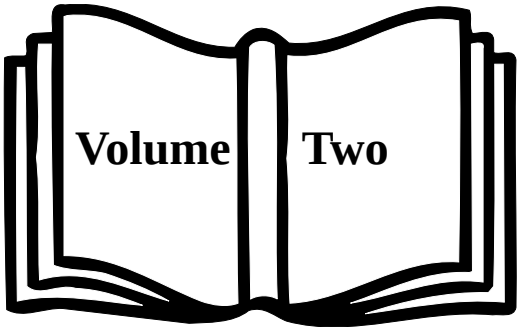
Grade Two

Classroom

Instructional

Strategies



Inquiries or complaints should be directed to:
the Office of Curriculum and School Reform Services
6307 Mail Service Center
Raleigh, NC 27699-6307
Telephone (919) 807-3761; fax (919) 807-3767

The learner will read, write, model and compute with whole numbers through 999.

1

Notes and textbook references

1.01 Develop number sense for whole numbers through 999.

a. Connect model, number word, and number using a variety of representations.

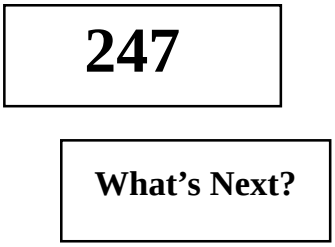
Rote counting is learning the names of numbers in sequence. The ability to name numbers in sequence is different from understanding what the numbers represent.

b. Read and write numbers.

A. Have children count, recording the upper limit. *It is not necessary to begin counting at one! The purpose is to note whether a child knows the counting sequence and can cross decades. Teachers may wish to begin by saying "How high can you count?" and allowing the child to decide where to begin.*

B. Ask students to write the next 20 counting numbers when given the first three numbers in a sequence.

C. Play a "**What's Next**?" game using numbers such as 247. On the back of each card, write "What's Next?". The child with 248 will respond and then say "What's Next?". This will continue until each child has had the opportunity to say his or her number.



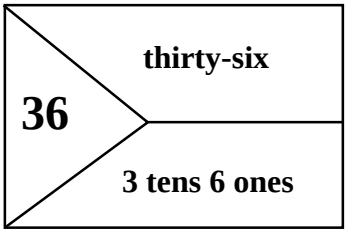
D. Create "dot-to-dot" puzzles that begin with 100, 200, etc. This can be done by placing digits in the tens and hundreds place on a "dot-to-dot" that already exists. Ex. 1, 2, 3, . . . can become 101, 102, 103, . . .

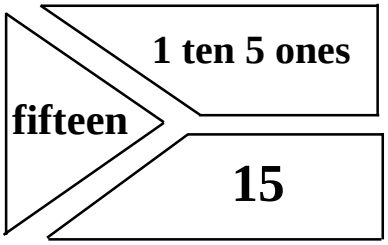
Notes and textbook references

Counting strategies that students need to experience include 1 to 1 correspondence, tallying, counting on, and grouping. Teachers should model all of these throughout the year. It is essential that students have a great deal of practice making groups, counting on from 10, and naming10 more and 10 less.

E. Have teams of students make collections of poem, song, and book titles which have number words in them. Ask students to read the titles that have been collected. Students should be encouraged to help each other learn to spell number words correctly.

F. Have students match cards with numbers to those with word names. Incorporate recognition of pictures of models of tens and ones in a puzzle format. Use shapes or designs that correspond to units of study (i.e., dinosaurs, eggs, apples, etc.).





G. Ask students to write word names for single-digit numbers. Have students write word names for multiples of ten. Advanced students will write word names for any two-digit numbers. *Learning to write the number words when they are not being used in a context is a spelling lesson.*

c. Compare and order.

A. A very powerful way to help children understand the relationship among numbers is to build a large hundred board using base ten blocks or beans and bean sticks. Mark off a regular size bed sheet in a 10 by 10 array. Have students build each number 1 through 100 in the appropriate squares on the sheet. This takes quite a while and you may not wish to build every number. Children can see the pattern developing as they complete their squares. Point out the increase by ten as you walk down the rows. Ask the children where the missing numbers will go, what numbers are missing in empty squares, etc. Ask them to explain how they know.

An alternative to this large hundred board is one made of paper on the wall or bulletin board. This can be made by supplying children with paper base ten blocks and glue or rubber stamps. This display can be referenced throughout the year when building number concepts.

Notes and textbook references

B. Create a village with buildings made of milk carton houses. Number houses along the streets. Talk about odd numbers on one side and even numbers on the other.

C. Show students a sequence of cards with one missing. For example,

41	42	43	45	46	47	48

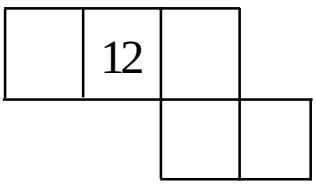
Ask children to tell what number is missing. Given a sequence of consecutive numbers, the child will fill in the blanks: 46, 47, 48, __, __, 51, 52.

D. Given four or five numbers on cards, ask students to arrange the number cards from smallest to largest (or from largest to smallest). Use consecutive numbers until the students are consistent in being able to arrange them without difficulty. Give the students random numbers for a harder task.

E. Give students eight cards with sequential numbers (cards randomly arranged). Without looking, pull one card from the child's set. Ask child to put the cards in order and tell what card the teacher has. If the student's cards are in an unbroken sequence, ask what are the two possibilities for the teacher's card (the number before or the number after the student's sequence). After students can order cards correctly (sequential and non sequential numbers), give numbers on a worksheet and ask students to write them from least to greatest or greatest to least.

F On the overhead cover five numbers on a hundred board. As students to tell what numbers are covered. On a hundred board have student cover five numbers in a pattern and ask students what additional number should also be covered? For example: 20, 22, 24, 26, 28 or 35, 40, 45, 50, 55

G Give sequentially numbered cards to members of student team (one card per child). For example, one team might be given 89, 95, 90, 92 91, 94, 93. They race to see which team can order themselves sequentiall first. Use randomly numbered cards and have them line up from least t greatest. For example, one team might have 36, 14, 83, 57, and 25. As students to explain why they organized themselves in that order



H. Cut apart sections of a hundred board to create number puzzles.
See Blackline Masters I - 1, I - 2

Notes and textbook references

I. Have a "Hundred Boards Race" by having each student cut up a hundred board and put the pieces in a bag or envelope. Exchange bags. At the signal, students dump their bags and put the pieces together on a blank hundred board. This could also be a partners activity.

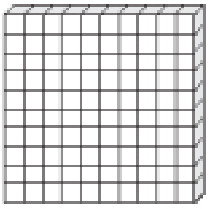
J. Have children cut numbers from advertisements in the newspaper. After finding at least ten numbers, have them glue the numbers on a paper in sequence.

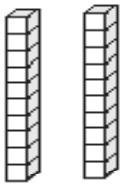
d. Rename

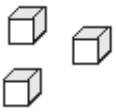
A. Have students solve word problems using a variety of grouping strategies. For example: Francine had 372 buttons in her collection. She wants to put them into bags of 100. How many bags will she need? How many will be left over?

Suppose she wants to put them in bags of ten. How many bags will she need?

Will there be any left over?







B. Use base ten blocks to rename numbers. Draw, stamp or paste the set of base ten blocks that use the **fewest** number of ones, tens, and hundreds.

2 rods 16 units =
8 rods 22 units =
3 flats 17 rods 5 units =
2 flats 17 rods 5 units =
1 flat 9 rods 24 units =
5 flats 12 units =

As students rename, trade and regroup to express the numbers given they will see a variety of equivalent models for the same number.

