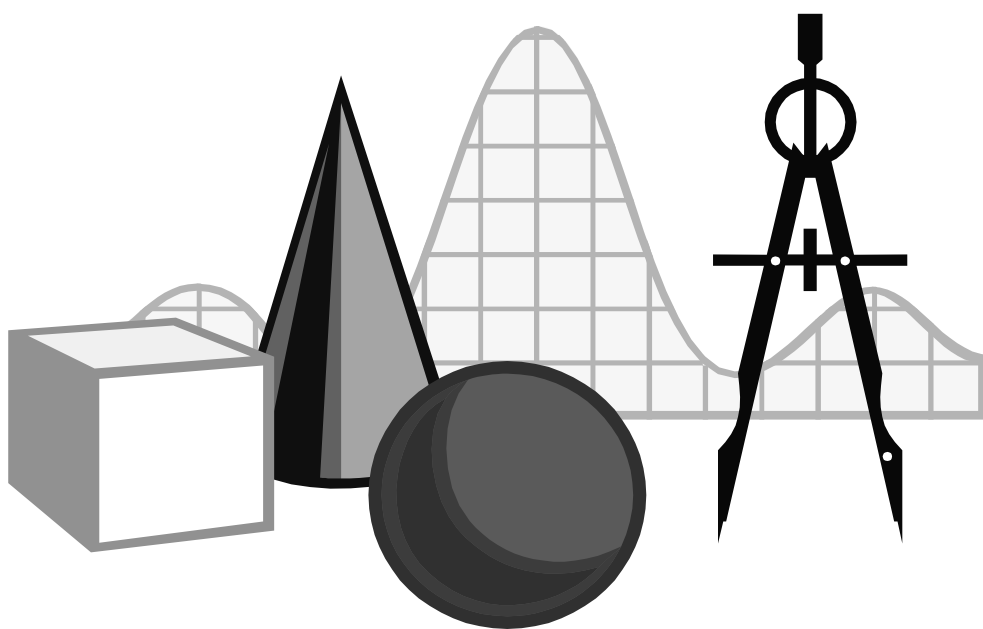


ENHANCED SCOPE AND SEQUENCE PLUS

Mathematics

Kindergarten



Commonwealth of Virginia
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Introduction

The Enhanced Scope and Sequence Plus is designed to provide teachers across the Commonwealth with a tool to deliver SOL-based content instruction to a diverse population of learners, including those with unique needs and learning challenges. This resource will provide lesson plans and activities aligned to the Mathematics Standards of Learning (adopted October, 2001). Each lesson plan includes differentiated strategies in the areas of technology, multi-sensory approaches, community connections, small group learning, vocabulary building and organization. These differentiated strategies have proven to be effective tools for all learners, including those with disabilities.

This tool represents the collaborative efforts of general educators, special educators, ESL educators, Training/Technical Assistance Center Staff and staff from the Virginia Department of Education. The Enhanced Scope and Sequence Plus (Mathematics) is an expansion of the Enhanced Scope and Sequence available on the Virginia Department of Education website at www.pen.k12.va.us. The Enhanced Scope and Sequence Plus includes:

- Units organized by topics from the original Mathematics Scope and Sequence
- Essential knowledge and skills from the Mathematics Standards of Learning Curriculum Framework
- Sample lesson plans containing:
 - Related Standards of Learning
 - Objectives
 - Prerequisite Understandings/Knowledge Skills
 - Materials Needed
 - Instructional activities
 - Sample Assessments
 - Follow-up/extensions
 - Specific options for Differentiating the lesson
 - Related resources
 - Related released SOL test items

School divisions and teachers can use the Enhanced Scope and Sequence Plus 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 Plus 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.

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

Standards of Learning

- K.1 The student, given two sets containing 10 or fewer concrete items, will identify and describe one set as having more, fewer, or the same number of members as the other set, using the concept of one-to-one correspondence.
- K.2 The student, given a set containing 10 or fewer concrete items, will
 - a) tell how many are in the set by counting the number of items orally;
 - b) select the corresponding numeral from a given set; and
 - c) write the numeral to tell how many are in the set.
- K.3 The student, given an ordered set of three objects and/or pictures, will indicate the ordinal position of each item, first through third, and the ordered position of each item from left-to-right, right-to-left, top-to-bottom, and/or bottom-to-top.
- K.4 The student will investigate and recognize patterns from counting by fives and tens to 30, using concrete objects and a calculator.
- K.5 The student will count forward to 30 and backward from 10.
- K.6 The student will add and subtract whole numbers, using up to 10 concrete items.

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

- Match each member of one set with each member of another set, using the concept of one-to-one correspondence to compare the number of members between sets, where each set contains 10 or fewer items.
- Compare and describe two sets of 10 or fewer items, using the terms *more*, *fewer*, and *the same*.
- Count orally the number of items in a set containing 10 or fewer concrete items, using one-to-one correspondence, and identify the corresponding numeral.
- Identify written numerals from 0 through 10 presented in random order.
- Select the numeral from a given set of numerals that corresponds to a set of 10 or fewer concrete items.
- Write the numerals from 0 through 10.
- Write a numeral that corresponds to a set of 10 or fewer concrete items.

- Identify the ordinal positions first, second, and third, using ordered sets of three concrete objects and/or pictures of such sets presented from
 - left-to-right;
 - right-to-left;
 - top-to-bottom; and/or
 - bottom-to-top.
- Group 30 or fewer objects together into sets of fives or tens and then count them by fives or by tens.
- Investigate and recognize the pattern of counting by fives and tens, using 30 or fewer concrete objects.
- Investigate and recognize the pattern of counting by fives and tens to 30, using a calculator.
- Count forward from 1 to 30.
- Count backward from 10 to 1.
- Combine two sets with known quantities in each set, and count the combined set to determine the sum, where the sum is not greater than 10 concrete items.
- Remove, “take away,” or separate part of a set from a given set to determine the result of subtraction.

Calendar Math

Reporting categories

Number Sense, Measurement

Overview

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

Related Standards of Learning K.4, K.5, K.8, K.14, K.18

Objectives

- The student will investigate and recognize patterns created on the calendar when counting by ones, fives, and tens.
- The student will count forward to 30.
- The student will count backward from 10.
- The student will identify the components of a calendar, including days and months.

