BRIDGES IN MATHEMATICS 2

GRADE 2 SUPPLEMENT

Set A5 Number & Operations: Multi-Digit Addition & Subtraction

Includes

Skills & Concepts

- ★ group three-digit numbers into hundreds, tens, and ones in more than one way
- ★ count by tens or hundreds forward and backward from 1 to 1,000 starting at any number
- ★ adding and subtracting tens and hundreds
- ★ comparing and ordering numbers from 0 to 1,000
- ★ add and subtract two-digit numbers efficiently and accurately using a procedure that works with all two-digit numbers and explain why the procedure works

Published by The MATH LEARNING CENTER *Salem, Oregon*

P0709

Bridges in Mathematics Grade 2 Supplement
Set A5 Number & Operations: Multi-Digit Addition & Subtraction

The Math Learning Center, PO Box 12929, Salem, Oregon 97309. Tel. 1 800 575–8130.

Prepared for publication on Macintosh Desktop Publishing system.
Printed in the United States of America.

P0709

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set A5 ★ Activity 1

ACTIVITY

52 Weeks; 365 Days

Overview

Student pairs use base ten pieces to represent 52 in a variety of ways. Then the class works together to consider some of the different ways to represent 365. This activity may be repeated many times with different numbers.

Skills & Concepts

★ group three-digit numbers into hundreds, tens, and ones in more than one way

★ describe the relative size among hours, days, weeks, months, and years

You'll need

★ set of base ten pieces for each pair of students

★ chart paper or space on the whiteboard

★ markers

★ 3 sheets of 9″ × 12″ construction paper, 1 white, 1 blue, and 1 yellow (see Advance Preparation)

Advance Preparation Write "Hundreds" on the yellow sheet of construction paper, "Tens" on the blue sheet, and "Ones" on the white sheet. (If you made mats like these for Set A4, Activity 1, and saved them, reuse them for this activity.)

Note The day before you conduct this activity, assign students to find out how many weeks and how many days there are in a year. If some of the children already know, ask them to keep the information secret until math time the following day.

Instructions for 52 Weeks; 365 Days

1. Gather students to your discussion area. Have them sit in a semi-circle where they can all see the whiteboard or chart paper you've posted. Ask them to share what they learned about how many weeks there are, and how many days there are in a year. As they share, press them to explain why there are so many more days than weeks in a year.

> ***Students*** *My dad told me there are 52 weeks in a year.*
> *I found out there are 365 days in a year.*
> *I got the same answers, 52 and 365.*
> *My mom said some years have an extra day in them, but most have 365.*
>
> ***Teacher*** *I'm going to record these two numbers up here on the whiteboard. Why are there so many more days than weeks in a year?*
>
> ***Students*** *It takes 7 days to make a week.*
> *A week is way longer than a day.*
> *There are lots of days in a year, but not so many weeks.*
> *It goes days, weeks, then months, because there are only 12 months in a year.*

Activity 1 52 Weeks; 365 Days (cont.)

2. As students watch, set out a base ten unit, strip, and mat in the middle of the circle. Review the name of each piece with the class, and make sure children understand that the unit is worth one. Then ask them the following questions:

- How many units are there in a strip? How do you know?
- How many strips are there in a mat? How do you know?
- How many units are there in a mat? Explain your thinking.

3. Now pass out a set of base ten pieces to each pair of students and ask them to display 52 units in any way they can. They can use any combination of strips and units, as long as there are 52 units total in their collection. Encourage students who are working quickly to see how many different combinations of pieces they can make that have a total of 52 units. As they work, write the headings shown below on the whiteboard or a piece of paper.

strips (10s) units (1s) total number of pieces

4. When they have had a few minutes to work, ask students to report how many strips and units are in their collections. Record the collections on the class chart as they share. Ask students to identify which collection used the most pieces and which used the fewest. Explain that the collection with the fewest pieces is called the *minimal* collection, and mark that collection with a star. Which collection is the fastest and easiest to build? Why?

52

strips (10s)	units (1s)	total number of pieces
0	52	52
1	42	43
2	32	34
3	22	25
4	12	16
5	2	7 ★

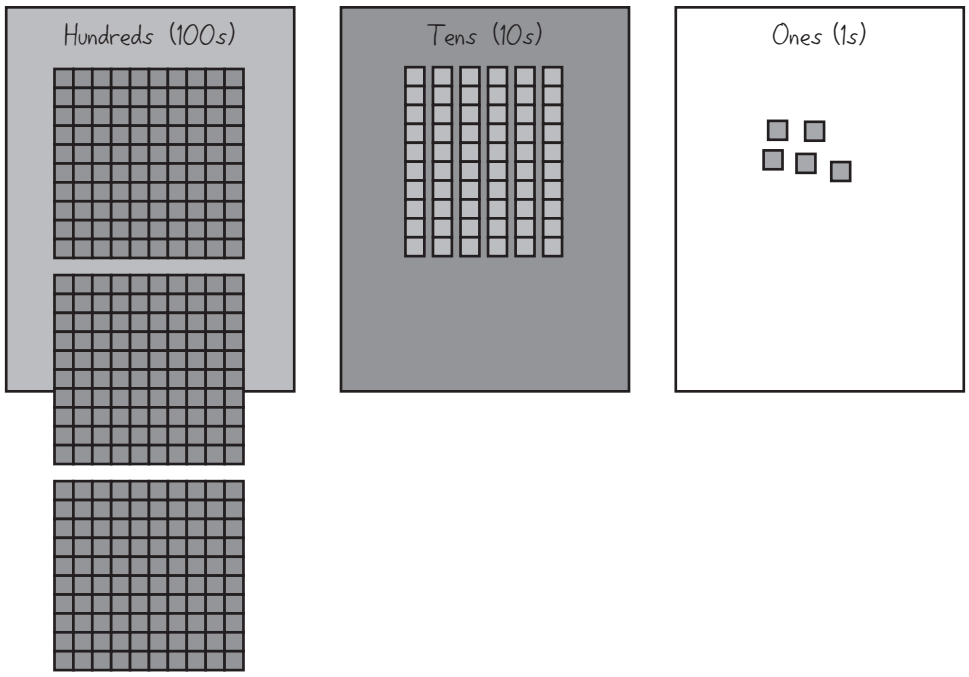
5. Next, ask students to consider the number 365. How could they build this number using the fewest possible pieces? What would be the minimal collection for 365? Have the children pair-share their ideas, and then call on volunteers to share their thinking with the class.

> ***Students*** *It would be 3 mats for the hundreds, but I'm not sure about the rest.*
> *Three mats for the hundreds, then 6 strips for the tens – that makes 9 pieces.*
> *I think 14 pieces because 3 mats, 6 strips, and 5 units. Three and 6 is 9, then 5 more is 14 in all.*

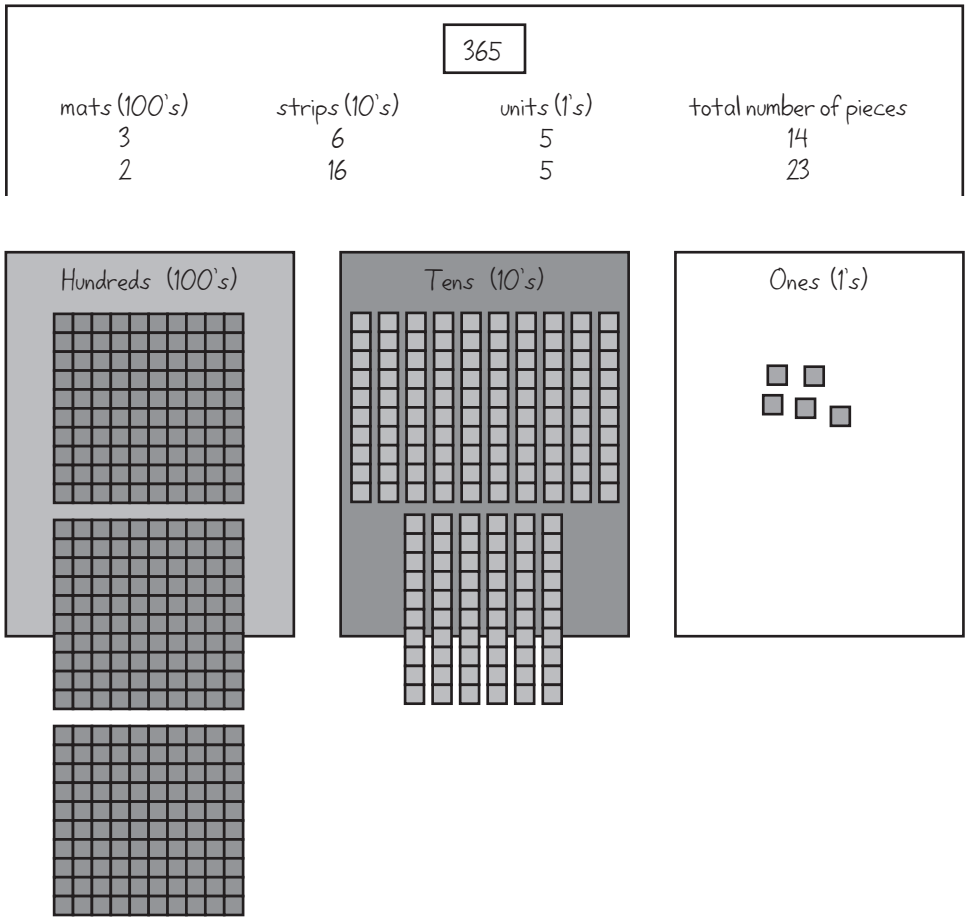
6. After some discussion, lay out the yellow, blue and white pieces of construction paper. Work with help from the students to build 365 with 3 mats, 6 strips, and 5 units. Discuss the resulting display with the class. Pose the following questions:

- Is this the minimal collection? How do you know?
- Is there any way you could build the number with fewer pieces?
- How many hundreds are there in 365?
- How many tens?
- How many ones?