C. Encourage students to complete a chart similar to this as they explore all possible ways to rewrite a given number.

Notes and textbook references

	Tens + Ones		Tens + Ones	
36				
42				
58				
175				
627				
89				
443				
991				
220				
314				
150				

Notes and textbook references

e. Estimate

A. Ask children which of these tasks could be done in an hour or less:

wash the dishes	count to 100 twice
sing a song	walk around the school 3 times
get a night's sleep	travel to California

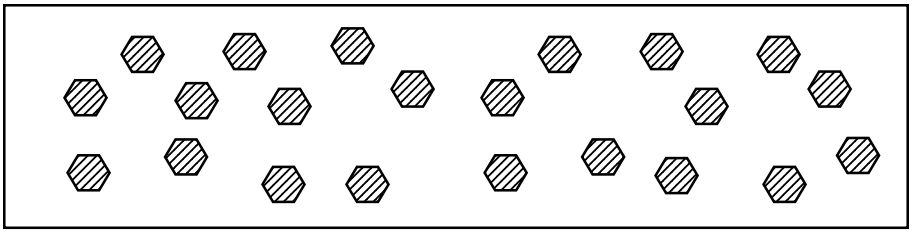
*Play **Race for A Dollar.** See gameboard in Week By Week Essentials (Week 17).*

Ask students to brainstorm things they can do in one hour.

B. Ask students how many cups of juice can be poured from a juice container. About how many name tags (provide sample) can be cut from this piece of construction paper? How many cups are in a container of beans, popcorn, or rice?

C. Ask students whether there are enough chairs in the classroom for the students and their parents to be seated at the same time. Would there be enough napkins in this pack to give one to all of the students?

D. Show students cards with dots or stars. Ask children whether there are closer to 20 or 50 objects on the card. (Repeat with other examples.)



E. Ask students to estimate about how many times students could touch their toes in one minute. Have students experiment. (Combine this with a graphing lesson.) Have them brainstorm things they can do in one minute.

F. Show pieces of confetti on the overhead. Ask students to estimate how many pieces they see. Group to count. Then add or take away and estimate again. Continue with different amounts and sizes of confetti. The estimates can be grouped, graphed and discussed. This additional activity, coupled with their estmations, will help students sharpen their estimation skills.

Notes and textbook references

G. Given a model of a two-digit number on the overhead, the student will count on to add more to the set. Operating at a pictorial level, the student will not count the original "ones" in a representation of ten but will count on. Ex. Show 28 on the overhead with base ten blocks. Flash off and on. Then add two more tens, "How many now?".

H. Encourage students to group objects to count by 2's, 5's and 10's as they visualize sets to make better estimates.

I. Given a model of a two-digit number, the student will count on to add more to the set. At a pictorial level the student will not count the individual ones in a representation of ten but will count on.

f. Use a variety of models to build understanding of place value (ones, tens, hundreds).

Place-value concepts develop slowly as students learn that ten 10's make a hundred. Understanding "hundredness" as a collection of ten 10's extends the pattern that one 10 is a collection of ten 1's. When children begin to understand this pattern at a concrete level, they have a reason for recording the numbers in the standard format adults call place value. All students need a thorough understanding of tens and ones at concrete, pictorial, and abstract levels before they are expected to work with three-place numbers independently. Some educators believe that models should carry children into the thousands so that the place-value pattern of trading 10 smaller parts for one group of 10 is established.

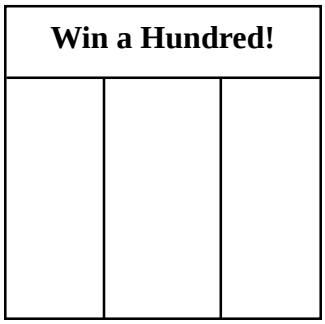
A. Use a blank 10 x 10 grid. Have students place ten Unifix cubes of the same color in each row. "How many cubes did you use to cover the board?" *(Alternate colors by row*s.) Snap the cubes in each row together. "How many are in each group? How many groups do you have? How many tens are there in a hundred?"

B. Have students model 100 as ten 10's in a variety of ways. Display ten paper chains of ten loops each, ten necklaces of ten beads, ten cards with ten pennies stamped on each, ten cards with ten seeds glued on each, ten chains with ten paper clips, ten trees with ten leaves on each, etc.

Notes and textbook references

C. Give students a bag of small objects. Ask children to group these into ones, tens, and hundreds, using cups for tens and box tops to hold ten 10's for the hundreds. Ask children to explain what they have done. *Because of the number of items, students should work in pairs, verifying each other's counting. Ask the students to explain the results. The teacher should show the students that one group of a hundred, four groups of tens, and two ones may be written as 142. The teacher also needs to discuss that another way to name the number would be 14 tens and 2 ones. Ask why this is true.*

D. Using a three-part place-value mat have students play games such as "**Race To a Hundred**" in Week 35. Students can use bean sticks and loose beans for tens and ones. A hundred is a raft (flat) made of ten bean sticks. Commercial base-ten materials, bundles of toothpicks, chains of paper clips, etc., work equally well.



E. Set up a **Bean Stick Factory**. Have children work as an assembly line to count out ten beans, put a line of glue on a craft stick, put the beans on the stick, and put another line of glue on top of the beans. Children are able to internalize the concept of ten ones making a ten if they are given the opportunity to create the tens themselves. The bean sticks can be used in many place-value and computation activities.

1.02 Use area of region models to build understanding of fractions to explore part-whole relationships in context.

a. Represent fractions (halves, thirds, fourths) concretely and symbolically.

Early experiences with recognizing (and dividing) regions and sets that are in equal (or unequal) parts provide a foundation for naming fractions as "equal" parts of a whole. Through hands-on activities students will discover that the size of each part decreases as the number of equal divisions increases. For example, a slice of a pizza that is cut into two

equal pieces is larger than a slice of the same pizza that is cut into six equal pieces. It is important that students focus on "the whole" as they begin talking about fractional parts. While the primary focus is on halves, thirds, and fourths, other fractions will appear in the context of the classroom. Set models may be easier for some students than models of geometric shapes (regions). Likewise, some students may recognize one model (region) and others sets (or parts of a line). It may be easier for some students to recognize pictures (or models) of fractional parts than to make the divisions themselves. Students should always be encouraged to explain their thinking.

Notes and textbook references

A. Explore part/whole relationships with pattern blocks. Using the hexagon as a whole, find the shape that is half of the whole. Which shape is one-third of the whole?

B. Have children fold paper as modelled by the teacher to show halves and fourths.

C. Give the student a workmat showing two animals and an even number of kernels of corn (counters). Ask the student to place one half of the corn in each animals's bowl. Expand to three and four animal workmats. See Blackline Masters I - 8, I - 9, I - 10.

D. Use snack time as a learning/assessing time for fractions. Given a cracker, ask the student to cover half of it with peanut butter or jam. Have a student cut a sandwich so that two students will each get an equal share. Give a student six raisins (or other snack goody) and ask her/him to put equal shares on each plate. how much does each one get? Try it with three plates. Encourage the use of appropriate vocabulary and symbolic notation.

E. Use two-color counters to have children show half red and half yellow. Tell the children a story such as: Maria went to the store to buy some seeds. She had enough money to buy ten seeds. She wants her garden to grow half red flowers and half yellow flowers. How many red seeds should she buy? how many yellow seeds? Continue with similar stories and vary the total number. What happens if she buys 15 seeds?

F. Given blocks from the pattern block set, have students find which shapes are half of which other shapes. Ask whether there is a shape that is half of the trapezoid. These pieces can also be used to show one-third.

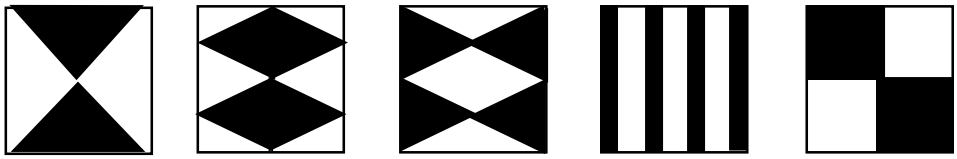
G. Have students fold different-sized pieces of paper into halves, thirds, or fourths. Are all of the halves the same size? Why, or why not?

Notes and textbook references

Explain. Be sure that the fractions always relate to the whole.

H. When teaching halves or fourths remember that many discussions and activities lead to integrating the concepts of odd and even, or symmetry.

I. Give students a square sheet of construction paper of one color and a sheet exactly half that size in another color. Have each student cut the smaller piece into two or four triangles (or other shapes) of equal size. Glue these pieces to the larger square to design a quilt. As an extra challenge, ask students to make their quilt symmetrical!



b. Compare fractions (halves, thirds, fourths) using models.

