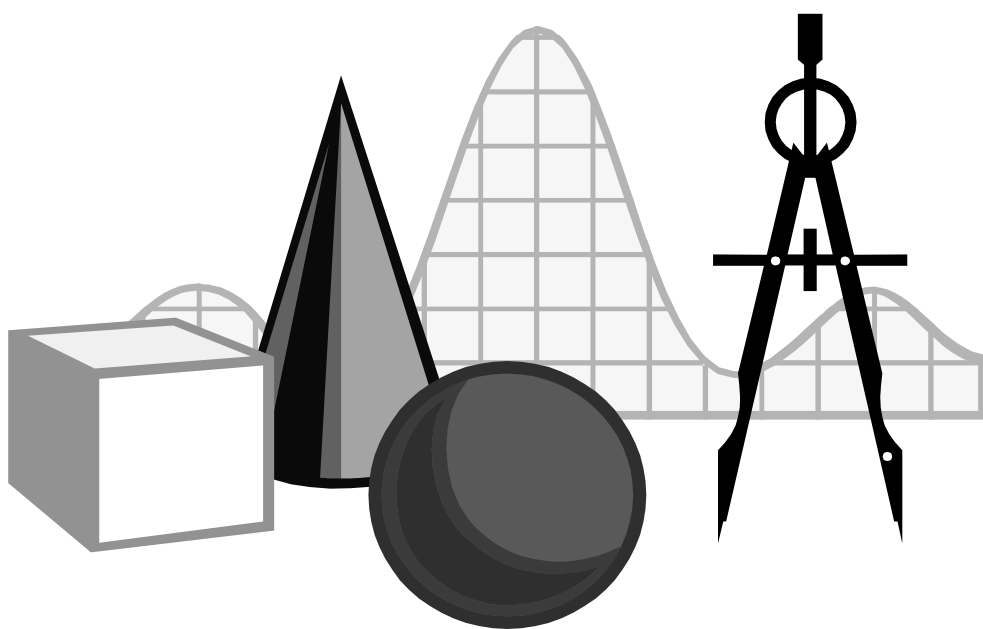


MATHEMATICS STANDARDS OF LEARNING ENHANCED SCOPE AND SEQUENCE

Grade 1



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Introduction

The *Mathematics Standards of Learning Enhanced Scope and Sequence* is a resource intended to help teachers align their classroom instruction with the Mathematics Standards of Learning that were adopted by the Board of Education in October 2001. The Mathematics Enhanced Scope and Sequence is organized by topics from the original Scope and Sequence document and includes the content of the Standards of Learning and the essential knowledge and skills from the Curriculum Framework. In addition, the Enhanced Scope and Sequence provides teachers with sample lesson plans that are aligned with the essential knowledge and skills in the Curriculum Framework.

School divisions and teachers can use the Enhanced Scope and Sequence as a resource for developing sound curricular and instructional programs. These materials are intended as examples of how the knowledge and skills might be presented to students in a sequence of lessons that has been aligned with the Standards of Learning. Teachers who use the Enhanced Scope and Sequence should correlate the essential knowledge and skills with available instructional resources as noted in the materials and determine the pacing of instruction as appropriate. This resource is not a complete curriculum and is neither required nor prescriptive, but it can be a valuable instructional tool.

The Enhanced Scope and Sequence contains the following:

- Units organized by topics from the original Mathematics Scope and Sequence
- Essential knowledge and skills from the Mathematics Standards of Learning Curriculum Framework
- Related Standards of Learning
- Sample lesson plans containing
 - Instructional activities
 - Sample assessments
 - Follow-up/extensions
 - Related resources
 - Related released SOL test items.

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Organizing Topic Whole Numbers: Representations, Relationships, Operations, and Estimation

Standards of Learning

- 1.1 The student will count objects in a given set containing between 1 and 100 objects and write the corresponding numeral.
- 1.2 The student will group a collection of up to 100 objects into tens and ones and write the corresponding numeral to develop an understanding of place value.
- 1.3 The student will count forward by ones, fives, and tens to 100, by twos to 20, and backward by ones from 20.
- 1.4 The student will recognize and write numerals 0 through 100.
- 1.5 The student will identify the ordinal positions first through tenth, using an ordered set of objects.
- 1.7 The student, given a familiar problem situation involving magnitude, will
 - a) select a reasonable magnitude from three given quantities: a one-digit numeral, a two-digit numeral, and a three-digit numeral (e.g., 5, 50, and 500); and
 - b) explain the reasonableness of his/her choice.
- 1.8 The student will recall basic addition facts — i.e., sums to 10 or less — and the corresponding subtraction facts.
- 1.9 The student will create and solve story and picture problems involving one-step solutions, using basic addition and subtraction facts.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Count by rote from 1 to 100.
- Write numerals for the numbers 1 to 100.
- Count a randomly placed collection of objects containing between 1 and 100 items and write the corresponding numeral.
- Group a collection of objects into sets of tens and ones.
- Write the numeral that corresponds to the total number of objects in a given collection of objects that have been grouped into sets of tens and ones.
- Count by ones, fives, and tens to 100, using concrete objects, such as counters, connecting cubes, pennies, nickels, and dimes.
- Skip-count orally by fives and tens to 100.
- Count by twos to 20, using concrete objects, such as counters, connecting cubes, and pennies.

Counting the Days

Reporting categories

Number and Number Sense; Patterns, Functions, and Algebra

Overview

The use of the monthly calendar offers many opportunities for students to count, describe and predict patterns, and learn number concepts.

Related Standards of Learning

1.3, 1.21

Objectives

- The student will investigate and recognize patterns created on the calendar when counting by ones, twos, fives, and tens.
- The student will count forward to 100.
- The student will count backward from 20.
- The student will identify the components of a calendar, including days, months, and seasons.
- The student will recognize, describe, extend, and create a wide variety of patterns that occur in the calendar.

Materials needed

- Seasonal cutouts to represent each month of the school year (e.g., apples for September, pumpkins for October, turkeys for November, stars or evergreen trees for December, snowmen for January, hearts for February, kites for March, umbrellas for April, flowers for May, and sailboats for June)
- A chart with three pockets labeled “ones,” “tens,” and “hundreds”
- Straws
- Numeral cards to be placed above the straws

Instructional activity

1. *Initiating Activity:* The activities related to the calendar are a mathematical way to begin the day. Start with the day of the week, the date, and the month. Have students indicate the day before and the day after today. Discuss how many days are in a week, the days of the week, how many months are in a year, and the seasons.
2. On the first day of the school year begin a number line that will be posted above the calendar. Use one red apple cutout to begin a red-yellow-green apple cutout pattern.
3. On the red apple, write the numeral 1 to represent the first day of school. On the following days, write the proper numeral to indicate that day of school. Have the students predict the next color apple and the next number. Use the apples as a source for reinforcing counting orally each day of the school year. Once there are a sufficient number of apples, students can count by twos, fives, and tens as well. Use the appropriate seasonal cutouts for each month to create a visual timeline that may be used to review the months, seasons, holidays, and the concept of past and present.
4. Once the appropriate cutout has been posted for the day, have a student add a straw to the ones pocket of the pocket chart. Have another student place the correct numeral card above the straw and tell the students that another straw will be added each day until there is a set of 10. The straws will then be bundled into a set of 10 and placed in the tens pocket. This procedure will continue until the 100th day when all 10 sets of 10 can be bundled together and placed in the hundreds pocket. Milk cartons work well as “pockets” on the chart to hold the straws.
5. Keep a tally count of the days in the month.

6. Play “I’m Thinking of a Number.” Give clues, and have students use the calendar to help figure out the number.

Sample assessment

- Each day have a different student count the number of days of a particular month as you do the calendar. Also have students count the number of students present for roll call or lunch counts.
- At the end of each day have a lead student count backward from twenty to one while other students are doing “floor clean-up.”
- Using unifix cubes and paper bowls, have the students place 10 in each bowl and then count by tens.
- Have students paint one hand and use that hand to “print” at least 10 hand images on a long piece of bulletin board paper. Then have them count their fingers by ones, by fives, and by tens. Place two student-hand strips together, and have the students practice counting to 100.

Follow-up/extension

- Sing along with tape recordings that feature counting by twos, fives and tens.
- Have the class stand in a circle. Designate one child to start the backward counting by giving the child a necklace to wear to signify that she/he is the starter. Have the starter predict who will be number 1 if she/he is number 10 and is counting the students backward from 10. Beginning with the starter as number 10, have the children count off backward in sequence. The child who says the last number in the sequence takes the necklace off the starter, places it on the student to his/her right, predicts who will be number 1 when counting backward from the new starter, and then sits down. The children continue around the circle, skipping those who are sitting down, until only one child is left standing.
- Put between 15 and 30 beans in a clear plastic bag. Have the students pass the bag around the circle, keeping all the beans in it while they guess the number of beans inside. After it has gone around the circle, ask the students to predict the number of beans in the bag, and write this number on the board. Then have them pass the bag again, and suddenly ring a bell as a signal to “spill the beans.” Have the child who “spilled the beans” begin putting them back in the bag, one by one, as the class counts aloud until all the beans are back in the bag. Write this number on the board. Was their prediction correct? Continue the game with a new number of beans for each round.
- Have students work with a partner. Distribute hundred charts and calculators. Have one student record on the chart while the other student punches in +5 on the calculator. Each time the = is pressed on the calculator, have the recorder color the appropriate square on the chart. Have the students describe the patterns that are formed. On a different day, use +2 can for this activity. Repeat the activity, using +10.
- The 100th day of school provides many opportunities to reinforce counting by tens. Student projects can include posters containing 100 objects and literature relating to the 100th day of school.

Pick A Card, Any Card

Reporting category

Computation and Estimation

Overview

Students practice recall of addition and subtraction facts by making their own set of fact cards to use with various activities.

Related Standards of Learning

1.8 (1.1–1.4 Number and Number Sense, 1.16 Geometry)

Objective

- The student will recall basic addition facts — i.e., sums to 10 or less — and the corresponding subtraction facts.

Materials needed

- 11 hexagonal fact family cards for each student
- Markers
- Stickers (small, self-adhesive colored dots, seasonal stickers, or thematic-design stickers)
- Overhead projector
- Transparency of a hexagon
- Colored disks for use on the overhead
- Student math journals

Instructional activity

1. Model on the overhead projector how to create a two-number combination with a sum of 10 or less, for example, 4 and 5.
2. Using the overhead transparency of a hexagon, write the smaller number, 4, at the top left on the hexagon, and write the larger number, 5, at the top right on the hexagon.
3. Place four colored discs beneath the 4 inside the hexagon. Then place five discs of a different color beneath the 5 inside the hexagon.
4. Show students how to count the total number of discs to come up with the sum of 9. Write the number 9 at the bottom of the hexagon.
5. Direct students to create several two-number combinations for sums of 10 or less. If some students still need help, provide them with a number combination to get started.
6. Provide students with a set of 11 hexagonal cards and several sheets self-adhesive dots in two different colors. (See directions at the end of the lesson for making the hexagonal cards.)
7. Allow students time to try to make 11 two-number combinations for the targeted sum, 9, and to place the corresponding dots on each card. Because there are only 10 two-number combinations for the sum of 9 ($0 + 9$, $9 + 0$, $1 + 8$, $8 + 1$, $2 + 7$, $7 + 2$, $3 + 6$, $6 + 3$, $4 + 5$, $5 + 4$) the students will use 10 of the 11 cards and have one left over. This card will be used to make the fact family “house.” (See directions at the end of the lesson for making these.)
8. Students may write the corresponding number sentence on the back of each card.
9. After the lesson, direct students to draw/write about the activity in their math journals.

Sample assessment

- As you circulate among the students, clarifying, assisting, and conversing, make notes about how well students follow directions, problem solve, and count, and about the accuracy of students' cards. Check math journals for evidence of understanding or need for reteaching and reinforcement.