Prerequisite Understandings/Knowledge/Skills

- The students must have experience counting forward from 1-10.
- The students must have some concept of “number” related to numerals and to the quantity of the numbers 1 and 5.

Materials needed

- For a school year of 180 days, 36 red circles and 144 blue circles
- Pocket chart divided into 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 posted above the calendar. Use one blue circle to begin a pattern of four blue circles followed by one red circle for the first five school days; the pattern will then repeat for the next five school days. The red circles will help students identify the numbers used when counting by fives. A star can be placed on the multiples of ten to help identify the numbers used when counting by tens.
3. In the blue circle, write the numeral 1 to represent the first day of school. On the following days, write the next numeral to indicate the correct day of school. Have the students predict the next color circle and the next numeral. Use the circles as a means for reinforcing counting orally each day of the school year. Once there are a sufficient number of circles, students should practice counting by fives and tens as well.
4. Once the circle 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 each day another straw will be added until there is a set of 10. The straws will then be

bundled into a set of 10 and placed in the 10s pocket. This procedure will continue until the 100th day when all 10 sets of 10 can be bundled together and placed in the 100s pocket. Milk cartons work well as “pockets” on the chart to hold the straws.

5. Keep a tally count of the days for the month.
6. Play “I’m Thinking of a Number.” Give clues, and have students use the calendar to help figure out the number. For example, if the number is 3, clues might include, “It is the number that comes after 2.” “When I count by ones, I say the number, but when I count by fives or tens, I don’t say the number.”

Sample assessment

- Assess student skills by observation.
- Each day have a different student count the number of days of a particular month as you do the Calendar Math activity. 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 10 to 1 while other students are doing “floor clean-up.”
- Using unifix cubes and paper bowls, have the students place 10 cubes in each bowl and then count by 10s.
- Have students paint one hand and print that hand on a long piece of bulletin board paper at least six more times. Then have them count their fingers by ones and then by fives.

Follow-up/extension

- Sing along with tape recordings that feature counting by fives and tens.
- Have the class stand in a circle. Designate one child to begin counting off in sequence backward from 10. Give the starting student a necklace to signify that she/he is to start the counting, and have this child predict who will be number one. The child who says the last number in the sequence (one) sits down. This student then takes the necklace and places it on the student to his/her right. She/he also predicts who will be number one when counting backward. 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 bag. Have the students pass the bag around the circle. Ask students to predict the number of beans in the bag. When they hear the bell ring, this is the signal to “spill the beans.” Have the child who “spilled the beans” begin putting the beans back in the bag one by one as the class helps him/her count until all the beans are back in the bag. Continue the game with a new number of beans for each round.
- Distribute hundred charts, and have students work in pairs. One student records on the hundred chart, while the other student punches in +5 on the calculator. Each time the = is pressed on the calculator, the appropriate square is colored on the chart. Have students describe the patterns that are formed.
- 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.

Specific options for differentiating this lesson

Technology

- Share a variety of calendar styles by bringing in samples such as monthly, weekly, and yearly calendars. Using a computer-generated calendar, the students can type in the days of the week and the numbers of the month.
- Provide picture symbols for the days of the week, months, and seasons. These picture symbols may include Velcro attachments to be used by students. Allow students to manipulate the symbols on an individual Velcro calendar for students who have difficulty using paper and pencil.

Multisensory

Use manipulatives for counting experiences that include a variety of textures: foam shapes, plastic straws, ceramic tiles, plastic and metal bottle caps, etc. Children will sing along with recorded songs involving seasons, days of the week and months of the year.

Community Connections

- Arrange for the kindergartners to visit other classrooms to see teacher- and child-generated calendars. Students can take a picture with a digital camera of the playground during the different seasons to observe, describe and predict changes over time.

Small Group Learning

- Have students work with partners to draw a calendar month from a classroom sample. Students will work with a partner to fill in the days of the week on a classroom calendar.

Vocabulary

- Students need to know the following vocabulary: Today is..., Yesterday was..., Tomorrow will be... Calendar, Number, Counting, Pattern.
- Make sure students demonstrate an understanding of and use the words “yesterday,” “today,” and “tomorrow” in calendar math activities. Students will practice finding patterns in their environment and developing patterns using classroom tools. Students will use the supporting language to describe the word “pattern.”
- Provide daily student practice writing numerals and saying the name for each numeral they write.
- Provide daily student practice counting objects in and out of the classroom.

Student Organization of Content

- Arrange for daily student practice filling in the days of the week and the numbers of the month on individual calendars. Visual stimulation to support student organization will include picture schedules, daily schedules, classroom lists, classroom charts and individual student “to-do lists.”

Counting on the Bus

Reporting category

Number Sense

Overview

Students listen to a story about a school bus and practice arranging themselves in different rows and seats.

Related Standard of Learning

K.3

Objective

- The student will use ordinal numbers and position words to describe his/her position.

Prerequisite Understandings/Knowledge/Skills

- Students must have practice following 1- and 2-step directions.
- Students must have practice with the sequential order of a simple story line.

Materials needed

- Paper diagram of school bus
- Unifix cubes
- Neighborhood map on grid paper, showing houses, apartment buildings, a school, and a library
- Sticky notes

Instructional activity

Part I

1. *Initiating Activity:* Read an appropriate story to the students with a school bus as the theme.
2. Set up three rows of chairs like the seats in a bus. Label the rows: **1st** row, **2nd** row, and **3rd** row.
3. As each student “enters” the bus, direct him/her to sit in a particular row.
4. Give each child a paper diagram of the school bus and a variety of colored unifix cubes.
5. Give the students directions to place different colored unifix cubes in certain rows on the school bus — for example, place the blue cube in the **first** row, the yellow cube in the **second** row, and the red cube in the **third** row.
6. End this part of the lesson with the “People on the Bus” song.

Part II

7. Place the transparency of the neighborhood map on the overhead. Ask children to find distances between the buildings by counting the squares on the grid. Have children practice giving and following directions such as, “Start at the library. Move left 4 spaces and up 9 spaces. Where are you?”

Part III

8. For the last part of the lesson, distribute sticky notes, and have students draw a picture of themselves and write their name on them. Have students bring their notes and gather in a group to discuss the types of buildings we see in the city when we get “off the bus.” Show students pictures of apartment buildings. Give students copies of a drawing of an apartment building with three floors. Tell them they will demonstrate with their sticky notes as directions are given to visit certain floors. Give students directions to visit the **first**, **second**, and **third** floors, and have students place their notes on the correct floors. Also use the terms *top*, *middle*, and *bottom*.