A. **Paper-folding Activity #1** Give students four sheets of paper (all same size) which students will fold as follows. First sheet in halves, second sheet in thirds and third sheet in fourths. The remaining sheet will serve as the whole. Students should label each piece according to its fractional part. Students can compare ans discuss fractional parts with a partner. Note: if tagboard or construction paper is used students can save these fraction models for use with later ativities.

B. **Paper-folding Activity #2** Give students eight pieces of paper (four 4-inch squares and four 6-inch squares). Students will fold one piece of each size in halves, one piece of eachsize in thirds and one piece of each size in fourths. The rmaining pieces will model thewhole. After pieces have bee labeled, students can compare and discuss the differences in the two halves, thirds and fourths. This ativity begins the development of an understanding that the size of the whole determines the relative size of fractional parts.

C. **Counter Activity** Students are given 12 counters apiece. In pairs students will separate the groups into halves, thirds and fourths. They will record their results each time and compare.

Notes and textbook references

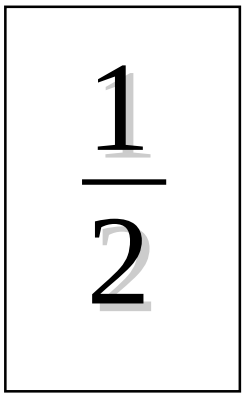
D. Make several fraction sets with different-colored egg cartons. Leave white cartons uncut. Slice pink cartons to show halves, green cartons to show thirds, yellow cartons to show sixths, and blue cartons to show fourths. In groups have students compare the number of sections in the different models, always relating back to the whole carton.

E. Play the traditional game of **Battle** where the fraction closest to one wins. Use fraction bars or other models which make comparison of fractions easy. Note: this is <u>not</u> an appropriate activity at an abstract level for second graders. Through experiences and pictures they will learn that 2/4 and 1/2 all shade the same amount of a region. See Blackline Masters I - 12 through I - 15.

F. Use the rectangular fraction models made by the children with the fractional pieces cut apart to play a cover-up game. Make a fraction die for each group of three or four children or a spinner with appropriate fractions. See Blackline Masters I - 16 and I - 17. The object of the game is to be the first to completely cover two "whole" strips. If a student rolls 1/2 and only needs 1/4 to complete a strip, allow the child to trade the 1/2 piece for two that are 1/4 each.

G. Make many different sets of fraction models.

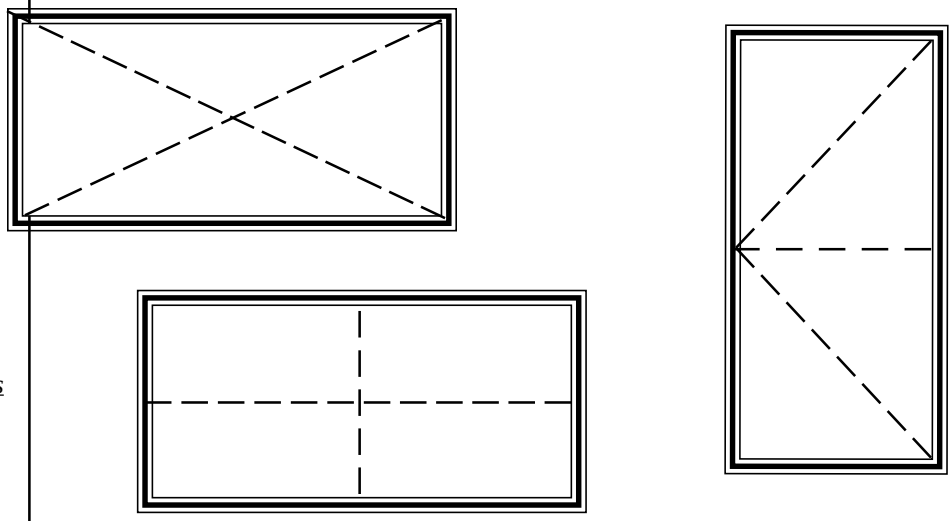
1. The easiest are made from rectangles 2" x 24" cut from construction paper. With the students, fold, mark divisions, and label fractional parts. Each student should have at least a whole, halves, fourths, thirds, and sixths.
   Extension: Challenge students to figure out how to make models for fifths and tenths.
2. Using cupcake paper have students flatten to form circle. Fold in half for halves, fold again for fourths, and so on. After folding, students may color sections with markers and label each section.
3. Use paper plates for a larger group or class models. Divide each plate into fractions to be displayed.



Notes and textbook references

c. Make different representations of the same fraction.

A. Pat has a brownie that he wants to share with three friends. Show two different ways he can cut his brownies into four equal parts.
Students can be given paper brownies (all the same size) and encouraged to share their soutions by cutting and matching parts to "prove" equality.



Read Two Good Friends by Margo Mason.

B. Each student will need six 24-inch strips of paper and a ruler. Leave one strip unfolded and label it as "one". Students fold the first strip in half and estimate the length of each half. The children then measure, verifying that each half is 12 inches. Label each side of the strip as one-half (1/2).
Using another strip, fold first into halves and then fold again to make fourths. Measure these sections. Label each section as one-fourth.
Continue to make models for thirds, labeling all sections. Note that children will need help in knowing how to fold their strips into thirds. When measuring these portions, students should focus on having each section be the same number of inches. Strips may then be used to compare many different fractions.

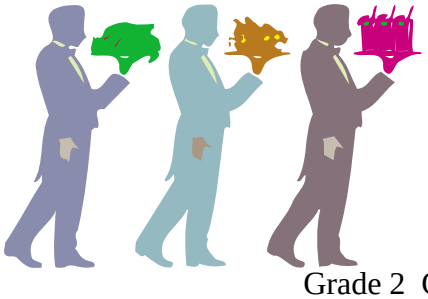
C. On overhead put 1 blue chip and 1 red chip. Discuss 1/2 of the group is blue and 1/2 is red. Add 1 more blue and 1 more red. Now 2/4 are blue and 2/4 are red; but 1/2 is still blue and 1/2 is still red. Continue the pattern. In small groups have children use colored squares or connecting cubes to extend the activity and record the equivalent fractions on a chart. Use the same activity for other fractions. For example: 1 red chip, 1 yellow chip, 1 green chip, and 1 blue chip to model fourths.

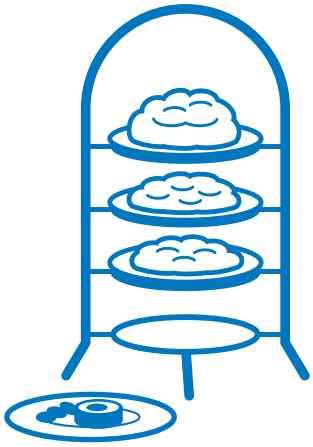
Notes and textbook references

D. **Fraction Tic-Tac-Toe**: Each student draws a tic-tac-toe board and writes a fraction using halves, thirds, and fourths,as a denominator in each block. Teacher draws a fraction bar from bag and shows it to the group. (Use overhead fraction bars if playing with the entire class.) Discuss the name of the fraction. Each student who has this fraction will cover on game board with marker. First to get tic tac toe is winner. Variation: Students play with a partner. Take turns drawing a fraction bar. Decide on fraction represented. If either player has this fraction on tic-tac-toe board, it is covered. First to get tic tac toe is the winner.

E. Supply small groups of students with several baggies with colored cubes or tiles. Each baggie should represent one of the following: 1 red, 1 blue; 2 red, 2 blue; 1 red 3 blue; 2 red four blue; 3 red 3 blue; 2 red 4 blue , using tiles or connecting cubes. Ask students to build a "train" using the several colors. Next, students color a representation of this train on grid paper. For example, students might build a train connecting 4 red tiles to 8 blue tiles and then color a line on grid paper with 4 red squares connected to 8 blue squares. After coloring the train on grid paper, students write what fraction of the train is red (1/3) and what fraction is blue (2/3). This might be repeated with other collections of objects.

