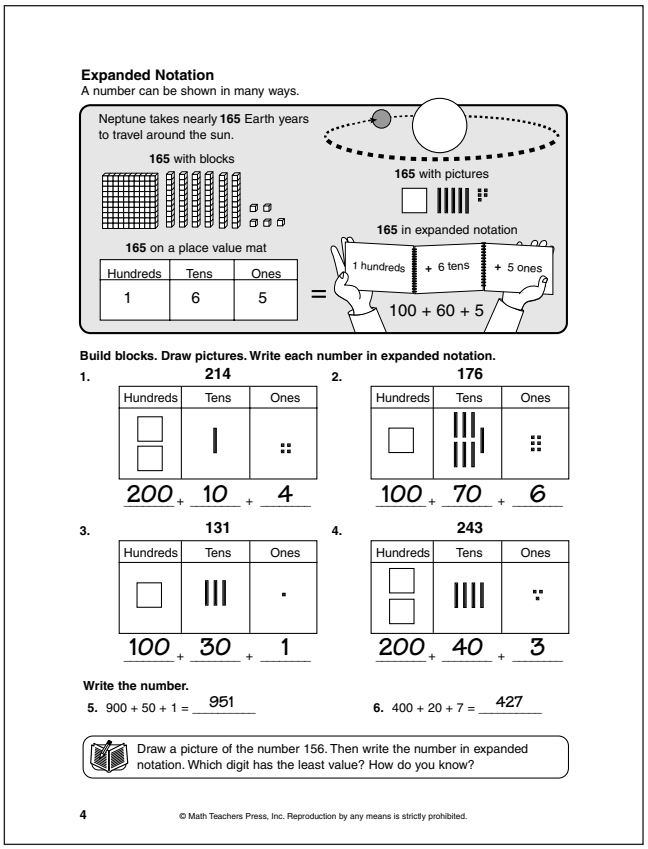
   Example: 243 = □□ IIII...

5. Writing numbers in expanded notation.
   Display 3 hundreds, 5 tens and 4 ones. **What is the value of the hundreds blocks?** (300) **What is the value of the tens blocks?** (50) **What is the value of the ones blocks?** (4) **We can write the number in a way that shows the value of each digit. This is called *expanded notation*.**

   Write on the board:

3 hundreds		5 tens		4 ones		
300	+	50	+	4	=	354

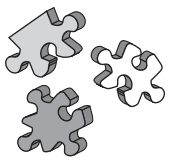
   Repeat with another example.



About This Page

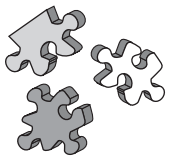
Together, read the information at the top of the page. Students may complete the page with a partner or on their own.

Follow Up Activities



Hammer to 100 Game

Game for 2 players. Use base ten blocks in a pile: 1 hundred flat, 20 tens and 30 ones. Each player takes turns tossing a 6-sided die and removing the number tossed from the pile. Each time a player gets 10 ones, they are exchanged for 1 ten. The first player to get exactly 10 tens on a toss exchanges it for the 100 flat and is the winner.



Chisel to 0 Game

Each player starts with a hundred flat. A player tosses a 6-sided die and removes the number tossed out of her hundred flat. For example, if a 3 were thrown on the first turn, the player would first have to exchange the hundred flat for 10 tens and then exchange 1 of the tens for 10 ones so that the 3 ones could be removed. The winner is the first player to toss the exact number to get to exactly 0 blocks in her pile.

SKILL BUILDERS 1-2

Place Value Bingo

Card 1

Hundred	Tens	Ones

Card 2

Hundred Thousands	Tens Thousands	Ones Thousands

Card 3

Hundred Millions	Tens Millions	Ones Millions

Card 4

Tenths	Hundredths	Thousandths

Players: The entire class

Students: write each of the digits 1-9 in random order on the squares on each card

Teacher prepares 27 index cards for each of the 4 bingo cards as follows:

Card 1: 1 one, 2 ones, ... 9 ones; 1 ten, 2 tens, ... 9 tens; 1 hundred, 2 hundred, ... 9 hundred.

Card 2: 1 one thousand, ... 9 one thosands; 1 ten thousand, ... 9 ten thousands; 1 hundred thousand, ... 9 hundred thousands.

Card 3: 1 one million, ... 9 one millions; 1 ten million, ... 9 ten millions; 1 hundred millions, ... 9 hundred millions.

Card 4: 1 tenth, ... 9 tenths; 1 hundredth, ... 9 hundredths; 1 thousandth, ... 9 thousandths.

Teacher selects and reads aloud 1 index card at a time, e.g. “6 hundreds” from Card 1. Every player having a 6 written in one of the hundreds squares covers the space. The first player to have 3 in a row in any direction is the winner

Addition and Subtraction

Objective:
To act out addition problems. To develop understanding of addition as combining or putting things together.
To draw pictures and write number sentences involving addition.

Vocabulary:
addition, plus sign, addition words... altogether, joining, coming together, in all

Read to Me — *Every Buddy Counts,* Murphy, Stuart J. (Activity 3)

Introductory Activities

Acting Out a Problem

Have students act out the following problem. Describe the problem and show the correct way to record the action after the problem is acted out.

Today we are going to act out a number problem and find how to write the action in a number sentence. Be ready to answer questions about what you see.

(Student's Name) **and** (Student's Name)**, please stand by the door.**

(Student's Name), (Student's Name) **and** (Student's Name)**, please stand by the window.**

Have the students by the door and by the window come together and stand by the teacher's desk. **How many students altogether are standing by my desk?** (5)

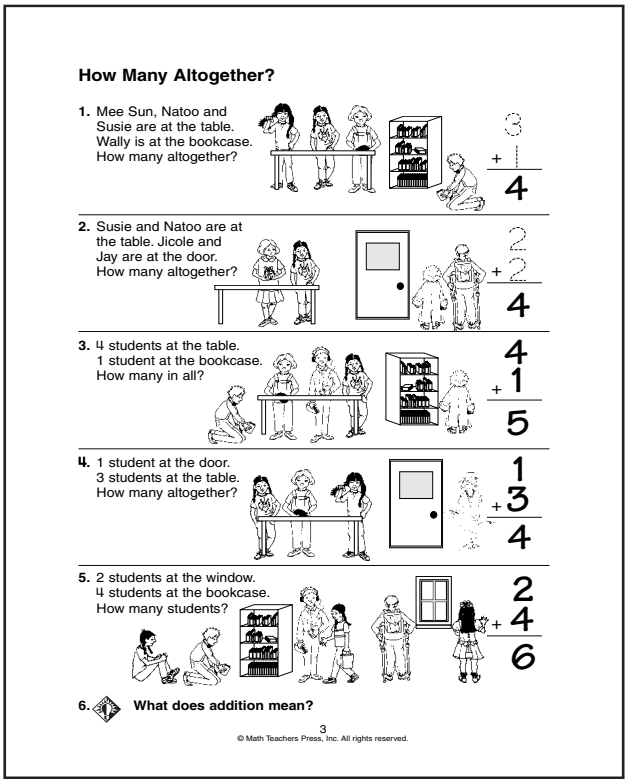
Think about what happened first in this problem and then what happened next. Tell the story to your partner. (Some students stood by a door and some students stood by a window. Then they came together and stood at the desk.) **How many stood by the door?** (2) Write 2 on the chalkboard. **How many stood by the window?** (3) Write 3 under the 2. **How many altogether were at my desk?** (5)

What are the words that describe the action in this problem—what is happening? (coming together or joining). **We call *joining* or *coming together* addition. We use the plus sign to show addition. I will write the plus sign here to show the complete sentence.**

$$\begin{array}{r} 2 \\ +\,3 \\ \hline 5 \end{array}$$

The word *altogether* means "how many in all" and tells us to add. Sometimes we will just use the words *in all* to mean addition. Now I am going to act out another problem, only this time I will see if you can write the problem correctly on your paper the same way I did on the chalkboard.

Tell another addition story using different numbers. Pause after each step to have the students record the action. **When you see a problem with a plus sign, it may help you to think about the problems we acted out.**



About This Page

Read over the first story. Ask the students to retell the story to a partner. Then go through the story step by step as the students write in the numbers. Have students work in pairs to complete the page on their own.

What words tell you there should be a plus sign? (in all, altogether)

Follow-Up Activities

Drawing a School Story

$n=?$

Re-enact the first story in Introductory Activities. **We can draw a picture of the story to help us remember what happened.** Show the students how they could draw a picture of the action using simple stick figures. For example, this problem could be drawn as below.

Now make your own addition story. Draw a picture of the story and write a number sentence.

Have students share completed stories.

Addition and Subtraction Read To Me Activity

Book: *Every Buddy Counts* by Stuart J. Murphy

Summary: A little girl goes through the day counting her "buddies," which include her pets, family members and neighbors.

Activity: Together as a class write the "buddies" that you can count around school. For example, 1 principal, 2 P.E. teachers, 3 janitors, etc. Have each student draw one set of the "buddies." When finished with the pages, put them in a class book titled, "Every Buddy at School Counts!"

Students can also write addition sentences using the class list. For example, "We have 1 principal and 3 P.E. teachers. How many buddies in all?" Have one student come to the board and write the addition sentence that goes with each problem.

Objective:
To use a Number Line and a Hundred Board to add a 2-digit number and a 1-digit number with regrouping.

Materials:
Classroom Number Line to 100, interlocking cubes, Blank Hundred Board (Master 12), Number Tiles (Master 6), small plastic bag, pennies and dimes, 10-sided dice

Read to Me

12 Ways To Get to 11, Merriam, Eve (Activity 30)

Introductory Activities

Addition on a Number Line and Hundred Board

Write on the board:

You have 28¢. You earn 5¢. How much do you have?

Put 9 dimes and 20 pennies in a small bag or coin purse. Ask a volunteer to show 28¢ with the fewest number of coins. (2 dimes 8 pennies)

Ask another student to show how much money they would have after they earned 5¢ more. Discuss the meaning of the word "earn" and different ways to find the answer. Ask students which way seems easier and why. Two possible solutions:

1. I put 5 pennies with the rest of the money and then I counted how much money in all. (10, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33¢)
2. I started with 28 and added by counting 1 penny at a time from 28. (29, 30, 31, 32, 33¢)

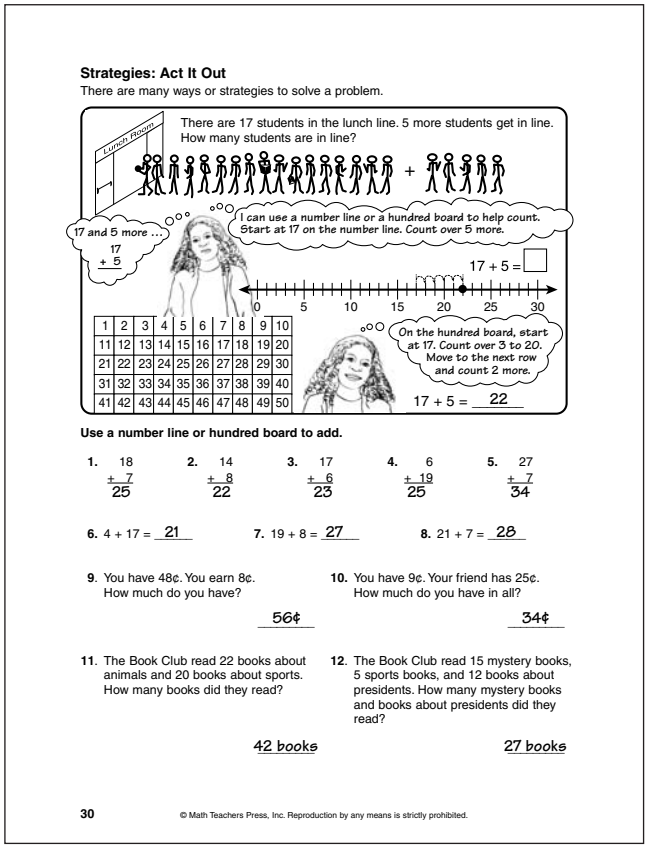
We can also show this on a number line. Have a student count out 28 cubes and place them on the number line. Have another student add 1 cube at a time and count to 33.

We can also find the answer on a Hundred Board. Have a student show how to count 5 steps up from 28 on a Hundred Board.

About This Page

Direct attention to the story and number line at the top of the page. Have a student use dimes and pennies to solve the problem, a second student show the problem on the Number Line and a third student show the problem on the Hundred Board.

Have students use a number line or Hundred Board to add. Students should complete the page on their own.



Strategies: Act It Out

There are many ways or strategies to solve a problem.

There are 17 students in the lunch line. 5 more students get in line. How many students are in line?

Lunch Room

17 and 5 more …

17 + 5

I can use a number line or a hundred board to help count. Start at 17 on the number line. Count over 5 more.

17 + 5 = □

0 5 10 15 20 25 30

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

On the hundred board, start at 17. Count over 3 to 20. Move to the next row and count 2 more.

17 + 5 = 22

Use a number line or hundred board to add.