Sample assessment

- As you circulate among the students, clarifying, assisting, and conversing, make notes about how well students follow directions and problem solve, and how accurately students place their cubes. Check evidence of understanding.
- Give each child a paper divided into thirds representing shelves. Have them draw a red smiley face on the **top** shelf, a yellow smiley face on the **middle** shelf, and a green smiley face on the **bottom** shelf.
- Give each child three cups, labeled **1st**, **2nd**, and **3rd**. Ask the children to put their cups in order. Give each child a red, a green, and a yellow unifix cube. Ask them to put the red unifix cube in the **third** cup, the green unifix cube in the **first** cup, and the yellow unifix cube in the **second** cup.
- Give each child a sheet with three blank squares drawn in a horizontal row. Ask the students to color the one on the **left** red, the one on the **right** yellow, and the one in the **middle** green.

Follow-up/extension

- Continue the lesson by using the “People on the Bus” song. Have partners create illustrations for each verse of the song, using a separate page for each illustration, and then put their pages in sequential order. Ask students what came **first**, **second**, and **third** in the song.
- Make a train from three shoeboxes by painting one as the engine, one as a boxcar, and one as the caboose. Emphasize that the engine is always **first** and the caboose is always **last**. Students will identify familiar objects as being in the **first**, **middle**, or **last** box.
- Place a red dot on each child’s right hand. Sing the song, “The Hokey Pokey,” emphasizing **right** and **left**. After the song, give each child a red cube, a yellow cube, a green cube, and a workspace. Ask them to place their red cube on the **right** side of the workspace, then the green cube on the **left** side of the workspace, and the yellow cube in the **middle**. Have the students clear their workspaces, and have volunteers give the directions for placing the cubes on the workspaces.
- Change the orientation of the bus activity so that students can practice counting ordinal numbers from **left** to **right** and from **right** to **left**.
- Use a picture of a three-story building to reference **bottom** as the **first** floor, **middle** as the **second** floor, and **third** as the **top** floor.

Specific options for differentiating this lesson

Technology

- Review with students different map outlines on the computer. The students will observe a simple map of the classroom, the school, the playground and the town.
- Together with students use the computer to type and print positional words to use for labeling items in the classroom.
- As a large group, have students place positional words to label areas within the classroom. For example, students will place the written word “top” to label the top of the door, the word “middle” to the middle of the door, and the word “bottom” to the bottom of the door.

Multisensory

- Have students make puppets to use along with the song, “The Wheels on the Bus.” To support practice arranging the steps of the song in sequential order, students will use props and puppets.
- Encourage students to use a variety of materials (nuts, cotton balls, sea shells, bottle caps) to practice one-to-one correspondence.

Community Connections

- Arrange for a field trip on a school bus or community transit bus. The bus trip will include student observation and discussion of street signs, side roads, and any monuments that may also be observed on the town map.

Small Group Learning

- Have students work in pairs to play and build a representation of the kindergarten classroom. The play and construction area must include: assorted blocks, stickers, picture symbols, paper, pencils and crayons for students to use when constructing, building, and drawing a representation of their classroom.

Vocabulary

- Students need to know the following vocabulary: start, left, right, middle, top, bottom, first, second, third, next, and last.
- To support the vocabulary for the lessons, provide a “math word wall” showing examples of directionality with the words: top, bottom, left, right, and middle.
- Place position words (first, second, third, next, and last) on posters throughout the room along with picture symbols to illustrate the order or position.
- Make sure students demonstrate an understanding of first, second, third, and last by recalling sequential order from the song, “The Wheels on the Bus.”
- Provide daily student practice lining up for classroom transitional activities, going to lunch and specialty classrooms. The teacher and students will practice positional words and number sense by referencing “the first person” in line, “the second person” in line, “the last person” in line.

Student Organization of Content

- Have students daily practice counting in numerical order.
- Have students daily practice following a picture schedule of the morning calendar and a picture schedule of the afternoon schedule.
- Have students write or draw pictures to illustrate a simple “to-do list” that involves sequential order: first step, second step, and third or last step.

Counting Stations

Reporting categories

Number Sense, Computation and Estimation

Overview

Students circulate through a series of counting learning centers to practice counting and number skills.

Related Standards of Learning

K.1, K.2, K.3, K.4, K.5, K.6

Objectives

- The student will tell how many are in a set containing 10 or fewer concrete items.
- The student will add and subtract whole numbers, using up to 10 concrete items.

Prerequisite Understandings/Knowledge/Skills

- Students must have practice counting concrete items up to 10.
- Students must have practice building and playing with colored pattern blocks.

Materials needed

- Toothpicks
- Glue
- Unifix cubes
- Tiles
- Pattern blocks
- Lima beans painted on one side
- Geoboards
- Squares of paper that will fit between the nails on the geoboard.

Instructional activity

Note: Prior to instruction, materials will need to be set up in a learning center format, as explained below. Students will explore one number for several days. When they have had sufficient practice with that number, they may explore the next number, using the same learning centers.

1. Group students so that each student is involved with a few of the centers. It is not necessary for each student to have equal contact with each material. Introduce the centers to the students by modeling with one of the materials. Toothpicks are used for the initial instruction.
2. Arrange four toothpicks in a design, and show it to the students. Distribute four toothpicks and a sheet of 6-by-9 dark construction paper to each student. Explain to students that there is one rule that they must follow when creating their designs: when a number design is created, all materials must touch at a corner or on a side. Have the students make different designs. Talk about the different designs, pointing out all the different designs the students made. Allow the students time to continue exploring “four” by making as many designs as they can. After students have explored many different designs, have them choose one design to record on their paper by gluing the toothpicks to the paper. After a designated time, have the students move in groups to other centers, where they explore the same number while using different materials. Listed below are the materials and recording activities for the other centers:
 - Tile Center – Place a variety of ceramic tiles or colored tiles on the table. Explain to the students that when they arrange the tiles, every tile must touch a corner or at least part of the

side of another tile. Provide precut paper tiles for students to use to record their arrangements, or have students trace around the ceramic tiles and then color their tracings.