Activity 1 52 Weeks; 365 Days (cont.)



7. Chances are, many students will report that there are 6 tens and 5 ones in 365. Press them to consider some of the other possibilities. What would happen if you traded in one of the mats for 10 strips? Work with help from students, and then record the results on the whiteboard or another piece of chart paper.



Activity 1 52 Weeks; 365 Days (cont.)

8. Repeat step 7 twice more, until all the mats have been traded for strips. Record the results on the chart each time.

365

mats (100s)	strips (10s)	units (1s)	total number of pieces
3	6	5	14
2	16	5	23
1	26	5	32
0	36	5	41

9. Ask students to share observations about the numbers on the chart. Can they spot any patterns?

> ***Students*** *The mats go down every time: 3, 2, 1, then 0.*
> *There are more strips every time. It goes 6, 16, 26, and then 36.*
> *It's 10 more strips every time.*
> *The units keep being the same every time. It's always 5 units.*
> *I know why it gets 10 more strips each time! It's because we get more 10 strips every time we trade in a mat!*

Here are some additional questions to pose during the discussion.

- Which collection took the fewest pieces to build? Why?
- Could there be a smaller collection of pieces for 365? Why or why not?
- When you trade all the mats of 100 in for strips of 10, how many tens are there in 365?
- If you traded in all the strips for units, how many ones would there be in 365?
- Which collection is the quickest and easiest to build? Why?

Extension

- Repeat this activity, steps 5–9 only, with other 3-digit numbers. You may want to have your students investigate a different 3-digit number each week during Number Corner for a couple of months running. You might choose even multiples of 100, such as 400 or 600, and/or 3-digit numbers that have some significance to students, such as the number of children in your school, the number of people that can be seated in the cafeteria, the number of people who bought tickets to the school play, and so on.

INDEPENDENT WORKSHEET

Use Set A5 Independent Worksheet 1 to provide students with more practice grouping three-digit numbers into hundreds, tens, and ones in more than one way.

Set A5 ★ Activity 2

ACTIVITY

Jump-a-Ten

Overview

Students count by tens starting from 10, and then from a variety of other numbers on a 1–100 and a 1–200 chart. Then they play a whole-group game on the 1–200 chart. Jump-a-Ten may be added to your set of Work Places once students have been introduced to the game.

Skills & Concepts

- ★ count by tens or hundreds forward and backward from 1 to 1,000 starting at any number
- ★ adding and subtracting tens
- ★ comparing and ordering numbers from 0 to 1,000

You'll need

- ★ 1–200 Chart (page A5.9, run a class set plus one copy on a transparency)
- ★ Jump-a-Ten Record Sheet (optional, page A5.10, run a class set)
- ★ Hundreds Grid pocket chart
- ★ Hundreds Grid Number Cards 1–100 (see Advance Preparation)
- ★ 3 yellow game markers
- ★ 1 red game marker for each student, plus one extra
- ★ 3 *pennies
- ★ 6 dice marked 1–6
- ★ whiteboard space and markers (see Advance Preparation)

Advance Preparation Fill the Hundreds Grid pocket chart on your Number Corner display board with all the number cards, 1–100. Draw 2 copies of the recording form shown below on the whiteboard or a piece of chart paper.

Starting Number	Yellow	Red

Activity 2 Jump-a-Ten (cont.)

Instructions for Jump-a-Ten

1. Ask students to join you in the Number Corner area. Explain that you are going to play a new game with them today, but first you're going to practice counting by tens. Point to the 10 on the Hundreds Grid pocket chart and ask the students to count by tens to 100 with you. Point to each multiple of 10 as the students count.

2. Now point to the 6. Ask students if it is possible to count by tens starting from 6 instead of 10. Give them a minute to pair-share their ideas and then call on volunteers to share their thinking with the class.

> ***Students*** *Nope, you have to start on 10 to count by tens.*
> *Counting by tens goes 10, 20, 30, 40, 50, 60, and like that. You have to start on 10.*
> *You could start on 0, and then go up to 10, but you can't start on 6.*
> *You could sort of count by tens if you started on 6 and then added 10. That would be 16.*

3. After some discussion, explain that today, the class is going to learn to count by tens starting with any number on the chart. Point to the 6 again, and ask students to add ten. What is 6 + 10? When they have had a moment to think and respond, point to the 16. Ask them to add ten again. What is 16 + 10? Give them a moment to think and respond, and point to the 26. Repeat this sequence through 96. Explain that moving forward or backward by adding or subtracting ten from any number is another way to count by tens.

4. Now point to 94 on the chart. If the children count backwards by tens from 94, where will they land at the end of the sequence? Give students a moment to discuss their ideas, and then point to each number as you count backwards by tens with the class.

> ***Students*** *94, 84, 74, 64, 54, 44, 34, 24, 14, 4.*
> *Four is the last number, just like I thought.*
> *You can't go any farther backwards.*

5. Next, point to the 3. If the children count forward by tens from 3, where will they land at the end of the sequence? Give students a moment to discuss their ideas, and then point to each number as you count forwards by tens with the class. When you get to 93, ask students what the next number in the sequence would be. What is 93 + 10? What would come after 103? What would come after 113? Count with the class by tens up to 193.

6. Ask students to return to their tables. Give them each a copy of the 1–200 Chart, and display your own copy at the overhead. Ask the children to study the chart quietly for a moment and then pair-share some of their observations. Can they find and describe any patterns?

7. After they have had a minute or two to share their ideas, ask them to point to the 7 on the chart as you circle the number on the overhead. Have them count forward by tens, pointing to each number on their chart, while you circle the numbers at the overhead. When you have reached 197, ask them what would come next in the sequence. Then have them share observations about the numbers you have circled.

> ***Students*** *It would be 207 next because that's 10 more.*
> *All those numbers have 7's at the end.*
> *It goes 7, 17, 27, 37, and when it gets to 107, it starts all over, like 117, 127, 137, and on and on.*
> *If we had more numbers on our chart, it would start over again at 207, then 307, and up and up.*

Activity 2 Jump-a-Ten (cont.)

8. Erase the overhead and tell the class that you are going to play a new game with them called Jump-a-Ten. Briefly explain the game rules outlined below and then take your turn so students can see how the game works.

- Each team places their marker anywhere on the 1–200 chart except the number 100. Each team has to choose a different column, but may start in the same row. (133 and 136 are okay starting places; 128 and 108 are not.)
* The two teams take turns to toss a die marked 1–6, and at the same time, a penny. The die tells how many jumps of 10 to make, and the penny tells whether to jump forward (heads) or backward (tails). For instance, if a team tosses a 5 and heads, they jump their marker ahead 5 tens. If a team tosses a 3 and tails, they jump their marker backwards 3 tens.
- Each team gets 5 turns to toss and jump. Each new turn starts from where the marker landed on the previous turn. If a team cannot take the designated number of jumps forward or backward, they lose that turn. (For instance, if their marker is on 27 and the team tosses 5 and tails, they cannot take 5 jumps of ten backwards, and must wait until their next turn.) The team that lands closest to 100 on their last turn wins. Teams have the option of using two dice marked 1–6 instead of one die on their last turn.

> ***Teacher*** *I'm going to put my marker on 105 to start. Then I'll toss the die and the penny at the same time. Let's see. I got heads and 4. If I jump my marker ahead 4 tens, where will I land?* (Gives students a moment to think and respond.) *Here I go. Please count with me.*
>
> ***Students*** *115, 125, 135, 145. You landed on 145. It's our turn.*

9. Give students each a red game marker. Choose a volunteer to decide where to place the red marker for the class. Have students each place their marker on that number on their own charts. Then ask a second volunteer to toss the penny and the die for the class, and a third to move the marker at the overhead as all the students move their markers on their own charts and count forward or backwards by tens.

10. Record the starting numbers and the results of the first turn on the board for both teams.

	Yellow	Red
Starting Number	105	99
	145	69

11. Continue taking turns with the class and recording the results on the board until both teams have had 5 turns. Then ask the students to determine which team landed closest to 100, and circle the winning team on the board.

Activity 2 Jump-a-Ten (cont.)