1. 18 + 7 = 25
2. 14 + 8 = 22
3. 17 + 6 = 23
4. 6 + 19 = 25
5. 27 + 7 = 34

6. 4 + 17 = 21
7. 19 + 8 = 27
8. 21 + 7 = 28

9. You have 48¢. You earn 8¢. How much do you have? 56¢
10. You have 9¢. Your friend has 25¢. How much do you have in all? 34¢
11. The Book Club read 22 books about animals and 20 books about sports. How many books did they read? 42 books
12. The Book Club read 15 mystery books, 5 sports books, and 12 books about presidents. How many mystery books and books about presidents did they read? 27 books

30

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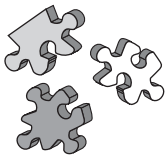
Follow Up Activities

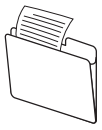


Hundred Board Game

Each pair or small group should have a blank Hundred Board and Number Tiles (Master 6), yellow interlocking cubes and a 10-sided die. Player 1 selects a Number Tile and places it on the correct space on the Hundred Board. She then throws the dice and counts forward as many steps as the number on the die. She marks the landing point with a yellow cube and writes the number sentence on paper.

Play rotates around the group. Players earn 1 point for each correct addition fact. If a player lands on a space with a Number Tile on it, she loses that turn.

Play continues for a designated period of time or until one player gets 10 points.



Writing Word Problems

Have students make up a story related to adding a 2-digit number and a 1-digit number with and without regrouping, e.g., 34 + 5 or 34 + 8.

Have students write each problem on a page titled "Different Ways to Solve a Problem," to be saved in the class word problem file. Review different ways. Have students explain 2 or 3 different ways to solve the problem.

SKILL BUILDERS 10-3

Objective:
To use base ten blocks to subtract 2-digit numbers, no regrouping. To find a pattern for subtracting 2-digit numbers.

Materials:
Place Value Mats (Masters 1 and 2), base ten blocks (tens and ones)

Introductory Activities

Subtracting 2-Digit Numbers

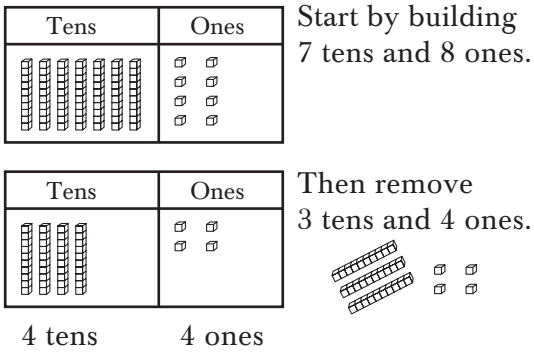
Each student, pair or group should have a Place Value Mat and base ten blocks. **Today I will tell you stories. Listen for the question and needed facts. Discuss with your partner or group how to solve the problem.**

Use the Place Value Mat and base ten blocks to solve the problem.

After you have found the answer with blocks, think of a way to record the story with paper and pencil. Be prepared to explain your method.

Story 1: You buy a box of 78 peanuts at the circus. You eat 34 peanuts. How many peanuts do you have left?

Students might record by drawing a picture,



by marking sticks or dots for tens and ones,

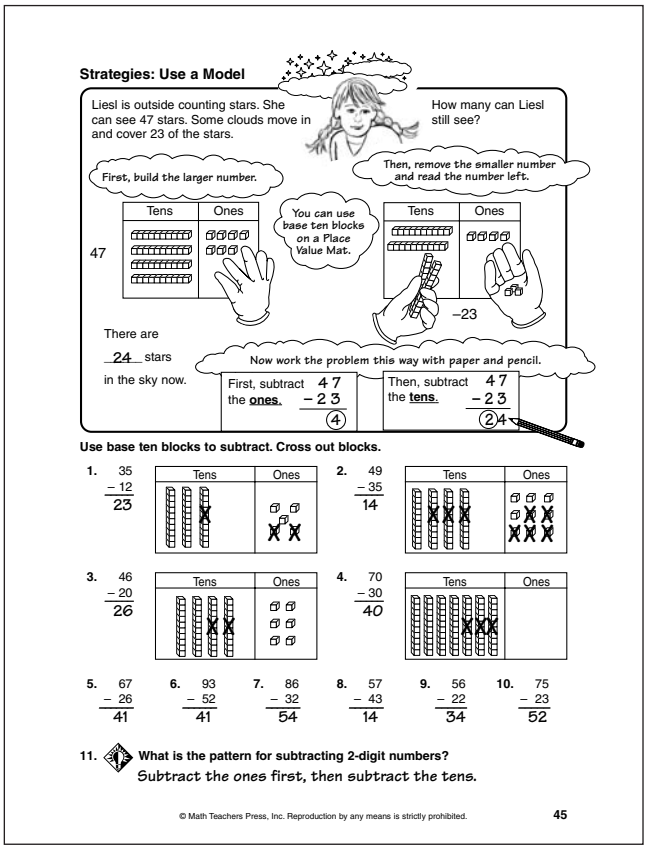
or they might record a number sentence:

$$78 - 34 = 44$$

Tell me a pattern for subtracting two 2-digit numbers.

(There are four possible patterns:

1. I subtracted 30 from 70 and 4 from 8
2. 78 – 30 is 48 and 48 – 4 is 44
3. 70 – 30 is 40 and 8 – 4 is 4, 44
4. Subtract the number in the ones place, then subtract the numbers in the tens place.)



Story 2: You have 79 hot dogs. You sell 28 hot dogs. How many hot dogs do you have?

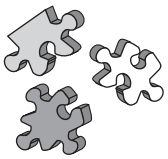
Story 3: You have 75 peanuts. Your friend Bill has fewer peanuts than you do. How many fewer peanuts does Bill have? (not enough information)

About This Page

Work the example at the top of the page together. Have students use base ten blocks.

What is the pattern for subtracting 2-digit numbers? (subtract the ones, then subtract the tens) Have students complete the page with a partner.

Follow Up Activities



Subtraction Bingo
Skill Builders 15-19

SKILL BUILDERS 15-5

Subtraction Bingo

97 − 35	76 − 34	90 − 30
65 − 24	89 − 26	78 − 25
87 − 53	69 − 20	68 − 54

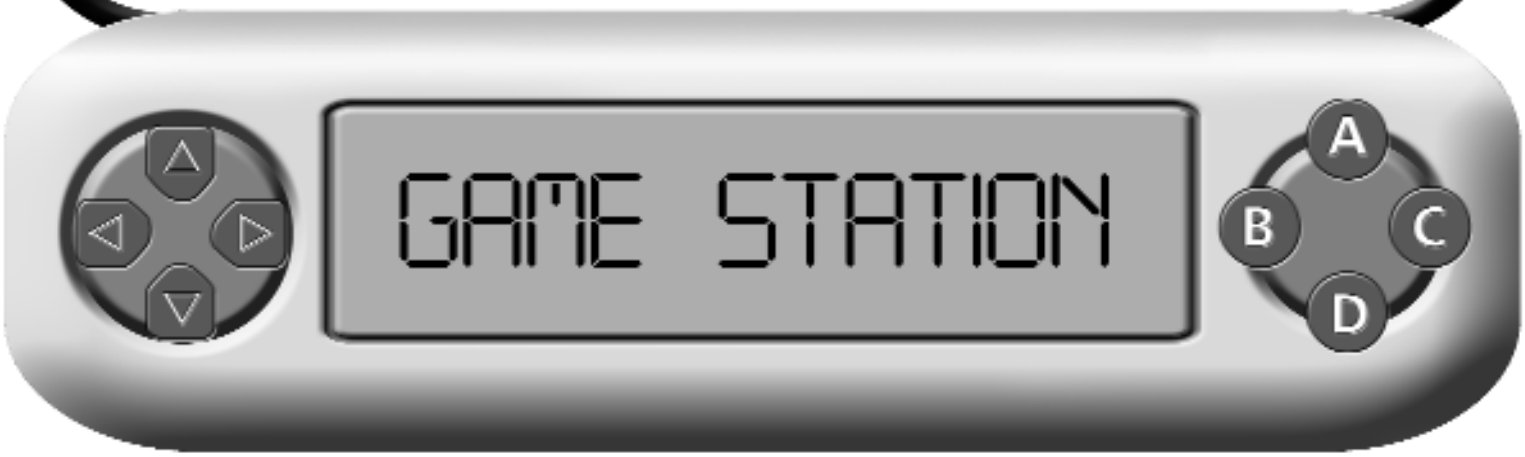
CALLER CARDS

53	34	63	49	60	42	41	62	14

Players: 2 or more

You Need: 9 small objects to cover your card. Cut out the CALLER CARDS from one of the sheets.

Choose a caller. Everyone else needs a blank bingo card. Write the problems above on your card in any order. The caller draws a CALLER CARD from the pile and says a number. Cover the problem on your card that would equal the number called. Yell "Bingo!" when you get 3 in any row, column, or diagonal.



Multiplication

Objective:
To multiply by 5 using pictures and models.

Materials:
Paper, crayons, interlocking cubes, tape, 100 Multiplication Facts (Master 35), Certificate of Achievement (Master 45)

Vocabulary:
product, factor

Read to Me — *Arctic Fives Arrive,* Pinczes, Elinor J. (Activity 4)
Aladdin and the Magic Lamp, (any version) to be read sometime this week

Introductory Activities

Multiplying by 5

Give each student a sheet of paper, a crayon, and interlocking cubes. **Outline a picture of one of your hands. Write your name at the top of your paper.**

Hold up one picture. **How many hands are on this picture? How many fingers?** (1 hand, 5 fingers) Tape the picture on a chalkboard. Hold up a second drawing. **How many hands in all?** (2) **How many fingers in all?** (10) Repeat with a third drawing (3 hands, 15 fingers)

How did you get your answer of 15? (counting by 1 or counting by 5). **This is a story about a 5 and a 3 that become 15.**

What was the action in this problem? (We are putting numbers together.) **What is special about the numbers we are putting together?** (They are all the same number.)

Write on the board:

$$5 + 5 + 5 = 15$$

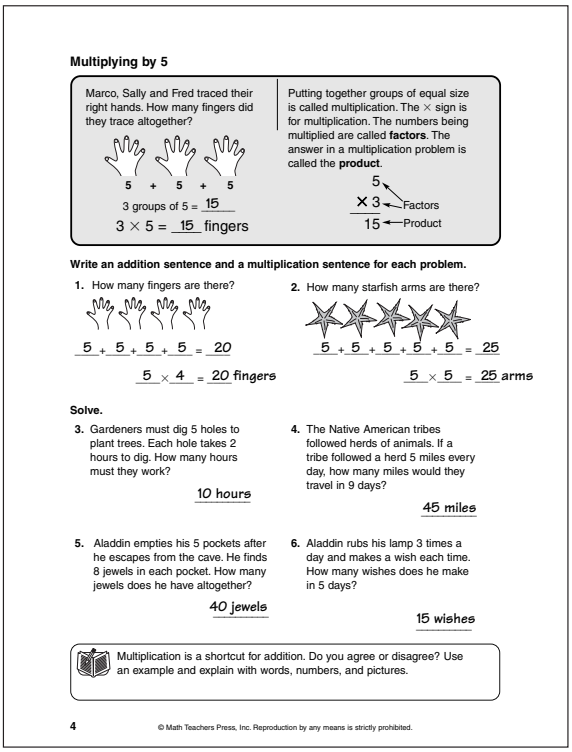
$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline 15 \end{array}$$

When we put together numbers of the same size, we are multiplying. The sign for multiplication is the times sign.

Write an × to the left of the 3 on the board.

$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline 15 \end{array} \quad \begin{array}{l} \text{factors} \\ \\ \text{product} \end{array} \qquad 5 \times 3 = 15$$

The answer in a multiplication problem is called the *product.* The numbers being multiplied are called *factors.* Add the words "factors" and "product" to the problem on the board.


Multiplying by 5

Marco, Sally and Fred traced their right hands. How many fingers did they trace altogether?

5 + 5 + 5

3 groups of 5 = 15

3 × 5 = 15 fingers

Putting together groups of equal size is called multiplication. The × sign is for multiplication. The numbers being multiplied are called **factors**. The answer in a multiplication problem is called the **product**.

5 × 3 (Factors) = 15 (Product)

Write an addition sentence and a multiplication sentence for each problem.

1. How many fingers are there?

5 + 5 + 5 + 5 = 20

5 × 4 = 20 fingers

2. How many starfish arms are there?

5 + 5 + 5 + 5 + 5 = 25

5 × 5 = 25 arms

Solve.

3. Gardeners must dig 5 holes to plant trees. Each hole takes 2 hours to dig. How many hours must they work?

10 hours

4. The Native American tribes followed herds of animals. If a tribe followed a herd 5 miles every day, how many miles would they travel in 9 days?

45 miles

5. Aladdin empties his 5 pockets after he escapes from the cave. He finds 8 jewels in each pocket. How many jewels does he have altogether?