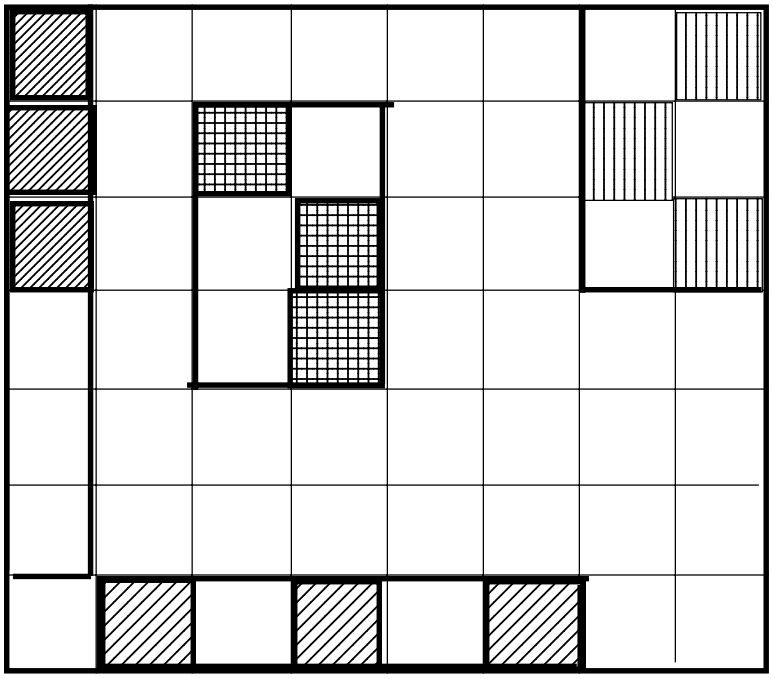
F. Ask students to search through discarded magazines for pictures of regions and objects that could represent fractions. Have them cut out the pictures, glue them onto background paper and write about the fractions shown. They might find pictures of pizzas with distinct sections of different toppings, or ice cream cones with different flavors. They might create their own by cutting out pictures of dogs and cats and labeling the fractional part represented by dogs or cats. Small groups of students might want to work together to create a "picture book" all about 1/2 or some other fraction. These books could be shared with younger students.





Notes and textbook references

G. Half-and-Half Rectangles Students are given colored tiles. They select six pieces, half of one color, half in another color. Students make a rectangle usung the six tiles. Students record and color their half-and-half rectangle on one-inch graph paper. Students then usetheir manipulatives to make and record another half-and-half rectangle. These are all recorded on graph paper.



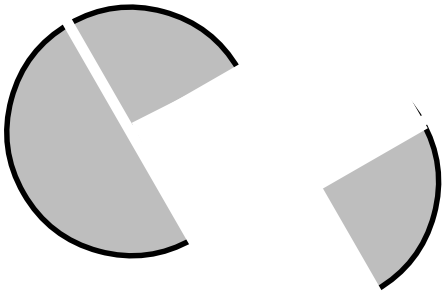
This activity can be repeated at another time with thirds and fourths.

d. Combine fractions to describe parts of a whole.

A. Pattern Block Activity Tell students that the green triangle is one-half of a shape. Ask students to show what the whole could look like. Then tell them that the triangle is one-third of a shape. Again, what could thewhole look like? Repeat on another occasion with the trapezoid, parallelogram or hexagon. Be sure studens share their "wholes" to see that the results could be very different in apperence bit still satisfy the conditions.

Notes and textbook references

B. Use paper plates or tagboard circles to represent pizzas. Cut the "pizzas" into halves, thirds and fourths. Explore differnt ways to make a whole pizza. Record the results.



$$\frac{1}{2} + \frac{1}{4} + \frac{1}{4} = 1$$

C. Using playing cards from Blackline Masters I - 18 and I - 19 to play **Cover Up!** Prepare three base shapes (wholes), four halves, eight fourths and six thirds. Students start with three base shapes between them. Players take turns spinning, take the fraction indicated and place it on the base shape. Players should say the name of the shape placed and also note what is needed to complete the shape (whole). Player completing the last whole is the winner.

1.03 Create, model, and solve problems that involve addition, subtraction, equal grouping, and division into halves, thirds, and fourths (record in fraction form).

A. Ask students to use objects to model skip-counting by 2's, 5's, and 10's. Note whether a child groups loose objects into repeated sets. Ask students to (rote) count by 10's, by 5's, and by 2's.

B. Have students model patterns of counting by 10's, 5's, and 2's on a hundred board. Have students write skip-counting sequences of 2's, 5's, or 10's. Given a worksheet with counting sequences, have students fill in missing numerals.

C. Observe whether student uses tallying to count immovable

Notes and textbook references

objects or events in sets of five. "How many shelves in the room? How many doorknobs in the hall?" Count by 5's.

D. Have children make up to nine sets of three (or four). Have students determine how many by adding repeatedly.

E. On a hundred board have students mark every third (fourth) number, beginning the sequence with three (or four). *Skip-counting by 3's (or 4's) does not mean to mark a number and then skip three (four) before marking the next. It means to mark the third number, beginning your counting with the number immediately following the one you have just marked. If six is marked, for example, the next marker is placed on the third number after six.*

F. Ask students to color the pattern of counting by 3's or 4's on a hundred chart after the students have identified the pattern with markers. *Counting sequences colored on hundred charts and displayed around the classroom helps students focus on the patterns in the number system. Students can color other patterns including 2's, 5's, 6's, 7's, etc.*

G. Ask students to count (rote) by 3's or 4's. Have students write the counting sequence of 3's or 4's. *It should not be a second-grade expectation that children will memorize these sequences. Rather, the focus should be on seeing the patterns and understanding the idea of skip-counting as an easy way to add similar sets. This is readiness for multiplication that needs to be well-developed in second grade at a concrete level.*

H. Read a story problem to the group. Ask students to act out the problem. Ask a student to explain why acting out the story helps to find the solution.

I. Have student use Unifix cubes to solve problems: "There are six cubes. Half of the cubes are yellow. One cube is red. The rest of the cubes are blue. How many cubes are blue?"

J. Give students containers with goldfish or animal crackers. Tell story problems and have students model the problem. Different students can be the story tellers. Children can make their own storyboards for these problems by coloring a paper plate blue to look like a goldfish bowl. Ex. There were eight fish swimming together. Two decided to stop

and eat, and four stopped to play. how many fish are swimming together now?

Notes and textbook references

K. Have children use colored cubes to determine the order in problems such as: Take a red, yellow, blue, green, and orange cube. The blue cube is second, the yellow cube is after the blue, the orange cube is first, the red cube is not last. Show me your cubes.

L. Give students a problem that involves finding all possibilities. Observe how the student finds the solution. For example, "There are four girls in the tournament. How many possible two-people teams could be set up? The girls - Sue, Jill, Maria, and Keiko - all work together."

*See **Division Dilemmas** Blackline Master I - 11 for a sharing equally activity.*

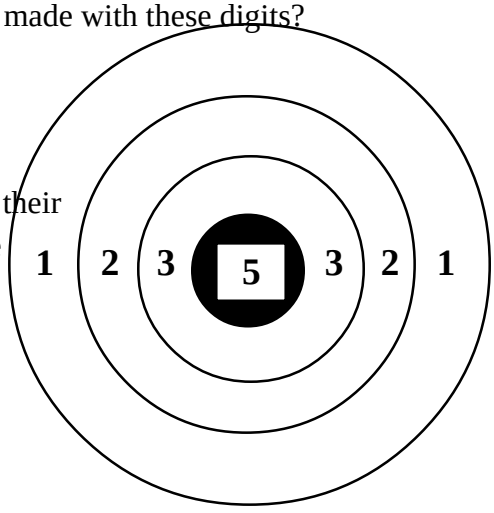
M. With a partner, ask students to make a chart to show what possible combinations of stamps you could purchase from a machine that holds 2¢ stamps, 3¢ stamps, and 5¢ stamps, if you have only 12¢.

N. Have students "bury" a treasure somewhere in the classroom. Ask child to write directions for finding the treasure in five or more instructions.

O. Give students a series of clues to find a number on the hundred board. Ask students to write other "number stumpers." For example: "The number has 2-digits" , "The digits have a sum of 10" ,"The number is less than 20 but more than 10" , "The number in the ones place is 9"; "Both digits are odd" , and finally "What is my number?"

P. Give students three digits (for example, 3, 6, 7). How many different two-digit numbers can be made with these digits?

Q. Ask students where their three arrows could hit if their score is seven. Where could three arrows hit if their score is six? See Blackline Master I - 3.