- **Pattern Block Center** – Provide pattern blocks in two different shapes. Have the students arrange a given quantity of blocks, making several designs. Provide cut-out pattern block shapes for students to glue to 6-by-9 drawing paper, or have students trace their pattern-block designs and color their tracings.
- **Unifix Cube Center** – Provide unifix cubes in two different colors to make different patterns with the number being explored. Ask the children to describe the stacks of cubes by determining the total number of each color or the quantity of each color that is grouped together as they read from left to right. Have the students trace each cube on 6-by-9 drawing paper and color in the combinations of each color that equal the total number.
- **Geoboard Center** – Provide geoboards and squares of paper which fit between the nails on the geoboard. Have the students use the paper squares in a given quantity to make different arrangements on the geoboard. Students can glue the paper squares onto a piece of dark construction paper that is the same size as the geoboard.
- **Beans** – Prepare lima beans by spray painting them on one side. Provide a given number of beans in a cup to each student. Have the students “spill the beans” and read their number combinations, e.g., 3 red beans and 2 white beans. Students record their number combinations by using a recording sheet with bean outlines that can be colored, or by recording the number sentence.

Sample assessment

- Observe students in each of the centers. Ask questions relating to the designs they have created. Ask students to talk about the number combinations that they see in their designs. Recording sheets can be used for assessment purposes.

Follow-up/extension

- Have students fold a 12-by-18 piece of newsprint into eight boxes. As they move through the stations on subsequent days, they create designs with their materials in each of the eight boxes. Then, have them record a number sentence that represents the designs. When they have completed the number sentences, have them clear their materials and move on to the next station, where they will recreate the designs to match the number sentences they have written.
- Have the students create books from their recording sheets to represent the numbers.

Specific options for differentiating this lesson

Technology

- With students create a picture chart of classroom items to count and record. A computer chart might include items in the classroom such as desks, chairs, flags, computers, trash cans, pencil sharpener, etc.
- For students requiring additional support with mobility and performing the tasks within each counting center (counting, patterning, grouping, recording, writing), assign a peer buddy or classroom aide to assist with any switch-activated devices, visual support, or occupational support needed.
- Use software programs that include mathematical thinking, number sense, computation, estimation, and patterning in math centers.

- **Multisensory**
- Within each counting center, provide a variety of large and small writing tools, adaptive scissors, and large and small crayons.
- Make sure that manipulatives used for sorting, patterning and counting include a variety of textures, sizes, and shapes (example: felt, sandpaper, tile, plastic, metal, wood).

Community Connections

- Arrange a field trip to observe a neighboring town or city to practice their counting skills.
- Ensure that group observation and discussion include talking about all the things found in both a town and a city. Teacher and students will create a chart based on the discussion. The chart should contain no more than 4 items for the counting field trip. For example, the chart may include: traffic lights, buildings, fire hydrants, police cars, flags, buses, etc. Children will count the items they find on the field trip. Children may work in small groups with the teacher and adult volunteers assisting in recording the information as needed. For example, how many traffic lights do they count in both the town and city? How many police cars do they count in the town, and how many police cars do they count in the city?

Small Group Learning

- Have students work with partners to practice counting sets containing 5 and 10 concrete objects. Students will work with partners to build and construct shapes from pipe cleaners, cooked spaghetti noodles, and bottle caps.
- Have students practice counting sets of 10, including: 10 crayons, 10 pencils, 10 erasers, 10 blocks, etc.

Vocabulary

- Students need to know the following vocabulary: add, plus, equals, subtract, take away, pattern, set.
- Conduct daily practice involving students seeing and using the words: add, plus, equals, subtract, take-away, and set. The teacher will provide a math word wall with picture symbols that illustrate the concept for each word. The word wall may also include words written in the home languages found within the classroom environment. Multilingual glossaries may also be available within the classroom environment to support the math and the integrated curriculum.

Student Organization of Content

- Provide visual support with charts, diagrams, and samples for all auditory directions.
- Make sure students have daily practice observing and finding patterns in their classroom, in the lunchroom, and on the playground. For example, the students will observe and describe number patterns found on the classroom calendar, and shape and color patterns found within the lunchroom and on the playground.

Counting 10 Black Dots

Reporting category

Number Sense

Overview

Students create dot charts and practice counting the dots from 1 through 10.

Related Standards of Learning

K.1, K.2

Objectives

- The student will create a set of dots to match a set shown by the teacher.
- The student will count the dots in the created set.

Prerequisite Understandings/Knowledge/Skills

- Students must have practice counting forward from 1-10.
- Students must have practice touching and counting concrete objects in small sets.
- Students must have practice manipulating and building with concrete objects.

Materials needed

- Drawing paper, pre-folded into five rows
- Numeral cards with numerals and corresponding numbers of objects
- Bingo chips or other counters

Instructional activity

1. *Initiating Activity:* Share with the students a story featuring counting dots. As each illustration is shown, have students count the dots.
2. Give each child a large piece of paper pre-folded into five rows.
3. Randomly show written numeral cards from 0 to 10. Each card should show the numeral and the corresponding number of objects.
4. Have each child print the correct number of dots on the first row as the number is shown and called out. For example, five would be called out, and five dots would be drawn.
5. Have the students then place a magnetic bingo chip over each dot, counting as they go.
6. After they finish counting, have the students use a magnetic wand to scoop up their chips.
7. Call the next number, and have the students repeat the activity until the front and back of their paper is filled.
8. Now have students write the correct numeral by each row of dots, referring to the numeral cards used in step 3.
9. Ask students which row has more or fewer dots.
10. Ask each student to find the row that is the same on his/her neighbor's paper.

Sample assessment

- Call out a number, and have the students draw that number of dots on their paper.
- Watch carefully as the students are drawing their dots, and then monitor them as they are placing chips on top of each dot.
- Listen to each of them count their set of dots.

Follow-up/extension

- Have the students create their own dot stories. Distribute a certain number of black, peel-off dots to each student, and have each student draw a picture to include the dots. Collect the illustrations, and put them together as a class book.
- After many different counting books have been made available to the students, have them create their own counting book, using glue, scissors, construction paper, markers, pencils, etc. Put these in the book center to be read at other times during the day.

Specific options for differentiating this lesson

Technology

- Use software programs to support practice with number sense, number concept, number skill, counting, matching, and one-to-one correspondence to supplement and extend the mathematics curriculum at small-group and during math center time.