40 jewels

6. Aladdin rubs his lamp 3 times a day and makes a wish each time. How many wishes does he make in 5 days?

15 wishes

Multiplication is a shortcut for addition. Do you agree or disagree? Use an example and explain with words, numbers, and pictures.

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Continue to hold up other pictures of hands until you have 10 pictures of hands, each time writing a new multiplication fact on the chalkboard.

Can you use your cubes to make a model of a picture of one hand? (5 cubes) **Two hands?** (10 cubes) Have small groups of students continue to build 10 towers of 5 cubes each. Touch the cubes and count aloud as they skip count by 5 from 5 to 50.

About This Page

Read the illustration together at the top of the page. Do problems 1 and 5 together. Problems 5 and 6 on this page reference the story of *Aladdin and the Magic Lamp.* This is the first of four age appropriate books that may be read aloud over the course of a week. Remind students that math will appear in other subjects and in everyday life.

Follow Up Activities

Baseline Test on Multiplication Facts (Optional Activity)

Make copies of the 100 Multiplication Facts (Master 35) for each student. See how many facts each student is able to answer correctly in 5 minutes (allow extra time for students with severe disabilities). Repeat the test once a week, and give a final test at the end. Write the number of correct answers on the Certificate of Achievement to be sent home with each student.

Multiplication Read To Me Activity

Book: *Arctic Fives Arrive* by Elinor J. Pinczes

Summary: A counting book in which animals in groups of five share a hilltop to view the northern lights.

Activity: As you read the story, ask, "How many groups of 5 animals are there now?" Keep track of how many animals are on the hilltop using repeated addition and multiplication. Since the story only goes to 30 have the students continue with repeated addition and multiplication up to 9 groups of 5.

Have the students vote to pick a place many different animals might go–a tree, a pond, a field an island. Assign a number to each student and tell them that is the number of groups of 2 animals that are going to the destination. Each student will fill in and illustrate the sentence, "Name's (number) groups of 2 (name of animal) are going to the (place). that is 2 + _____ (number needed) or 2 x _____ = _____ (name of animal) altogether. Ex. John's 3 groups of 2 blue jays are going to the big oak tree. That is 2 + 2+ 2 or 2 x 3 = 6 blue jays altogether. These pages may be placed on a bulletin board or in a class book titled, "Places Twos Arrive."

Objective: To skip count on a number line to find multiplication facts with 5.

Materials:
Interlocking cubes, Number Line to 100 (Master 7), counters or marbles, pie tin or empty coffee can

Read to Me — *Reese's Pieces Count by Fives,* Pallotta, Jerry (Activity 5)

Introductory Activities

Mental Math for the 5 Facts

The strategy for finding products when 5 is a factor is to count by 5. Provide oral practice with students to use this strategy.

Write on the board:

There are 7 students standing in line.
Each student has their right hand raised.
How many fingers are raised?

Have 7 students come to the front of the room. Have each student raise his or her right hand with the fingers outstretched as the class counts aloud, **"5, 10, 15, 20, 25, 30."** Continue until the last student raises her hand and the class says **"35."** Repeat with 8 students, 9 students and 10 students.

Plastic Cubes on a Number Line

Prepare a class number line by taping 2-inch wide strips of paper together from Master 7. Label the marks from 1 to 100, and tape the number line on the board or a classroom wall. Each small group of students should have interlocking cubes.

Place 1 pile of cubes on your desk equal to the fingers on 1 hand. How many cubes are shown? (5) **Place another group of 5 cubes on your desk. How many cubes are shown?** (10) Add another group of 5. **How many cubes?** (15) **How did you get your answer?** (added 3 groups of 5, counted by 5)

Have a volunteer bring her cubes to the board and demonstrate that the cubes add to 15.

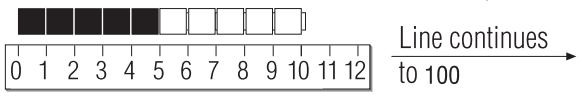
Tell an addition fact and a multiplication fact for this problem. (5 + 5 + 5 = 15 and 3 × 5 = 15)

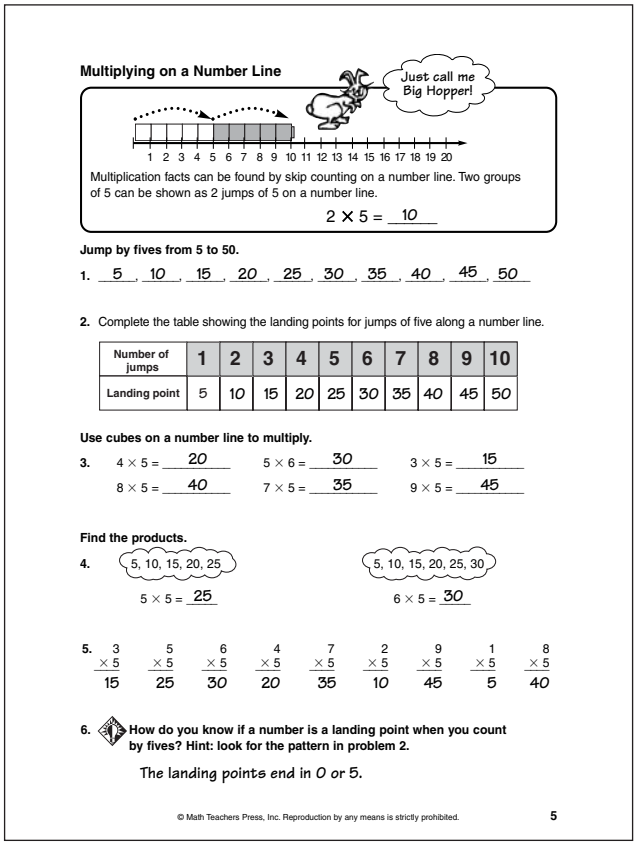
Ask a student to place the set of cubes above the number line on the board and tell how many cubes in 1 group of 5.

Write on the board:

1 group of 5 = 5 or 1 × 5 = 5

Ask a second student to join another set of 5 cubes to the first set. Then have him show the cubes on the number line. (The second set of cubes, when joined to the first set, should cover the line between 5 and 10.)





Multiplying on a Number Line

Just call me Big Hopper!

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Multiplication facts can be found by skip counting on a number line. Two groups of 5 can be shown as 2 jumps of 5 on a number line.

2 × 5 = 10

Jump by fives from 5 to 50.

1. 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

2. Complete the table showing the landing points for jumps of five along a number line.

Number of jumps	1	2	3	4	5	6	7	8	9	10
Landing point	5	10	15	20	25	30	35	40	45	50

Use cubes on a number line to multiply.

3. 4 × 5 = 20 5 × 6 = 30 3 × 5 = 15
8 × 5 = 40 7 × 5 = 35 9 × 5 = 45

Find the products.

4. 5, 10, 15, 20, 25 → 5 × 5 = 25
5, 10, 15, 20, 25, 30 → 6 × 5 = 30

5.

3 × 5 = 15	5 × 5 = 25	6 × 5 = 30	4 × 5 = 20	7 × 5 = 35	2 × 5 = 10	9 × 5 = 45	1 × 5 = 5	8 × 5 = 40

6. **How do you know if a number is a landing point when you count by fives? Hint: look for the pattern in problem 2.**
The landing points end in 0 or 5.

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Write on the board:

2 groups of 5 = 10 or 2 × 5 = 10

Repeat through 10 × 5 = 50.

Write the landing points on the board. **What pattern do you see with numbers that are the landing points of 5?** (last digit is a 0 or 5)

About This Page

Direct attention to the example at the top of the page. Demonstrate by placing 2 trains of 5 cubes each on the number line. Work several problems with the class, showing students 2 ways to multiply: (1) building upright towers of 5 cubes each and skip counting or (2) building cubes and placing them on the number line.

Follow Up Activities

Listen and Count

This activity reaches out to auditory learners. Drop marbles or counters into a pie plate or empty coffee can, one at a time, pausing after each group of 5. Students count mentally and write the number of cubes or marbles when the counting stops. Have students share the totals they wrote down.

Check the total by taking the counters out of the container, one at a time, pausing as you count each group of 5.

Emphasize the landing points when you are counting.

SKILL BUILDERS 20-3

Objective: To model multiplication using arrays.

Materials: Interlocking cubes, One-Inch Graph Paper (Master 5), stapler, scissors, Multiplication Facts with 5 (Master 25), blue construction paper, glue, small plastic storage bag

Vocabulary: array

Introductory Activities

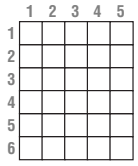
Building Arrays

Each small group will need several copies of Master 5 and 50 interlocking cubes.

Write on the board:

Mr. Banks arranged his classroom so there were 6 rows with 5 chairs in each row. How many chairs are there in his classroom?

Use your cubes to model 6 rows of chairs with 5 chairs in each row. Begin by making 1 row of 5 cubes. How many cubes in all? (5) **Write this multiplication fact.** (1 × 5 = 5). Repeat until 6 rows of 5 cubes have been made and put next to each other.



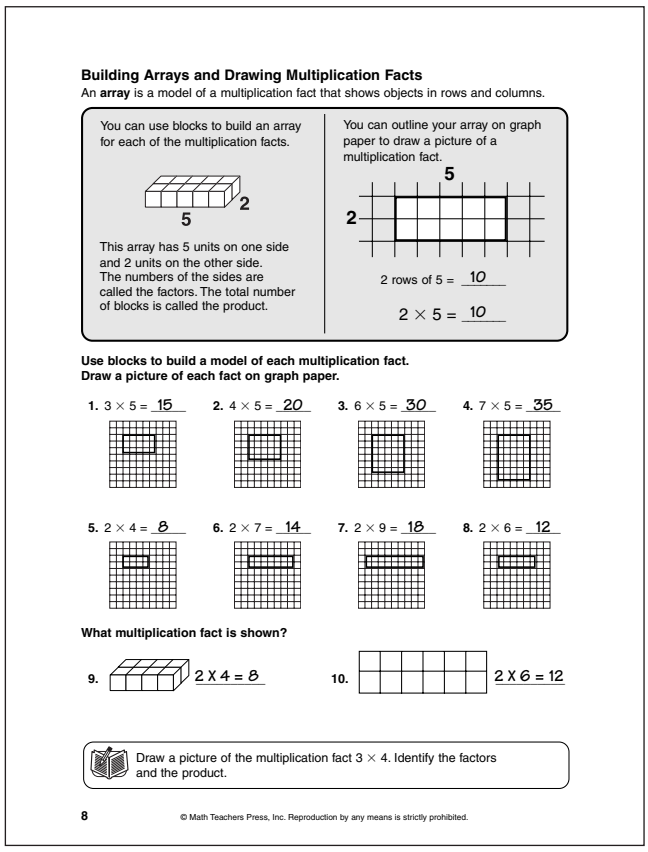
Make sure students understand the difference between rows and columns. **This rectangle is an array. An *array* models a multiplication fact by showing objects in rows (horizontal) and columns (vertical) with an equal number in each row and an equal number in each column. Move your finger to show a row. Move your finger to show a column.**

How many groups or rows of 5 do you have? (6) **How many cubes in all?** (30) **Write the multiplication fact.** (6 × 5 = 30). **Now let's look at the columns. How many columns?** (5) **How many cubes in each column?** (6) **Write the multiplication fact** (5 × 6 = 30)

Repeat the procedures through 9 groups of 5. **We have just made a model of the multiplication facts of 5. We will draw pictures of each of the arrays in the 5 family on graph paper. Outline an array to show 1 group of 5. The array will look like 1 row of square cubes. Write 1 × 5 on your array.**

	1	×	5	

The first number in a multiplication sentence indicates the number of rows, and the second number tells how many squares in each row. Relate 6 rows of 5 to the addition of 5 six times (5 + 5 + 5 + 5 + 5 + 5 = 30). Repeat drawing pictures through 9 rows of 5. After ensuring that the arrays have been drawn correctly, have each student cut out their nine arrays and staple them at the top to make a stair of 5s as shown on lesson plan page 90.



Building Arrays and Drawing Multiplication Facts

An **array** is a model of a multiplication fact that shows objects in rows and columns.

You can use blocks to build an array for each of the multiplication facts.

This array has 5 units on one side and 2 units on the other side. The numbers of the sides are called the factors. The total number of blocks is called the product.

You can outline your array on graph paper to draw a picture of a multiplication fact.

2 rows of 5 = 10

2 × 5 = 10

Use blocks to build a model of each multiplication fact. Draw a picture of each fact on graph paper.

1. 3 × 5 = 15
2. 4 × 5 = 20
3. 6 × 5 = 30
4. 7 × 5 = 35

5. 2 × 4 = 8
6. 2 × 7 = 14
7. 2 × 9 = 18
8. 2 × 6 = 12

What multiplication fact is shown?

9. 2 X 4 = 8

10. 2 X 6 = 12

Draw a picture of the multiplication fact 3 × 4. Identify the factors and the product.

8

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Write the answer to each fact on the back of the array so that the student can use the stairs to drill and check the multiplication facts. Refer to the diagram on page 9 of the Lesson Plans.