Notes and textbook references

R. Give students four number cards and ask students to arrange them to make the largest sum, smallest sum, largest difference, or smallest difference. See Blackline Masters I - 4, I - 5.

S. Ask children to find all the possible ways they could make a certain amount of money. This could be organized in a chart. See Blackline Master I - 6. Ex. 38¢

Quarters	Dimes	Nickels	Pennies
1	1		3
1		2	3
	3	1	3
			etc.

T. Use charts like this one to to solve problems:

Number of People	Number of Legs
1	2
2	4
3	?
–	–
–	–
?	12

Can you finish this table?

U. Ask children to estimate results (For example, "The answer will be about . . . ") Then use calculators to find sums and differences. For example, 28 + 34 will be about 60.

V. Have students use calculators to solve problems in their textbook. Be certain to provide problems where a calculator is beneficial. Some problems are easier to solve mentally than with a calculator, and students should realize this from the earliest lessons. Problems with 3-digit numbers or several addends are appropriate for calculator use.

Notes and textbook references

W. Have students use calculator to model skip-counting. *When students are comfortable using the automatic constant for addition or subtraction, they will be able to explore problems such as: Count on by 2's starting at 24. If you enter 24 + 2 and press "=" six times, what number do you think you will see?*

X. Discuss with children when it is appropriate to use a calculator and when they should use their heads. Model by having one student use a calculator only and having another student use only their head. Play "Race the Calculator" by having one student calculate problems such as 3 + 4 + 6 in his/her head, while another student enters the numbers in a calculator. Who finished first?

Technology is changing the manner in which mathematics is applied in everyday consumer situations. Technology is allowing mathematics to be studied by more students; it is creating new mathematics; and it is making some mathematics less important. Not only calculators and computers, but also video equipment, tape recorders, and other electronic devices are affecting society. It is the school's responsibility to be certain that all children learn to use these tools appropriately. Computer programs provide motivating drill, but more importantly, offer problem-solving application for students at all elementary levels. Logo should be explored by second grade students both as geometry lessons and as problem-solving lessons. Children wear calculators on their wrists and tend to believe whatever magically appears on the display. Schools must help the students understand that calculators function because people push certain buttons, not because the machines can "think."

How Many Snails and Each Orange Had 8 Slices
by Paul Giganti, Jr.

Read the books to children and talk about all of the questions on the page. Make up other questions that could be asked on each page. Choose a page and have children record the answers to the questions on that page. You may want to make a transparency of that page to be sure everyone can see it. Then, make a class book by having pairs or small groups of children make their own page following the same pattern Mr. Giganti used to make his book.

Notes and textbook references

Y. Given a measurement task (for example, to find which of three objects is the heaviest), ask children to describe how they completed the project and what they learned.

Z. Give students an incomplete list of steps in completing a task. Have students tell what steps are missing. For example, making a peanut better and jelly sandwich or brushing your teeth.

AA. Tell students there is something of interest in a box. Ask students different ways to find out what is in the box.

BB. Given a problem, ask children to describe how the problem was solved. Following a group problem-solving activity, ask students to tell (write) how the problem was described.

CC. Given a page with problems already solved (some with mistakes), ask students to correct errors.

DD. Give students a series of cartoon pictures. In the first two frames, present an open-ended problem. Ask students to write two possible endings to the story. Delete the words in a cartoon series and allow students to write new dialog.

19 Nice Ones *can be found in Week 21 of the Week by Weeks.*

EE. Have students play Nim-type games such as **19 Nice Ones**. Challenge students to find a way always to win.

Game rules: Place 19 counters on a game mat. The two students take turns removing one, two, or three counters at a time. The object of the game is to force the opponent to pick up the last counter. Game mats could be easily constructed to go with any topic currently being studied in the class. For example, if the science unit is on dinosaurs, draw 19 dinosaur eggs on which students would place their counters.

FF. Have students solve problems that involve manipulatives, such as "How many ways can you cover the yellow hexagon using pattern blocks." Students can then draw, trace, or stamp their solutions to record

them. They should also be encouraged to write or draw about their method of solution.

Notes and textbook references

GG. Student pulls a handful of cubes from a bag that contains three colors of Unifix cubes. Child records on a chart how many of each color and writes the total. A more advanced level has the child write the number sentence. Use the blackline master record. *It is extremely important to relate the actions of adding three groups to the manner in which the action is recorded. Many children will add 3 + 4 + 2 successfully when it is written horizontally; but they will write 63 or 36 or 72 or 27 as the answer when the problem is written vertically, adding two of the addends and "bringing down" the third. To introduce students to addition with three or more addends at an abstract level rather than concretely because the students are successful with problems with two addends is to make the assumption (frequently false) that children intuitively understand the new symbolic notation.*

HH. Roll threenumber cubes and add. Write the number sentence to show what has taken place. Use a calculator to keep a running total. Play with a partner, the first (or last) to reach 100 is the winner!

II. Draw three numeral cards. Use counters in three colors to model a problem which could be created with the numbers. Write the number sentence.

JJ. Use number tiles to show three numbers that will equal a sum. How many different ways can you use the 0-9 tiles to get the same sum? Do this for different sums and have the children record their findings.

KK. Given a problem with three addends, students will model with counters. More advanced students will solve the problems, especially if the addends are small, without counters.

LL. Have students interview ten to twelve students, asking their preferences on a question with three possible responses. (For example, at snack time today do you want orange juice, apple juice, or lemonade?) Have students explain results of the survey and then write an appropriate

Notes and textbook references

number sentence to account for all choices.

Students traditionally are not as good at solving word problems as we would like for them to be. The number of word problems students are asked to do is small compared with the amount of computation drill. As the amount of time devoted to problem-solving is increased, efforts should be made to include a wide variety of applications in addition to routine word problems.

MM. Teach children strategies beginning with doubles. Ex. 4 + 4, 6 + 6. Then work with *almost* doubles such as 4 + 5, 3 + 2. Teach the strategy of combinations to 10. Model adding 9 as 10 - 1. Work with strategies such as *counting on* and *counting back.*

NN. Give students a number fact (6 + 5 or 12 - 7, for example). Ask children to write a story to go with the problem and illustrate the story. Feature students' work on the "Problem of the Day" board.

OO. Give students a cartoon picture. Have children write a story about the picture and pose an addition or subtraction problem in the story. Ask students to write the solution on the back. Display students' work.

1.04 Develop fluency with multi-digit addition and subtraction through 999 using multiple strategies.

a. Strategies for adding and subtracting numbers.

b. Estimation of sums and differences in appropriate situations.

A. Show children a stick with ten Unifix cubes. Put it behind your back and remove a few of the cubes. Then show the remaining cubes to the children and ask them how many you have behind your back.

Children can then play this with their partner. It can be made more complex by increasing the number of cubes in the stick.

Notes and textbook references

B. Give students opportunities to solve missing addend problems in real-life contexts. For example, the table is set for three people but there will be eight at dinner. How many more forks do we need?

C. Using facts for which the students have demonstrated memorization, ask students to identify missing addends. For example, three plus what number equals six? What number plus six equals eight?

When students have many experiences with building numbers, adding to a set, and taking cubes away from a set, and when they have worked with naming numbers in different ways (for example, 3 tens and 4 ones is the same value as 2 tens and 14 ones), problems with regrouping (renaming) are not mysterious and do not present the major difficulties they have in the past with students who have few experiences with place value. By spending many weeks building and recording problems (i.e., work at a concrete level), children can be introduced to 2-digit operations with and without regrouping simultaneously.

D. Make models of numbers on five different place-value mats. Ask students to tell about each set. Have students choose any two groups and explain what the sum would be if they are added. *Create models so that some problems would involve regrouping and others would not. If students have had many experiences renaming numbers in numeration activities, regrouping at a concrete level should not be difficult.*

E. Ask students to build a number greater than 30 but less than 50. Have students subtract the number of children in the class.

F. Direct students to build a two-digit number on a workmat. Have students build a second number. Combine the sets, trading ones for a ten if necessary, and explain the sum. Using that sum, ask students to remove a given amount and explain the results. For example: "Build 34. Build 23. What is the sum? (57) From your 57, take away 14. What do you have now?"