Students *We did! We landed on 89 right at the end, and you're only on 85.*
89 is closer to 100 because it's only 11 away. 85 is 15 away. We won!
I was worried when we got all the way back to 9, but then we got heads two times.

Set A5 Number & Operations: Multi-Digit Addition & Subtraction Blackline Run a class set and one copy on a transparency.

NAME _____ DATE _____

1–120 Chart

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

Starting Number	Yellow	Red
	105	99
	145	69
	175	9
	115	59
	75	49
	85	89

12. If time allows, play the game a second time. This time, let the class be first to place their marker and take their turn.

Extensions

- Repeat this activity several more times with the whole class. Once students learn to play, it makes a good sponge activity.
- If you want to add Jump-a-Ten to your collection of Work Places, laminate three of the 1-200 charts, or place them in protective plastic sleeves. Place the charts, along with 3 pennies, 6 dice marked 1-6, 3 yellow and 3 red game markers, and a class set of Jump-a-Ten record sheets in a Work Place tub.

NAME _____ **DATE** _____

1–200 Chart

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

NAME _____ **DATE** _____

Jump-a-Ten Record Sheet

Game 1			Game 2		
	Yellow	Red		Yellow	Red
Starting Number			Starting Number		
1			1		
2			2		
3			3		
4			4		
5			5		

Game 3			Game 4		
	Yellow	Red		Yellow	Red
Starting Number			Starting Number		
1			1		
2			2		
3			3		
4			4		
5			5		

Set A5 ★ Activity 3

ACTIVITY

Jump-a-Hundred

Overview

Students count by hundreds starting from 0, and then from a variety of other numbers on an open number line. Then they play a whole-group game on the number line. Jump-a-Hundred may be added to your set of Work Places once students have been introduced to the game.

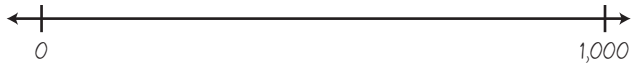
Skills & Concepts

- ★ count by tens or hundreds forward and backward from 1 to 1,000 starting at any number
- ★ adding and subtracting hundreds
- ★ comparing and ordering numbers from 0 to 1,000

You'll need

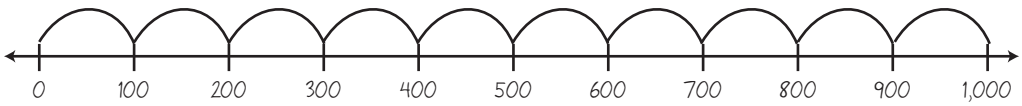
- ★ Jump-a-Hundred Record Sheet (page A5.15, run one copy on a transparency; class set optional)
- ★ 3 pennies
- ★ 3 dice marked 1–6
- ★ blue and red overhead pens
- ★ 3 blue and 3 red colored pencils (optional)
- ★ whiteboard space and markers (see Advance Preparation)

Advance Preparation Draw an open number line on the whiteboard. Label it at one end with 0 and the other with 1,000.



Instructions for Jump-a-Hundred

1. Draw students' attention to the number line on the whiteboard. Explain that you are going to play a new game with them today, but first you're going to practice counting by hundreds. Point to the 0 on the number line and ask the students to count by hundreds to 1,000 as you draw "jumps" along the line. When you reach 1,000, go back and work with student input to label the jumps with numbers.

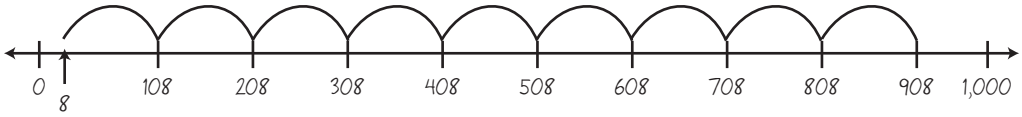


2. Erase the line and quickly draw another, labeled with 0 at one end and 1,000 at the other. Make a mark a short distance from the 0 and label it with 8. Ask students if it is possible to count by hundreds starting from 8 instead of 0. Give them a minute to pair-share their ideas and then call on volunteers to share their thinking with the class.

> ***Students*** *I think it's like those tens on the chart. You can start with any number if you just add 100 every time.*
> *I don't. I think you have to start with zero to count by hundreds.*
> *If you start with 8 and add 100, you get 108. Then if you add another hundred, you get 208. You can keep going, but you won't land on 1,000.*

Activity 3 Jump-a-Hundred (cont.)

3. After some discussion, ask students to add 100 to 8 as you draw a "jump" on the line. What is the total? Add hundreds one by one, marking and labeling the line each time. Explain that moving forward or backward by adding or subtracting one hundred from any number is another way to count by hundreds.



4. Erase the line again and draw a new one, labeled with 0 at one end and 1,000 at the other. Make a mark a short distance before the 1,000 and label it 983. If the children count backwards by hundreds from 983 toward 0, where will they land at the end of the sequence? Give students a moment to discuss their ideas, and then draw jumps and work with student input to label them as you count backwards by hundreds from 983 with the class.

5. Repeat steps 2–4 several times, erasing the line each time, starting with a new number between 0 and 100 or 900 and 1,000, and counting by hundreds forwards or backwards as far as the line allows.

6. Display the record sheet at the overhead and tell the class that you are going to play a new game with them called Jump-a-Hundred. Briefly explain the game rules outlined below and then take your turn so students can see how the game works.

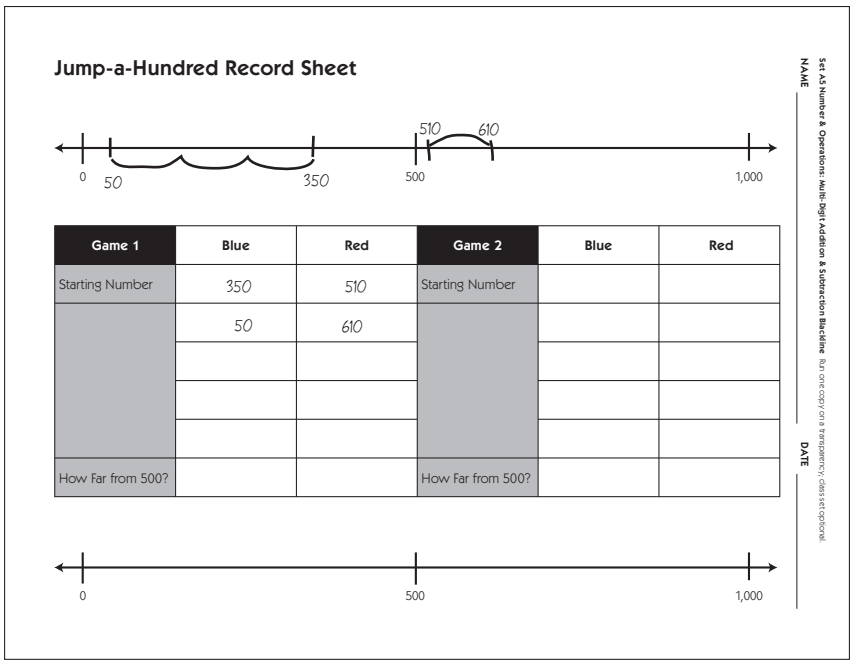
- Each team marks and labels a number anywhere along the line except the number 500. Each team uses its own pen color. One team marks and labels above the line, the other below.
- The two teams take turns to toss a die marked 1–6, and at the same time, a penny. The die tells how many jumps of 100 to make, and the penny tells whether to jump forward (heads) or backward (tails). For instance, if a team tosses a 5 and heads, they make 5 jumps of 100 forward along the line and label their end point. If a team tosses a 3 and tails, they make 3 jumps of 100 backward along the line and label their end point.
- Each team gets 5 turns to toss and jump. Each new turn starts from where they landed along the line on the previous turn. If a team cannot take the designated number of jumps forward or backward, they lose that turn. (For instance, if they landed on 228 the previous turn and happen to toss a 5 and a tails, they cannot take 5 jumps of one hundred backwards, and must wait until their next turn.) Each team circles their final number on the line. The team that lands closest to 500 on their last turn wins.

> ***Teacher*** *I'm going to be the blue team, and you're going to be the red. I'm going to make a mark in blue at 350 to start. Then I'll toss the die and the penny at the same time. Let's see. I got tails and 3. If I jump backwards 3 hundreds from 350, where will I land? (*Gives students a moment to think and respond.*) Here I go. Please count with me as I mark the line.*
>
> ***Students*** *250, 150, 50. You landed on 50. It's our turn.*

7. Ask students to pair-share where they would like to start along the line. When they have had a minute to discuss their options, choose a volunteer to decide where the class will start. Make a mark in red at that location along the line. Then ask a second volunteer to toss the penny and the die for the class, and report the results. Have students predict where they will land along the line. Then draw the jumps and label the endpoint as they count forwards or backward by hundreds.

8. Record the starting numbers and the results of the first turn on the overhead for both teams.

Activity 3 Jump-a-Hundred (cont.)