Multisensory

- Provide a variety of large and small dice for children to practice rolling and counting the dots (pips) on the dice.
- Provide an assortment of writing tools, including adaptive writing tools, for students to practice drawing number quantities to match the numeral on number flash cards.
- For students requiring sensory exploration, provide counting manipulatives made from ceramic, plastic, wood, and cardboard.
- Add music and movement activities that support jumping, skipping, hopping, and clapping to the musical beats. Teacher and students will choose familiar songs and count the beats within small frames of the musical piece.
- For students with mobility challenges, such as a student on crutches or in a wheel chair, provide a variety of ways to enable students to participate and demonstrate their understanding. For example, the child on crutches may actively participate by calling out the number of the beats in the musical frame being played. Or the same child may be in charge of controlling the starting and stopping of the music. A recorded message on a communication device can be provided if the student is nonverbal.

Community Connections

- To provide for the home-to-school connection, invite students to bring in small objects to use for counting, sorting, matching and one-to-one correspondence. Students may bring in items in quantities of 5 and 10.
- With students, develop a classroom invitation asking a 5th-grade classroom to participate in an upcoming math project related to number sense, number concept, counting, and creating.
- Invite guest readers for the beginning math hour to include the principal, custodian, grandparent, or individual. Guest readers may read a storybook containing mathematical thinking to support number sense, number skill, counting, and numeral recognition. The reading can be recorded on a tape recorder or composed on a talking word processing program and saved for future readings.

Small Group Learning

- Ask students to work with partners to practice counting during math centers and within small groups.
- Have students take turns listening to each other practice touching and counting real objects in their environment.

- Have students play simple board games with partners that include mathematical thinking, number sense, number concept, and counting forward.

Vocabulary

- Students need to know the following vocabulary: number and numerals 0-10, count, more, fewer, same.
- Have students practice daily using the mathematical terms and vocabulary (number, count, more, fewer, and same).
- Have students practice describing the attributes for the terms: fewer, same and Have students use graphs, charts, lists, and manipulatives to help them describe and demonstrate an understanding of sorting the “same,” counting “more,” and finding “fewer.”
- Have students match the quantity of objects with numerals as represented on a card or board game.
- Have students refer to the class-generated math word wall to support mathematical vocabulary.
- Include picture symbols and photographs for each vocabulary math word and place in the math center. For example, a photograph may include a picture of the students in the room showing “more” boys than girls, or “fewer” students with blond hair than brown hair.

Student Organization of Content

- Arrange daily practice for students seeing, saying, and writing numerals.
- Provide daily practice in counting and matching concrete objects to numerals.
- Provide math bags to support students’ math number sense, number skill, and number concept. Math bags may be made from mesh drawstring bags or plastic bags with zipper seal. Math bags should contain math concepts to support independent work such as counting, number match, and one-to-one correspondence.
- For the student with limited English skills, have flash cards and visuals available to support the classroom language. Flash cards should include the home language and English language along with a picture symbol or photograph to support the direction, schedule, task, activity, or lesson.

Math Stories

Reporting category

Computation and Estimation

Overview

Students listen to traditional stories such as “The Three Bears,” “The Three Billy Goats Gruff,” and “The Three Little Pigs.” Students use manipulatives to model the stories.

Related Standard of Learning

K.6

Objective

- The student will add and subtract whole numbers, using up to 10 concrete items in the context of a story problem.

Prerequisite Understandings/Knowledge/Skills

- Students must be able to count from 1-10.
- Students must be able to operationalize 1:1 correspondence.
- Students must be able to demonstrate an understanding of the concept and process of addition.
- Students must be able to demonstrate an understanding of the concept and process of subtraction.

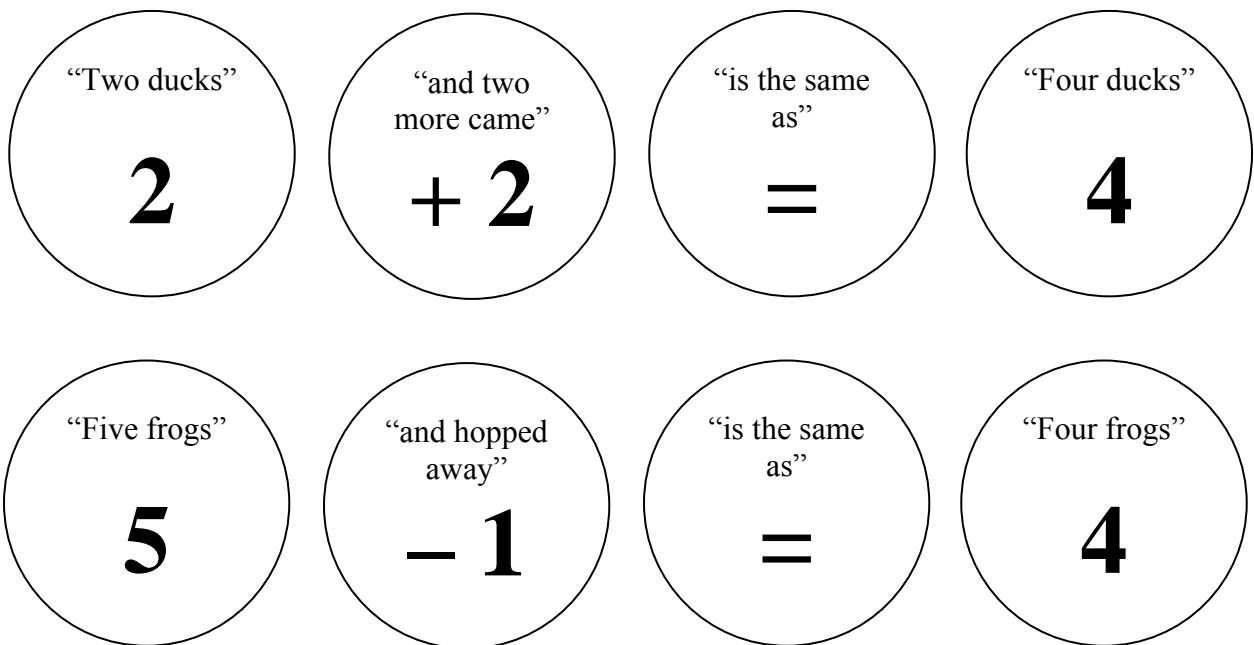
Materials needed

- Traditional children’s stories, such as “The Three Bears,” “The Three Billy Goats Gruff,” and “The Three Little Pigs,” or other animal-related stories
- Manipulatives to use to model the stories, such as counting bears, toy animals, and goldfish crackers
- Workmats designed to fit the setting of the stories
- For each students, one container with lid, large enough to hold 10 objects