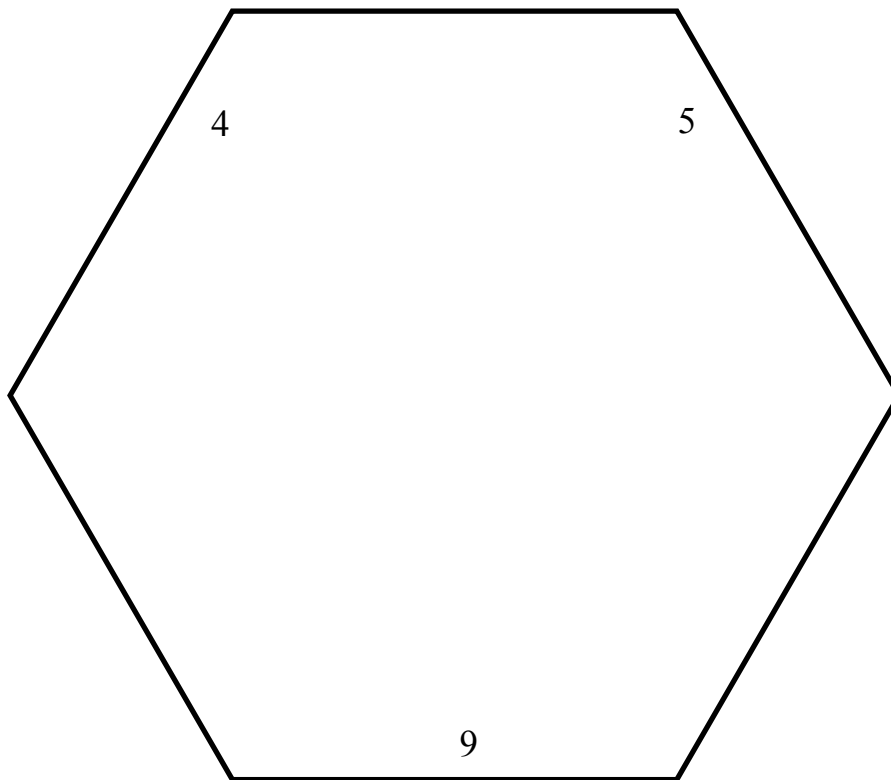
Follow-up/extension

- Challenge students to make fact family cards for other sums of 10 or less. They may design their own card images to illustrate the number combinations. Students may also use their fact family "house" to hide one or two numbers at a time in order to practice fact recall. The student may say each missing number as a part of an addition or subtraction problem.

Directions for making fact family cards and houses

Use the hexagon pattern below or an Ellison die cut, if available, to cut out multiple copies of a hexagonal shape for use by the students individually. For the hexagon to be used on the overhead, make one that is at least nine inches tall.

To make a fact family "house," cut a hexagon in half, and glue the two trapezoids together, leaving the long side open so that students can slide fact family cards into their house.



Fact Family Houses

Reporting category

Computation and Estimation

Overview

Students make fact family houses to explore the basic addition facts and corresponding subtraction facts.

Related Standard of Learning

1.8

Objective

- The student will recall basic addition facts — i.e., sums to 10 or less — and their corresponding subtraction facts.

Materials needed

- Four 3-by-5 index cards for every student
- An 11-by-17 sheet of colored construction paper for each student
- Pencils, markers, crayons
- White glue

Instructional activity

1. Tell students a story about Fact Families. “Once upon a time...there was a town known as Numbertown. The Number Five family lived on 5th street in this town. They lived in a lovely 2-story house. Mother’s favorite room was the living room downstairs (aaaah). Father’s favorite room was the dining room (yum!). Brother’s favorite room was his bedroom upstairs (yeeha!), and sister’s favorite room was her bedroom (tadah!).”
2. Ask students to give two numbers that make 5 (for example, 2 and 3). These numbers were the Number Five fact family house number: 235. Tell students only these three numbers were used because they were the only members of the household! You couldn’t bring in another number because only 2, 3, and 5 lived there! All others were uninvited guests.
3. Direct students to fold their construction paper into halves vertically. Then with the folded edge in their left hand, have them fold the upper right corners over to the folded edge, making a triangle. Crease. Have them open up the crease and guide them in cutting along the crease line. When the page is opened up, it will look like a house with a triangular roof.
4. Direct students to write the addition fact $2 + 3 = 5$ in vertical form in the upper left area of the “house,” brother’s room. Guide students in writing the “turn-around” fact, $3 + 2 = 5$, in sister’s room in the upper right area.
5. Moving “downstairs” to the dining room on the left of the front door, ask students to write the corresponding subtraction fact. Tell them: “Remember, only the numbers 2, 3, and 5 may be used. Therefore, if we are going to “take away,” the larger number must appear first: 5 take away 2 equals 3, or $5 - 2 = 3$. Direct students to write this fact in vertical form in father’s favorite room.
6. Have the students move to the right of the front door, where mother is sitting in the living room. Direct them to write her turn-around fact in this area.
7. Students may illustrate/decorate their fact family houses with window boxes holding five flowers each, curtained windows with five polka dots on each curtain, five vines growing up the front of the house, etc. On the front door should be the house number **235**. Have students write across the roof (*student’s name*)’s **Fact Family House**.

Sample assessment

- Circulate throughout the class as students begin making their houses, offering assistance as needed, clarifying questions, and noting their successes or failures.

Follow-up/extension

- Challenge students to invent their own number combinations in order to build another fact family house.

Watermelon Fun, Part I

Reporting category

Computation and Estimation

Overview

Students explore magnitude by estimating and verifying the weight of a watermelon.

Related Standards of Learning 1.7 (1.1–1.4 Number and Number Sense)

Objective

- The student, given a familiar problem situation involving magnitude, will
 - a) select a reasonable magnitude from three given quantities: a one-digit numeral, a two-digit numeral, and a three-digit numeral (e.g., 5, 50, 500); and
 - b) explain the reasonableness of his /her choice.

Materials needed

- One medium watermelon (or pumpkin, pomegranate, or kiwi)
- Comparison items: feather, dictionary, cabinet
- Melon recording booklets (directions at the end of lesson)
- Guessing box
- Classroom graphing chart
- Small melon cutouts for the graph
- Programmed individual graph sheets (optional)

Instructional activity

Note: Depending on the availability of melons (or pumpkins, etc.), this lesson may be presented at the beginning of the year as a community building activity, or at the end of the year as a celebration.

1. Invite students to play “20 Questions,” in which students may ask up to 20 “yes/no” questions to determine what is in the guessing box. Ask one student to keep a tally of the number of questions asked. Remind students that it is important to listen closely so as not to duplicate questions and waste an opportunity.
2. If after 20 questions no one has guessed, you may give more clues, allow more time, or allow more questions. But at some point, reveal the watermelon to the students. Set out the melon in full view on a table. Place the melon near three objects for weight comparison. For example, a feather, a large dictionary, and a file cabinet or bookshelf.
3. Ask students to guess which item is closest in weight to the melon. Allow students to investigate the items, but supervise from close at hand.
4. Distribute a small melon-shaped cutout to each child. Have each student indicate his/her guess on the melon by writing the name of the item or drawing a picture of it. Have the students write their name on the back of their melon.
5. Using a classroom graph, have the students place their melon icon in the proper column.
6. Discuss the graph, using words such as *greater than*, *less than*, and *same*. Encourage students to name the item they chose and explain the reason for their choice.
7. Complete this part of the lesson by checking which object compare to the weight of the melon.

Sample assessment

- Circulate through the room as students write their guesses, challenging them to support their choice, offering assistance as needed, and clarifying any questions. During the whole class discussion of the graph, observe for indications of understanding or need for reinforcement/ reteaching. Math journals may also provide evidence of understanding and need.

Follow-up/extension

- Have students draw/write in their melon recording journals about the lesson. Students may be instructed to transfer the graph information onto an individual programmed graph sheet in order to challenge those students who need it.
- Use the follow-up activity “Watermelon Fun, Part 2.”

Directions for making melon recording booklet

These booklets are to be used for all three “Watermelon Fun” activities: parts 1, 2, and 3.

Fold in half together two sheets of drawing paper and one piece of pink construction paper to make an eight-page booklet with a pink cover. Staple along the fold. Program six of the eight pages with the following sentence frames or charts:

- Page 1: **I think our melon weighs about as much as a _____.** (Students draw a picture of or write the word *feather*, *dictionary*, or *file cabinet*. You may also make this sentence frame into a rebus sentence for built-in support for emerging readers.)
- Page 2: **I think our melon is about _____ inches around.** (Students select a precut string from 3 choices: One short (3 in.), one average length (30 in.), and one long (300 in.).)
- Page 3: **I think our melon has about _____ seeds inside.** (Students choose from three numbers, such as 3, 30, 300. Keep in mind that the numbers you choose should depend upon the melon size and variety.)
- Page 4: Include the following chart:

Melon Weight Chart			
	Feather	Dictionary	Cabinet
My guess			
Most Likely			

- Page 5: Melon Circumference Chart (Include the same chart, but change the column headers to “3,” “30,” and “300.”)
- Page 6: Melon Seeds Count Chart (Use the same chart, but change the column headers to match the numbers of seeds used on page 3.)

Watermelon Fun, Part 2

Reporting category

Computation and Estimation

Overview

Students explore magnitude by estimating and verifying the circumference of a watermelon

Related Standards of Learning 1.7 (1.1–1.4 Number and Number Sense)

Objective

- The student, given a familiar problem situation involving magnitude, will
 - a) select a reasonable magnitude from three given quantities: a one-digit numeral, a two-digit numeral, and a three-digit numeral (e.g., 5, 50, 500); and
 - b) explain the reasonableness of his/her choice.
- The student will count by tens to 100.

Materials needed

- One medium watermelon (or pumpkin, pomegranate, or kiwi)
- Yarn or string cut into 3-in., 30-in., and 300-in. lengths
- Watermelon recording booklets (directions at end of “Watermelon Fun, Part 1”)
- Classroom graphing chart
- Small melon cutouts for the graph
- Programmed individual graph sheets (optional)

Instructional activity

1. This lesson follows up on part 1, in which students estimated the weight of a watermelon. Using the same melon as a reference, show students a tagboard cutout of a melon with three strings hanging from it. The strings are labeled “3,” “30,” and “300.” Discuss with students which one would be a reasonable choice to show the distance around our melon.
2. Distribute the melon cutouts, and direct students to write their estimate on one side and their name on the other.
3. Have the students, one by one, place their cutouts in the appropriate column on the class graph. Lead a discussion about the results of the graph. How many students estimated 3? 30? 300? Which category is *greater*, *less than*, *the same*? Are the guesses reasonable? Why or why not?
4. Have the students write/draw in their melon booklet on page 2 and fill in the “Melon Circumference Chart” page 5.
5. Complete this part of the lesson by measuring the circumference of the melon.

Sample assessment

- Circulate through the classroom, observing the students completing their melon booklet. Watch for misunderstandings, application of knowledge, ability to follow directions, and general understanding of the concept. The melon booklets will be used at the end of part 3 as assessment documents.

Follow-up/extension

- Challenge students to transfer the melon data to a paper/pencil activity, if appropriate. For instance, the students may make an individual graph showing the estimates. Also, provide students with the challenge of describing the results of the inquiry in writing. Were there any surprises?

Watermelon Fun, Part 3

Reporting category

Computation and Estimation

Overview

Students explore magnitude by estimating, counting, grouping, and verifying the number of seeds in a watermelon

Related Standards of Learning 1.7 (1.1–1.4 Number and Number Sense)

Objective

- The student, given a familiar problem situation involving magnitude, will
 - a) select a reasonable magnitude from three given quantities: a one-digit numeral, a two-digit numeral, and a three-digit numeral (e.g., 5, 50, 500); and
 - b) explain the reasonableness of his/her choice.

Materials needed

- One medium watermelon (or pumpkin, pomegranate, or kiwi)
- Watermelon recording booklets (directions at end of “Watermelon Fun, Part 1”)
- Counting cups (Small party-mint cups are ideal.)
- Colander
- Classroom graphing chart
- Small melon cutouts for the graph
- Programmed individual graph sheets (optional)
- Paper towels, table cloth, wet wipes
- Plastic trays to hold counting cups

Instructional activity

Note: This culminating lesson for Watermelon Fun may be done outside on a warm day, as it is rather messy. If weather doesn’t permit, cover a large table with the tablecloth and place newspapers on the floor.