Jump-a-Hundred Record Sheet

NAME

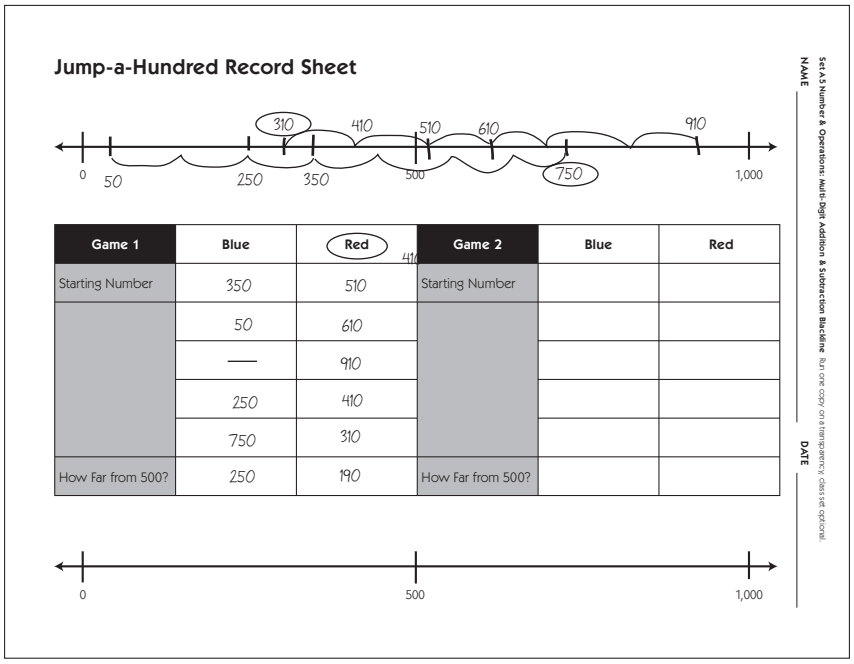
DATE

Set A5 Number & Operations: Multi-Digit Addition & Subtraction Blackline Run one copy on a transparency; class set optional.

Game 1	Blue	Red	Game 2	Blue	Red
Starting Number	350	510	Starting Number		
	50	610			
How Far from 500?			How Far from 500?		

9. Continue taking turns with the class and recording the results on the board until both teams have had 5 turns. Then ask the students to determine which team landed closest to 500, and circle the winning team on the board.

> ***Students*** *I think we won this time.*
> *You landed on 750 for your last turn. That's up 200 and then 50 more from 500.*
> *We got 310. It's 90 up to 400, and then 100 more.*
> *We're only 190 away, but you're 250 away. We won!*



Jump-a-Hundred Record Sheet

NAME

DATE

Set A5 Number & Operations: Multi-Digit Addition & Subtraction Blackline Run one copy on a transparency; class set optional.

Game 1	Blue	Red	Game 2	Blue	Red
Starting Number	350	510	Starting Number		
	50	610			
	——	910			
	250	410			
	750	310			
How Far from 500?	250	190	How Far from 500?		

Activity 3 Jump-a-Hundred (cont.)

10. The Jump-a-Hundred record sheet has a second number line at the bottom, and space to record a second game. Play again with the class if time allows. Let them choose their number and start first this time. You may want to continue to record at the overhead for them.

Extensions

- Repeat this activity several more times with the whole class. Once students learn to play, it makes a good sponge activity.
- If you want to add Jump-a-Hundred to your collection of Work Places, run a class set of the Jump-a-Hundred record sheets. Place the sheets, along with 3 pennies, 3 dice marked 1–6, 3 blue pencils, and 3 red pencils in a Work Place tub.

NAME ______________________________ DATE ______________

Jump-a-Hundred Record Sheet

Game 1	Blue	Red	Game 2	Blue	Red
Starting Number			Starting Number		
How Far from 500?			How Far from 500?		

Set A5 ★ Activity 4

ACTIVITY

Modifying the Base Ten Bank

Overview

The Base Ten Bank is a Number Corner component introduced in January to help second graders develop place value understandings, as well as generate strategies for adding and subtracting 2- and 3-digit numbers. This component is revisited in the Number Corner each month through April. The text below suggests modifications you can make to the Base Ten Bank starting in March to teach a regrouping strategy for multi-digit addition and subtraction.

Skills & Concepts

★ add and subtract two-digit numbers efficiently and accurately using a procedure that works with all two-digit numbers and explain why the procedure works

You'll need

★ the Base Ten Bank pocket chart

★ base ten pieces (mats, strips, and units)

★ Base Ten Bank Ten Strips (page A5.29, see Advance Preparation)

★ Base Ten Bank Addition blacklines (pages A5.30 and A5.31, run as needed

★ 5 dice, one marked 1–6, two marked 4–9 and two marked 10, 10, 20, 20, 30, 40

Advance Preparation Prepare this component by posting the Base Ten Bank pocket chart where all the students can see it. In addition, run 10 copies of Blackline A5.29. Cut these sheets in half lengthwise. Staple the 20 half-sheets together to form a pad of ten-strips. If you don't already have 2 dice numbered 4–9 and 5–10, label 2 of your wooden cubes with the appropriate numbers. Keep your collection of base ten pieces close at hand.

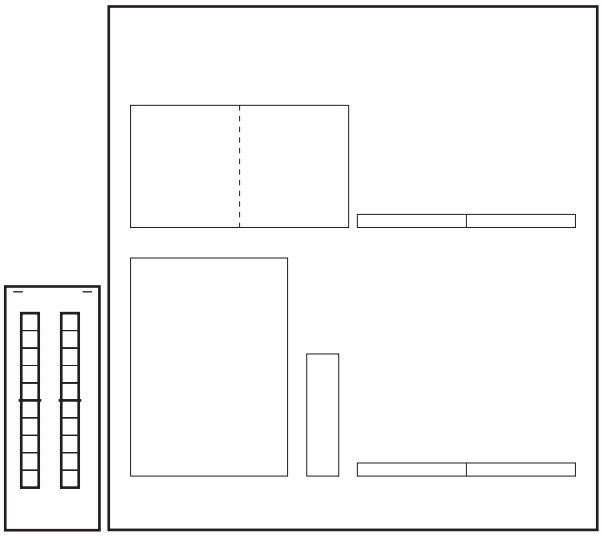
January Base Ten Bank Overview

The Base Ten Bank is a specially-designed pocket chart that holds a growing collection of base ten pieces. While it has nothing to do with the day's date or the number of school days that have passed, it provides important opportunities for children to develop place value understandings. Each time this component is featured, the students roll 2 dice, total the numbers, and add that many base ten pieces to the collection in the "bank." After the first day, they are asked to add the new deposit to the standing collection. Some do so by mentally combining the pieces. Others use mental arithmetic, usually adding the 10's first and then the 1's. Still others use base ten pieces from the class supply or make sketches to arrive at the total. Solutions and strategies are shared, all the pieces are moved to the top row of pockets, and the new total is posted.

Introducing the Base Ten Bank in January

When you first introduce this component, the Base Ten Bank will be empty, as shown on the next page:

Activity 4 Modifying the Base Ten Bank (cont.)

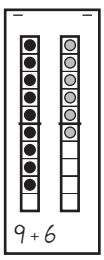


Take a minute for student observations, and then explain that this is a wall bank. Each time you do the Number Corner this month and next, you'll make a deposit of base ten pieces. The amount deposited will be determined by rolling the dice and adding the 2 numbers, and will have nothing to do with the day's date or the number of days you've been in school. Today you'll have a student volunteer roll the 2 dice. The children will work together to determine the total, using dots on the ten-strips to help, and you'll place that many base ten pieces in the top row of pockets.

> ***Teacher*** *Anna, you're the Helping Hand for today. Would you please roll the 2 dice to determine our first deposit?*
>
> ***Anna*** *Sure! The 2 numbers are 9 and 6.*
>
> ***Hayden*** *That's 15!*

(Some of your students will probably be able to total any combination that comes up on the dice instantly. Others will need a minute to figure the answer. In order to encourage children to use strategies other than counting on (or counting from 1 in some cases), we recommend that you show the combination with dots on a pair of ten-strips. The fact that the ten-strips are placed side-by-side and subdivided into fives tends to help students think in chunks and mentally move dots around to form easier combinations.)

> ***Teacher*** *Even though some of you already know the total, let's have a look at 9 + 6 on our ten-strips here. I'm going to stick 9 dots on one strip and 6 dots on the other. Will you help me count as I go?*
>
> ***Children*** *1, 2, 3, 4, 5, 6, 7, 8, 9—1, 2, 3, 4, 5, 6!*



Activity 4 Modifying the Base Ten Bank (cont.)

Teacher *If you didn't already know the total, how could you use the dots on these 2 ten-strips to help?*

Nicholas *I'd count on: 9—10, 11, 12, 13, 14, 15.*

Teacher *Well sure—counting on always works, but it can take a little time. Can anyone think of a different way?*

(While we want to acknowledge the idea of counting on, we also want to nudge children in the direction of applying more efficient strategies.)