About This Page

Read the example at the top of the page that relates the picture to the Introductory Activity. **We cannot see all of the cubes in problem 9. Can you build a model to match?** Have students study problems 9 and 10. **These are both pictures of arrays. What is the difference between the two?** (Problem 9 is a picture of cubes and problem 10 is a drawing of squares on graph paper.)

Follow Up Activities

Flash Cards for Fives

Practice on the basic facts should be done in manageable groups. Each student or pair of students will need a copy of Master 25, a sheet of blue construction paper and a small plastic storage bag. Students glue Master 25 on blue construction paper, cut out each card and write the product on the back of the card. Store cards in the bag for each student to use to practice on a regular basis, e.g., every Friday. Demonstrate how to practice with a partner. Display the fact to the student who will say the product aloud. If the student takes more than 3 or 4 seconds to say the answer, have the student repeat the fact 3 times in a complete sentence to their partner (e.g., "2 times 6 is 12,...")

Playing Card Doubles

Players: 2–4

You Need: A deck of playing cards with Jokers, Jacks, Queens and Kings removed

Shuffle the deck and place it face down in your group. One player is the leader who turns over the top card while the rest of the players mentally double the number and try to be the first to shout out the answer. The winner keeps the card. Play through the deck, then switch leaders until everyone has the chance to be leader. Write down each person's score each round and add them up to find the winner.

Card War

Players: 2

You Need: A 36 card deck (Ace through 9 in all four suits)

One player turns over a card and both players multiply it by 6 (or 7, 8, or 9 depending on the facts you learned today). The first player to say the correct product wins the card. Play continues a designated period of time (e.g., until all cards are gone, after a pass through the deck, or 3 minutes). You can also play with three players where one player turns over a card and judges who said the fact first.

Fractions

Objective: To name fractions from fraction bars. To identify similarities and differences among fraction bars.

Materials: Fraction Bars® or Fraction Strips (Master 1) and color crayons, overhead Fraction Bars® (optional)

Vocabulary: similarities, differences

Introductory Activities

Fraction Similarities and Differences

Distribute a set of Fraction Bars® to each group of 2-5 students (or students may prepare their own out of Fraction Strips, Master 1, by coloring with crayons).

Each fraction bar in this set represents one whole unit such as one whole cracker or one whole brownie. Look through your set of fraction bars with your group. Find ways your bars are all alike (similarities) and ways they are not alike (differences). Record your findings in a table with two columns headed *Similarities* and *Differences*.

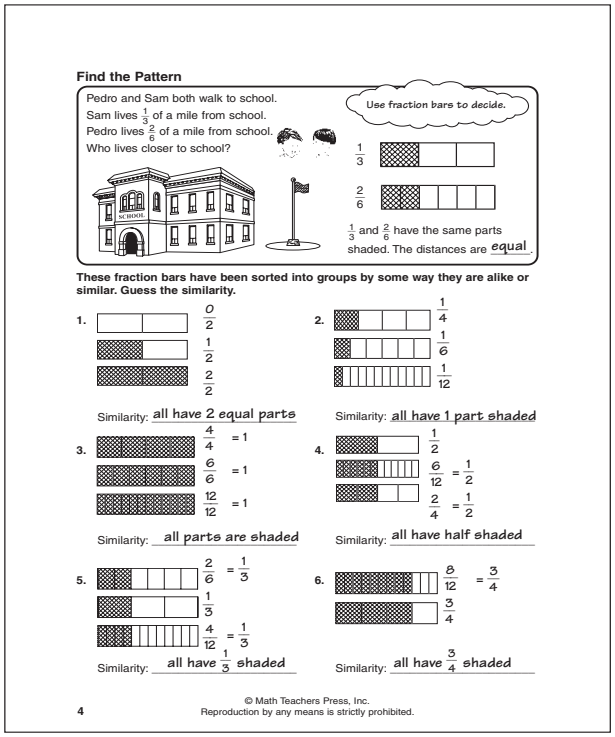
Begin by asking students to name one way they are all alike (all made of the same material) and one way they are different (all different colors). After 5 minutes, ask volunteers from each group to suggest similarities and differences they have found as you list their ideas on the board or overhead.

Similarities	Differences
same material same size same shape congruent same width and height same area and perimeter same thickness same weight all divided into parts of equal size*	colors divided into different parts number of shaded parts differs number of bars of any one color differs

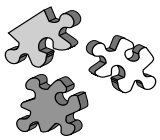
*It is very important that the last similarity (that each whole bar is divided into parts of equal size) be verbalized. This is the *essential* concept of a fraction.

About This Page

Read the example at the top of the page together. Reinforce that even though there are a different number of equal parts shaded for ⅓ and ²⁄₆, they represent the same part of the whole fraction bar. On the remainder of this page, students generalize about how a group of three fractions are alike according to a shared attribute. Illustrate the first problem with overhead fraction bars.



Follow-Up Activities



What's My Secret?

With a partner or small group, students take turns selecting a subset of fraction bars which are alike in one way. Others in the group try to guess the secret. Demonstrate an example by showing all the bars of one color and have students guess the secret of the sorting. Other ways in which the students may sort are everything shaded, nothing shaded, one part shaded and equivalent parts shaded.

Connections to Literature:

Fractions are Part of Things, Dennis, J. Richard. Fractional parts of simple shapes and irregular figures are shown.

Skill Builders 11-1, 11-2, 11-6

Fractions
Read To Me Activity

Book: *How Many Ways Can You Cut a Pie?* by Jane Belk Moncure

Summary: Squirrel promises to divide her pie into sections for her animal friends if she wins the pie contest.

Activity: As you read the story, have the students use their fraction bars to show how the pie is divided. Also have students draw a number line to show each fraction. This illustrates that there are many ways to show the same fraction.

Objective: To add fractions with unlike denominators.

Materials: Multiple strips (made from the Table of Multiples, Master 4), Fraction Bars®

Introductory Activities

Adding with Fraction Bars

The following activities prepare students to discover and use the patterns or rules for finding the lowest common denominator and changing the fractions into equivalent fractions.

Write on the board:

You are making a pizza topping with $\frac{2}{3}$ cup of white cheese and $\frac{1}{4}$ cup of yellow cheese. How much cheese in all?

Allow each small group time to discuss possible ways to solve the problem using a set of Fraction Bars®. Have students explain their thinking. Guide students to discover the Golden Rule of Fractions: you cannot add or subtract fractions unless they are the same color. **To add ⅔ (yellow) plus ¼ (blue), the bars must be changed to a common color.**

What common color can we change ⅔ and ¼ to? (orange) **Find the equivalent fractions in orange.** (⅔ = ⁸⁄₁₂ and ¼ = ³⁄₁₂)

Write on the board:

$$\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

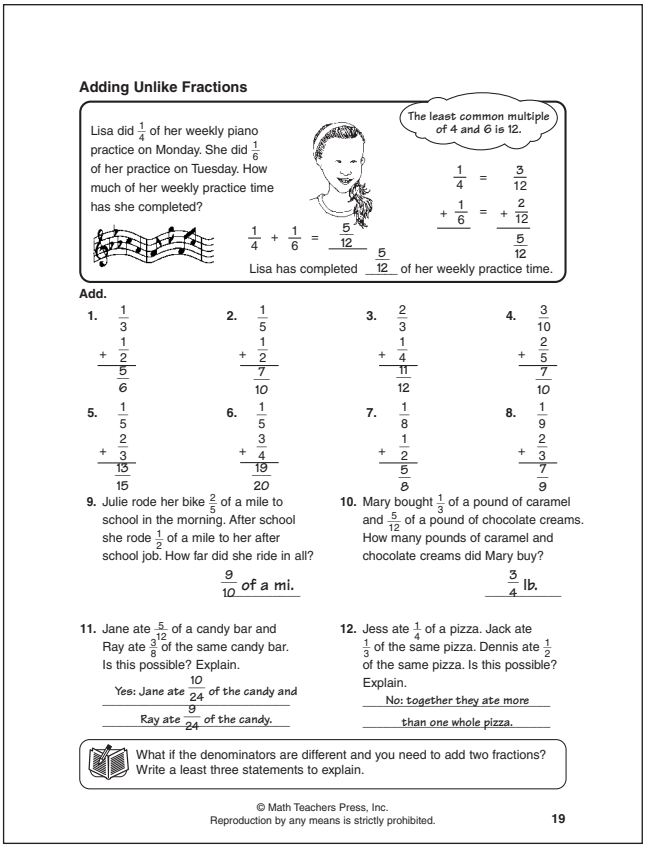
Addition with Multiple Strips

Demonstrate the same problem with the Table of Multiples (Master 4).

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

Cut the multiplication table into multiple strips. Use your multiple strips to find the lowest common denominator and equivalent fractions for each pair of fractions.

To add ⅔ + ¼, place the 2 multiple strip over the 3 multiple strip and the 1 multiple strip over the 4 multiple strip.



Adding Unlike Fractions

Lisa did $\frac{1}{4}$ of her weekly piano practice on Monday. She did $\frac{1}{6}$ of her practice on Tuesday. How much of her weekly practice time has she completed?

The least common multiple of 4 and 6 is 12.

$\frac{1}{4} = \frac{3}{12}$

$+ \frac{1}{6} = + \frac{2}{12}$

$\frac{5}{12}$

$\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$

Lisa has completed $\frac{5}{12}$ of her weekly practice time.

Add.

1. $\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$
2. $\frac{1}{5} + \frac{1}{2} = \frac{7}{10}$
3. $\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$
4. $\frac{3}{10} + \frac{2}{5} = \frac{7}{10}$
5. $\frac{1}{5} + \frac{2}{3} = \frac{13}{15}$
6. $\frac{1}{5} + \frac{3}{4} = \frac{19}{20}$
7. $\frac{1}{8} + \frac{1}{2} = \frac{5}{8}$
8. $\frac{1}{9} + \frac{2}{3} = \frac{7}{9}$

9. Julie rode her bike $\frac{2}{5}$ of a mile to school in the morning. After school she rode $\frac{1}{2}$ of a mile to her after school job. How far did she ride in all?

   $\frac{9}{10}$ of a mi.

10. Mary bought $\frac{1}{3}$ of a pound of caramel and $\frac{5}{12}$ of a pound of chocolate creams. How many pounds of caramel and chocolate creams did Mary buy?

    $\frac{3}{4}$ lb.

11. Jane ate $\frac{5}{12}$ of a candy bar and Ray ate $\frac{3}{8}$ of the same candy bar. Is this possible? Explain.

    Yes: Jane ate $\frac{10}{24}$ of the candy and Ray ate $\frac{9}{24}$ of the candy.

12. Jess ate $\frac{1}{4}$ of a pizza. Jack ate $\frac{1}{3}$ of the same pizza. Dennis ate $\frac{1}{2}$ of the same pizza. Is this possible? Explain.

    No: together they ate more than one whole pizza.

What if the denominators are different and you need to add two fractions? Write a least three statements to explain.

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2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36

1	1	2	3	4	5	6	7	8	9	10	11	12
4	4	8	12	16	20	24	28	32	36	40	44	48

What is the smallest common number in the bottom row of each fraction, the 3 and 4 rows? (12) **What number is above the 12 in the 2 row?** (8) **⁸⁄₁₂ is another name for ⅔.**

What number is above the 12 in the 1 row? (3) **³⁄₁₂ is another name for ¼.**

Write on the board:

$$\begin{array}{r} \frac{2}{3} = \frac{8}{12} \\ +\ \frac{1}{4} = +\ \frac{3}{12} \\ \hline \frac{11}{12} \end{array}$$

About This Page

Together, read the example at the top of the page. Have students use fraction bars for the first row and multiple strips for the second row. In problem 11, students may generate multiples of 12 and 8 to find the lowest common denominator of 24.

Follow-Up Activities

Skill Builders 17-1

Objective: To subtract fractions with unlike denominators.

Materials: Fraction Bars®, multiple strips (made from the Table of Multiples, Master 4), 10-sided dice

Introductory Activities

Subtraction with Fraction Bars

Write on the board:

You buy $\frac{3}{4}$ yard of fabric. You use $\frac{1}{3}$ yard to make a pillow. How much do you have left?

You live $\frac{9}{10}$ kilometer from school. You walk $\frac{1}{2}$ kilometer. How far are you from school?

Demonstrate the solution to each problem with Fraction Bars® and multiple strips. Each small group will need a set of fraction bars and a Table of Multiples (Master 4) cut into multiple strips.

You cannot add or subtract fractions unless they are the same color. Find ¾ and ⅓. Are they the same color? (No) **What color can they be changed to?** (orange)

For problem 1 change the blue ¾ bar into orange 9/12 and the yellow ⅓ bar to orange 4/12.

To show the same problem with multiple strips, place the 3 multiple strip over the 4 strip and the 1 strip over the 3 strip.