1. Using the same melon as a reference, review the project up to this point. Have students share their ideas, observations, and questions. Then spread a large tablecloth on the ground, and tell students that they will each receive a slice of the melon and that as they eat it, they must collect the seeds in the counting cups provided. Collect all the seeds in one container when students are finished.
2. Back in the classroom, distribute the melon cutouts, and direct students to write their estimate of the number of seeds in the *whole* melon on one side and their name on the other.
3. Have the students, one by one, place their cutouts in the appropriate column on the class graph. Lead a discussion about the results of the graph. How many students estimated 3? 30? 300? Which category is *greater, less than, the same*? Are the guesses reasonable? Why or why not?
4. Have the students write/draw in their melon booklets on page 3 and fill in the “Melon Seeds Count Chart” on page 6. (This should give you time to clean up any mess and rinse the melon seeds in a colander.)
5. Direct students to clear their desktops and get into cooperative groups of 3 to 4. Circulate through the class, distributing several new counting cups and a scoop of seeds to each student.
6. Lead the students in counting out a group of 10 seeds, putting them into a counting cup, and repeating the process. At the point they are no longer able to make a group of 10, tell them that

these are “leftovers” that should be set aside to be used later. Once all students have grouped as many of their seeds as possible, ask each child to tell how many seed cups (groups of 10) he/she has. Mark a tally on the board for each cup, or ask a student volunteer to keep track.

7. Direct students to combine their tens cups by placing them on a tray that you will pass to each cooperative group in turn. Put the tens cups from the tray in a row that is visible to the whole class. Lead students in skip-counting by tens to determine the number of seeds in the cups. Write this number on the board. (If your students are at the point of using a place-value mat, you may ask where on the mat you should place this number. However, most students will not be at this level early in the school year.)
8. Instruct the students to combine all their cooperative group’s leftover seeds. Allow them time to group these combined seeds into tens cups and set aside any new leftovers. Repeat the process of adding by directing the cooperative groups to place all their tens cups on the tray as you pass it again. Line these cups up, and have the students skip-count by tens to determine the total number of seeds in the cups. Write this number on the board.
9. Now have a representative from each group bring that group’s leftovers to the table to combine with all other leftovers. Can any tens cups be made this time? Have the representatives make as many tens cups as possible, line them up, and skip-count by tens to determine the number of seeds. Write this third number on the board. Then have one child count the final leftovers (fewer than 10) aloud, and write this final number on the board.
10. As a class, skip-count by tens all the tens cups and “count on” the final leftovers to come up with the grand total. Engage students in a discussion about how reasonable their guesses were.
11. Have the students write/draw in their melon booklet on page 3 and fill in the “Melon Seeds Count Chart” page 6.

Sample assessment

- Circulate through the classroom, observing the students completing the melon booklet. Watch for misunderstandings, application of knowledge, ability to follow directions, and general understanding of the concept.
- Use the melon booklets as assessment documents.

Follow-up/extension

- Challenge students to transfer the melon data to a paper/pencil activity, if appropriate. For instance, the students may make an individual graph showing the estimates. Also, provide students with the challenge of describing the results of the inquiry in writing. Were there any surprises?

Choo! Choo! To 10

Reporting category

Computation and Estimation

Overview

Students make unifix-cube trains to explore the different ways to make 10 and then tally and record the different number combinations with 10 as the sum.

Related Standard of Learning

1.8

Objective

- The student will recall basic addition facts — i.e., sums to 10 or less — and their corresponding subtraction facts.

Materials needed

- Overhead projector
- A class supply of part-part-whole mats and a transparency of the mat
- A teacher-made recording booklet for each child (directions at the end of lesson)
- Transparency of one page of the recording booklet
- 10 unifix cubes for each child
- Markers, crayons, pencils

Instructional activity

Note: Since our number system is based upon 10, it is important that students know all the possible combinations for making 10. Provide students with many opportunities to explore this concept.

1. Begin by reading a book with a context of counting to 10. Follow up by asking for ideas or questions about the book. Ask students to share number combinations from the book.
2. Tell students that they will be looking for combinations of numbers that add up to 10. Ask, “How many ways are there to get to 10?”
3. Using a train of 10 unifix cubes, show students how to place their train on the “whole” section of the mat. Next tell students you are going to break the train into two parts, and place each part of the train in the part-part portion of the mat. Ask students, “How many train cars are left at this station? That station? (What part is in this box? That box?)” Guide students to understand that the two parts (e.g., 5 and 5) make up the whole train (10). Do several of these examples with the students to make sure they understand.
4. Using the overhead, show students how to record the number combinations on the teacher-made recording sheets. For example, if the train is broken into 7 and 3, students should record the combination as “7 and 3 make 10.” (You may verbalize this as: “7 train cars and 3 train cars make a whole train of 10 cars.”)
5. Collect the part-part-whole mats, and distribute the recording booklets and a unifix train to each student. Have students open to the first page, and using their train, break it apart and record the number combinations in their booklet.
6. Students should proceed to fill in all the possible number combinations in their booklet without repeating one. Students may then draw pictures of train cars to illustrate each number combination. (For example, show students how to draw 7 linked train cars linked with a hitch to 3 more linked train cars to show a complete train. Some students may add an engine as a car. That’s fine, as long as they are counting the correct number of cars. Some students will still need assistance completing

this activity, so while early finishers are illustrating their booklets, circulate and assist those in need.

Sample assessment

- Circulate through the class, engaging the students in discussions about the activity. Make note of those who can proceed independently and those who need more support. The student booklet will become an excellent means of gauging understanding of the skill.

Follow-up/extension

- Follow up this lesson immediately with the question: “Are there really 11 ways to get to 10?” (Yes) “How do we know?” (We counted to find out.)
- Challenge students to prepare a similar booklet for subtraction facts, using the number sentence, “____ take away ____ makes 10.”
- Extend this activity by challenging students to come up with number combinations for other numbers. They may record them as they did in the activity or in the symbolic form. This should be done only if the individual student is prepared for the leap to symbolic interpretation.
- Students may also record the numbers in an organized list, for example:
 - 0 and 10 make 10
 - 1 and 9 make 10
 - 2 and 8 make 10...Challenge students to communicate the pattern they see.

Directions for making recording booklet

- Fold in half together three sheets of drawing paper and one piece of colored construction paper to make a 12-page booklet with a colored cover.
- Program each page in the booklet with the sentence frame: “____ and ____ make 10.” (This can be done on a word processor and then duplicated.)
- Staple the booklet together at the top left corner along the crease.
- Allow students to decorate and title their booklet.

Numbers to 100

Reporting categories

Number and Number Sense, Computation and Estimation

Overview

Students use a variety of materials to practice writing numerals and counting to 100.

Related Standards of Learning 1.1, 1.2, 1.3, 1.4, 1.7

Objectives

- The student will write numerals for the numbers 0 through 100.
- The student will count a randomly placed collection of objects containing between 1 and 100 items and write the corresponding numeral.
- The student will count forward by ones, fives, and tens to 100, by twos to 20, and backward by ones from 20.
- The student will group a collection of objects into sets of tens and ones and record the corresponding numeral.
- The student, given a familiar problem situation involving magnitude, will
 - a) select a reasonable magnitude from three given quantities: a one-digit numeral, a two-digit numeral, and a three-digit numeral (e.g., 5, 50, 500); and
 - b) explain the reasonableness of his/her choice.

Materials needed

- A book to read to the students that features counting
- Collections of various manipulatives to use for counting (e.g., bottle caps, shells, beans, keys, jewels, toothpicks, buttons, chicken rings, plastic animals, beads, marbles, and erasers)
- Bags of assorted items to be counted by the students, one bag per pair of students. Distribute 100 items in these bags randomly; do not place an equal number of items in each bag.
- 1 index card for each pair of students
- A place-value mat for each student
- Place-value materials (e.g., beans and cups, place-value blocks, or unifix cubes)
- Overhead place-value materials

Instructional activity

Note: Some of the activities listed in the Follow-up/extension section would also be appropriate prior to this activity.

1. Review with students how to write the numerals from 0 through 10. Explain that these same numerals will be used to write all the numerals from 11 through 100. Have students practice writing the numerals each day in practical situations, e.g., numerals on the calendar, attendance slips, lunch counts.
2. Introduce the students to the numerals from 1 to 100 by sharing an appropriate book that features counting. While sharing the story, have the students count orally the number of objects in each illustration. After the story, distribute bags of objects to each pair of students. Have the students count the objects in their bag and record the number counted on an index card. After each bag has been counted, have the students count the total number of objects. Have students observe how long this process has taken. Ask if there is a simpler way to count the objects, suggesting grouping the

objects in a different manner. Accept student responses and try various groupings, e.g., grouping and skip-counting by twos, fives, and tens. After the items have been “regrouped,” have the students skip-count to determine the total number.

3. Provide many opportunities for students to count different sets of objects (e.g., the students present for attendance, the steps to the cafeteria, the students at the lunch table, the books on the bookshelf, the pencils in a box, the straws in a box, etc.) and to regroup the objects. (See the “Counting the Days” lesson plan.) For each situation, ask students how the objects could be regrouped to make the counting easier. These activities need to precede place-value activities, in which students will group objects in sets of 10.
4. After students have had many opportunities with regrouping objects into sets of two, three, four, five, and 10, provide students with a place-value mat (made by folding an $8\frac{1}{2} \times 11$ sheet of paper in half and labeling the two columns formed by the crease with the appropriate representation like a cube for the ones column and a rod for the tens column) and sets of materials that can be used for regrouping (e.g., beans and cups, place-value blocks, or unifix cubes). Begin with a blank mat, and talk about how many items are on the mat. Talk about the numeral zero, and record it to represent the blank mat. (Once students regroup 10 items, the zero will be recorded again, this time as a placeholder in the ones place.)
5. Tell students to add one item to their place-value mat while modeling the placement in the ones (cube) column on the overhead mat. Continue adding one item at a time and recording the numeral that corresponds until you reach a total of 10. Explain that 10 items cannot be placed in the ones column. Tell the students that the items will be traded/regrouped into the rod column or tens column. (The materials used determine the word that should be used: place-value blocks are *traded*, 10 cubes for one rod; beans are *regrouped* into a cup; unifix cubes can be *regrouped* — individual cubes snapped together to create a stick/rod. For students who have had no previous experience with these types of materials, grouping materials is a more concrete concept than trading materials.). Continue the process until you reach 99. At this point, the two column mat will not accommodate trading 10 tens for one one-hundred. Ask students what they think will happen next.
6. Students need many experiences with all types of objects and place-value materials, grouping into sets of tens and ones and recording the numeral. At this level, emphasize grouping as a shortcut to counting all the objects.

Sample assessment

- Make observations while groups are counting and regrouping objects.
- Use recording sheets to show progress when students are writing numerals, counting orally, and skip-counting.
- Provide sheets with pictures of sets of items, and have students count and record the number in each set.

Follow-up/extension

- Provide various materials for students to use to develop their number-writing skills (e.g., dough, clay, chenille sticks, sand, carpet pieces, shaving cream, and pudding). Provide stencils for students to trace the numerals. Students can practice forming a numeral on a partner’s back and having the partner guess the numeral.
- After modeling for students how to form the numerals correctly, guide them in copying the numerals on a dry erase board with markers, on a chalkboard with wet paintbrushes, or on a sidewalk with playground chalk.