Caroline *You could pretend to move a dot over from the 6 to the 9. That would make it 10 plus 5, and that's 15.*

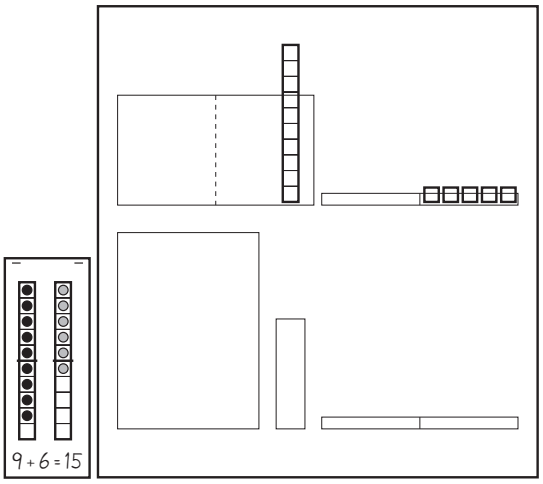
Teacher *Any other methods?*

Jensen *I'd count the 5's above the lines, and then see that there were 5 more below the lines—5, 10, 15.*

Teacher *Do we all agree that the total is 15?*

Children *Yes!*

Teacher *Let's record the answer using base ten pieces and post 15 in the top row of our bank then.*



Continuing Through January and February with the Base Ten Bank

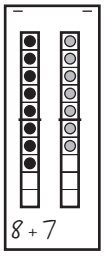
Each time you conduct a Number Corner session for the rest of this month and the next, your class will make a deposit to the Base Ten Bank. Just as they did for the first deposit, children will roll the 2 dice, calculate the sum using dots on the ten-strips as a visual aid, deposit that number of base ten pieces in the bank, and figure the new bank total. Your focus will be on helping children develop a variety of strategies for adding 2- and 3-digit numbers. Although you could certainly use the Base Ten Bank as a way to teach "carrying," we strongly urge you to let children develop their own methods right now. You can introduce the traditional method later, as one of several options, but if you hold off for now, you'll find that your students' place value understandings will be greatly enhanced.

Activity 4 Modifying the Base Ten Bank (cont.)

Teacher *Taylor, you're the helper for today. Will you please roll the 2 dice and report the numbers that come up?*

Taylor *I got 8 and 7.*

Teacher *Let's have a look at that by putting dots on the ten-strips.*



Natalie *It's 15 because 7 plus 7 makes 14, and 1 more is 15.*

Laura *8 + 7 is a neighbor because the 2 numbers live next door.*

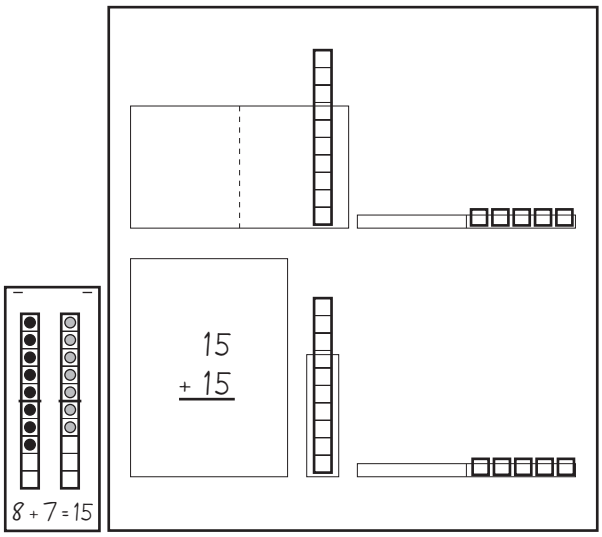
Teacher *That's right, and Natalie used the strategy of figuring the double and adding 1 more. Can anyone think of a different way?*

Brittany *You can look at the 5's. There are two 5's above the line, and if you add the 3 and the 2 below the line, that's another 5. Three 5's is 15.*

Vincent *Look! You can move 2 dots over from the 7 to the 8. Then it's like 10 plus 5—15!*

Teacher *Wow! There certainly are lots of ways to add 8 and 7! So we're going to make a deposit of 15 base ten pieces to our bank today? Let's go ahead and put those pieces in the second row of pockets. I'm also going to write a number sentence to show what we're adding. What should I write?*

Nicholas *15 + 15, 'cause you have 15 on top and you're adding 15.*



Activity 4 Modifying the Base Ten Bank (cont.)

Teacher *Now the question is, when we add today's deposit to the amount we already have in the bank, how much will we have in all? I'm going to ask you to take a minute to look at the base ten pieces, look at the numbers, and figure out the total.*

Megan *I already know what it is!*

Teacher *That's great! Let's take a minute for other people to think about it. I see kids really thinking hard about this one.*

(We generally ask children to think about the problem quietly for a minute and raise their hands when they have an idea. After having students share their solutions, we go back and ask several of them to explain their strategies.)

Teacher *Is anyone willing to share their solution to this problem?*

Ele Tasia *It's 30.*

Zachary *I got 30 too.*

Teacher *Did anyone get a different solution? No? Who would like to share how they got 30?*

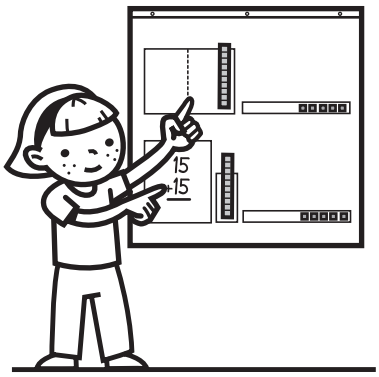
Zaavosh *I already knew it. I just know that 15 and 15 is 30.*

Hayden *Me too.*

Sarah *Can I show?*

Teacher *Sure!*

Sarah *I looked and saw 10 and 10 was 20. Then I just counted on the little ones.*



Anna *I kind of did it like Sarah. I looked at the sticks and saw 2 tens. Then I knew that 5 plus 5 is 10, so I knew the whole thing was 30.*

Things may not always go as smoothly as in the discussion above. There will be days when students arrive at several different solutions. In a way, this makes things far more interesting in that children have more reason to listen to one another, and more reason to present their thinking as clearly as possible. There will be days when nearly everyone seems to be able to calculate a total in his or her head and other days when some of your students may choose to get out base ten kits and work with the pieces directly.

Activity 4 Modifying the Base Ten Bank (cont.)

It won't be more than about 7 or 8 sessions until you've reached 100. At that point, you'll need to trade the ten strips in for a mat and pin the mat up beside the Base Ten Bank. In the space of 2 months, we usually reach 300 to 400. No matter how far we have or haven't gotten, though, we start "withdrawing" base ten pieces from the bank at the beginning of March. (This process will be described in the March Number Corner.)

One of the reasons we like the Base Ten Bank so well as a method of introducing double- and triple-digit addition is that it necessitates regrouping some days and not others. Children are very quick to distinguish the 2 situations: 53 + 15 brings cries of "Oh, easy!" while 69 + 18 produces thoughtful silence as some children reach for scratch paper or base ten pieces. *Allowing children to invent and share their own solution methods is central to this activity.* Even students who are still one-by-one counters at heart quickly see the wisdom of working in 10's and 1's and learn readily from one another. Those who aren't ready to think about adding double digits in the abstract are usually able to do so using base ten pieces. These students are literally able to *see* the strategies described by your more abstract thinkers.

> ***Justin*** *When I do 69 + 18, I just think 60 plus 10 is 70. Then I know that 9 plus 8 is 17 and 70 plus 17 is 87.*
>
> ***Laura*** *I see what you mean. 60 plus 10 is 70. Then I have 9 more. That's 79, 8 more would be* 79—*80, 81, 82, 83, 84, 85, 86, 87.*

If no one proposes the traditional method of carrying, you might want to offer it as another possibility toward the end of the month. You'll find that if you present it as the "real" or "best" method, though, you may shut down some of the mathematical thinking your students have been doing. If you remain open to the children's inventions, you'll find that as a group, they'll head in the direction of efficiency while demonstrating some great number sense and math power.

Base Ten Bank Addition

There may come a point this month when you'd like to have students work a couple of the Base Ten Bank problems on their own. After several weeks of group work, it can be useful to know how individual students in your class are handling these problems. Although most may appear to follow the strategies proposed by classmates during group discussion, it's entirely possible that some don't really understand what's going on, or haven't yet moved beyond counting by 1's. On the other hand, you may have some very quiet students who haven't really demonstrated what they can do in front of the group. Finally, there are children who just do better when they're able to work through problems using paper and pencil to track their work with manipulatives or numbers. For some of these children, it's harder to think and work in the pressure cooker of a whole-group discussion, and easier to share their ideas once they've had a little time to think things through on their own.

The Base Ten Bank Addition blacklines simply give students a place to record and work the problem of the day on paper. Children are encouraged to use Unifix cubes, base ten pieces, pictures, or numbers, and to show as much of their thinking and work on the page as possible using words, pictures, and/or numbers. You will almost certainly have to nudge some of them into showing more than the answer, especially if they've used Unifix cubes or base ten pieces to solve the problem. Sketches labeled with numbers, written descriptions, or number sentences, no matter how rough, will be instrumental in helping you understand their methods.