G. Give two students a place value-mat each and a set of bean

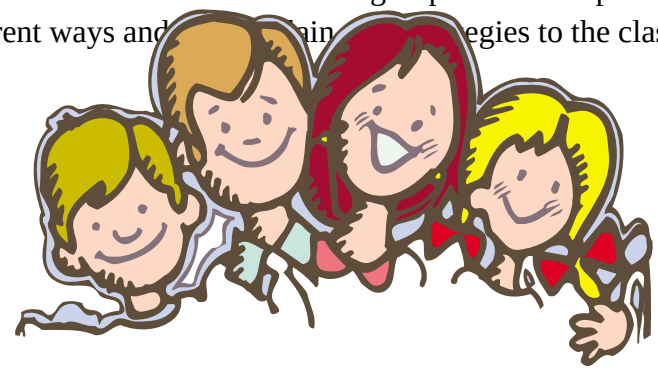
Notes and textbook references

sticks. Have students use a file folder to separate their workmats so they cannot see what the other is building.

Rules: Each student draws a card and builds a two-digit number on the place value mat and predicts whether the sum of the two numbers being built will be greater or less than 50. Students combine sets. If one or both students predicted correctly, they win a point. The first player to get ten points wins. *Cards should designate numbers from 10 to 40. A deck of 20 cards, shuffled after each turn, is sufficient.*

H. Given the numbers, student models a two-digit addition problem. The student then records what has taken place and explains the solution. *The importance of continuing language experiences with the math lessons cannot be overemphasized.*

I. Students work in small groups to solve a problem in at least two different ways and explain their strategies to the class.



J. Many students will develop alternate algorithms for solving addition and subtraction problems. As students solve problems have them explain their strategies in pictures, words, or numbers. Encourage students to share these strategies with the class.

40 + 20 = 60
3 + 9 = 12
12 + 60 = 72

4 tens + 2 tens = 6 tens
3 + 9 = 12, or 1 ten and 2 ones
6 tens + 1 ten + 2 ones = 7 tens and 2 ones = 72

43 + 20 = 63
63 + 9 = 62 + 10 = 72

Students should not treat two-digit exercises as separate number facts. For example, 47 + 32 is not two separate facts of 7 + 2 and 4 + 3. Finding sums in this manner leads to solutions such as 28 + 34 = 512.

Notes and textbook references

K. Students can play games involving two-digit addition and subtraction. For example, **Foxy Boxes**.

Rules: (1) Student has gameboard (see Blackline Master I - 7) with a discard box .

(2) The teacher will call out five digits. As the digits are called out, the student must write (or place) one number in each spot on the gameboard. Once a digit has been written, it cannot be moved.

(3) The object of the game is to build the highest sum.

(4) To play a subtraction game the gameboard will have places for only four digits. The greatest difference wins.

L. When presenting problems for students to solve , be sure to vary their type and difficulty so that problems and their solutions are not predictable.

M. As students perfect their individual strategies and methods be sure to provide opportunities for sharing. Problems involving regrouping have many methods of solution. Students need to see more than one strategy and be encouraged to find alternate ways to solve problems. One good strategy is to group students and ask each group to come up with two or more solutions to a given problem.

N. Before focusing on subtraction involving zeros in a written form, have children experience problem solving involving multiples of ten. Give problems such as:"I had a bag of 50 cookies for our class. A dog ate 20. How do we know that we have enough left for everyone to get one? What if the dog had only eaten 14?" Children may come up with many different responses. Some will count backwards. Others may break the number apart. Some children may be familiar with the algorithm, but subtract incorrectly, i.e., 50 - 14 = 44. Valuing responses other than the traditional algorithm gives children the message that thinking is important. Having the children find the correct answer and "prove" it empowers and teaches them to rely on their own "brain power," rather than always relying on the teacher for the correct answer. Such self-reliance and problem-solving skills will help the child on standardized tests figure out problems written in new formats.

O. Whenever you assign a page of drill and practice, have children estimate answers to addition and/or subtraction problems. Teach them to

Notes and textbook references

give a reasonable range rather than exact answers.

P. Use play money (dollars, dimes, and pennies) to subtract across zeros. Dollars stand for hundreds, dimes for tens, and pennies for ones. Children will trade dollars for dimes and dimes for pennies as necessary. A place value mat is helpful. The primary purpose of this activity is to help children understand the pattern of trading money (and the formal subtraction algorithm). While you will want children to write money in decimal form, in this lesson focus on the trading for equivalent values. Students need to understand that $3.54 may be 3 dollar bills, 5 dimes, and 4 pennies. Or you can model this amount as 3 dollars, 4 dimes, and 14 pennies, or as 2 dollars, 15 dimes, and 4 pennies.

Q. Play **Keeper of Wood**. Divide class into groups of four. Each group needs numeration blocks and a number cube. Each student needs a place value board. One person is keeper of wood. Each student begins with a hundred flat. In turn, students roll the cube and take away the number rolled. However, the number rolled always represents ones, so the students will need to trade materials on many of their turns. For example: If student rolls a 6, the student must trade a flat for ten rods. A transaction must be made with the keeper of wood. The student trades one ten rod for ten ones. The student is now able to take away 6 ones. Continue with the next student's turn. The first person to reach zero is the winner. At any time in the game both the player and the keeper of wood should be able to explain transactions.

R. When you are comfortable that students are ready for drill and practice to promote proficiency (not practice getting wrong answers), consider the following:

S. Engage students in mental computation on a regular basis. For example, "I bought a bag of 50 cookies for our class. My dog got into the bag and ate 20 cookies before I could retrieve it. How do I know whether I have enough left for our class?" Ask many students to respond by giving their answers and explaining their solution strategies. By asking students to share their own thinking, you will send the message that thinking is the main goal and they are expected to rely on their own brain power, rather than upon the teacher for validation. "What if my dog ate only 15 cookies?" Again, listen for a variety of approaches and always ask students to explain or "prove" their answers.

*Play **Numberville**. See Week 11 in the Week by Week Essentials.*

T. Introduce students to trading games. These games require a set of base ten materials such as base ten blocks, bean sticks, play money, and some kind of data generator such as a die or spinner. Students play in small groups; four is a good number. One person is the banker or keeper of the

base ten materials. This person distributes and trades materials as others take their turns. Of course, the job of banker or keeper rotates. The group chooses a target number such as 50 or 100. Players take turns rolling the die or spinning. The player asks the banker for whatever amount shows. If a die lands with five showing, that player asks the banker for five units. When appropriate, a player makes a trade, exchanging 10 units for a long for ten beans for a ten-bean stick, or 10 pennies for a dime. The banker or keeper is expected to monitor trades and make sure they are carried out correctly. The first player to reach the target number wins. Rather than continuing play until all players reach the target, the game ends as soon as one player reaches the target. All other players compute the difference between their current amount and the target. That difference becomes their score for that round of the game. The winners score for that round is zero. As additional rounds are played, these differences are recorded. After each person has had a turn to be the banker or keeper, everyone totals their scores for all rounds. If each group has four students, each player should have three scores to add. No score will be recorded when a student is the banker. The player with the lowest total is the grand winner. These games can also be played by taking the target number ,such as 50 or 100, and giving the number generated each turn to the banker. The goal is to be the first to reach zero. Once students understand how to play these games, they can continue to play with a variety of target numbers and materials. They might change the rules. For example, on a turn, you can either roll the die or trade with the banker, but not both. How does this rule change playing strategies?

Notes and textbook references

*Children need to construct a new vocabulary in which "even" means that each object in the collection has a partner and "odd" means that there will be one without a partner. Focus first on numbers to ten. Memorizing 0, 2, 4, 6, 8 as even and 1, 3, 5, 7, and 9 as odd does not explain why they are grouped as they are. Be sure to give students many opportunities to pair objec*ts.

U. To encourage estimating answers to problems prior to computing and a problem-solving approach, use some of these approaches when assigning problems from your textbook:

Do just the problems whose answers are less (or greater) than 200 (or some other target number).

Do just the problems whose answers are even (or odd).

Do just the problems whose answers are multiples of 10 (or 100 or 5).

Work the 5 problems that will have the greatest (or smallest) answers.

Match answers (supplied by the teacher) to the appropriate problems.