- Use number cubes to reinforce skip-counting. Have students put together five cubes of the same color, then another train of five in a different color, then another up to 100. Then have them skip-count each train. The same activity can be used with two cubes up to 20, and 10 cubes up to 100.
- Trace 20 handprints, or use commercial cutouts. Write the numeral 5 on each handprint, and have the students use these to practice counting by fives to 100.
- Use cheers, chants, raps, or poems to reinforce skip-counting by twos, fives, and tens.
- Play “Blast Off” to practice counting backward from 20. Have the class join you in counting “20, 19, 18, 17, 16, 15. Whoa, we forgot to put on our spacesuit!” Begin again, and count a little further before saying “Whoa!” Each time indicate another item that you have forgotten but this is necessary to go into space. Finally, end with “5, 4, 3, 2, 1, BLAST OFF!”
- Provide many opportunities for students to estimate the number of objects in a jar. Start with a small number of large objects, e.g., 10 large marbles. Ask students if the number is closer to 1, closer to 10, or closer to 100. Once students are comfortable with the numbers from 1 to 10, try a larger number of a smaller object, e.g., 19 gumballs. Again, ask the students to determine if the number is closer to 1, 10, or 100. Use illustrations of larger numbers of objects, and have students determine if the number is closer to 5, 50, or 500.
- Set up part of the bulletin board as an “Estimation Station.” Each week, have a different student take home a “Guessing Jar” and fill it with items to estimate/count/sort/group into tens and ones for additional place-value practice.

Counting in Line

Reporting category

Number and Number Sense

Overview

Students count objects in order, using the ordinal-number words *first* through *tenth*.

Related Standard of Learning

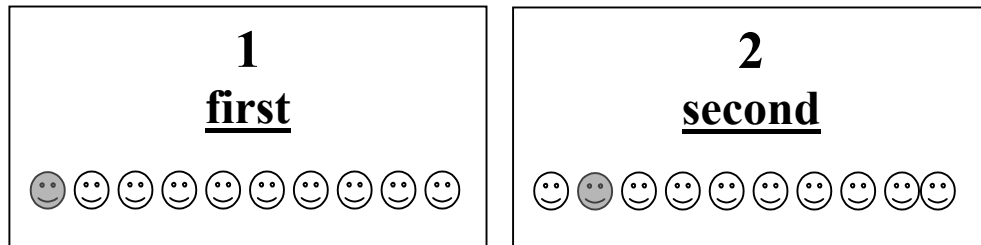
1.5

Objectives

- The student will count an ordered set of up to 10 objects
- The student will match the correct ordinal-number word, *first* through *tenth*, with the object.
- The student will identify the ordinal positions, first through tenth.

Materials needed

- Posters for the ordinal numbers, first through tenth, as shown below:



- Flash cards containing only the ordinal-number words, *first* through *tenth*
- Ten unifix cubes of 10 different colors for each student

Instructional activity

1. Introduce the students to ordinal numbers by having 10 students line up across the front of the room. Beginning with the first student, give each student a small poster containing the numeral for the student's position in the line, the ordinal-number word, and a corresponding shaded object in a line of 10 objects. After students have learned the appropriate ordinal-number words, (*first*, *second*, *third*, etc.) demonstrate on the poster another way to write *first* by adding the letters *st* to the numeral 1 to make *1st*. Repeat with the other posters, adding *nd* to 2, *rd* to 3, and *th* to 4, 5, 6, 7, 8, 9, and 10. Point out to students that the letters added are the last two letters in the ordinal-number word.
2. Distribute the flash cards containing only the ordinal-number words to a second group of 10 students. Have the students line up in the correct order. Continue with different groups of 10 students until all have had an opportunity.
3. Distribute unifix cubes of 10 different colors to each group of students. Instruct the students to begin a train of cubes, using ordinal-number words. Tell students that the first cube is red and the second cube is blue. Continue the sequence of colors until students have a train of 10 different colored cubes. Have the students then match their train with a partner's train to check the order. After the trains are completed, ask students which color cube is fourth, which color is second, etc. Have partners ask each other similar questions.
4. Whenever students are lining up, provide opportunities for them to use ordinal-number words by asking questions that can be answered with these words, e.g., "Which of you is the tallest? Which

of you has on a red shirt?” On the playground, review ordinal-number words when running races by asking who crossed the finish line first, second, third, etc.

5. During reading/language arts time, use the ordinal-number words after reading a story. Have students indicate what happened first in the story, and write or illustrate on a sentence strip. Continue to sequence at least five of the events in the story.
6. Have the students practice using ordinal-number words by writing and illustrating the steps for doing simple tasks, e.g., making a bed, making a sandwich, setting the table.

Sample assessment


- Have students use various geometric figures of different colors to sequence by using ordinal-number words. Direct the students to place the green triangle first, the red circle second, the blue square third, etc. Once a line of 10 geometric figures has been created on the student’s workspace, have students identify the position as you name the colored figure. Alternatively, a worksheet with the figures pre-drawn can be used, and you can direct students to color each figure a certain color as you indicate the ordinal-number word of the figure.
- Have students create a flip booklet that has the ordinal-number words written under the flaps. Have them draw illustrations to indicate the ordinal-number word.
- For written documentation of student understanding, give a teacher-made quiz using position puzzles. (See directions for position puzzles at end of this lesson.)

Follow-up/extension

- Provide students with position puzzles to solve independently. Extend student learning by challenging them to design their own position puzzles for the class to solve.


Directions for position puzzles

1. Beginning on the upper 1/3 of the reverse side of a sentence strip, place 10 identical stickers equidistance apart in a horizontal row. Highlight one of the stickers. You could also use the word processor to make these puzzles.
2. Beneath the row of stickers, write the sentence frame: **The highlighted (sticker) is in _____ position.** For example:



The highlighted apple is in _____ position

3. Use a variety of stickers and the sentence frame:



The elephant is in the _____ position.

Number Stories

Reporting categories

Number and Number Sense, Computation and Estimation

Overview

Students recall the basic addition and subtraction facts and create and solve story problems, using the facts.

Related Standards of Learning

1.8, 1.9

Objectives

- The student will identify + as a symbol for addition and – as a symbol for subtraction.
- The student will recall and state the basic addition and subtraction facts.
- The student will create and solve story problems with one-step solutions.
- The student will identify a correct number sentence to solve an oral or written story or picture problem, selecting from among basic addition and subtraction facts.

Materials needed

- Appropriate number story
- Bags containing 10 two-color counting chips for each pair of students
- Ten two-color overhead counting chips
- Sentence strips
- A number sentence recording sheet for each pair of students

Instructional activity

1. Share with students an appropriate number story that illustrates the concepts of adding and subtracting. As addition or subtraction occurs in the story, discuss the problem with the students, and record the number sentence that represents the problem on a sentence strip. Use and explain the plus sign, the minus sign, and the equals sign in the number sentence. After the story, distribute sentence strips to pairs of students, and have them draw pictures to represent the story problem on their strip.
2. On the overhead, model the process of combining sets of objects, using the two colors of counting chips. Using 10 chips, make two groups — eight of one color on one side and two of the other color. Record the number sentence on a chart like the one at right. Show a different combination next — five of one color and five of the other. Record this combination as well. Explain to students that they will be using the two-color counters in their bags and their recording sheet to find all the combinations that equal 10. Distribute the materials to the students, and have them work with partners to complete the activity.
3. To conclude the activity, have the students present the various number combinations that they discovered. As the various combinations are presented, record them in an ordered fashion on the chart.
4. Have students discuss any patterns that they observe and also note if any combinations were not recorded.

10	+	0	=	10
9	+	1	=	10
8	+	2	=	10
7	+	3	=	10
6	+	4	=	10
5	+	5	=	10
4	+	6	=	10
3	+	7	=	10
2	+	8	=	10
1	+	9	=	10
0	+	10	=	10

5. This activity can be repeated using other sums and other manipulatives, (e.g., specially created spinners containing appropriate addends, or two colors of unifix cubes totaling a particular sum).

Follow-up/extension

- Encourage the use of numeration and number sentences whenever the opportunity presents itself. When discussing and interpreting a graph, ask students to develop a number sentence. Have students act out seasonal favorites, such as *The Night Before Thanksgiving*, in which they present addition and subtraction sentences orally. Use students' favorite books with number themes to develop Reader's Theater productions. Use these as springboards for class story problems. Have students develop recall of basic number facts by acting out number stories.

Sample assessment

- Distribute blank sheets of paper to students and index cards containing a number sentence. Have students create a story problem that represents the number sentence.
- Tell students a number story, and have them indicate the number sentence on a sheet of paper.
- Have students create a number story with illustrations and a number sentence.

Sample resources

www.k111.k12.il.us/king/math.htm – This Web site has lots of interactive activities for the primary grades. Many of the activities require the Shockwave plug-in.

<http://standards.nctm.org/document/chapter4/numb.htm#bp1> – This link contains information about numbers and operations from the NCTM's Principles and Standards document.

<http://illuminations.nctm.org/lessonplans/prek-2/dominoes/index.html#11> – This instructional unit focuses on addition for students who have learned to count but have not yet mastered addition of one-digit numbers. These lessons also explore foundational algebraic understandings.

www.aaamath.com – This site contains interactive games and lesson plans.

Organizing Topic Fractions

Standard of Learning

- 1.6 The student will identify and represent the concepts of one-half and one-fourth, using appropriate materials or a drawing.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Represent a whole to show it having two equal parts.
- Represent a whole to show it having four equal parts.
- Identify and model one-half and one-fourth of a whole, using
 - region/area models (e.g., pie pieces, pattern blocks, geoboards, drawings); and
 - measurement models (e.g., cuisenaire rods, connecting cubes, fraction strips, drawings).

Ben Franklin's Kite

Reporting category

Fractions

Overview

Students fold paper squares to make a kite depicting Benjamin Franklin's achievements.

Related Standards of Learning 1.6 (1.16, 1.17 Geometry)

Objectives

- The student will follow oral instructions to create a kite depicting Benjamin Franklin's achievements while exploring fractional parts of a whole.
- The student will identify and model one-half and one-fourth using region/area models (e.g. paper shapes)

Materials needed

- One 11-inch square of construction paper for each student
- String or yarn cut into 6-to-8-inch lengths
- Bow and key tagboard tracers
- Tape

Instructional activity

1. Distribute the 11-inch squares to the students. Discuss with students how they can verify that the paper is square. (It has four equal sides.) Direct students to fold the square in half. Remind students to make sure the corners "kiss" or meet exactly. Show students how to make a good horizontal or vertical crease. Remind students that there are two parts to the whole square now. What shape are they?
2. Next, direct students to make a second fold like a sandwich. Assist students who need help. Then have students fully open their paper. How many equal parts to the whole square are there now? What shape are they? Can you see the point where the four parts come together when it was creased? The four parts should meet at right angles. Ask students to talk about each part as one of four parts that equal the whole square — each part is "one fourth."
3. Direct students to place the square directly in front of their body atop the table. Tell students to pivot or turn the square so that the creases at the point where the four parts meet look like they form an **X**.
4. Make sure all students have their paper turned correctly. Then direct students to grasp a corner of the paper and fold it over to meet the center of the **X**. This will make a triangular flap. Have them do the same with the other three points to complete the kite.
5. Provide students with string or yarn, construction paper scraps, and tagboard tracers of a kite bow and a key with which to cut out two bows and a key. Tape these to the string at two-inch intervals. Then secure the string to the bottom of the kite.

Sample assessment

- Circulate throughout the class to make sure students are following directions. Offer assistance as needed. Encourage discussions of the different shapes made by creasing, and challenge students to name the shapes and their attributes. After students have finished their kite, direct them to write in their math journals to describe the activity. Use the following prompt: "Identify the shapes in the

kite, and describe their attributes. Describe how you created one-half and one-fourth of your shape.” Note any student questions and observations, either verbal or written, as a means of assessing student learning. Was the student able to name the shapes? Draw the shapes? Could he/she verbalize the attributes?

Follow-up/extension

- Have students place a picture of Benjamin Franklin in the center of the **X** on their kites and then glue 2-by-3 in. strips of writing paper onto the flaps — one on each side of the flap. Then they should attach one of four labels, “Statesman,” “Inventor,” “Scientist,” “Writer,” on the outside of each flap. On the underside of each flap, they should attach a sentence telling about each label.

Apple Fractions

Reporting category

Number and Number Sense

Overview

Students create an apple-print fractions booklet as they investigate the concept of parts of a whole.

Related Standard of Learning 1.6

Objectives

- The student will follow oral instructions to create apple prints to show the fractional part of a whole.
- The student will identify and model one-half, using region/area models (e.g., pattern blocks, drawings).