Activity 4 Modifying the Base Ten Bank (cont.)

It's important for students to understand that there's no one right way to do these problems, and that what you're most interested in is their current thinking. It's important for you to accept all levels of work, understanding that even children who need to solve the problem by drawing two sets of tally marks, and then counting them all one by one (or do the equivalent in Unifix cubes) will grow and change over the next few months.

Once children have solved the problem in their books, be sure to take a minute to discuss their solutions and post the new base ten pieces in the pocket chart.

February Base Ten Bank

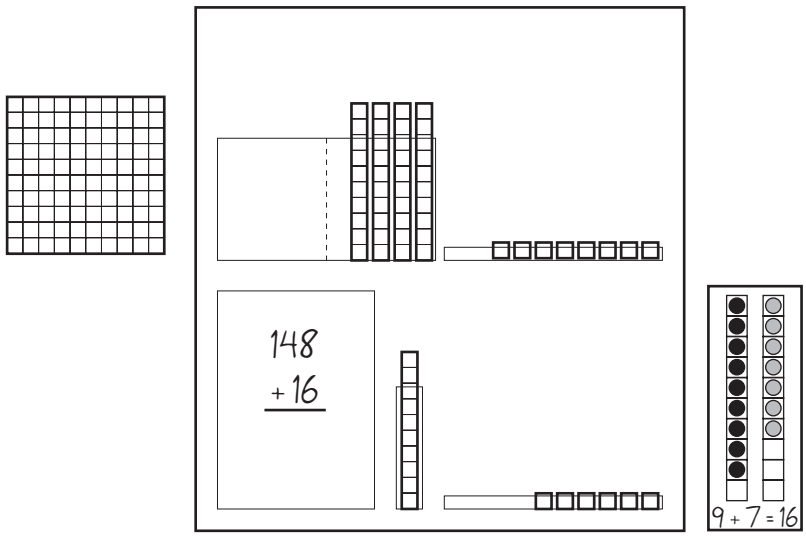
Each time you conduct a Number Corner session this month, your class will make a deposit to the Base Ten Bank. Just as they did for their January deposits, children will roll the two dice, calculate the sum using dots on the ten-strips as a visual aid, deposit that number of base ten pieces to the bank, and figure the new bank total. Your focus will be on helping children continue to develop a variety of strategies for adding 2- and 3-digit numbers.

> ***Teacher*** *Justin, you're the helper for today. Will you please roll the 2 dice and report the numbers that come up?*
>
> ***Justin*** *I got 9 and 7.*
>
> ***Children*** *It's 16!*
>
> ***Teacher*** *How do you know?*
>
> ***Children*** *I've been practicing. I just know that one now.*
> ***It's*** *like 10 and 7, but it's 1 less. That's 16.*
> ***If*** *you level off the 2 numbers, it's like 8 and 8—16!*

By now, you'll probably find that you don't need to post the combination on the ten-strips with adhesive dots every day.

> ***Teacher*** *Now the question is, when we add today's deposit to the amount we already have in the bank, how much will we have in all? I'm going to ask you to take a minute to look at the base ten pieces, look at the numbers, and figure out the total.*

Activity 4 Modifying the Base Ten Bank (cont.)



Once the problem has been posted, ask children to think about the problem quietly for a minute and raise their hands when they have an idea. After having students share their solutions, go back and ask several of them to explain their strategies.

Teacher *Is anyone willing to share their solution to this problem?*

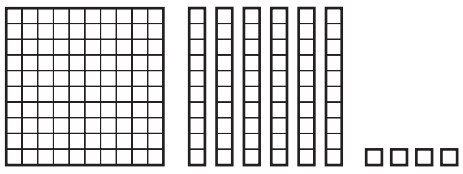
Brittany *It's 164.*

Sarah *That's what I got too.*

Laura *Not me. I got 166.*

Teacher *It sounds like we have two different ideas. Would anyone be willing to share their strategy with us? Perhaps we'll understand your answers better if we see what you were thinking.*

Ian *I got 164. What I did is I knew there was 100 already. Then I saw that 40 and 10 more would be 50. Then I added the 1's. I moved 2 up to the 8 to make 10 and traded it in for a ten-strip. Then I had 60 with 4 more left over, like this:*



Teacher *What do you think of Ian's method? Do you understand what he did here?*

Children *Yes!*
That's *what I thought—164!*
I *see what I did wrong. I thought 8 plus 6 was 16 instead of 14.*

Teacher *Did anyone have a different method?*

Activity 4 Modifying the Base Ten Bank (cont.)

Hayden *I did. I worked with the numbers. I looked and saw 8 plus 6 was 14. I carried the 10 over to the 10's like my mom showed me, so I had 10 plus 40 plus 10, and that was 60. And then I had the 100.*

$$\begin{array}{r} {\scriptstyle 1} \\ 148 \\ +\ 16 \\ \hline 164 \end{array}$$

Teacher *Anyone else?*

Zachary *I did it the other way from Hayden. I started with the hundred. Then I added the 10's. That was 50. Then the 1's were 14, and I knew that 50 plus 14 was 64. So I had 164.*

Teacher *If I write Zachary's method out in numbers, it could look like this:*

$$\begin{array}{r} 148 \\ +\ 16 \\ \hline 100 \\ 50 \\ 14 \\ \hline 164 \end{array}$$

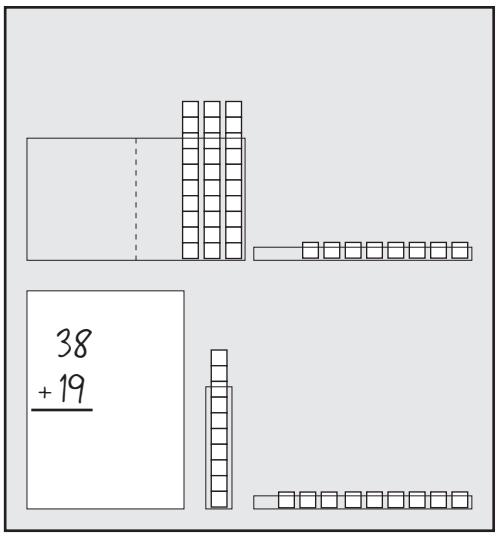
By the end of this month, you will probably have collected somewhere between 200 to 300 units. Children will have had many opportunities to explore strategies for adding 2- and 3-digit numbers. Starting in March, you will formally introduce the standard algorithm for adding multi-digit numbers. In April, you'll introduce the standard algorithm for subtracting multi-digit numbers.

March Base Ten Bank

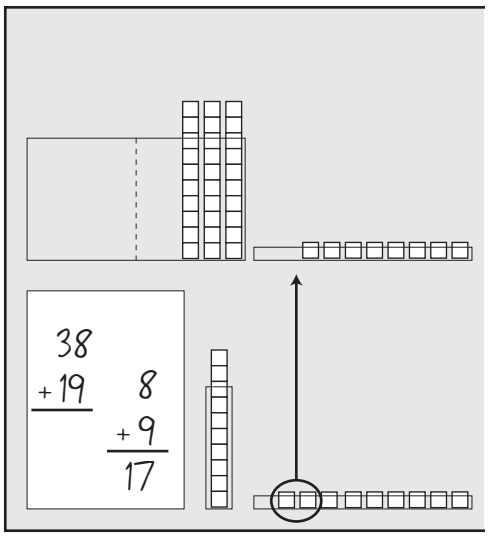
Instead of starting from the total number of base 10 pieces you have accumulated by the end of February and going backwards in March as described in the Number Corner guide (pages 197–201), clear all the pieces out of the Base 10 Bank pocket chart. Then roll two dice, one numbered 4–9 and the other 10, 10, 20, 20, 30, 40 once, and then once again to generate problems such as 38 + 19. Work with students to model and solve a couple of double-digit problems each day during Number Corner using the Base Ten Bank pocket chart and base ten pieces. Clear out the pieces after each problem rather than keeping a cumulative collection. You may want to use dice or find other ways to make up 3-digit, as well as 2-digit addition problems.

Invite many different strategies the first few days. If a student volunteers a regrouping strategy, work with the class to model it with the base ten pieces. If not, introduce it yourself, adding the units first, and regrouping as necessary. Record the process with numbers and symbols on the pocket chart, whiteboard, or a piece of chart paper. One way of handling this on the Base Ten Bank pocket chart is shown below.