3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48

1	2	3	4	5	6	7	8	9	10	11	12
3	6	9	12	15	18	21	24	27	30	33	36

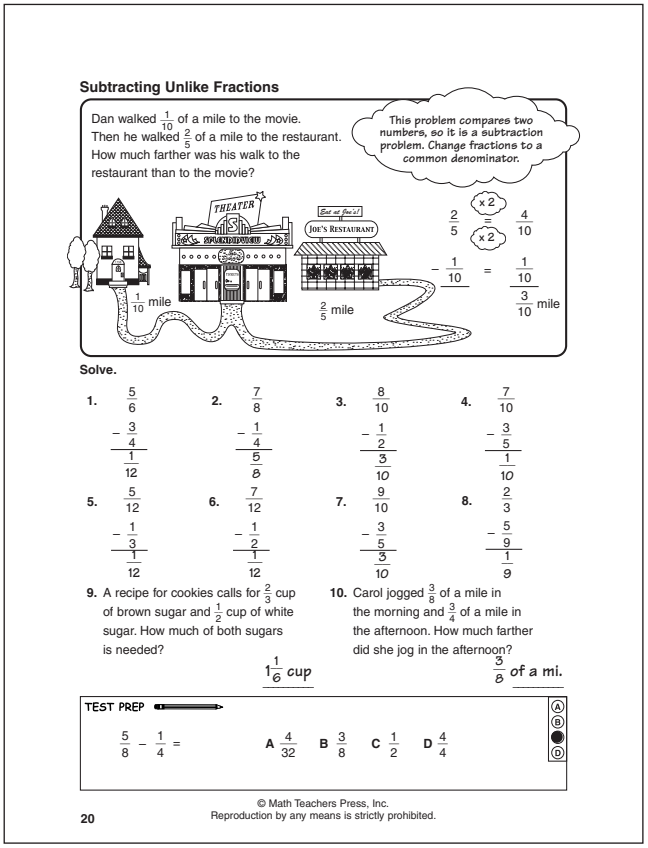
Write on the board:

$$\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

For problem 2, change ½ green to 5/10 white and then subtract: 9/10 – 5/10 = 4/10. The fraction 4/10 may be simplified to 2/5.

About This Page

Direct attention to the top of the page. Demonstrate the solution with multiple strips. Students may use fraction bars or multiple strips to complete the rest of the page.



Subtracting Unlike Fractions

Dan walked $\frac{1}{10}$ of a mile to the movie. Then he walked $\frac{2}{5}$ of a mile to the restaurant. How much farther was his walk to the restaurant than to the movie?

This problem compares two numbers, so it is a subtraction problem. Change fractions to a common denominator.

THEATER

JOE'S RESTAURANT

$\frac{1}{10}$ mile

$\frac{2}{5}$ mile

$\frac{2}{5} \times 2 = \frac{4}{10}$

$\times 2$

$-\frac{1}{10} = \frac{1}{10}$

$\frac{3}{10}$ mile

Solve.

1. $\frac{5}{6} - \frac{3}{4} = \frac{1}{12}$
2. $\frac{7}{8} - \frac{1}{4} = \frac{5}{8}$
3. $\frac{8}{10} - \frac{1}{2} = \frac{3}{10}$
4. $\frac{7}{10} - \frac{3}{5} = \frac{1}{10}$
5. $\frac{5}{12} - \frac{1}{3} = \frac{1}{12}$
6. $\frac{7}{12} - \frac{1}{2} = \frac{1}{12}$
7. $\frac{9}{10} - \frac{3}{5} = \frac{3}{10}$
8. $\frac{2}{3} - \frac{5}{9} = \frac{1}{9}$

9. A recipe for cookies calls for $\frac{2}{3}$ cup of brown sugar and $\frac{1}{2}$ cup of white sugar. How much of both sugars is needed? $1\frac{1}{6}$ cup

10. Carol jogged $\frac{3}{8}$ of a mile in the morning and $\frac{3}{4}$ of a mile in the afternoon. How much farther did she jog in the afternoon? $\frac{3}{8}$ of a mi.

TEST PREP

$\frac{5}{8} - \frac{1}{4} =$ A $\frac{4}{32}$ B $\frac{3}{8}$ C $\frac{1}{2}$ D $\frac{4}{4}$

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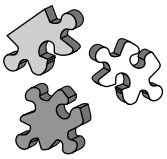
20

Follow-Up Activities



Dicey Differences

Game for 2 players. Players take turns throwing two 10-sided dice twice and forming a fraction each time using the smaller number for the numerator and the larger number for the denominator. The player with the greater difference between his or her fractions earns one point. For example, a player throwing a 1 and a 6 on the first throw and a 2 and a 3 on the second throw would subtract: ⅔ – ⅙ for a difference of ½.

Authoring Word Problems

Continue developing a class file of word problems by having students author at least one addition problem and one subtraction problem that might be solved by a computation problem from pages 19–21. Suggest common settings for the problems, e.g., cooking, map directions, capacity. Encourage students to write problems about their real world.

Skill Builders 17-2

Fraction Bar Bingo

X				X
		X		
X				X

Players: The entire class

You Need: 5 x 5 Bingo Cards, Counters to Cover the Squares, and Fraction Bars®

Students write one of the following fractions in each of the blank squares:
$\frac{1}{2}, \frac{2}{2}, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}, \frac{1}{6}, \frac{5}{6}, \frac{6}{6}, \frac{1}{10}, \frac{2}{10}, \frac{3}{10}, \frac{5}{10}, \frac{7}{10}, \frac{9}{10}, \frac{1}{12}, \frac{5}{12}, \frac{7}{12}, \frac{11}{12}, \frac{12}{12}$

Place a set of Fraction Bars® in a small box and shake. Select one fraction at a time and read it aloud. Students having that fraction or another name for it in lowest terms cover the square. For example if $\frac{9}{12}$ is drawn $\frac{3}{4}$ could be covered. The first player to get five covered in a row, column, or diagonal, is the winner. After playing a few turns, ask students which factors are best to write in the squares. (those which have the greatest number of equivalent fractions)

Using Hands-On Activities, Games, and Literacy Connections to Reach Diverse Student Needs

BOOST Conference April 30, 2011 9:15am-11:15am

Agenda

Using Hands-On Activities, Games, and Literacy Connections to Reach Diverse Student Needs

I. The Problem

II. The Solution
   A. Linking objectives, tests, and instruction
   B. The three stages of learning
   C. Scaffolding logical structures
   D. Teaching conceptual underpinnings

III. Hand-On Activities

IV. Conclusion

The Problem

National Results Indicate That Students Lack Conceptual Understanding

Problem (7- year-olds)	Percent Correct
70 - 8	42%
47 -18	40%

Stanford Achievement Test (SAT 9)

The Problem

National Results Indicate That Students Lack Conceptual Understanding

Problem	Average	Upper Quartile	Lower Quartile
34 x 2	83%	99%	68%

MATHEMATICS DEPARTMENT - MINNEAPOLIS PUBLIC SCHOOLS
Fourth Grade Math Benchmark Test Results

The Problem

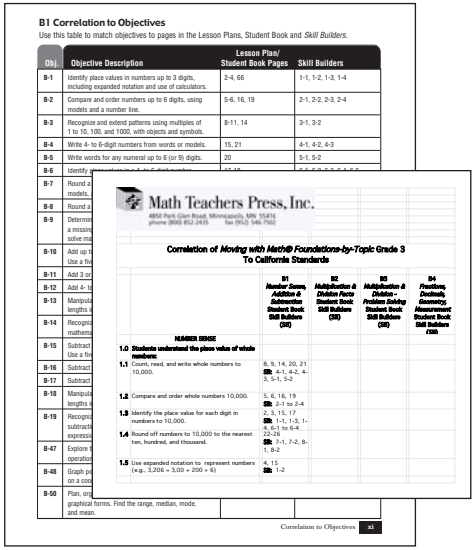
National Results Indicate That Students Lack Conceptual Understanding

Problem (13 year-olds)	% Answering Correctly
$\frac{1}{2} + \frac{1}{3}$	33%
$\frac{3}{4} + \frac{1}{2}$	33%
Estimate the best answer for $\frac{12}{13} + \frac{7}{8}$ **A** 1 **B** 2 **C** 19 **D** 21	25%

National Assessment of Educational Progress

The Solution

Linking Objectives, Tests, and Instruction



B1 Correlation to Objectives

Use this table to match objectives to pages in the Lesson Plans, Student Book and *Skill Builders*.

Obj.	Objective Description	Lesson Plan/ Student Book Pages	Skill Builders
B-1	Identify place values in numbers up to 3 digits, including expanded notation and use of calculators.	2-4, 66	1-1, 1-2, 1-3, 1-4
B-2	Compare and order numbers up to 6 digits, using models and a number line.	5-6, 16, 19	2-1, 2-2, 2-3, 2-4
B-3	Recognize and extend patterns using multiples of 1 to 10, 100, and 1000, with objects and symbols.	8-11, 14	3-1, 3-2
B-4	Write 4- to 6-digit numbers from words or models.	15, 21	4-1, 4-2, 4-3
B-5	Write words for any numeral up to 6 (or 9) digits.	20	5-1, 5-2
B-6	Identify		
B-7	Round a		
B-8	Round a		
B-9	Determin a missin solve ma		
B-10	Add up t Use a flo		
B-11	Add 3 or		
B-12	Add 4- to		
B-13	Manipula lengths a		
B-14	Recogniz mathema		
B-15	Subtract Use a flo		
B-16	Subtract		
B-17	Subtract		
B-18	Manipula lengths a		
B-19	Recogniz subtract expressi		
B-47	Explore t operatio		
B-48	Graph po on a coo		
B-50	Plan, org graphical forms. Find the range, median, mode, and mean.		

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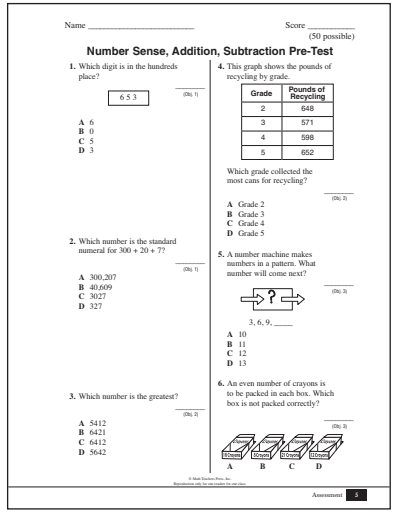
Correlation of *Moving with Math® Foundations-by-Topic* Grade 3 To California Standards

	B1 Number Sense, Addition & Subtraction Student Book: Skill Builders (SB)	B2 Multiplication & Division Facts Student Book: Skill Builders (SB)	B3 Multiplication & Division - Problem Solving Student Book: Skill Builders (SB)	B4 Fractions, Decimals, Geometry, Measurement Student Book Skill Builders only
NUMBER SENSE				
1.0 Students understand the place value of whole numbers:				
1.1 Count, read, and write whole numbers to 10,000.	8, 9, 14, 20, 21 SB: 4-1, 4-2, 4-3, 5-1, 5-2			
1.2 Compare and order whole numbers 10,000.	5, 6, 16, 19 SB: 2-1 to 2-4			
1.3 Identify the place value for each digit in numbers to 10,000.	2, 3, 15, 17 SB: 1-1, 1-3, 1-4, 4-1 to 4-4			
1.4 Round off numbers to 10,000 to the nearest ten, hundred, and thousand.	22-26 SB: 7-1, 7-2, 8-1, 8-2			
1.5 Use expanded notation to represent numbers (e.g., 3,206 = 3,00 + 200 + 6)	4, 15 SB: 1-2			

Correlation to Objectives x1



Name _____ Score _____ (50 possible)

Number Sense, Addition, Subtraction Pre-Test

1. Which digit is in the hundreds place?

6 5 3

(Obj. 1)

A 6
B 0
C 5
D 3

2. Which number is the standard numeral for 300 + 20 + 7?

(Obj. 1)

A 300,207
B 40,609
C 3027
D 327

3. Which number is the greatest?

(Obj. 2)

A 5412
B 6421
C 6412
D 5642

4. This graph shows the pounds of recycling by grade.

Grade	Pounds of Recycling
2	648
3	571
4	598
5	652

Which grade collected the most cans for recycling?

(Obj. 3)

A Grade 2
B Grade 3
C Grade 4
D Grade 5

5. A number machine makes numbers in a pattern. What number will come next?

(Obj. 3)

3, 6, 9, ____

A 10
B 11
C 12
D 13

6. An even number of crayons is to be packed in each box. Which box is not packed correctly?

(Obj. 3)

A B C D

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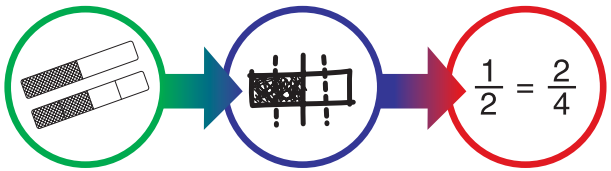
Assessment 3

The Solution

The Three Stages of Learning



Concrete Transitional Abstract

The Three Learning Styles

Kinesthetic Visual Auditory

The Solution

Scaffolding Logical Structures

An explicit and logical structure that guides and helps students understand new topics.