Materials needed

- One ripe apple for each pair of students, precut in half vertically and held together with a wooden toothpick or rubber band
- One piece of 9-by-11 white construction paper for each student
- Red paint
- Paper plates to hold paint (a “paint palette”)
- Scissors
- Sentence strips programmed with: “ $\frac{1}{2}$ apple and $\frac{1}{2}$ apple make a whole apple.”
- Pencils
- Apple seeds (optional)

Instructional activity

1. Give each student a $8\frac{1}{2}$ -by-11 piece of white construction paper.
2. Demonstrate how to make a “hamburger” fold with the paper. Holding the paper vertically, bring up the bottom corners to meet or “kiss” the top corners and crease. Direct students to cut along the crease line made by the fold. Discuss with students the idea of symmetry. There is no need to go into great detail, just emphasize that both halves of the paper look to be the same size. Set the two sheets aside.
3. Using an uncut apple, demonstrate while students observe how the apple can be cut vertically into two equal (same-size) parts. Lead a discussion on how the apple halves look. Are they the same size? Same shape? If you were dividing the apple to be shared by two people, are they fair shares? Explain that the whole apple is made up of its two equal parts. It may be necessary to elaborate upon “equal” at this time so students understand the concept. Take another whole apple, and cut it in two horizontally. Discuss with students how the two apples compare. Ask, “Which has two equal parts? Which shows two fair shares?” After this discussion, direct students to separate their individual apples into the two parts. Encourage mathematical communication by asking students to tell about their apple, using the terms *part*, *whole*, *equal*, *fair shares*, and *same*.
4. Ask students to retrieve one of their half pieces of white construction paper. Model for the students how to fold this rectangle in half: holding the rectangle vertically, bring the bottom edge up to the

top edge and crease. Circulate and offer assistance as needed. Once this is done, distribute the prepared paint palettes. Direct students to open their folded paper and place it horizontally like an open book, then dip the flat side of one of their apple halves into the red paint, scrape off the excess, and make an apple imprint on each side of the piece of white construction paper. Set these aside to dry.

5. Lead students to understand that two equal parts make a whole apple. Have the students place their sentence strips under their apple prints. Students should illustrate the cover of their booklet, adding apple seeds as desired.
6. Provide students with extra time at the end of the lesson to reflect upon what they did by writing/drawing in their math journals about the lesson. Use the following prompt: “Describe how you found $\frac{1}{2}$ of your apple. What happens to a whole apple when you want to get $\frac{1}{2}$ of it?”

Sample assessment

- Observe students as they follow your directions. Circulate to be sure that students understand the task; note questions/observations arising from their investigations. Question students to encourage mathematical communication as a means of assessing student understanding. Encourage students to share their finished product as another authentic assessment.

Follow-up/extension

- Have students use a hexagonal pattern block to represent the apple shape and use two trapezoids to show the two parts of the whole hexagon. After using the manipulatives, provide the students with pattern-block paper cutouts to make a paper representation of the whole and its parts.

All Aboard the Fraction Train

Reporting category	Fractions
Overview	Students explore parts of a whole, using cuisenaire rods
Related Standard of Learning	1.6

Objective

- The student will identify and represent the concepts of one-half and one-fourth, using appropriate materials or a drawing.

Materials needed

- Cuisenaire rods for each student pair
- Cuisenaire rods for use on the overhead
- Fraction strips to correspond with the length/color of each cuisenaire rod
- Recording booklet programmed with sentence frames (instructions at end of lesson)

Instructional activity

1. Provide students with cuisenaire rods of each color. Model on the overhead projector how to match a one-color rod (one-car train) with its two-car-train equivalent.
2. Guide students to understand and describe the relationship of the combinations. (For example, two white rods match one red rod, so a white rod or train can be described as one-half of a red rod.)
3. Challenge students to describe the other relationships for other matching rods/trains.
4. Provide students with paper fraction strips and a recording booklet. Model for students how to glue a one-car train at the top of the page and its corresponding/equivalent two-car train below it.
5. Direct students to complete the sentence frame at the bottom of each page by filling in the number of one-car trains and their two-car-train equivalents.

Sample assessment

- Use informal conversations and observations during and after the lesson to assess student understanding and application. Use the completed booklet for documentation of student achievement.

Follow-up/extension

- Extend this activity by encouraging students to find other equivalent/matching rods. By guiding students to “count thirds, fifths, sixths, etc.” we can set the stage for introduction of the symbolic representations of fractions. (For example, the “bottom” number is the *denominator* — the type of item being counted. The “top” number is the *numerator* — the number of those items. The terminology is not appropriate for early investigations of fractions, but it will help children internalize more advanced concepts even before the concepts are sequentially introduced.)

Instructions for making recording booklet

- Cut three sheets of printer paper in half to make six booklet pages. Make an “engine” cover out of black construction paper. (This can be two 6-by-4½ sheets stapled together, with a smoke stack, cow catcher, and two wheels.) Program each page with the sentence frame: “Two (color) boxcars

can carry the same as one (color) boxcar.” Have the students glue the appropriate number and color fraction pieces on each page. Allow them then to illustrate the pieces to look like the container cars on a freight train.

Sample resources

www.k111.k12.il.us/king/math.htm – Click on fractions for interactive games and activities for students.

http://www.indianastandardsresources.org/math/mant_1_1_7.pdf– lesson plan that uses parts of a whole in an appropriate fraction lesson.

Organizing Topic Measurement: Money, Length, Weight/Mass, Volume (Liquid), Time

Standards of Learning

- 1.10 The student will
 - a) identify the number of pennies equivalent to a nickel, a dime, and a quarter; and
 - b) determine the value of a collection of pennies, nickels, and dimes whose total value is 100 cents or less.
- 1.11 The student will tell time to the half-hour, using an analog or digital clock.
- 1.12 The student will use nonstandard units to measure length and weight.
- 1.13 The student will compare the volumes of two given containers by using concrete materials (e.g., jelly beans, sand, water, rice).
- 1.14 The student will compare the weights of two objects, using a balance scale.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Identify the value of a nickel, a dime, and a quarter in terms of pennies.
- Recognize the characteristics of pennies, nickels, and dimes (e.g., color, size).
- Identify the value of a collection of pennies, nickels, and dimes whose total value is 100 cents or less.
- Count by ones to determine the total value of a collection of pennies whose total value is 100 cents or less.
- Count by fives to determine the total value of a collection of nickels whose total value is 100 cents or less.
- Count by tens to determine the total value of a collection of dimes whose total value is 100 cents or less.
- Tell time to the hour on an analog clock.
- Tell time to the hour on a digital clock.
- Match a written time to the time shown on a digital or analog clock to the half hour.
- Measure the length of objects, using nonstandard units (e.g., connecting cubes, paper clips, erasers).
- Measure the weight of objects, using nonstandard units (e.g., paper clips, bean bags, cubes).
- Compare the volumes of two containers to determine if the volume of one is greater than, less than, or the same as the

other, using nonstandard units of measure (e.g., a spoonful, scoopful, or teacupful).

- Compare the volumes of two containers to determine if the volume of one is greater than, less than, or the same as the other by pouring the contents of one container into the other.
- Compare the weights of two objects, using the terms *lighter*, *heavier*, or *the same*, using a balance scale.

The Magic Money Box

Reporting category

Measurement

Overview

Students identify coin equivalents and determine the value of a collection of pennies, nickels, and dimes whose total value is 100 cents or less.

Related Standards of Learning 1.10 (1.1, 1.2, 1.3 Number and Number Sense)

Objectives

- The student will work in pairs to exchange pennies for the correct values of nickels, dimes, and quarters.
- The student will count out the appropriate number of each kind of coin to make a total value of 100 cents or less.

Materials needed

- A coin collection that includes 100 pennies, 20 nickels, 10 dimes, and 4 quarters.
- A Magic Money Machine (directions at the end of lesson)

Instructional activity

1. Seat students in pairs facing each other, and have one student act as the Money Magician, the keeper of the money.
2. The Magician begins play by making the Magic Money Machine drop 5 pennies into the OUT drawer tray. The other student counts aloud the value of the pennies.
3. The student then puts the 5 pennies into the IN drawer of the Magic Money Machine. This time the Magician makes a nickel appear along with 5 more pennies. The student counts aloud the value of these coins. Play continues as long as desired, with the Magician giving out coins while the other student counts and exchanges money.
4. Students may switch roles and continue playing.

Sample assessment

- Model this activity prior to allowing students to do it independently. Then observe how students follow directions. Offer assistance as needed to clarify questions and correct misunderstanding. Observe students as they exchange coins, and listen to their verbalizations about the task.

Follow-up/extension

- Students may play “Race for a Dollar,” in which they roll a number cube and collect that many pennies. They may trade the pennies in for nickels and dimes in a race to get to a dollar. Using a teacher-made recording sheet with four columns labeled “Pennies,” “Nickels,” “Dimes,” and “A Dollar,” students place their coins in the appropriate column until they can exchange. The first one to get enough dimes to make a dollar wins. This activity may be differentiated by providing recording sheets that have columns labeled “Pennies,” “Nickels,” “Dimes,” “Quarters,” and “Dollars,”

Directions for making a Magic Money Machine

- Use a cardboard box that is approximately 20 in. wide by 24 in. long. Cut two small (approximately 3-by-5) openings in the center of the long side at the bottom. Make two “drawers” to fit within the openings. (These can be anything that will fit through the opening, such as cut-off half-pint milk cartons) Make a small finger cutout in the drawer, or glue on a small wooden bead so players can pull out the drawer easily. The box can then be whimsically decorated.

Inch by Inch

Reporting category

Measurement

Overview

Students record observations and length measurements of a bean as it grows from seed to plant.

Related Standard of Learning

1.12

Objective

- The student will measure the length of objects, using nonstandard units.

Materials needed

- Fast-germinating bean seeds, enough for the class
- One 4 oz. paper cup for each student
- One 3-inch plastic pot
- Potting soil
- A bean-shaped booklet for each student (5 to 8 pages of first grade story paper)
- Markers, pencils, crayons
- Magnifying glass
- A supply of “inchworms” (purchased, teacher-made, or unifix cubes)
- Diagram of the parts of a seed/plant (teacher-made or purchased)

Instructional Activities

1. As an introduction to the lesson, read an appropriate story about growing plants. Point out the steps in the process of a seed becoming a plant, using the diagram of seed/plant. Lead a brief discussion of the book to review the information.
2. Provide each cooperative group with bean seeds that have been soaked for several hours and with a magnifying glass. Give each student a bean booklet, and have them label it with their name.
3. Instruct each group to gently pry apart a seed and use the magnifying glass to observe the inside. Refer students to the diagram of the seed parts, and focus on the part of the seed that becomes the plant stem.
4. Allow students adequate time to observe and discuss their observations. Then direct them to draw/write in their booklets about the bean seed, making sure to date the page. If students are using the first grade story paper, they may draw what the bean looked like at the top, including labels, and write sentences about what they have learned on the lower half and back.
5. Using a presoaked seed and the 3-inch pot, demonstrate for students how to plant the seed in soil by tamping it down, spreading soil over the surface, and watering it well. Then assist students in planting bean seeds of their own in the paper cups. These may be taken home, but the 3-inch pot should remain in the classroom for measurement activities.
6. Set up an area in the classroom that can be used as an investigation center including the classroom bean plant, student bean booklets, pencils, crayons, the “inchworms,” and a sign with center directions. Provide a whole-class demonstration at the beginning of the project on how to use the center. This means following directions and completing the tasks. Two to three students go together to the center once a week to record in their booklets the growth of the plant in “inchworms.” They also draw and write about the classroom plant, making sure to include the

day's date. Set up center rotations according to what works best for you. (This plan is based upon three 20-minute rotations, which means 6 to 9 students will visit the center each day with extra time for makeups.)