Instructional activity

1. Read one of the traditional stories to the students, and have some of them act out the story as it is read. Have the rest of the students use their workmats and their manipulatives to model the story during the reading. Revise the story by adding additional bears, and have students use the manipulatives to model the actions in the story, e.g., two more bears came to the house for breakfast. How many bears are now in the house?
2. Continue the lesson by discussing the process of addition and subtraction with the students. For the second part of the lesson, use a flannel board or dry erase board to create more word problems. As children understand the process, allow them to tell a word problem to the class. The remainder of the students will manipulate their materials to reflect the story.
3. Additional lessons can include workmats that are created for particular sets of manipulatives or objects, e.g., frogs in a pond, animals in a barn, fish in a goldfish bowl. Tell the class story problems, and have the students use their manipulatives to represent the problems. During the activity, discuss the following questions:
 - How many objects (pond, barn, fishbowl) are in the setting?
 - Do you have more objects than you did before?
 - How did you decide if you had more or fewer objects?
 - After the new objects were added, how did you know how many objects were in the setting?
4. The same activities can be used with subtraction.

5. Follow up with a lesson on subtraction that relates the removal of objects to the process of subtraction. Divide students into groups of two to play the “Hidden Object” subtraction game.
6. Have one student choose a specific number of objects and place them in an open container. Have the student’s partner count the number of objects and tell how many have been placed in the container.
7. Have the partner then turn around and face away from the first student. The first student then takes some of the objects out of the container and hides them in a second container with a lid.
8. Have the partner now turn around and figure out how many objects were taken out of the open container. The partner can use objects or tally marks to determine how many were taken out.
9. Have the pair remove the lid of the closed container to check the solution.
10. Have the students switch roles and repeat the activity. During the activity, observe students and ask the following questions:
 - How many objects did you start out with?
 - Does subtraction leave you with more or fewer objects than before?
 - How many objects did you subtract from the original group?
 - How did you figure out how many objects were subtracted (hidden in the container)?
11. Eventually have students transfer a word problem to paper by illustrating the word problem to “write” the story. After much practice with the language of addition and subtraction contained in stories and modeling with concrete objects, have the students begin to transfer the words they are using into the symbolic representation for *add*, *subtract*, and *equal*. For example:



Sample assessment

- Record student responses to questions.
- Have students represent the problems and record their solutions.

Specific options for differentiating this lesson

Technology

- Have students use enlarged manipulatives to model story actions.
- Consider providing a larger work area than their desk (for instance, the floor) to model story actions.
- Provide enlargements of number lines placed on the students' desks to assist in addition and subtraction and in determining the concepts of "more than," "less than," and "equal."
- Create picture cues indicating the directionality of "more than" and "less than" along a number line on students' desks.
- Have students use picture cues indicating the directionality of addition and subtraction along a number line on their desks.

Multisensory

- Provide number lines containing raised and/or color-coded bars with arrows in another medium that students can slide their fingers up and down to help them comprehend the concepts of "more than" and "less than."
- Provide number lines containing raised and/or color-coded bars with arrows in another medium and have students slide their fingers up and down to help them comprehend the concepts of addition and subtraction.
- Arrange numbered sandwich boards (each child is a 1) on the children and have them act out the lessons to emphasize how many are joining (1+1) or leaving (Five 1's and 1 and 1 leave). After the presentation, portions of the story relevant to the objective can be reenacted using human number sentences. Additionally, other stories can be read where children wearing the numbered sandwich boards listen for the number sentence and go to the front of the class (or leave as the story progresses).

Community Connections

- Have students visit a community theatre or a high school group's presentation of one of the stories covered in the unit. Present the class's version to the theatre group if possible.
- Present a play based on the stories the students have read, complete with numbered sandwich boards, to the parents or to some other group. Take pictures and publish in the school newspaper or call a local reporter and ask that they take pictures for the local paper.

Small Group Learning

- Have students "write" their own story in a small group using pictorial representations for both the words and the math facts.
- If some groups of students are not ready for this task, represent the story with the students filling in a pictorial representation of the parts of the story that are relevant to math objectives.
- Create stories on a large wall board and hang them in the classroom or in the hall.
- Make human number sentences. Working in small groups, one student can tell a simple story, for instance, "one duck walked to the pond and three ducks joined him" (either provided to the student by the teacher or made up by the student), and other students in the group (each student representing 1) enact the story. If one or more of the group's students are ready, one student can be in charge of the symbols for addition and subtraction and the group can name the correct sign to join the group. Later, the correct placement of an "equal" sign can be introduced and added to the activity.

Vocabulary

- Students need to know the following vocabulary using specific strategies: One-to-one correspondence – Manipulatives placed on pictorial representations of number/objects, sandwich board number cards for students to wear (they represent 1) in the recreation of stories, human number sentences.
- Counting – Counting along a number line, repetition as stories are read and numbers are frequently counted aloud, visual representations through enactments and presentations
- Addition – Number lines with raised or color-coded cues to the directionality of adding along the line, visual representations of addition through enactments and presentations; use of manipulatives on pictorial representations of addition sentences;
- Subtraction – Number lines with raised or color-coded cues to the directionality of adding along the line, visual representations of subtraction through enactments and presentations; use of manipulatives on pictorial representations of subtraction sentences.

Student Organization of Content

- Have students maintain a folder with a list of activities, represented in picture symbols, which will be initialed by the teacher upon completion
- Have students maintain a book list of stories read with accompanying samples of activities completed associated with each story.
- Provide wall charts denoting each of the activities, accompanied by a photograph or other picture symbol, with the student's name written or tagged on the chart upon completion of the task.
- Collect pictures and videos taken of the students' play presentations, number sentences, etc., and display in a school-wide exhibit in the hall.
- Issue certificates of completion when all work from the unit is complete and send a note home to the parent.