Choose the 10 problems to work which you know you will workcorrectly.

Choose 5 problems and write 5 new problems which will give thesame answers as those you chose.

Be sure to spend class time allowing students to share their strategies for completing these tasks. Ask questions such as, "How did you

Notes and textbook references

decide which problems would have answers that were multiples of ten without working all the problems first?"

Techers Talk: What works for you in implementing the K-2 Assessment?

1. A clipboard with cards or stickies for each student.
2. Using manipulatives really helps with understanding and retention.
3. Grouping objectives on one list stapled to a folder. *"I put all the activities, games and blacklines that I used all together to make next year easier."*
4. Story Mats bring in real-life situations.
5. Use one activity to assess more than one objective.

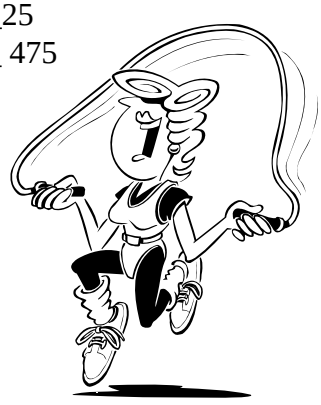
c. Relationships between operations.

A. Use activities in the Week by Week Essentials and the Games sections to support students' memorization of number facts.

B. Use the Mental Math section in the Week by Week Essentials to develop memorization of number facts and encourage students to share their strategies. Ex. Doubles, one more (or less) than ten, counting up to an even number and then counting by 2's.

C. Use +, -, and = to make a true number sentence.

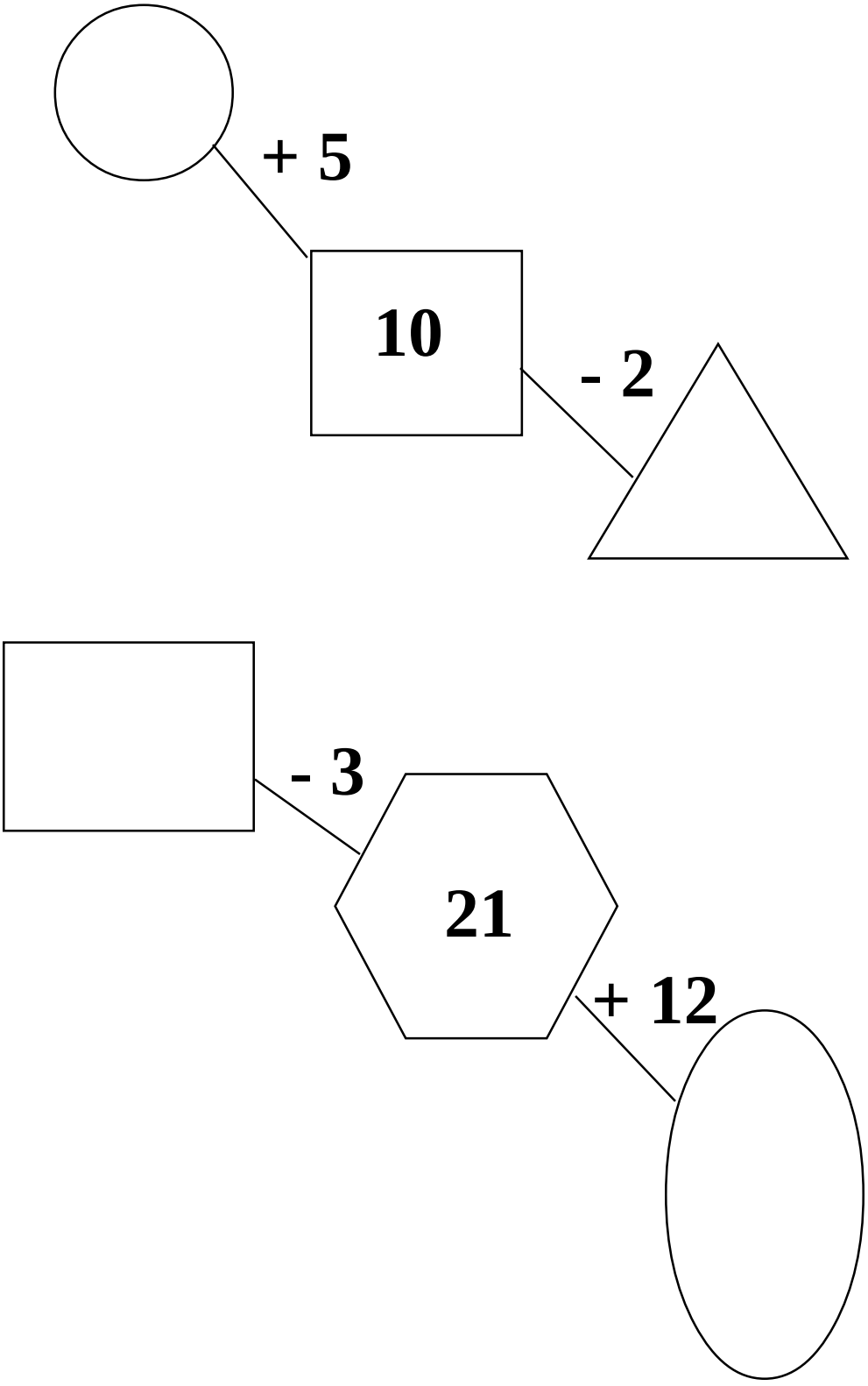
a) 14 __ 12 __ 26
b) 37 __ 12 __25
c) 48 __ 26__ 22
d) 430 __72__ 475



e) 714 __ 192__ 522 e) 21 __9 __ 30

Notes and textbook references

D. Play **Fill in the Missing Numbers** games to examine the effect of addition and subtraction. See Blackline Masters I - 20 and I - 21.



Notes and textbook references

1.05 Create and solve problems using strategies such as modeling, composing and decomposing quantities, using doubles, and making tens and hundreds.

A. Using a place-value mat, have students build a number. For example, have students put 2 hundreds, 4 tens, and 7 ones on the mat. Ask students to name/write the number. Another example is 2 hundreds, 14 tens and 7 ones.

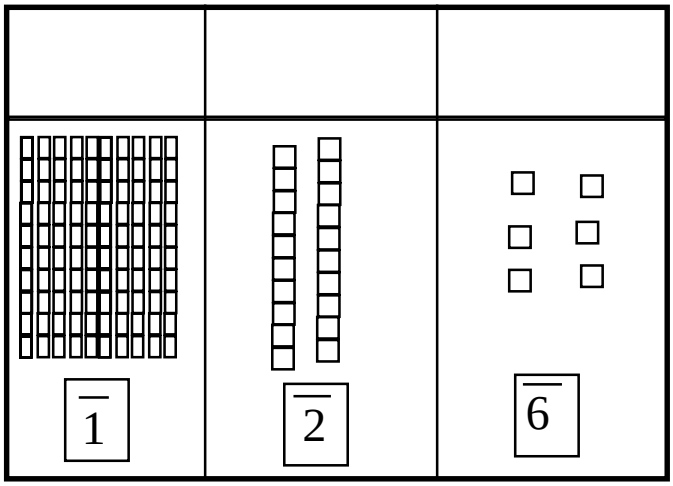
B. Play "**Out-Number Your Neighbor**" in Week 25. The directions are supplied and here is an extension:

The first card tells how many ones; the second card tells the number of tens, and the third card tells how many hundreds. The students model the numbers on the place-value mats. The player with the highest number (or lowest number) wins a point. Play continues until one student has 10 points.

C. Have students create place-value cards. Give them two sheets of white 8 1/2 by 11 paper. Fold until there are 16 small rectangles (as shown). They will have 32 sections from the two sheets of paper. Then have students write the numeral 0 - 9 three times in the respective rectangles. Cut out the rectangles and staple them into three separate "charts". These sets can be used to connect the manipulative materials to the abstract three-digit number.

0	1	2	3
4	5	6	7
8	9	0	1
2	3	4	5

6	7	8	9
0	1	2	3
4	5	6	7
8	9		



Flip the 0-9 cards to match the cubes shown.

Notes and textbook references

D. Given pictures which model three-digit numbers, tell and write the number in standard form. *Note whether the students recognize and utilize the groupings that are displayed or whether the students tend to count individual parts.*

E. Have the students model the same number with three different materials. Allow students to draw a picture as one of the representations.