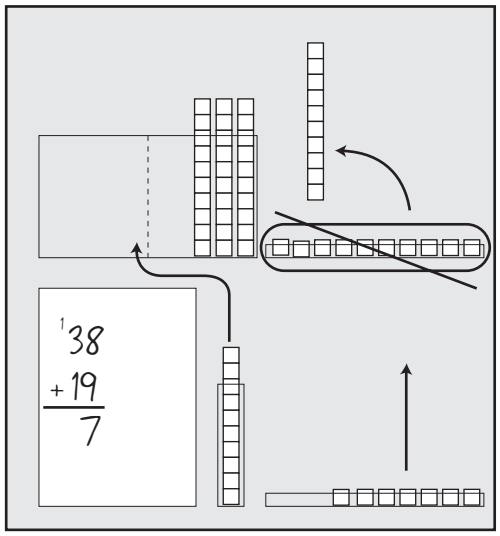
Activity 4 Modifying the Base Ten Bank (cont.)



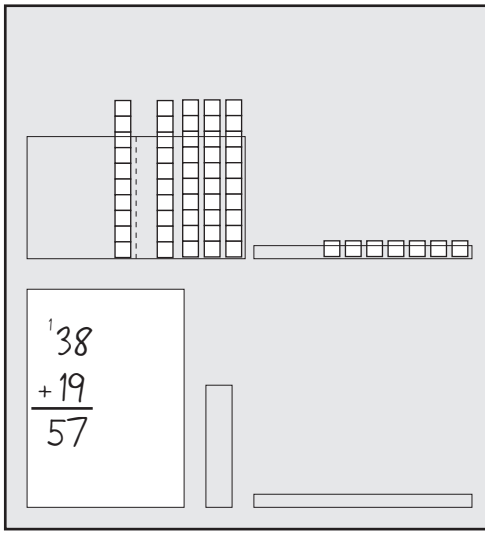
Step 1: Set up the problem



Step 2: Add the 1's



Step 3: Regroup if necessary



Step 4: Find the total

Over the course of the month, have students use their own base 10 pieces, sketches, and numbers to practice the regrouping strategy.

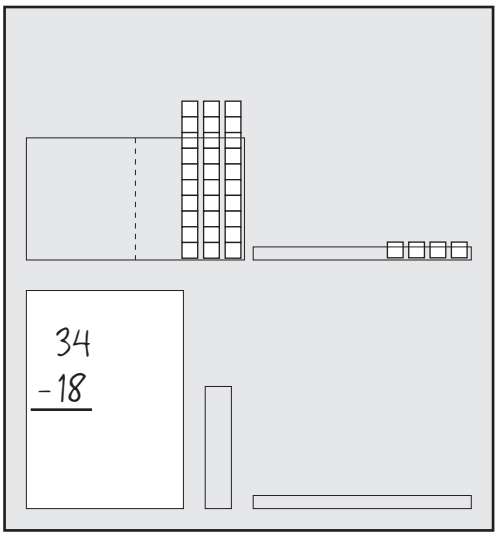
Do your students need to be completely proficient with the regrouping strategy for addition by the end of the school year, or do they just need to understand it and be able to explain how it works? If the goal is complete proficiency, you will need to provide practice several times a week during Number Corner, as well as giving students short problem sets during seatwork and/or homework throughout the entire spring.

April Base Ten Bank

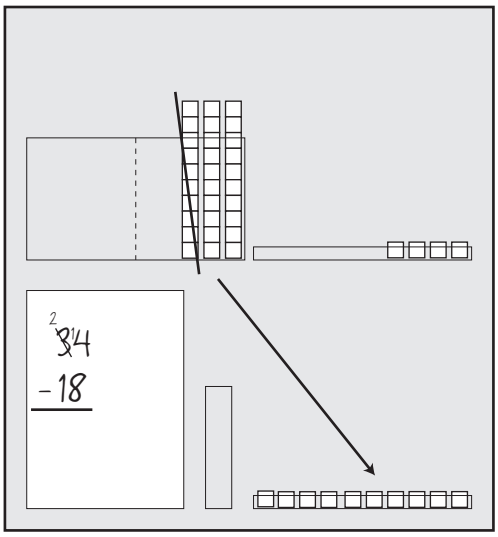
Begin with an empty Base Ten Bank pocket chart. Roll two dice numbered 10, 10, 20, 20, 30, 40, along with one die numbered 1–6. Set up that quantity with base 10 pieces in the Bank Ten Bank pocket chart. Then roll two dice numbered 4–9, or some other combination of dice that seems reasonable to generate a subtrahend. Do a couple of subtraction problems generated in this way each day, clearing out the pocket chart between each problem. Solicit students' invented strategies for the first several days of the

Activity 4 Modifying the Base Ten Bank (cont.)

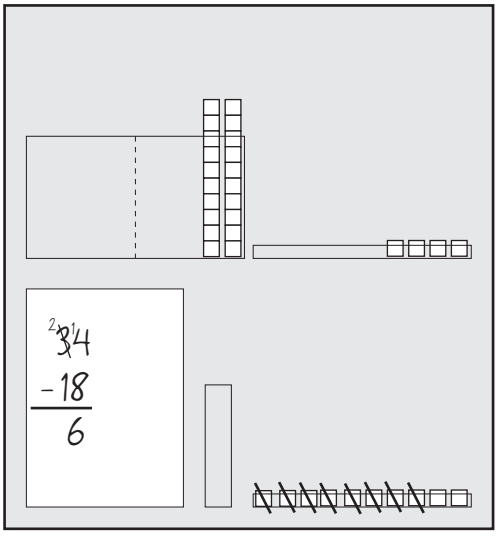
month, and then either model a regrouping strategy for subtraction as described by a student, or volunteer it yourself, as another option. One way of handling this on the Base Ten Bank pocket chart is shown below.



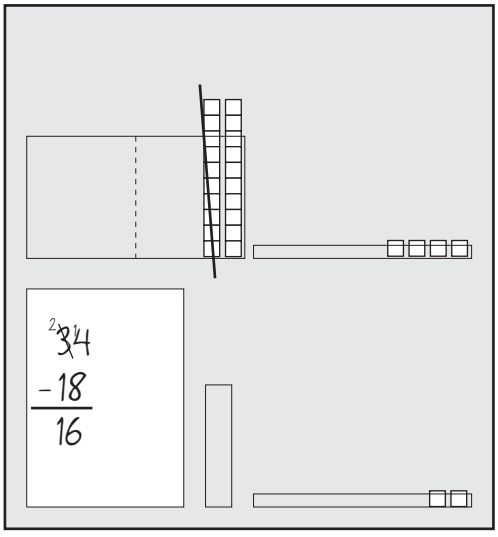
Step 1: Set up the problem



Step 2: Regroup if necessary



Step 3: Subtract the 1's



Step 4: Subtract the 10's

Over the course of the month, have students use their own base 10 pieces, sketches, and numbers to practice this strategy. It is important that students understand how and why the strategy works, and that you allow the children to continue using the base 10 pieces to perform the regrouping or "trading" for as long as they're needed. We find that unless students model the process of regrouping, using this strategy may compromise their sense of place value because they tend to think about the digits in isolation instead of thinking about tens and ones.

May Base Ten Bank

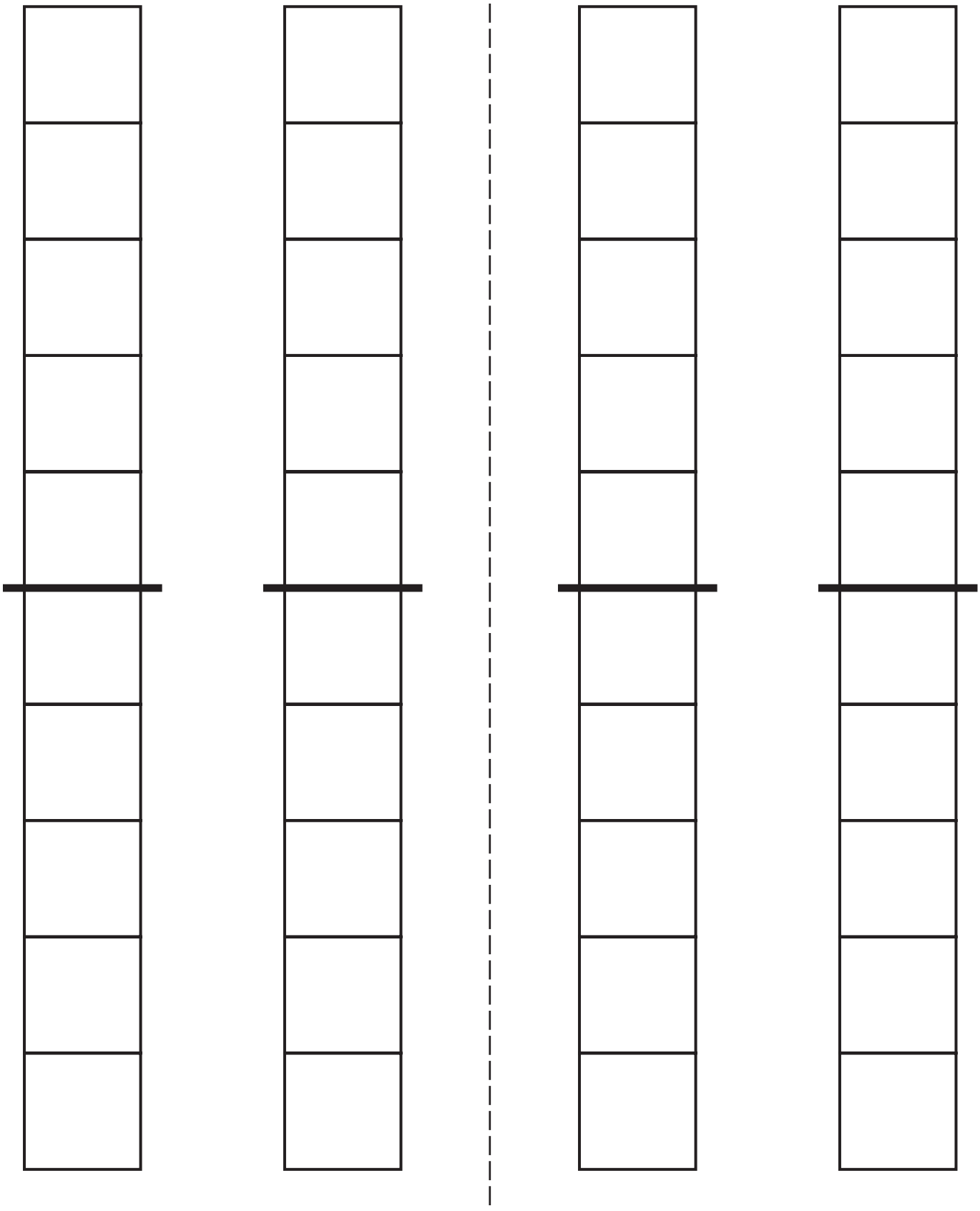
Use the Base Ten Bank pocket chart to pose and solve several 3-digit addition and subtraction problems each week. Solicit student-invented strategies, but use the opportunity to keep working on the regroup-