7. Provide the students with extra measurement activities to do in the center as well. These can be assessment or practice activities. For example, put in the center other plants, plastic bugs, flowers, or gummy worms that can be measured, using a variety of nonstandard units.
8. Set out a container of gummy worms for students to measure, along with a teacher-made recording sheet with columns for **Estimate**, **Actual**, and **Difference**. Students estimate how long a gummy worm is, stretch it out as far as possible, measure it, then record the actual length. Was the actual length *shorter*, *longer*, or *the same*? Students record their answer in the Difference column.
9. This center may remain active for 4 to 5 weeks after the initial lesson, with students recording plant growth each week in their individual booklets. Additionally, set aside time at each week's end to plot the plant's growth on a large classroom graph.
10. Celebrate the "harvest" by providing students with a small bag of jellybeans. (Of course, this provides the opportunity for more estimation, statistics, and measurement explorations.)

Sample assessment

- Use the students' completed project booklets and supplemental center activities.

Follow-up/extension

- Students may plot the growth of their own bean plant at home and make a graph to compare to the classroom plant's growth.
- The bean in this lesson may be replaced with a seed peanut (available at farm supply stores) and integrated with a History and Social Science lesson on George Washington Carver.

Weigh Fun!

Reporting category

Measurement

Overview

Students explore weight, using nonstandard units of measure, in a cooperative learning situation.

Related Standards of Learning 1.14 (1.1 Number Sense)

Objective

- The student will compare the weights of two objects, using a balance scale.

Materials needed

- One balance scale for every two students
- Teacher-made recording sheets with columns labeled “Unit of Measure,” “Estimate,” and “Actual”
- A variety of nonstandard units of measure, such as paper clips, bean bags, cubes, counters, rice, beans, shells
- A variety of focus objects to weigh
- Overhead projector and a transparency of the recording sheet
- Pencils

Instructional activity

1. Explain to students that today they will explore weight measurement. This is a good time to review or clarify specific vocabulary, remind students how to use manipulatives, and model the use of a balance scale.
2. Use a transparency of the recording sheet to model for students how to fill in the columns correctly. Use this as an opportunity to build upon estimation skills by directing students to estimate how many whatevers (nonstandard units of measure) it will take to balance the focus object. For example, have them estimate how many paper clips it will take to balance a canister of rice. Write in their estimate, then perform the investigation and verify the results. Note the actual number of paper clips needed, and analyze the task. Did their estimate “weigh in” heavier, lighter, or the same?
3. Answer any clarifying questions the students may have, distribute the balance scales, focus objects, and nonstandard units of measure to the pairs of students, and direct them to begin weighing the objects. Circulate throughout the room to check for understanding, questions, and proper use of materials. Engage students in a dialogue about their observations, estimations, and results. Students should describe their investigations, using the terms *heavier*, *lighter*, or *same as*.
4. After the hands-on activity, direct students to reflect upon their learning by writing/drawing about the task in their math journals.

Sample assessment

- Circulate through the class during the lesson to observe students and engage them about their explorations. Use questioning strategies that probe the students’ understanding of the concept. The math journal entries provide an excellent assessment tool.

Follow-up/extension

- Allow students additional opportunities to practice estimation and measuring skills by setting up a center with balance scales, recording sheets, and a variety of focus objects to measure.

How Much Does It Hold?

Reporting category

Measurement

Overview

Students predict and confirm which container has the greatest volume by collecting and interpreting data.

Related Standards of Learning 1.13 (1.18, 1.19)

Objectives

- The student will conduct a survey of which container can hold the most water.
- The student will verify his/her predictions by measuring and comparing the amounts of water each container can hold.
- The student will graph and interpret the results.

Materials needed

- Two see-through bottles or jars
- A pitcher containing enough water to fill the two bottles or jars
- Two identical measuring containers (e.g., 8-cup, see-through measuring cups; graduated cylinders)
- Recording sheet
- Chart with outlines of the two containers (to be used to display tally marks)
- Paper towels
- Food coloring (optional)

Instructional activity

1. Introduce the lesson by showing students a variety of different-size jars or bottles, (e.g., a peanut butter jar, a jelly jar, a ketchup bottle). Explain that they will be exploring various containers to determine which holds the greatest amount.
2. Give each student the opportunity to vote for the container that he or she thinks would hold the most water. Indicate the students' votes with tally marks on the chart showing the outlines of the two different-shaped containers.
3. Once the votes have been collected, show students how to measure the amount of water that each of the two see-through bottles or jars can hold. (Note: At this level, it is not important that students be able to measure units accurately, but only to compare.) Fill each container with water from the pitcher. Then, using two identical measuring containers that allow students to see measured amounts, pour the water from each bottle or jar into one of the two measuring containers. Have students indicate which measuring container has the greatest amount of water and which has the least. Keep each measuring container next to the bottle/jar its water came from. At this point, the water in the two containers could be colored two different colors to help make the comparison.
4. Have students check to see if their predictions shown on the chart were correct. At this point, lead a discussion of comparing and contrasting by asking questions, such as, "Which container could hold the most? The least?" Extend student thinking with the following questions: "How much more? How much less? How do the results compare with the predictions? Could the results be different at another time?"

5. At the end of this lesson, direct students to write in their math journals a description of the survey, including their own prediction and the results. Note students' use of terminology (i.e., *greater than*, *less than*, *same as*) and level of understanding, as articulated in their writing.

Sample classroom assessment

- Throughout this activity, encourage mathematical discussion and communication as a means of provoking student thought. Note the students' questions and observations. Student math journals may be used to evaluate learning.

Follow-up/extension

- Students can use containers in a future lesson to determine whether two containers contain *the same* amount or whether one container contains *more than* or *less than* the other, by pouring water from one to another. (Note: This needs to be modeled by the teacher before students practice on their own.)
- Students may create individual picture or bar graphs, using programmed graph sheets. Differentiate instruction by making this an independent activity (no support), reinforcement activity (little support), or instructional activity (guided support). Students may be challenged to come up with their own survey questions.

It's About Time

Reporting category

Measurement

Overview

Students show time to the hour and half hour in digital and analog form by contributing to a class book about times of day.

Related Standard of Learning

1.11

Objective

- The student will contribute text and illustrations for a class book that shows a typical student's day in 30-minute increments. Each page will show the time in analog and digital form.

Materials needed

- Chart tablet
- Markers
- Crayons
- White glue
- One 12-by-18 sheet of construction paper for each student
- One teacher-made or commercially-produced analog clock face for each student
- One set of cutout clock hands for each student

Instructional Activities

1. Begin by challenging students to think about how they spend a typical day. (This is a good time to review the fact that day and night result from the rotation of the Earth and to talk about the concepts of past, present, and future.) Guide students to come up with examples of appropriate activities for specific times throughout the day. (e.g., 8:00 — “I get on the bus to go to school.” 3:30 — “I get off the bus at my house.”) Write their ideas on chart paper, making sure each student has the opportunity to provide one idea. Label the idea with the student's name.
2. Distribute the construction paper, clock faces, and clock hands. Direct students to orient the paper horizontally and then glue the clock face onto the paper. Instruct students to find their sentence on the chart paper and write the corresponding time beneath the clock face on their paper. Once they have completed these steps, allow them to illustrate their page.
3. During the next lesson period, provide each student with a typed copy of his/her sentence with the name typed in parentheses. Direct them to glue this sentence strip to the bottom of their illustration.
4. Next, direct the students to *show* the time they wrote beneath their clock face by placing the clock hands on the face correctly. Allow the students to check each other. This is the time to review hour and minute hands and to provide support for those students needing it. Circulate to make sure students have placed the hands correctly before going to the next step.
5. Once the correct time has been shown on each student's clock picture, instruct students to glue the paper hands in place.
6. Create a class *Times of the Day* book by collecting and binding together all the students' constructed clocks, ordering them chronologically according to the time of day.

Sample assessment

- Circulate throughout the classroom observing if and how well students follow directions. Challenge students to communicate the time on their page and to elaborate upon their drawings. Observe and take note of the ease with which students duplicate the target times. Students may share their page with the class.

Follow-up/extension

- Have students create their own mini-book about their day, using the same procedures as for the class book. A “Reader’s Theater” production could be developed from the class book.

Sample resources

http://illuminations.nctm.org/lessonplans/prek-2/number_cents/index.html#13 – This lesson plan contains activities in which students find sets of coins equivalent to a quarter, using pennies, nickels, and dimes. They also estimate and count coin collections and count by fives and tens, using calculators, and pose and answer coin puzzles.

<http://standards.nctm.org/document/chapter4/meas.htm#bp1> – Principles and Standards information related to measurement for prekindergarten through Grade 2.

<http://illuminations.nctm.org/lessonplans/prek-2/measurement/index.html#srs> – A multi-day lesson plan, entitled “Magnificent Measurement,” contains six lessons that build early understandings about the attributes of measurement as well as the units, systems, and processes of measurement.

http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=13142 – a hands-on lesson that includes a PowerPoint presentation in which students use length to order objects from longest to shortest.

http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=15678 – a lesson plan that compares students’ heights (taller/shorter) and compares lengths of straws longer/shorter.

<http://www.sbgmath.com/grk/chapter7/start/index.html> – a pennies activity with Internet links to information about American coins.

Organizing Topic Geometry: Two-Dimensional (Plane), Spatial Relationships

Standards of Learning

- 1.15 The student will describe the proximity of objects in space (near, far, close by, below, above, up, down, beside, and next to).
- 1.16 The student will draw, describe, and sort plane geometric figures (triangle, square, rectangle, and circle) according to number of sides, corners, and square corners.
- 1.17 The student will identify and describe objects in his/her environment that depict plane geometric figures (triangle, rectangle, square, and circle).

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Identify the spatial relationships of objects, using the terms *near, far, close by, below, above, up, down, beside, and next to.*
- Draw triangles, squares, rectangles, and circles.
- Describe triangles, squares, and rectangles by the number of sides, corners, and square corners.
- Describe circles.
- Identify the name of the shape when given information about the number of sides, corners, and/or square corners.
- Identify representations of circles, squares, rectangles, and triangles in the environment at school and home and tell why they represent those shapes.
- Describe representations of circles, squares, rectangles, and triangles in the environment (e.g., “I know it’s a rectangle because it looks like a door, and I know that a door is a rectangle.”).

Shapes

Reporting category

Geometry

Overview

Students search for plane geometric shapes in the environment by photographing shapes found in nature while on a shape hunt and by searching through magazines and newspapers for shapes to cut out. They compile these images into a class book about shapes.

Related Standard of Learning 1.17

Objective

- The student will identify and describe objects in his/her environment that depict plane geometric figures (triangle, rectangle, square, and circle)

Materials needed

- Outdated newspapers and periodicals
- Digital camera (if possible)
- Chart paper
- Class supply of white 12-by-18 construction paper
- Tagboard, poster board, or mat board to use as a cover for the class book
- Metal rings
- White glue
- Scissors

Instructional activity

Note: Review critical attribute of triangles, rectangles, squares, and circles. Include examples of right triangles, isosceles triangles, scalene acute triangles, and obtuse triangles. Focus on the square corners in rectangles, and point out that the square is a special type of rectangle.

1. Provide students with old magazines and newspapers from which to cut out pictures of objects shaped like triangles, rectangles, squares, and circles.
2. Go on a shape hunt around the classroom, school building, and outdoors, searching for various environmental and natural shapes. Photograph the shapes as students identify them.
3. Once all of the pictures have been collected, divide the students into four cooperative groups, and assign each group a different shape. Have the students in each group describe on a sheet of chart paper the attributes of their shape. Then have each group glue the pictures of their shape to sheets of white construction paper, which they label with the name of the shape. Each group should produce two to three such pages.
4. When all the groups are finished, direct students to share their project pages with the class.
5. After everyone has had a chance to share, combine the pages into a large class book, using metal rings. The pages may be laminated first for durability. Allow the students to illustrate/decorate a cover for the book, using more pictures and making drawings of all four shapes.
6. Provide students with time to reflect upon their learning by making a math journal entry.

Sample assessment

- Watch for student feedback on learning during the group share. Also, circulate throughout the groups, spot checking for understanding, helping with problem solving, and/or extending learning. The class book will serve as an authentic assessment of the group's understanding.

Where's Bear?