The Solution

Teaching Conceptual Underpinnings

- Pattern used in counting
- Pattern in our number system
- What addition means
- Meaning of multiplication
- Meaning of a fraction
- Pattern for equivalent fractions

MOVING with MATH LEARNING SYSTEM

Number Sense Read To Me Activity

Book: *Ten Flashing Fireflies* by Philemon Sturges

Summary: A young boy is proud of having caught a jar full of fireflies which seems to him like owning a piece of moonlight.

Activity: Use this story to introduce the "Towers of One More" activity. Give each student ten interlocking cubes and tell them that these will be their "fireflies." As you read the story have them show the number of fireflies that they have caught. Before you turn each page to find the number, have them add one cube to their tower and tell how many fireflies they have as one is added each time. Students will delight in being able to check their answers by reading the next page in the story.

Objective: To order the numbers 1 to 10.

Materials: Interlocking cubes, number stair, Numeral Cards 1-10, cubes and margarine tubs

Read to Me
One Bear with Bees in His Hair, Wood, Jakki
Fish Eyes, Ehlert, Lois
One Gorilla, Morozumi, Atsuko
Ten Flashing Fireflies, Sturges, Philomon (Activity 75)

1 Introductory Activity

Review: Towers of 1 More

On page 58, children used the pattern of "1 more" to make towers for the numbers 1 to 5. On this page, the activity is continued for the numbers 6 through 10. If available, a plastic number stair should be used at the end of the activity to store the towers.

In an earlier chapter, we built towers to 5 following a special pattern. The special pattern was that each new tower was made by matching the old tower and making the new tower 1 story more. Today we continue the activity and make towers up to 10 stories. First, build a tower 1 story high. Now, build a new tower by matching your old tower and making the new tower 1 story more. (Repeat 9 times.)

Now, build a new tower by matching your old tower and making the new tower 1 story more. How many stories are in your tower? (10)

Touch your shortest tower and say aloud the number of stories. Count the number of stories in each tower from your shortest tower to your tallest tower. (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

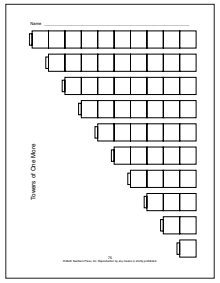
Counting from a Tower

After children can touch and count from 1 to 10, have them begin to count forward from a number.

Today we are going to count up to 10, starting from a tower other than the 1 tower. Touch your 2 tower. Count aloud from 2 to 10. (3, 4, 5, 6, 7, 8, 9, 10) Remind the children that they should not say aloud the tower they are starting from; rather, they are to count forward from that tower. This activity of counting from a number is an important readiness activity for success with addition where students should learn to count up from a number rather than having to count by ones from 1 to the number.

2 Connections Activity

Place your towers on the matching picture. Color the pictures of cubes the same color as the cubes in your tower. Write the number of stories in each tower inside the highest cube of each tower.



3 Follow-Up Activities

A STAIRCASE OF TOWERS

This game is for 2 children. Each pair will need 100 interlocking cubes and 2 sets of numeral cards 1-10. Shuffle the cards and place them face down between the 2 players. Players take turns selecting a card and building a tower to match the number selected. After each play, the card is returned to the bottom of the deck.

The object of the game is to build the towers from 1 to 10 in order. The first player to complete the staircase is the winner. If a card is selected for a tower the child has already built, the child loses that turn. After all cards have been selected once, the cards in the pile may be shuffled and used again.

ONE MORE

Hide from 1 to 9 cubes in random order under margarine tubs. Hold up 1 tub and ask the students to write the number of cubes they see under the tub.

Place 1 more cube under the tub. Ask the students to write the number of cubes under the tub now. Lift up the tub. Ask a volunteer to count the cubes. If children make a mistake, have them erase their answer and write the correct answer.

Objective:
To explore and name base ten blocks. To match the blocks with their place value names.

Materials:
Base ten blocks, Place Value Mats (Masters 1 and 2)

Note: Before class, make copies of Master 20 (Vocabulary Cards). Make copies of Master 21 (My Math Glossary) and distribute to each student.

Vocabulary:
different, place value names, same

Read to Me
One Hundred Is a Family, Ryan, Pam Munoz (Activity 2)

Introductory Activity

Introducing Base Ten Blocks

The main reason students make errors with whole number algorithms is that they do not understand multi-digit numeration. They do not know that 43 means 4 tens and 3 ones or 40 + 3.

Base ten blocks are ideal for teaching numeration concepts because students can see the abstract concept of place value each time they pick up a block. One tens block is always seen both as 1 ten and 10 ones.

Each pair or small group should have 20 ones blocks, 10 tens blocks, 10 hundreds blocks, and a place value mat.

Explain the benefits and proper use of manipulatives. Set ground rules for using them and discuss take-out and clean-up routines.

We are going to begin using base ten blocks. See what you can discover about your blocks. Allow exploratory time. Students might make buildings, roads and parking ramps.

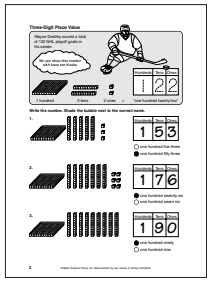
Encourage students to look for patterns. **We can find important patterns if we ask ourselves how these blocks are the *same*, or alike, and how they are *different*, or not alike.**

Write 2 columns on the board:

How are the blocks the same?
How are the blocks different?

What is one way the blocks are the same? (e.g., same material) After a period of time, ask students to share.

Same	Different
made of wood natural color points & corners solids made of 1 cm cubes 10 of 1 block = 1 of the next larger block	sizes shapes volumes weight



How many different sizes do you have? (3) **Put 1 of each size in front of you. We call the smallest block the "ones" or "units" block. How many ones does it take to make the next-sized block?** (10) **We name this block the "tens" or "long" block.**

How many of the ones blocks are the same as the largest block? (100) **We name this block the "hundreds" or "flat" block.**

The words "ones," "tens," and "hundreds" are *place value names.*

Display 1 hundred, 2 tens, 5 ones. Place the blocks correctly on a Place Value Mat. Then say the words for the blocks, **one hundred twenty-five.**

Show Me Pg. 2

Work through the example together. **Look at problem 1. What blocks are shown?** (1 hundred, 5 tens, 3 ones) **Write the number in the correct place on the chart.** (153)

To say this number aloud, touch the biggest block and say its value. (100) **Now touch the next biggest blocks and say their value.** (50) **Then touch the smallest blocks and say their value.** (3) **Now say the number together as you touch the blocks.** (one hundred fifty-three)

Have students complete problems 2 and 3 on their own or with a partner.

Objective:
To build models and draw pictures of numerals. To write numbers in expanded notation.

Materials:
Base ten blocks, Place Value Mats (Masters 1 and 2), 6-sided dice

Vocabulary: expanded notation

Read Me Me — *Amazing and Incredible Counting Stories,* Grover, Max (Activity 4)

Introductory Activities

Matching Models, Pictures and Numerals

Students develop a deeper understanding of multi-digit numeration when they see numbers represented in different ways. In this activity, students will match numbers to blocks, words, pictures and expanded notation. Each small group of students will need 20 ones blocks, 10 tens blocks and 10 hundreds blocks. Provide practice with the following activities:

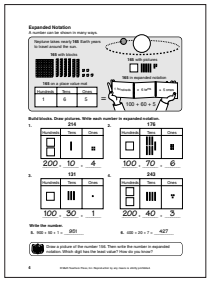
1. Writing numerals from blocks.
   Display 3 hundreds, 5 tens, 4 ones. Ask students to say the words for the blocks and then write the numbers for the blocks. (three hundred fifty-four)
2. Building blocks from numerals.
   Write a 3-digit numeral on the board. Ask students to explain what each digit in the numeral means. Ask how to read this number. Then ask them to build the number with base ten blocks on Place Value Mats. This activity can be practiced in pairs.
3. Building blocks and writing numerals from an oral presentation.
   Say a 3-digit numeral. Students build the number with base ten blocks and then record it.
4. Drawing pictures from numerals.
   Write a numeral on the board. Have students draw a picture, using small squares for hundreds, vertical lines for tens and dots for ones.

   Example: 243 = □□IIII...
5. Writing numbers in expanded notation.
   Display 3 hundreds, 5 tens and 4 ones. **What is the value of the hundreds blocks?** (300) **What is the value of the tens blocks?** (50) **What is the value of the ones blocks?** (4) **We can write the number in a way that shows the value of each digit. This is called *expanded notation*.**

   Write on the board:

3 hundreds		5 tens		4 ones		
300	+	50	+	4	=	354

Repeat with another example.



About This Page

Together, read the information at the top of the page. Students may complete the page with a partner or on their own.

Toilet Tag Activities

Hammer to 100 Game

Game for 2 players. Use base ten blocks in a pile: 1 hundred flat, 20 tens and 30 ones. Each player takes turns tossing a 6-sided die and removing the number tossed from the pile. Each time a player gets 10 ones, they are exchanged for 1 ten. The first player to get exactly 10 tens on a toss exchanges it for the 100 flat and is the winner.

Chisel to 0 Game

Each player starts with a hundred flat. A player tosses a 6-sided die and removes the number tossed out of her hundred flat. For example, if a 3 were thrown on the first turn, the player would first have to exchange the hundred flat for 10 tens and then exchange 1 of the tens for 10 ones so that the 3 ones could be removed. The winner is the first player to toss the exact number to get to exactly 0 blocks in her pile.

Skill Builders 1-2

Place Value Bingo

Card 1

Hundred	Tens	Ones

Card 2

Hundred Thousands	Tens Thousands	Ones Thousands

Card 3

Hundred Millions	Tens Millions	Ones Millions

Card 4

Tenths	Hundredths	Thousandths

1. Students write each of the digits 1–9 in random order on the squares on each card.
2. Teacher prepares 27 index cards for each of the 4 cards as follows:
   Card 1: 1 one, 2 ones, … 9 ones; 1 ten, 2 tens, … 9 tens; 1 hundred, 2 hundred, … 9 hundred.
   Card 2: 1 one thousand, … 9 one thousands; 1 ten thousand, … 9 ten thousands; 1 hundred thousand, … 9 hundred thousands.
   Card 3: 1 one million, … 9 one millions; 1 ten millions, … 9 ten millions; 1 hundred millions … 9 hundred millions.
   Card 4: 1 tenth, … 9 tenths; 1 hundredth, … 9 hundredths; 1 thousandth, … 9 thousandths.
3. Teacher (or student) selects and reads aloud 1 index card at a time, e.g., "6 hundreds" from Card 1. Every player having a 6 written in one of the hundreds squares covers the space. The first player to have 3 in a row in any direction is the winner.

Master 9

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Objective:
To act out addition problems. To develop understanding of addition as combining or putting things together. To draw pictures and write number sentences involving addition.

Vocabulary:
addition, plus sign, addition words... altogether, joining, coming together, in all

Read Me Me — *Every Buddy Counts,* Murphy, Stuart J. (Activity 3)

Introductory Activities

Acting Out a Problem

Have students act out the following problem. Describe the problem and show the correct way to record the action after the problem is acted out.

Today we are going to act out a number problem and find how to write the action in a number sentence. Be ready to answer questions about what you see.

(Student's Name) **and** (Student's Name)**, please stand by the door.**

(Student's Name), (Student's Name) **and** (Student's Name)**, please stand by the window.**

Have the students by the door and by the window come together and stand by the teacher's desk. **How many students altogether are standing by my desk?** (5)

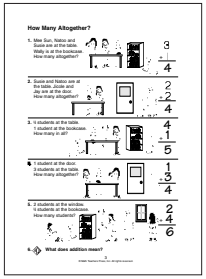
Think about what happened first in this problem and then what happened next. Tell the story to your partner. (Some students stood by a door and some students stood by a window. Then they came together and stood at the desk.) **How many stood by the door?** (2) Write 2 on the chalkboard. **How many stood by the window?** (3) Write 3 under the 2. **How many altogether were at my desk?** (5)

What are the words that describe the action in this problem—what is happening? (coming together or joining). **We call *joining* or *coming together* addition. We use the plus sign to show addition. I will write the plus sign here to show the complete sentence.**

```
  2
+ 3
  5
```

The word *altogether* means "how many in all" and tells us to add. Sometimes we will just use the words *in all* to mean addition. Now I am going to act out another problem, only this time I will see if you can write the problem correctly on your paper the same way I did on the chalkboard.

Tell another addition story using different numbers. Pause after each step to have the students record the action. **When you see a problem with a plus sign, it may help you to think about the problems we acted out.**



About The Page

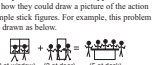
Read over the first story. Ask the students to retell the story to a partner. Then go through the story step by step as the students write in the numbers. Have students work in pairs to complete the page on their own.

What words tell you there should be a plus sign? (in all, altogether)

Toilet Tag Activities

Drawing a School Story

Re-enact the first story in Introductory Activities. **We can draw a picture of the story to help us remember what happened.** Show the students how they could draw a picture of the action using simple stick figures. For example, this problem could be drawn as below.



Now make your own addition story. Draw a picture of the story and write a number sentence.

Have students share completed stories.