Musical Counting

Reporting category

Number Sense

Overview

Music, musical instruments, songs and rhymes are used for counting activities.

Related Standards of Learning K.1, K.2

Objective

- The student will count chairs and objects during musical activities.

Prerequisite Understandings/Knowledge/Skills

- Students must be able to count from 1-10.
- Students must understand the concept of and know how to use 1:1 correspondence as it applies to counting objects and musical notes.

Materials needed

- Student chairs
- Counting objects (teddy bear counters, unifix cubes)
- Xylophone
- Rhythm instruments

Instructional activity

1. *Initiating Activity:* Begin the lesson with a traditional game of musical chairs. Set up a circle of chairs as you would normally for playing musical chairs. Make certain you have one fewer chair than the number of students. Have the students count the chairs as they circle each time. As each student is out, have him or her move the chair to a second circle that grows as each chair is added. The students who are out proceed around the second circle and continue to count — at no time is any student really out. The anticipation as to when the music will stop keeps both groups going and counting.
2. After the musical introduction, give each student a workspace and some teddy bear counters or other counting objects. Play a certain number of tones on the xylophone.
3. Direct the students to place an object on their workspace for each tone they hear.
4. Have the students count orally the number of objects on their workspace; then have them clear their workspace for the next number of musical notes.
5. Have students work in pairs for the next activity. Distribute rhythm instruments and a set of unifix cubes to each pair.
6. The first student will put together a set containing between 1 and 10 cubes. The other student will sound his/her instrument an equal number of times. Partners switch after performing three different numbers.
7. End the day's activities with counting songs, rhymes, and finger plays, such as "Ten Little Indians" or "Five Little Pumpkins."

Specific options for differentiating this lesson

Technology

- Have students use enlarged manipulatives to replace teddy bear counters.
- Have students follow hand signals provided by the teacher to add a visual dimension.
- Have students use a pictorial representation of the directions.
- Have students use a pictorial depiction of counting songs, rhymes, and finger plays.

Multisensory

- Have students use number cards, 1-10, placed on desks on which students place counters as notes are played.
- Play clapping games in which the students replicate a series of sounds that they hear, counting as they clap.
- Have students use pictorial representations of counting songs, rhymes, and finger plays to facilitate memorization.

Community Connections

- Arrange for students to visit a group, such as a school band, community orchestra, etc., for a performance.
- Invite a drummer (preferably one who plays congos or steel drums) to demonstrate for students the playing of individual sounds and give students an opportunity to imitate him/her;
- Invite a local musician to visit the class and explain the part of counting, reading of individual notes, etc., in playing their instrument.
- Arrange for students to visit an ROTC or workout at the local armory to watch soldiers march while counting or reciting a rhyme.

Cooperative Learning

- Have students work in pairs, with one student imitating the other in counting rhythms around the chairs.
- Working in pairs, have one student play and count a short musical rhythm on an instrument and the other imitate it by foot stomps, hand claps, or by playing the same rhythm on another instrument.
- Have students create a musical composition with different instruments that can be performed in front of the rest of the class, utilizing counting to the notes played.
- Assign students to make pictorial representations of different counting songs, rhymes, and finger plays to be exhibited in the classroom. For instance, for “Five Little Pumpkins,” one child could draw a line of five pumpkins, the next child a line of four pumpkins, etc. Each child can stand up and present his or her part of the song (rhyme) as it is done in class.

Vocabulary

- Students need to understand the following vocabulary using specific strategies:
- One-to-one correspondence – Manipulatives placed on pictorial representations of number/objects, imitation of various sounds such as musical notes, clapping, stomping the foot, etc.
- Counting – Counting as they perform certain tasks such as walking to the gym, steps to the sink, etc. Make a legend showing how many steps to the bathroom, how many steps from the door to the rug, to individual desks, etc.
- Wall chart, mnemonics through songs, rhymes, and finger plays.

Student Organization of Content:

- Have students make a counting book where their “study” is represented in written and in pictorial form (using self-drawings, magazine cut-outs, etc.).
- Have students maintain a folder with a list of activities, represented in picture symbols to be initialed by the teacher upon completion.
- Issue students certificates of completion when all work from the unit is complete, and send a note home to the parent.

Sample assessment

- Circulate throughout the room to offer assistance as needed. Note individual students who need additional help and provide activities.

Sample resources

Eggciting Math – Using plastic eggs, students can do a variety of activities that will help them with one-to-one correspondence and with relating symbolic, pictorial, and concrete materials to number concepts. <http://explorer.scrtec.org/explorer/explorer-db/html/817016193-81ED7D4C.html>

The Autumn People: Addition – Worksheet featuring beginning addition with a few story problems. <http://www.geocities.com/EnchantedForest/Dell/5232/work1.html>

The Autumn People: Subtraction – Worksheet featuring beginning subtraction with a few story problems. <http://www.geocities.com/EnchantedForest/Dell/5232/work2.html>

- Compare and describe heights of two objects (as taller or shorter), using direct comparison or nonstandard units of measure (e.g., book, hand span, new pencil, paper clip, block).
- Compare and describe weights of two objects (as heavier or lighter), using direct comparison or nonstandard units of measure (e.g., book, cubes, new pencil, paper clip, block).
- Compare and describe temperatures of two objects or environment (as hotter or colder), using direct comparison.

Money Math

Reporting category

Measurement

Overview

Students identify coins and learn their values of a collection of pennies and nickels up to 10 cents.

Related Standard of Learning

K.7

Objectives

- The student will recognize a penny, nickel, dime, and quarter.
- The student will describe the properties of the penny, nickel, dime, and quarter.
- The student will count a collection of pennies and nickels with a value of up to 10 cents.

Prerequisite Understandings/Knowledge/Skills

- Students must have been exposed to the use of coins.
- Students must be able to visually differentiate between the physical properties of each coin (shape, color, detail).
- Students must be able to count 1-10.
- Students must be able to use count-on strategies.