Reporting category

Geometry

Overview

Students follow directions to create an interactive book describing the proximity of objects in space, using the terms *near*, *far*, *close by*, *below*, *above*, *up*, *down*, *beside*, and *next to*.

Related Standard of Learning

1.15

Objectives

- The student will follow oral directions to create an interactive book describing the proximity of objects in space.
- The student will use correct vocabulary to describe proximity.

Materials needed

- Drawing paper
- Brown construction paper
- A class supply of 4-inch-tall, heavy-paper teddy bear cutouts (teacher-made or purchased)
- A copy of the “Where’s Bear?” handout for each student
- White glue
- Markers or crayons
- Brown yarn or twine

Instructional activity

1. As an introduction to proximity terms, direct students to indicate a position as you say it. For example, tell students to put their hands *above* their head, to put knees *under* the desk, and to stand *next to* the sink. Use transition times or recess to explore this terminology.
2. Display a completed *Where's Bear?* book, and model for students how the bear character “walks” through the book. Verbalize the bear’s proximity in space on each page. For example, ask, “As Bear walks to this page, where do you see him?” — *Up* at the top of the tree.
3. Give each student a 4-inch-tall teddy bear cutout, a prepared 10-page blank book, and a copy of the sentence frames handout. Each sentence frame uses one of the nine position words.
4. Next, direct students to cut out the first sentence frame and glue it to the bottom of page 1. Discuss how to draw a picture of a house, leaving enough space for the Bear cut-out to stand beside it. Be sure to remind students they are *not* to draw Bear because they will be using the cut-out. Continue to the next page (front of next sheet, not back of first sheet). Have the students cut out and glue in the second sentence frame. Discuss how to draw the required picture, and allow the students to draw. Complete each page this way. The illustrations for each page are as follows:
 - Page 1: Bear’s house with space for Bear **beside** it
 - Page 2: a honey pot with space for bear **next to** it
 - Page 3: Bear’s house very small on one side of the page with space for Bear “**far**” from it on the other side of the page
 - Page 4: the edge of a forest with space for Bear **near** it
 - Page 5: a fallen tree with space for Bear **below** the tree
 - Page 6: a large, low rock on the ground with space for bear **above** it
 - Page 7: a tree with space for Bear **up** at the top

- Page 8: a hill with space for Bear **down** at the bottom
 - Page 9: a self-portrait with space for Bear **close by**
5. Upon completion of the sentences and illustrations, assist students in tying one end of a string to the bear cutout and the other to the book's spine.
 6. As the student reads a sentence, he/she places the bear in the appropriate position. The student then turns the page, reads the next sentence, and moves the bear to the position described in that sentence.

Sample assessment

- Circulate through the room to offer assistance as needed. Early in the school year it will probably be necessary to walk students slowly through each step until they are used to doing sentence frames. Upon completion of their book, ask individual students to share with the class by walking the bear through the book as he/she verbalizes the position words.

Follow-up/extension

- This lesson could be repeated to cover first grade Science SOL 1.5, Life Processes, by making a book about how animals prepare for winter using position words in the context of an animal's winter hibernation, migration, or adaptation. Use sentence frames such as "Bear is *next to* his cave." "Bear is *under* a bed of leaves." "The Canada goose is *far* from home." "The frog is *below* the mud."

Directions for making book

Use five sheets of 8½-by-11 drawing paper and one sheet of brown construction paper to create a small book by folding the pages together in half and stapling along the crease near the top.

Where's Bear? Title and Sentence Frames

Where's Bear?

Where's Bear? He's **beside** the house.

Where's Bear? He's **next to** the honey pot.

Where's Bear? He's **far** from home.

Where's Bear? He's **near** the forest.

Where's Bear? He's **below** the tree.

Where's Bear? He's **above** ground.

Where's Bear? He's **up** a tree.

Where's Bear? He's fallen **down**.

Where's Bear? He's **close by** ME!

Block Heads

Reporting category

Geometry

Overview

Students explore plane geometry by making pattern block designs, transferring the designs onto paper, and sorting and recording them.

Related Standard of Learning

1.17

Objective

- The student will draw, describe, and sort plane geometric figures according to their number of sides, corners, and square corners.

Materials needed

- Classroom supply of pattern blocks
- A teacher-made recording sheet for each student (directions included in lesson)
- Paper pattern shapes in colors that correspond to the blocks
- White glue
- Math journals

Instructional activity

1. Provide student partners with a variety of pattern blocks, and direct partners to use the pattern blocks to create a design of a person.
2. Circulate among students to clarify, offer assistance as needed, and encourage mathematical communication.
3. When students have completed their pattern block design, direct them to record individually on their recording sheet the shapes they used. (The chart is divided into four columns with a specific pattern shape [i.e., triangle, square, rectangle, or circle] at the head of each column. Students may color the drawn shapes to correspond to the actual block colors.)
4. Have students count the number of each shape used by making tally marks in the appropriate column.
5. Have students reflect upon their learning by drawing/writing about the lesson in their math journals. Have students display their designs and describe them to the class.

Sample assessment

- As you circulate among the students clarifying, assisting, and conversing, make notes about how well students follow directions, solve problems, count, and tally, and about how accurately they sort. Check math journals for evidence of understanding. Note the use of terminology in their verbal descriptions.

Follow-up/extension

- Make available to students construction paper cutouts that correspond to the pattern block shapes and colors. Direct students to transfer their design onto pattern paper by gluing the shapes on the paper in the proper arrangement.

Sample resources

- <http://standards.nctm.org/document/chapter4/geom.htm#bp1> – information on geometry for the prekindergarten through Grade Two strand; from NCTM’s Principles and Standards document
- http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=4078 – a lesson plan for identifying two-dimensional figures, with shape-flashcard and worksheet masters
- <http://standards.nctm.org/document/chapter4/geom.htm#bp4> – information on spatial relationships for the prekindergarten through Grade Two strand; from NCTM’s Principles and Standards document
- http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=13293 – a hands-on lesson in which students sort geometric figures by color, size, and shape
- <http://www.successlink.org/great2/g1720.html> – a unit on shapes, with suggestions for poetry, songs, games and other activities, and other related Internet sites
- http://illuminations.nctm.org/lessonplans/prek-2/investi_shapes/ – “Investigating Shapes” is an Internet lesson plan available from NCTM in which students identify characteristics of triangles, manipulate triangles on an electronic geoboard, and name the triangle’s relative location.
- <http://matti.usu.edu/nlvm/nav> – National Library of Virtual Manipulatives
- VDOE Geometry Instructional Module* – professional development training module that contains activities that can be adapted for student use
- Navigating through Geometry in Prekindergarten through Grade 2* – available from NCTM; contains additional lessons for geometric activities

Organizing Topic Statistics

Standards of Learning

- 1.18 The student will investigate, identify, and describe various forms of data collection in his/her world (e.g., recording daily temperature, lunch count, attendance, and favorite ice cream), using tables, picture graphs, and object graphs.
- 1.19 The student will interpret information displayed in a picture or object graph, using the vocabulary *more*, *less*, *fewer*, *greater than*, *less than*, and *equal to*.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Investigate various forms of data collection, including counting and tallying, informal surveys, observations, and voting.
- Identify and describe various forms of data collection in his or her world (e.g., recording daily temperature, lunch count, attendance, and favorite ice cream.)
- Demonstrate the meaning of the terms *more*, *less*, *fewer*, *greater than*, *less than*, and *equal to*, using concrete materials.
- Compare one category to another in a graph, indicating which has more and which has less.
- Interpret information displayed in object graphs and picture graphs, using the words *more*, *less*, *fewer*, *greater than*, *less than*, and *equal to*.
- Find answers to questions, using graphs (e.g., “Which category has more?” “Which category has less?”).

How Do You Eat a Chocolate Bunny?

Reporting category

Statistics

Overview

Students analyze how individuals go about eating a chocolate bunny and display the data on a classroom graph. Students analyze the results, using appropriate vocabulary.

Related Standards of Learning

1.18, 1.19

Objective

- The student will investigate, identify, and describe various forms of data collection in his/her world and interpret the data, using appropriate vocabulary, such as *more*, *less*, *fewer*, *greater than*, *less than* and *equal to*.

Materials needed

- A classroom supply of small, individually wrapped chocolate bunnies
- A classroom graph made from two sheets of tagboard chart paper
- Reusable picture-graph icons of each student (i.e., a small circle with a student's face drawn on the front and his/her name on the back, laminated for yearlong use)
- Several bunny-shaped cutouts
- Drawing paper for each student

Instructional activity

1. This is an activity that is particularly fun for celebrating spring. For the anticipatory read-aloud, use an appropriate spring story about chocolate animals. Discuss with students what types of chocolate animals they have eaten in the past. Tell students that today they will be given a chocolate bunny to eat and the only thing they must do is write down the steps they took to eat it.
2. Demonstrate for students how to eat a bunny by unwrapping it and proceeding to eat a part of it. Take note of what you begin eating — the ears, the tail, the head, or the torso. Write this down as step #1. The second part to be eaten is step #2, etc.
3. Ask students to draw each step in an event frame (sequence map, flow chart). This can be done on white drawing paper that has been divided into four parts by folding and opening. Label the first box #1, the next #2, etc. Have each student draw a self-portrait of him/herself eating the bunny.
4. Upon completion of the event frame, allow the students to eat their bunny, and guide them in a discussion about who began eating what part of the bunny first — the head, the tail, the ears, or the torso.
5. Next, have students place their self-picture-graph icon in the appropriate column on the classroom graph that has been labeled with the headings “Ears,” “Head,” “Tail,” and “Torso.” Follow this with a discussion of the results. Which category had the *most* icons? The *fewest*? Are there any categories that are *equal to* each other (have the same number of icons)? What can you tell from the graph?
6. Students may transfer the picture graph to a bar graph by using a teacher-made or commercially prepared graph page on which they color in a small box for each number within the column. (If you are making the graph page, be sure to leave a space between each column.)
7. Students should then write/draw in math journals a sentence describing the graph and its results.

Sample assessment

- Circulate through the classroom, offering assistance as needed and providing guidance. Check for understanding by engaging students in conversations about the graph. Use the math journal entries and individual graphs for assessing student understanding.

Follow-up/extension

- This activity may be extended by challenging students to pose the same question to several family members, tally the results, and bring the results back to class.

Data in Our World

Reporting category

Statistics

Overview

Students investigate, identify, collect and interpret data based upon a survey question developed by the students.

Related Standards of Learning

1.18, 1.19

Objectives

- The student will investigate various forms of data collection, including counting and tallying, informal surveys, observations, and voting.
- The student will compare one category to another in a graph, indicating which has more and which has less.
- The student will find answers to questions, using graphs.

Materials needed

- A “clipboard” (see below) for each student
- A recording sheet for each student
- Pencil
- Graphing sheets
- Crayons or markers
- Math journals

Instructional activity

Note: This activity should come after students have had many experiences with teacher-developed surveys.

1. Review with students how to develop a graph by first coming up with an appropriate survey question. Brainstorm with the students various ideas for a survey.
2. Once students have decided upon a survey question, provide each student with a clipboard (an 8-by-10 piece of cardboard with a clothespin attached) with a recording sheet attached. Assist students in writing his/her survey question in the appropriate space.
3. Review with students the procedures for conducting a survey. For example, if surveying outside the classroom, students should follow appropriate school behavior, time allowances, etc. Show them how to note response data on the recording sheet, using tally marks.
4. Once the time is up, students should return to their seats (or classroom) in order to describe the results of the survey. They may do this orally, or may complete a representational bar graph that can be shared with the class later. Encourage mathematical communication by assisting students in using words such as *more*, *less*, *fewer*, *greater than*, *less than*, and *equal to*.
5. Direct students to describe the data collection process in their math journal.
6. Direct students to develop a number sentence from their graph.
7. Provide each student with a copy of another student’s graph, and direct him/her to describe the results, using math language.
8. Direct students to develop a word problem from the graph.