MOVING with MATH LEARNING SYSTEM

Addition and Subtraction Read To Me Activity

Book: *Every Buddy Counts* by Stuart J. Murphy

Summary: A little girl goes through the day counting her "buddies," which include her pets, family members and neighbors.

Activity: Together as a class write the "buddies" that you can count around school. For example, 1 principal, 2 P.E. teachers, 3 janitors, etc. Have each student draw one set of the "buddies." When finished with the pages, put them in a class book titled, "Every Buddy at School Counts!"

Students can also write addition sentences using the class list. For example, "We have 1 principal and 3 P.E. teachers. How many buddies in all?" Have one student come to the board and write the addition sentence that goes with each problem.

Addition and Subtraction

Objective:
To use a Number Line and a Hundred Board to add a 2-digit number and a 1-digit number with regrouping.

Materials:
Classroom Number Line to 100, interlocking cubes, Blank Hundred Board (Master 12), Number Tiles (Master 6), small plastic bag, pennies and dimes, 10-sided dice

Read to Me — *12 Ways To Get to 11*, Merriam, Eve (Activity 30)

Introductory Activities

Addition on a Number Line and Hundred Board

Write on the board:

You have 28¢. You earn 5¢. How much do you have?

Put 9 dimes and 20 pennies in a small bag or coin purse. Ask a volunteer to show 28¢ with the fewest number of coins. (2 dimes 8 pennies)

Ask another student to show how much money they would have after they earned 5¢ more. Discuss the meaning of the word "earn" and different ways to find the answer. Ask students which way seems easier and why. Two possible solutions:

1. I put 5 pennies with the rest of the money and then I counted how much money in all. (10, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33¢)
2. I started with 28 and added by counting 1 penny at a time from 28. (29, 30, 31, 32, 33¢)

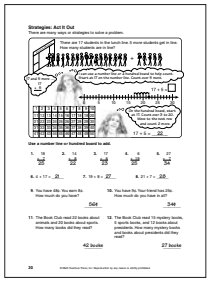
We can also show this on a number line. Have a student count out 28 cubes and place them on the number line. Have another student add 1 cube at a time and count to 33.

We can also find the answer on a Hundred Board. Have a student show how to count 5 steps up from 28 on a Hundred Board.

About This Page

Direct attention to the story and number line at the top of the page. Have a student use dimes and pennies to solve the problem, a second student show the problem on the Number Line and a third student show the problem on the Hundred Board.

Have students use a number line or Hundred Board to add. Students should complete the page on their own.



Toolbox Activities

Hundred Board Game

Each pair or small group should have a blank Hundred Board and Number Tiles (Master 6), yellow interlocking cubes and a 10-sided die. Player 1 selects a Number Tile and places it on the correct space on the Hundred Board. She then throws the dice and counts forward as many steps as the number on the die. She marks the landing point with a yellow cube and writes the number sentence on paper.

Play rotates around the group. Players earn 1 point for each correct addition fact. If a player lands on a space with a Number Tile on it, she loses that turn.

Play continues for a designated period of time or until one player gets 10 points.

Writing Word Problems

Have students make up a story related to adding a 2-digit number and a 1-digit number with and without regrouping, e.g., 34 + 5 or 34 + 8.

Have students write each problem on a page titled "Different Ways to Solve a Problem," to be saved in the class word problem file. Review different ways. Have students explain 2 or 3 different ways to solve the problem.

Skill Builders 10-3

Addition and Subtraction

Objective:
To use base ten blocks to subtract 2-digit numbers, no regrouping. To find a pattern for subtracting 2-digit numbers.

Materials:
Place Value Mats (Masters 1 and 2), base ten blocks (tens and ones)

Introductory Activities

Subtracting 2-Digit Numbers

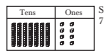
Each student, pair or group should have a Place Value Mat and base ten blocks. **Today I will tell you stories. Listen for the question and needed facts. Discuss with your partner or group how to solve the problem.**

Use the Place Value Mat and base ten blocks to solve the problem.

After you have found the answer with blocks, think of a way to record the story with paper and pencil. Be prepared to explain your method.

Story 1: You buy a box of 78 peanuts at the circus. You eat 34 peanuts. How many peanuts do you have left?

Students might record by drawing a picture,

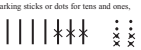


Start by building 7 tens and 8 ones.

Then remove 3 tens and 4 ones.

4 tens 4 ones

by marking sticks or dots for tens and ones,



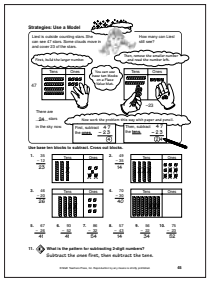
or they might record a number sentence:

78 – 34 = 44

Tell me a pattern for subtracting two 2-digit numbers.

(There are four possible patterns:

1. I subtracted 30 from 70 and 4 from 8
2. 78 – 30 is 48 and 48 – 4 is 44
3. 70 – 30 is 40 and 8 – 4 is 4, 44
4. Subtract the number in the ones place, then subtract the numbers in the tens place.)



Story 2: You have 79 hot dogs. You sell 28 hot dogs. How many hot dogs do you have?

Story 3: You have 75 peanuts. Your friend Bill has fewer peanuts than you do. How many fewer peanuts does Bill have? (not enough information)

About This Page

Work the example at the top of the page together. Have students use base ten blocks.

What is the pattern for subtracting 2-digit numbers? (subtract the ones, then subtract the tens) Have students complete the page with a partner.

Toolbox Activities

Subtraction Bingo
Skill Builders 15-19

Skill Builders 15-5

Addition and Subtraction

Subtraction Bingo

97 – 35	76 – 34	90 – 30
65 – 24	89 – 26	78 – 25
87 – 53	69 – 20	68 – 54

CALLER CARDS

53	34	63	49	60	42	41	62	14

Players: 2 or more

You Need: 9 small objects to cover your card. Cut out the CALLER CARDS from one of the sheets.

Choose a caller. Everyone else needs a blank bingo card. Write the problems above on your card in any order. The caller draws a CALLER CARD from the pile and says a number. Cover the problem on your card that would equal the number called. Yell "Bingo!" when you get 3 in any row, column, or diagonal.

Skill Builders 15-19

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Multiplication

Objective:
To multiply by 5 using pictures and models.

Materials:
Paper, crayons, interlocking cubes, tape, 100 Multiplication Facts (Master 35), Certificate of Achievement (Master 45)

Vocabulary:
product, factor

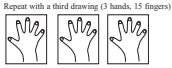
Read to Me — *Arctic Fives Arrive*, Pinczes, Elinor J. (Activity 4)
Aladdin and the Magic Lamp, (any version) to be read sometime this week

Introductory Activities

Multiplying by 5

Give each student a sheet of paper, a crayon, and interlocking cubes. **Outline a picture of one of your hands. Write your name at the top of your paper.**

Hold up one picture. **How many hands are on this picture? How many fingers?** (1 hand, 5 fingers) Tape the picture on a chalkboard. Hold up a second drawing. **How many hands in all?** (2) **How many fingers in all?** (10) Repeat with a third drawing (3 hands, 15 fingers)



How did you get your answer of 15? (counting by 1 or counting by 5). **This is a story about a 5 and a 3 that become 15.**

What was the action in this problem? (We are putting numbers together.) **What is special about the numbers we are putting together?** (They are all the same number.)

Write on the board:

5 + 5 + 5 = 15

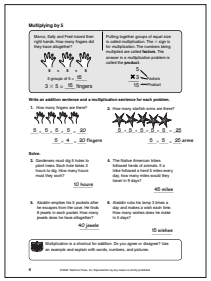
$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline 15 \end{array}$$

When we put together numbers of the same size, we are multiplying. The sign for multiplication is the times sign.

Write an × to the left of the 3 on the board.

$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline 15 \end{array} \quad \begin{array}{l} \leftarrow \text{factors} \\ \leftarrow \text{product} \end{array} \qquad 5 \times 3 = 15$$

The answer in a multiplication problem is called the *product*. The numbers being multiplied are called *factors*. Add the words "factors" and "product" to the problem on the board.



Continue to hold up other pictures of hands until you have 10 pictures of hands, each time writing a new multiplication fact on the chalkboard.

Can you use your cubes to make a model of a picture of one hand? (5 cubes) **Two hands?** (10 cubes) Have small groups of students continue to build 10 towers of 5 cubes each. Touch the cubes and count aloud as they skip count by 5 from 5 to 50.

About This Page

Read the illustration together at the top of the page. Do problems 1 and 5 together. Problems 5 and 6 on this page reference the story of *Aladdin and the Magic Lamp*. This is the first of four age appropriate books that may be read aloud over the course of a week. Remind students that math will appear in other subjects and in everyday life.

Toolbox Activities

Baseline Test on Multiplication Facts (Optional Activity)

Make copies of the 100 Multiplication Facts (Master 35) for each student. See how many facts each student is able to answer correctly in 5 minutes (allow extra time for students with severe disabilities). Repeat the test once a week, and give a final test at the end. Write the number of correct answers on the Certificate of Achievement to be sent home with each student.

MOVING with MATH LEARNING SYSTEM

Multiplication
Read To Me Activity

Book: *Arctic Fives Arrive* by Elinor J. Pinczes

Summary: A counting book in which animals in groups of five share a hilltop to view the northern lights.

Activity: As you read the story, ask, "How many groups of 5 animals are there now?" Keep track of how many animals are on the hilltop using repeated addition and multiplication. Since the story only goes to 30 have the students continue with repeated addition and multiplication up to 9 groups of 5.

Have the students vote to pick a place many different animals might go–a tree, a pond, a field an island. Assign a number to each student and tell them that is the number of groups of 2 animals that are going to the destination. Each student will fill in and illustrate the sentence, "Name's (number) groups of 2 (name of animal) are going to the (place). that is 2 + _____ (number needed) or 2 x _____ = _____ (name of animal) altogether. Ex. John's 3 groups of 2 blue jays are going to the big oak tree. That is 2 + 2+ 2 or 2 x 3 = 6 blue jays altogether. These pages may be placed on a bulletin board or in a class book titled, "Places Twos Arrive."

Objective: To skip count on a number line to find multiplication facts with 5.

Materials:
Interlocking cubes, Number Line to 100 (Master 7), counters or marbles, pie tin or empty coffee can

Read to Me — *Reese's Pieces Count by Fives,* Pallotta, Jerry (Activity 5)

Mental Math for the 5 Facts

The strategy for finding products when 5 is a factor is to count by 5. Provide oral practice with students to use this strategy.

Write on the board:

There are 7 students standing in line.
Each student has their right hand raised.
How many fingers are raised?

Have 7 students come to the front of the room. Have each student raise his or her right hand with the fingers outstretched as the class counts aloud, **"5, 10, 15, 20, 25, 30."** Continue until the last student raises her hand and the class says **"35."** Repeat with 8 students, 9 students and 10 students.

Plastic Cubes on a Number Line

Prepare a class number line by taping 2-inch wide strips of paper together from Master 7. Label the marks from 1 to 100, and tape the number line on the board or a classroom wall. Each small group of students should have interlocking cubes.

Place 1 pile of cubes on your desk equal to the fingers on 1 hand. How many cubes are shown? (5) **Place another group of 5 cubes on your desk. How many cubes are shown?** (10) Add another group of 5. **How many cubes?** (15) **How did you get your answer?** (added 3 groups of 5, counted by 5)

Have a volunteer bring her cubes to the board and demonstrate that the cubes add to 15.

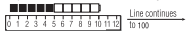
Tell an addition fact and a multiplication fact for this problem. (5 + 5 + 5 = 15 and 3 × 5 = 15)

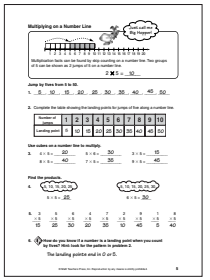
Ask a student to place the set of cubes above the number line on the board and tell how many cubes in 1 group of 5.

Write on the board:

1 group of 5 = 5 or 1 × 5 = 5

Ask a second student to join another set of 5 cubes to the first set. Then have him show the cubes on the number line. (The second set of cubes, when joined to the first set, should cover the line between 5 and 10.)





Write on the board:

2 groups of 5 = 10 or 2 × 5 = 10

Repeat through 10 × 5 = 50.

Write the landing points on the board. **What pattern do you see with numbers that are the landing points of 5?** (last digit is a 0 or 5)

Direct attention to the example at the top of the page. Demonstrate by placing 2 trains of 5 cubes each on the number line. Work several problems with the class, showing students 2 ways to multiply: (1) building upright towers of 5 cubes each and skip counting or (2) building cubes and placing them on the number line.

Listen and Count

This activity reaches out to auditory learners. Drop marbles or counters into a pie plate or empty coffee can, one at a time, pausing after each group of 5. Students count mentally and write the number of cubes or marbles when the counting stops. Have students share the totals they wrote down.

Check the total by taking the counters out of the container, one at a time, pausing as you count each group of 5.

Emphasize the landing points when you are counting.

Skill Builders 20-3

Objective: To model multiplication using arrays.