F. Model a 2- or 3-digit number on the overhead. Ask students to tell about the model and demonstrate how to write the number as tens and ones as well as in standard form. Show students a 2- or 3-digit number and ask them to build the model and explain.

G. Write a 2- or 3-digit number on the board. Point to one of the digits and have students get out the appropriate number of unifix cubes or numeration blocks.

Notes and textbook references

H. The following games from the **Week by Week Essentials** will help develop their concept:

"**Number Concentration**"	Week 32
"**Closest to 100**"	Week 30
"**Bone Up**"	Week 31
"**Out Number Your Neighbor**"	Week 35

I. Play "**Highest Number**". Each child draws three blanks on a sheet of paper. (_____, _____, _____) The teacher rolls a die (1-6, or 0-9) or spins a spinner. After the number is announced the students write the digit in one of the blanks. Once a number is written it cannot be changed. After three turns or spins class check to see who made the largest 3-digit number.
You may want to introduce this by the teacher playing against the class. Then have the class play against each other in two teams. This activity helps children see the power of the hundreds place. (It is also a nice introduction to the idea of probability.)
Variations: Play to make the smallest possible number, the number closest to 500, 250, etc.

J. The student is given beans (or any counters) and asked to share equally with three friends. "Leftovers" are returned to the teacher.

K. Given a quantity of beans and cups, the student distributes the beans equally in the cups. Remaining beans are left on the desk.

L. Ask students to deal cards for a game, making certain that each player has the same number.

M. Read <u>The Doorbell Rang</u> by Pat Hutchins and bring in cookies for the children to divide equally among themselves. Repeat with various numbers.

N. The teacher directs the student to be a farmer who is planting rows of corn. The farmer wants four rows with three kernels of corn in each row. Using Unifix cubes, the students model the rows of corn. Ask students to figure the total number of kernels. *(Counting, repeated addition, and multiplicatio*n.)

O. Ask students to find the number of legs on four chairs. Ask

students, how can this be determined without counting? (4 + 4 + 4)

Notes and textbook references

P. Give students circles of yarn and counters. Ask children to show three sets of five. Repeat with other numbers.

Q. Using Unifix cubes, ask students to model examples of repeated addition (for example, crayons in two boxes, wheels on three tricycles, etc.).

R. Given word problems using repeated addition *(simple multiplicatio*n), have students solve the problem using manipulatives.

S. Use literature such as *Bunches and Bunches of Bunnie*s and Each Orange Had Eight Slices to illustrate repeated addition. Have the children write about the story.

T. Present simple word problems such as: Kim had 20 marbles to put in four boxes, equally. How many marbles will be in each box?

1.06 Define and recognize odd and even numbers.

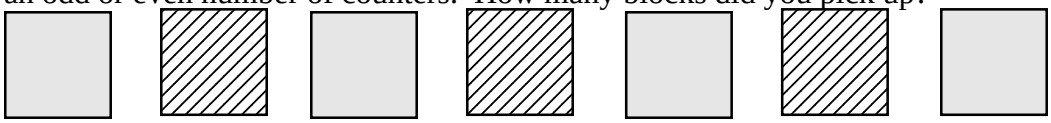
A. Have students come to the front of the room in groups such as everyone wearing glasses, or everyone with a brother, everyone with a birthday this month, etc. Ask each group to form partners. Each time record whether everyone has a partner or if there is someone left over. Record results on a chart:

All Partners	Not All Partners
2	13
8	9
4	5
12	11

Discuss which group is odd, which is even. How do you know?

Notes and textbook references

B. Have students take a handful of objects (unifix cubes or the larger pattern blocks are a good size). Ask students to show whether there is an odd or even number of counters. How many blocks did you pick up?

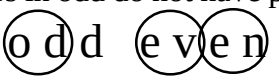


"Seven is an odd number because there are three pairs and one left over."

C. Ask students to make a picture to show whether the number nine (or another appropriate number) is odd or even. *Observe whether the students have a strategy for verifying odd and even when manipulatives are not available.* Show students a numeral and ask them to predict whether it is odd or even and then verify their prediction.

D. Ask the students if they can suggest some rules about which numbers are odd and which ones are even. *Some students may not have reached a level of maturity to be able to do this. The process of defining and determining whether a number is odd or even should be the focus, not memorizing examples.*

E. If children have trouble with the vocabulary of odd and even, show them that the letters in odd do not have partners, but the letters in even do.



F. Two students scoop a spoonful of beans from a container. Students count the beans and estimate whether their number is odd or even. Students pair beans to verify odd or even. Record the numbers in the appropriate columns and summarize as the example shows. Repeat the activity ten times. Discuss the findings with group and develop a generalization of odd and even numbers.

G. **Step and Hop on Odd and Even Numbers**. Write the numbers on a hard surface for children to step on if odd and hop on if even.

2 4 6 8 10 12 14

Notes and textbook references

1 3 5 7 9 11 13 15

The numbers on the bottom represent the steps and the numbers on the top represent the hops. Class moves together. Variation: Clap for odd and snap fingers for even numbers as the teacher shows them on the overhead

H. Have each student examine the page numbers in different library books. Which pages have odd numbers? Which have even numbers? After a group discussion, predict, then check to see whether the following pages would be on the right side or the left side of an open book: 81, 29, 36, 53, 192, 315, 4480.

I. To help students check even or odd have students pair fingers of left hand with right hand. When all fingers are paired, you have 10. To determine whether a 2-digit number is odd or even, pair all fingers for each ten and then pair the remaining ones as needed. For example: 37 - all fingers (hands) pair 3 times, then thumbs, index, and middle fingers pair, leaving the ring finger (7) without a partner, so 37 is odd.

J. Pair desks (or students) in classroom. Note whether there is an even or odd number of students. What happens when one student is absent? What happens if one more student enrolls? Two students?

K. Each pair of students will use a hundred board and 100 objects to be shared. Working in pairs, students will choose a number of objects. If the objects can be shared equally that number is covered on the hundred board. Process is to be repeated numerous times. Children write and post their conclusions.

L. Set up a station called **Grab and Group**. Supply a variety of objects such as paper clips (use jumbo and then another set of regular), macaroni, various kinds of beans, plastic clips from bread wrappers, rubber or metal washers, buttons, nuts, screws, etc. A direction card at this station asks students to: (1) decide upon an object, (2) estimate the number that they can grab in one handful, (3) record this estimate and indicate whether it is an odd or even number, (4) grab a handful, (5) group the handful of objects into pairs, (6) count this number and record it, again indicating odd or even.

Students repeat this process many times as they use different objects. Ask students if there is another way to group the objects to count and determine whether they are odd or even (parity). If the objects are grouped by 5's or

Notes and textbook references

10's, how does one determine parity? See Blackline Master I - 11.

M. Supply each student with a hundred board and 13 counters. Explain that students will place the 13 markers on the hundred board by starting on 2 and counting by 2's; i.e. 2,4,6, etc. Ask them to predict where the thirteenth marker will land and whether this number will be odd or even. Then lead the class in rhythmically placing and counting aloud as the markers are placed. Then discuss the results. Be sure to discuss visual pattern and multiplication facts; have students count backwards aloud as they remove the markers, twenty-six, twenty-four, etc. Repeat this with other number groupings such as 5's, 10's, 9's, etc. Will students realize ahead of time that all 13 markers won't "fit" on the hundred board when counting by 9's and/or 10's? Try this with other hundred boards such as 0-99, etc.

Hundreds ***Tens*** ***Ones***

Drill and Practice

From a Problem-Solving Approach

Drill and practice continues to be an important strategy for internalizing and sharpening skills. However, textbook drills can be presented in a variety of appealing ways and problem-solving skills can be enhanced.

Do just the problems whose answers are less than 200.
Do just the problems whose answers are equal to more than the value of two quarters.
Do just the problems whose answers are multiples of 10.
Present a problem, have students read the information and question then write another, different question which would be appropriate with the information given.
Choose 10 problems to work which you know you will get the right answer.
Work 10 problems that will have the greatest answers.
Given the answers to 10 problems, students match the answers to the problems.
Teacher works all the problems and students check teacher's answers.