Sample assessment

- Circulate through the classroom as students conduct the survey, assisting and clarifying as needed. Once students have finished the process and are sharing the survey data, question them, using math language such as *more*, *less*, *fewer*, *greater than*, *less than*, and *equal to*. This informal conversation/observation may be used to monitor understanding and application of the concept. The student product (bar graph) and their entries in their math journals may be used to document progress.

Follow-up/extension

- Challenge students to develop a question from another's data results.
- Challenge students to develop survey questions that could be included on a class list for next year's students.
- Collect all the surveys, and make a class book of graphs.

Sample resources

<http://standards.nctm.org/document/chapter4/data.htm#bp2> – information from NCTM's Principles and Standards in relation to data analysis for prekindergarten through Grade 2.

http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=35982 – a lesson plan that revolves around the student's favorite things. The items are graphed according to selected categories, and the student creates a "My Favorite Things" book about himself.

http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=11245 – a lesson plan describing graphing activities related to students' types of homes.

http://ericir.syr.edu/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Process_Skills/MPS0004.html – a lesson plan describing graphing and sorting activities with jelly beans.

Probability and Statistics Professional Development Module available from VDOE Web site – contains activities related to this strand that can be modified for student use.

Navigating through Data Analysis and Probability in Prekindergarten through Grade 2 – available from NCTM; contains additional lessons for data analysis activities

Organizing Topic Patterns and Functions: Representations and Relationships

Standards of Learning

- 1.20 The student will sort and classify concrete objects according to one or more attributes, including color, size, shape, and thickness.
- 1.21 The student will recognize, describe, extend, and create a wide variety of patterns, including rhythmic, color, shape, and numerical. Patterns will include both growing and repeating patterns. Concrete materials and calculators will be used by students.

Essential understandings, knowledge, and skills

Correlation to textbooks and other instructional materials

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Sort and classify objects into appropriate subsets (categories) based on one or two attributes, such as size, shape, color, or thickness.
- Recognize the pattern in a given rhythmic, color, shape, or numerical sequence.
- Describe the pattern in a given rhythmic, color, shape, or numerical sequence.
- Extend a pattern, using manipulatives, geometric figures, numbers, or calculators.
- Create a repeating or growing pattern, using manipulatives, geometric figures, numbers, or calculators (e.g., the growing patterns 2, 3, 2, 4, 2, 5, 2, 6, 2, ...)
- Create an arithmetic number pattern, using a calculator (e.g., when skip-counting by fives, use the constant feature on the calculator by pressing $5 + 5 = = = \dots$ to produce the pattern 5, 10, 15, 20, ...).

I Need a Necktie, Please!

Reporting category

Patterns, Functions, and Algebra

Overview

Students experience rhythmic patterns, describe those patterns, using wooden pattern blocks, and copy the patterns onto paper as they create a necktie.

Related Standards of Learning 1.20, 1.21

Objective

- The student will listen to rhythmic patterns that can be made with hands and feet and then create and describe the same patterns, using pattern blocks.

Materials needed

- Wooden pattern blocks
- Adding machine tape strips
- Paper pattern blocks corresponding to the wooden ones
- A “Father Giraffe” worksheet for each student
- White glue

Instructional activity

1. Engage students in the rhythmic pattern: clap, clap, pat (your lap), clap, clap, pat, clap, clap, pat, and so on.
2. Ask students to create a pattern with their pattern blocks that is the same as the clap, clap, pat pattern such as red, red, blue, red, red, blue, and so on.
3. Repeat this activity several times with different rhythmic patterns, such as snap, clap, snap, clap, until all students have created a pattern with their pattern blocks.
4. Distribute strips of adding machine tape, and explain to students that they should copy their pattern onto the strips by gluing the paper pattern blocks because they are going to make Father Giraffe a special necktie with a pattern design.
5. Remind students that they are to repeat their pattern over and over until they have filled Father’s necktie from top to bottom.
6. Instruct students to glue their neckties on Father Giraffe.
7. When the students have completed their worksheet, have them display their ties to the whole class.
8. Discuss the different patterns and the numerous ways to sort and organize the patterns on the neckties, such as ABB, AABB, AB, or even ABCD.
9. Introduce the students to growing patterns, using the same process.

Pattern types

Repeating patterns (repeating the basic units)

1. ABABABAB
2. ABCABC
3. AABBAABBAABB
4. AABAAB

5. AABCAABC

6. ABACABAC

Growing patterns

1. ABAABAAABAAAAB

2. ABABBABBBABBBB

3. ABCAABCAAABC

Places to find patterns

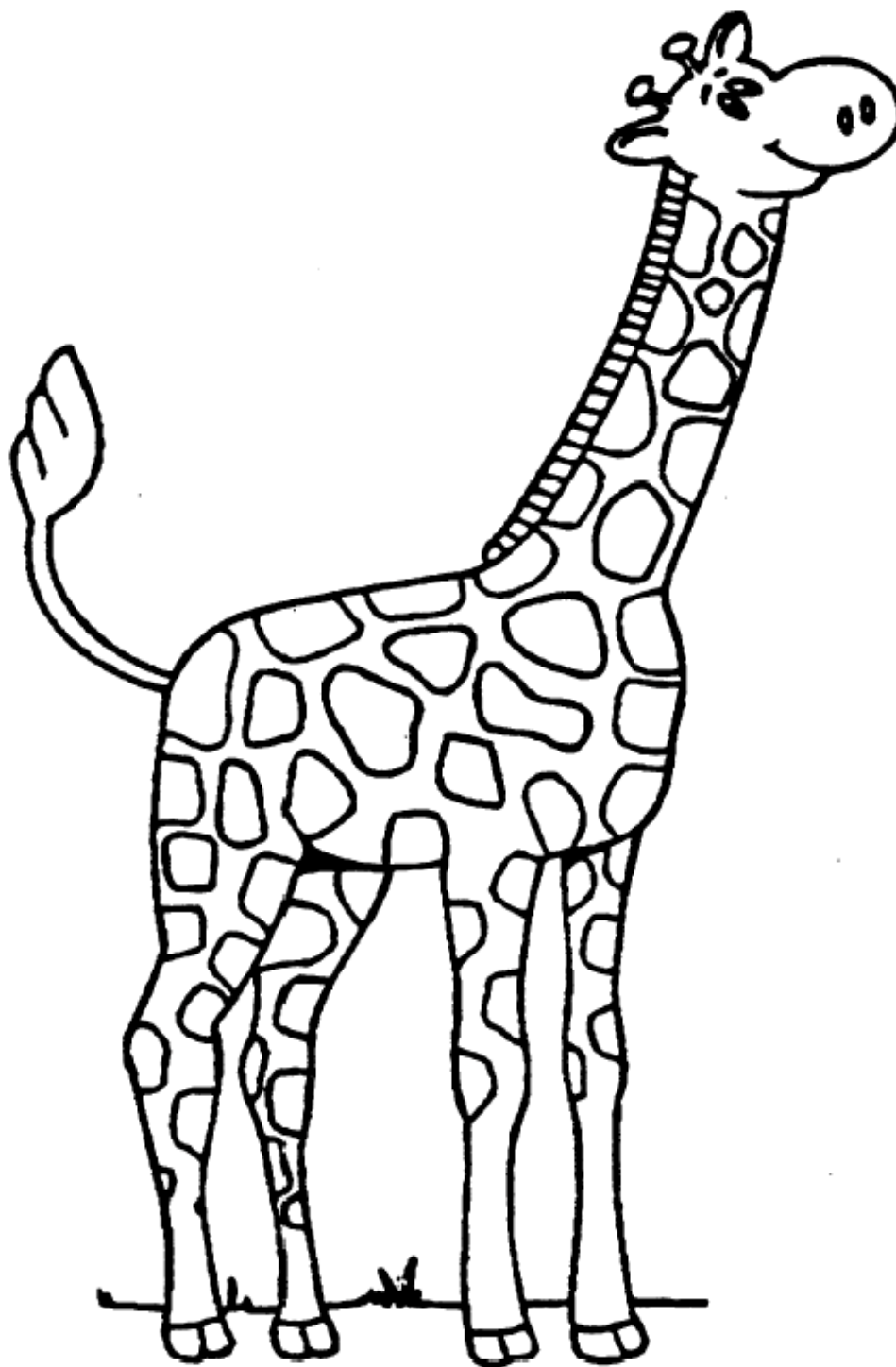
- Seasons
- Nature
- Honeycombs
- Stop light – G,Y,R, G,Y,R
- Class schedules
- Music
- Rhythm — clapping soft, clapping loud

Sample assessment

- Observe students as they work with the pattern blocks. Note students who have difficulty with patterns and assist. Use completed necktie as assessment of skill.

I Need A Necktie, Please!

Name: _____



Growing Patterns

Reporting category

Patterns, Functions, and Algebra

Overview

Students sort and classify shapes before using them to show a growing pattern.

Related Standards of Learning 1.20, 1.21

Objective

- The student extends a growing pattern, using geometric figures.

Materials needed

- A large supply of green paper triangles, blue rhombuses, and brown squares. (These must be uniform sizes — approximately 1" by 1" to 1" by 2".)
- Overhead projector and transparent pattern shapes
- A class supply of 11-by-17 white construction paper
- White glue
- Sequins, small adhesive dots in red and gold, adhesive gold stars, glitter glue

Instructional activity

Note: This activity would culminate a unit on patterns. Students should have had lots of opportunities to work with patterns through free exploration of manipulatives, such as pattern blocks, tangrams, and rhythmic patterning, such as snap/clap activities, music, or literature patterns, prior to this lesson. This would be a good time to review those pattern concepts.

1. Tell students that today they are going to make what is called a *growing pattern*. Solicit student ideas about this term, and then model on an overhead projector how to make a tree pattern. Starting at the bottom of the viewing area, place one 1-by-1 brown square; then place a blue rhombus atop it; next place a green triangle atop the rhombus. Tell students that this is the growing tree at one year of age. Review the attributes of each shape.
2. Direct students to sort their shapes according to the same attributes. Quickly scan the class to determine if all students can readily do this.
3. Next, direct students to duplicate the one-year-old tree on their construction paper, making sure that the paper is turned vertically and beginning at the bottom of the left side of the paper.
4. Model for the students on the overhead the growing tree at two years of age, using two brown squares, two blue rhombuses, and one green triangle. Instruct students to duplicate this tree next to the first one.
5. Ask suggestions for the pattern of the tree at three years of age. Duplicate their suggestions on the overhead projector. Everyone should eventually agree that the tree at three years of age should consist of three brown squares, three rhombuses, and one triangle.
6. Engage students in a discussion about the tree by asking about the pattern, how it grows, and what changes occur with a year of growth. Use this time to check for understanding.
7. At this point there will be three growing trees on the student's page. Now challenge students to problem solve to determine what the tree will look like at age six. Allow them to converse in small groups and submit their ideas to the class. Accept all answers until all agree on the pattern. Verify this with the whole class, and allow students time to duplicate this tree on their page.

8. The final challenge is to problem solve what the tree would look like at age 10. Students work independently to solve the problem.
9. Circulate through the classroom to monitor for understanding, answer questions, and offer clarifying assistance as needed.
10. When the students have completed the construction of the tree, have them write/draw about the growing tree pattern in their math journals.

Sample assessment

- As you circulate among the students, clarifying, assisting, and conversing, make notes about their ability to follow directions and problem solve, the accuracy of their sorting, and the correctness of their patterning. Check math journals for evidence of understanding of pattern concepts in general and growing patterns in particular. The completed trees may also be used as an assessment.

Follow-up/extension

- Make dot paper available to students on which they may transfer their designs.

Sample resources

<http://standards.nctm.org/document/chapter4/alg.htm#bp1> – information from NCTM’s Principles and Standards related to patterns, functions, and algebra for the prekindergarten to Grade 2 strand

<http://www.illuminations.nctm.org/lessonplans/prek-2/button/index.html> – lesson plan from NCTM’s “Illuminations” site related to sorting and organizing objects

Patterns, Functions, and Algebra Professional Development Module available from VDOE Web site – contains activities relating to this strand that can be modified for student use

Navigating through Algebra in Prekindergarten through Grade 2 – available from NCTM; contains additional lessons for pattern and function activities