Materials: Interlocking cubes, One-Inch Graph Paper (Master 5), stapler, scissors, Multiplication Facts with 5 (Master 25), blue construction paper, glue, small plastic storage bag

Vocabulary: array

Building Arrays

Each small group will need several copies of Master 5 and 50 interlocking cubes.

Write on the board:

Mr. Banks arranged his classroom so there were 6 rows with 5 chairs in each row. How many chairs are there in his classroom?

Use your cubes to model 6 rows of chairs with 5 chairs in each row. Begin by making 1 row of 5 cubes. How many cubes in all? (5) **Write this multiplication fact.** (1 × 5 = 5). Repeat until 6 rows of 5 cubes have been made and put next to each other.

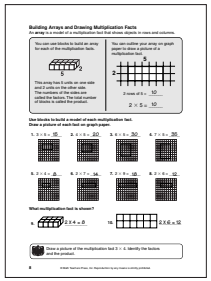
Make sure students understand the difference between rows and columns. **This rectangle is an array. An *array* models a multiplication fact by showing objects in rows (horizontal) and columns (vertical) with an equal number in each row and an equal number in each column. Move your finger to show a row. Move your finger to show a column.**

How many groups or rows of 5 do you have? (6) **How many cubes in all?** (30) **Write the multiplication fact.** (6 × 5 = 30). **Now let's look at the columns. How many columns?** (5) **How many cubes in each column?** (6) **Write the multiplication fact** (5 × 6 = 30)

Repeat the procedures through 9 groups of 5. **We have just made a model of the multiplication facts of 5. We will draw pictures of each of the arrays in the 5 family on graph paper. Outline an array to show 1 group of 5. The array will look like 1 row of square cubes. Write 1 × 5 on your array.**

Hints

The first number in a multiplication sentence indicates the number of rows, and the second number tells how many squares in each row. Relate 6 rows of 5 to the addition of 5 six times (5 + 5 + 5 + 5 + 5 + 5 = 30). Repeat drawing pictures through 9 rows of 5. After ensuring that the arrays have been drawn correctly, have each student cut out their nine arrays and staple them at the top to make a stair of 5s as shown on lesson plan page 90.



Write the answer to each fact on the back of the array so that the student can use the stairs to drill and check the multiplication facts. Refer to the diagram on page 9 of the Lesson Plans.

Activity

Read the example at the top of the page that relates the picture to the Introductory Activity. **We cannot see all of the cubes in problem 9. Can you build a model to match?** Have students study problems 9 and 10. **These are both pictures of arrays. What is the difference between the two?** (Problem 9 is a picture of cubes and problem 10 is a drawing of squares on graph paper.)

Extra Practice

Flash Cards for Fives

Practice on the basic facts should be done in manageable groups. Each student or pair of students will need a copy of Master 25, a sheet of blue construction paper and a small plastic storage bag. Students glue Master 25 on blue construction paper, cut out each card and write the product on the back of the card. Store cards in the bag for each student to use to practice on a regular basis, e.g., every Friday. Demonstrate how to practice with a partner. Display the fact to the student who will say the product aloud. If the student takes more than 3 or 4 seconds to say the answer, have the student repeat the fact 3 times in a complete sentence to their partner (e.g., "2 times 6 is 12,...")

Playing Card Doubles

Players: 2–4

You Need: A deck of playing cards with Jokers, Jacks, Queens and Kings removed

Shuffle the deck and place it face down in your group. One player is the leader who turns over the top card while the rest of the players mentally double the number and try to be the first to shout out the answer. The winner keeps the card. Play through the deck, then switch leaders until everyone has the chance to be leader. Write down each person's score each round and add them up to find the winner.

Card War

Players: 2

You Need: A 36 card deck (Ace through 9 in all four suits)

One player turns over a card and both players multiply it by 6 (or 7, 8, or 9 depending on the facts you learned today). The first player to say the correct product wins the card. Play continues a designated period of time (e.g., until all cards are gone, after a pass through the deck, or 3 minutes). You can also play with three players where one player turns over a card and judges who said the fact first.

Skill Builders 20-19

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Objective: To name fractions from fraction bars. To identify similarities and differences among fraction bars.

Materials: Fraction Bars® or Fraction Strips (Master 1) and color crayons, overhead Fraction Bars® (optional)

Vocabulary: similarities, differences

Introductory Activities

Fraction Similarities and Differences

Distribute a set of Fraction Bars® to each group of 2-5 students (or students may prepare their own out of Fraction Strips, Master 1, by coloring with crayons).

Each fraction bar in this set represents one whole unit such as one whole cracker or one whole brownie. Look through your set of fraction bars with your group. Find ways your bars are all alike (similarities) and ways they are not alike (differences). Record your findings in a table with two columns headed *Similarities* and *Differences*.

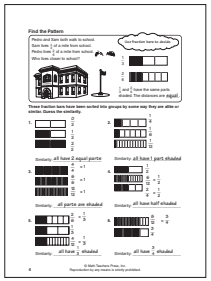
Begin by asking students to name one way they are all alike (all made of the same material) and one way they are different (all different colors). After 5 minutes, ask volunteers from each group to suggest similarities and differences they have found as you list their ideas on the board or overhead.

Similarities	Differences
same material same size same shape congruent same width and height same area and perimeter same thickness same weight all divided into parts of equal size*	colors divided into different parts number of shaded parts differs number of bars of any one color differs

*It is very important that the last similarity (that each whole bar is divided into parts of equal size) be verbalized. This is the *essential* concept of a fraction.

About This Page

Read the example at the top of the page together. Reinforce that even though there are a different number of equal parts shaded for $\frac{1}{3}$ and $\frac{2}{6}$, they represent the same part of the whole fraction bar. On the remainder of this page, students generalize



about how a group of three fractions are alike according to a shared attribute. Illustrate the first problem with overhead fraction bars.

Follow-Up Activities

What's My Secret?

With a partner or small group, students take turns selecting a subset of fraction bars which are alike in one way. Others in the group try to guess the secret. Demonstrate an example by showing all the bars of one color and have students guess the secret of the sorting. Other ways in which the students may sort are everything shaded, nothing shaded, one part shaded and equivalent parts shaded.

Connections to Literature:

Fractions are Part of Things, Dennis, J. Richard. Fractional parts of simple shapes and irregular figures are shown.

Skill Builders 11-1, 11-2, 11-6

MOVING with MATH LEARNING SYSTEM

Fractions
Read To Me Activity

Book: *How Many Ways Can You Cut a Pie?* by Jane Belk Moncure

Summary: Squirrel promises to divide her pie into sections for her animal friends if she wins the pie contest.

Activity: As you read the story, have the students use their fraction bars to show how the pie is divided. Also have students draw a number line to show each fraction. This illustrates that there are many ways to show the same fraction.

Objective: To add fractions with unlike denominators.

Materials: Multiple strips (made from the Table of Multiples, Master 4), Fraction Bars®

Introductory Activities

Adding with Fraction Bars

The following activities prepare students to discover and use the patterns or rules for finding the lowest common denominator and changing the fractions into equivalent fractions.

Write on the board:

You are making a pizza topping with $\frac{2}{3}$ cup of white cheese and $\frac{1}{4}$ cup of yellow cheese. How much cheese in all?

Allow each small group time to discuss possible ways to solve the problem using a set of Fraction Bars®. Have students explain their thinking. Guide students to discover the Golden Rule of Fractions: you cannot add or subtract fractions unless they are the same color. **To add ⅔ (yellow) plus ¼ (blue), the bars must be changed to a common color.**

What common color can we change ⅔ and ¼ to? (orange) **Find the equivalent fractions in orange.** (⅔ = 8/12 and ¼ = 3/12)

Write on the board:

$$\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

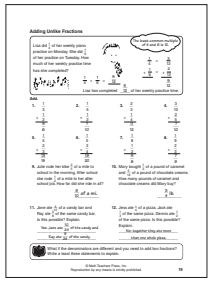
Addition with Multiple Strips

Demonstrate the same problem with the Table of Multiples (Master 4).

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

Cut the multiplication table into multiple strips. Use your multiple strips to find the lowest common denominator and equivalent fractions for each pair of fractions.

To add ⅔ + ¼, place the 2 multiple strip over the 3 multiple strip and the 1 multiple strip over the 4 multiple strip.



2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36

1	1	2	3	4	5	6	7	8	9	10	11	12
4	4	8	12	16	20	24	28	32	36	40	44	48

What is the smallest common number in the bottom row of each fraction, the 3 and 4 rows? (12) **What number is above the 12 in the 2 row?** (8) **8/12 is another name for ⅔.**

What number is above the 12 in the 1 row? (3) **3/12 is another name for ¼.**

Write on the board:

$$\frac{2}{3} = \frac{8}{12}$$
$$+ \frac{1}{4} = + \frac{3}{12}$$
$$\frac{11}{12}$$

About This Page

Together, read the example at the top of the page. Have students use fraction bars for the first row and multiple strips for the second row. In problem 11, students may generate multiples of 12 and 8 to find the lowest common denominator of 24.

Follow-Up Activities

Skill Builders 17-1

Objective: To subtract fractions with unlike denominators.

Materials: Fraction Bars®, multiple strips (made from the Table of Multiples, Master 4), 10-sided dice

Introductory Activities

Subtraction with Fraction Bars

Write on the board:

You buy $\frac{3}{4}$ yard of fabric. You use $\frac{1}{2}$ yard to make a pillow. How much do you have left?

You live $\frac{9}{10}$ kilometer from school. You walk $\frac{1}{2}$ kilometer. How far are you from school?

Demonstrate the solution to each problem with Fraction Bars® and multiple strips. Each small group will need a set of fraction bars and a Table of Multiples (Master 4) cut into multiple strips.

You cannot add or subtract fractions unless they are the same color. Find ⅔ and ¼. Are they the same color? (No) **What color can they be changed to?** (orange)

For problem 1 change the blue ¾ bar into orange 9/12 and the yellow ½ bar to orange 6/12.

To show the same problem with multiple strips, place the 3 multiple strip over the 4 strip and the 1 strip over the 3 strip.

3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48

1	2	3	4	5	6	7	8	9	10	11	12
3	6	9	12	15	18	21	24	27	30	33	36

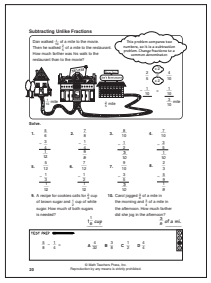
Write on the board:

$$\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

For problem 2, change ½ green to 5/10 white and then subtract: 7/10 – 5/10 = 2/10. The fraction 2/10 may be simplified to ⅕.

About This Page

Direct attention to the top of the page. Demonstrate the solution with multiple strips. Students may use fraction bars or multiple strips to complete the rest of the page.



Follow-Up Activities

Dicey Differences

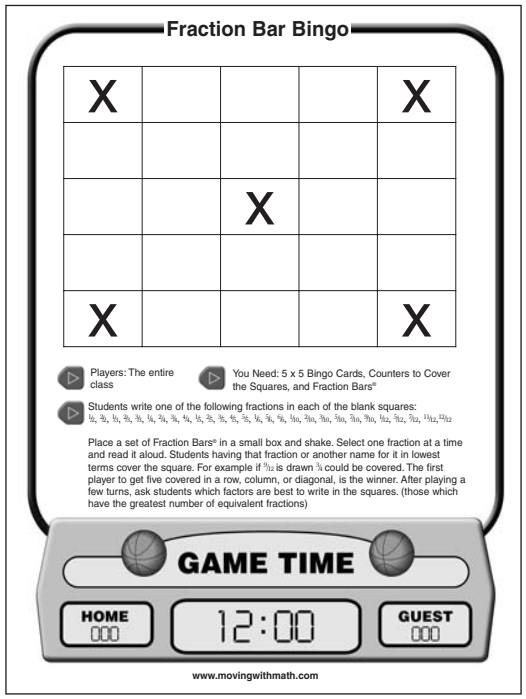
Game for 2 players. Players take turns throwing two 10-sided dice twice and forming a fraction each time using the smaller number for the numerator and the larger number for the denominator. The player with the greater difference between his or her fractions earns one point. For example, a player throwing a 1 and a 6 on the first throw and a 2 and a 3 on the second throw would subtract: ⅔ – 1/6 for a difference of ½.

Authoring Word Problems

Continue developing a class file of word problems by having students author at least one addition problem and one subtraction problem that might be solved by a computation problem from pages 19–21. Suggest common settings for the problems, e.g., cooking, map directions, capacity. Encourage students to write problems about their real world.

Skill Builders 17-2

Fractions



Conclusion

Teaching Conceptual Underpinnings

- **Counting Pattern** - each number is one more
- **Place Value** - 10 of one block is the same as one of the next larger block
- **Addition** - putting numbers together
- **Multiplication** - putting together groups of the same size
- **Fraction** - a whole divided into parts of equal size
- **Equivalent Fractions** - multiply or divide numerator and denominator by the same number

Conclusion

"We remember 10% of what we hear, 30% of what we see, and 90% of what we do."

- Jean Piaget