Activity 4 Modifying the Base Ten Bank (cont.)

ing strategies you have introduced as well. You may want to have your class develop a list of multi-digit addition strategies and another of multi-digit subtraction strategies, including the regrouping strategies. Students can then be asked every so often to evaluate which strategies are most effective to handle the numbers involved in a particular problem. For instance, they might decide that starting with the 1's and regrouping is best for a problem like 589 + 327 but adding the tens and then the ones is more efficient for a problem like 53 + 29.

> ***Dontrelle*** *On 53 + 29, I like to go 3 + 9 is 12, move the ten over so it's 50 + 20 + 10. That makes 82 in all.*
>
> ***Sara*** *I think it's easier to just go 50 + 20 is 70 and 3 + 9 is 12. 70 + 12 makes 82. It's the same answer, but I like doing the tens first.*

Base Ten Bank Ten Strips



NAME _____ **DATE** _____

Base Ten Bank Addition

The problem on our Base Ten Bank today is:

	10's	1's
+		

You can use Unifix cubes, base ten pieces, pictures, or numbers to figure out what the answer is. Please show all your work in this box:

NAME _____ **DATE** _____

Base Ten Bank Addition

The problem on our Base Ten Bank today is:

100's	10's	1's

+

You can use Unifix cubes, base ten pieces, pictures, or numbers to figure out what the answer is. Please show all your work in this box:

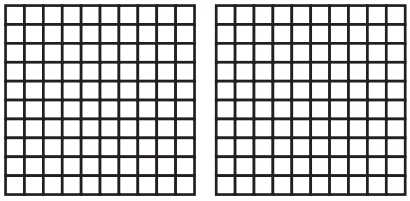
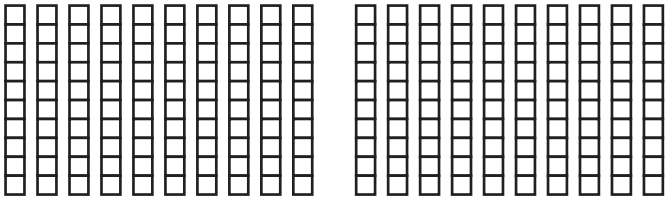
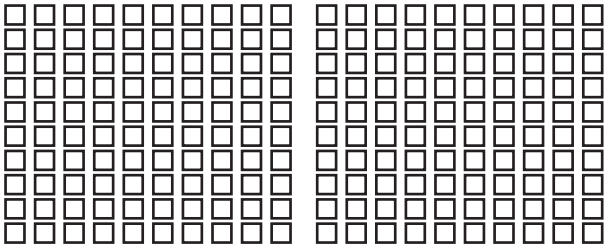
NAME _____ **DATE** _____

Set A5 ★ Independent Worksheet 1

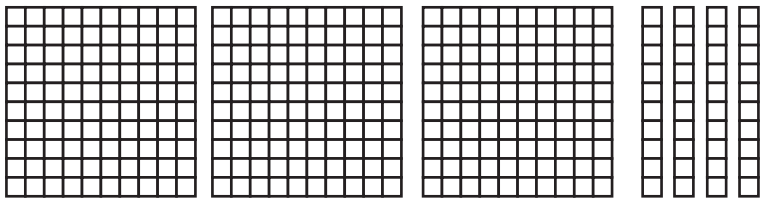
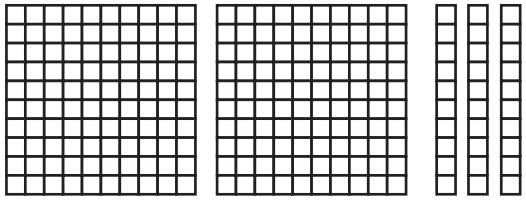
INDEPENDENT WORKSHEET

Different Ways to Look at the Same Number

1 Solve the problems below, use the pictures to help.

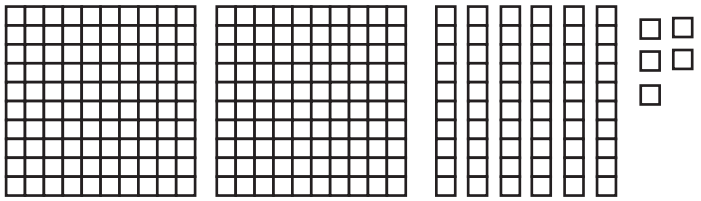
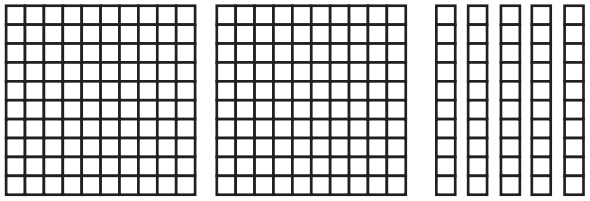
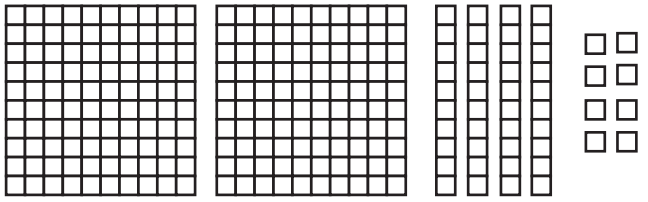
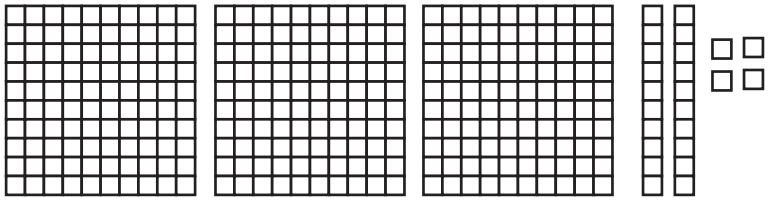
Problem	Picture
a James built 200 with mats. How many hundreds are there in 200? _____	
b His sister traded in both mats for ten strips. How many tens are there in 200? _____	
c If you traded in all the strips for units, how many ones would that be? There are _____ ones in 200.	

2 Tell how many hundreds, tens, and ones there are in each number. Use the pictures to help.

Problem	Picture
example There are 3 hundreds in 340. There are 34 tens in 340. There are 340 ones in 340.	
a There are _____ hundreds in 230. There are _____ tens in 230. There are _____ ones in 230.	

Independent Worksheet 1 Different Ways to Look at the Same Number (cont.)

3. Tell how many hundreds, tens, and ones there are in each number. Use the pictures to help

Problem	Picture
example There are 2 hundreds in 265. There are 26 tens in 265. There are 265 ones in 265.	
a There are _____ hundreds in 250. There are _____ tens in 250. There are _____ ones in 250.	
b There are _____ hundreds in 248. There are _____ tens in 248. There are _____ ones in 248.	
c There are _____ hundreds in 324. There are _____ tens in 324. There are _____ ones in 324.	

CHALLENGE

4 Find the number on the right that matches the number on the left. Draw a line to show.

a 4 hundreds + 6 tens + 3 ones	640 ones
b 64 tens	61 tens + 8 ones
c 40 tens + 5 ones	3 hundreds + 16 tens + 3 ones
d 2 hundreds + 29 ones	1 hundred + 12 tens + 9 ones
e 618 ones	2 hundreds + 20 tens + 5 ones