Materials needed

- Money strips (see #1 below)
- Assortment of pennies, nickels, dimes, and quarters (either real coins or play money)
- Brown paper bags with a collection of coins — one bag per two students
- Items in the classroom labeled with various price tags with prices of between 1 cent and 10 cents

Instructional activity

1. To create money strips, glue a penny to a 1-in. square of tagboard. Glue a nickel to a 1-by-5-in. piece of tagboard marked off in 1-in. squares. Glue a dime to a 1-by-5-in. piece of tagboard similarly marked off in 1-in. squares. Glue a quarter to a marked-off 1-by-25-in. piece. Make these guides with showing both heads and tails of the coins.
2. Using the money strips, show and name each coin, relating its value to the number of squares on the strip to which it is attached.
3. Ask the students how many ways they can make 5 cents by using their strips. (5 pennies or 1 nickel) Ask them to show all the ways to make 10 cents by making strips that are 10 squares long. (10 pennies; 5 pennies and 1 nickel; 2 nickels; 1 dime).
4. Practice counting on from 5 by first putting down a nickel strip and then adding penny strips one by one while counting: “Five...six, seven, eight, nine, ten.”
5. Display a collection of pennies, nickels, dimes, and quarters, showing both heads and tails of each type of coin. Invite the children to sort the coins into four groups. Discuss how each of the coins is different. Show and name each of the coins. For review, hold up a coin, and ask a student to name it.
6. Divide the class into pairs of students. Distribute the brown paper bags with a collection of coins to each pair. Explain that one student will reach in the bag and pull out a coin and the other student will name the coin. The partners will then switch and repeat the activity as many times as time permits.

7. For the final part of the lesson, let the students use their coins to select items in the classroom. Label classroom items with price tags of from 1 cent to 10 cents. To practice counting on from 5 cents, have students start from 5 and count to 10 by ones. Hold up 5 fingers, and have students tell how many fingers there are without counting. Then put up 1 finger at a time from the other hand and have students count on from 5. This same activity can be done with a 10 frame. Begin with 5 counters already in a top row. Then place 1 more counter on the bottom row, and have students tell the new number. Continue until you get to 10. Show students a nickel, and say “five.” Add one penny at a time, and have students tell the new amount of money.
8. Give a bag of coins to each student for a shopping activity. Review the name and value of each coin prior to the shopping. Have students count the value of the coins in their bag and then “go shopping” to purchase one item with their coins. Then have them bring the item they wish to purchase to the clerk (teacher), who verifies that the total value of the coins matches the price of the item. Have the students trade bags and repeat the activity.

Sample assessment

- Play Money Bingo, in which students will recognize the coin or locate the value of the coin.
- Create a coin booklet in which students draw a picture of each coin and write the value of the coin.

Specific options for differentiating this lesson

Technology

- Provide sorting charts (T-charts, tables) by coin and by value.
- Use a teacher model and laminated student charts.
- Use transparency coins for lesson presentation and guided practice.
- Use software programs to provide experience with labeling coins.

Multisensory

- Use manipulative coins of varying sizes.
- Teach and sing songs that teach coin names and coin values.
- Show preschool video segments from an educational television show to reinforce the vocabulary and concepts contained in this lesson.

Community Connections

- Visit the school store in small groups to purchase items.
- Go on a field trip to purchase items at a discount store.
- Invite a representative on children’s banking to visit the classroom.

Small Group Learning

- Provide time to play “money games;” for example, “The Penny Game,” “Race to a Nickel,” etc., for more practice.
- Structure center time for playing more money games or for completing counting coins tasks.
- Develop a classroom bank and assign students jobs for saving and/or withdrawing money.
- Integrate counting money into calendar math routine.

Vocabulary

- Students need to know the following vocabulary: same, different, difference, penny, pennies, nickel(s), dime(s), quarter(s), coin, value, one, five, ten, twenty-five, cent(s), copper (brown),

silver, Abraham Lincoln, George Washington, How much is ...?, It costs..., money, buy, sell, price.

- Provide students with opportunities to repeat the names of coins and values through question/answer portions of the lesson(s).
- Provide opportunities for students to locate, recognize and describe details on the coins.
- Utilize a money pocket chart for labeling and for counting quantities of coins as a part of Calendar Math or on an interactive math bulletin board.

Student Organization of Content

- Create an interactive money journal or cut and paste a journal within which students glue pictures of coins in appropriate places according to coin name and/or value.
- Provide a home version of the same money journal for practice at home.
- Have students utilize a classroom-made flash card set for guided and independent practice. Through teacher observation of this task, ongoing and final assessment data could be collected.

Alternative assessment option

- Teacher observation of Cooperative Learning Activities (see below in the next section entitled “Sample Classroom Assessments) and suggestions in Student Organization of Content (also described below).

How Long Is It?

Reporting category

Measurement

Overview

Students measure with nonstandard units of measurement to determine how long classroom objects are. They measure the distance they can jump and compare their distance with those of their classmates.

Related Standards of Learning

K.8, K.10

Objectives

- The student will determine that a ruler is used to measure the length of objects in the classroom.
- The student will measure the distance he/she jumps, using a nonstandard unit of measurement.
- The student will compare the length of his/her jump with that of a classmate.

Prerequisite Understandings/Knowledge/Skills

- Students must be able to visually differentiate lengths of objects and distances of 1 yard or less.
- Students must be able to compare differing lengths of objects.
- Students must be able to jump (or be able to use another student's jump for data collection).

Materials needed

- Masking tape
- Yarn
- Unifix cubes
- Index cards with pictures of objects in the classroom (e.g., table, pencil, yardstick, carpet, bookcase, window, sand table, desk, sink, a floor tile) and arrows on the pictures to identify the length that students should measure.

Instructional activity

1. Introduce students to the concept of measuring length after reading an appropriate piece of children's literature to the students. Ask students what could be used to measure how long something is. Examples include a ruler, a yardstick, and a measuring tape. Tell students that they will be measuring objects in the classroom with unifix cubes to determine how long the objects are. Model how to measure the length of one side of the carpet. Have a student place unifix cubes along the length of the carpet and then count the cubes to determine the length of one side of the carpet. Model again, using the side of the book. Pass out the index cards with pictures of classroom items, and give a container of unifix cubes to each set of partners. Have students measure the length of each object shown on the cards. After all students have measured the objects, record the results on chart paper. Talk about which object was the longest, which objects were longer than other objects, which object was the shortest, and which objects were shorter than other objects.
2. For the second part of the lesson, students will participate in a "broad jump" activity. Place the masking tape to mark a broad-jump starting point on the floor in a suitable space in the classroom. Have students take turns jumping with two feet. The teacher will measure with a length of yarn the distance each student jumps, cut it to this length, and give it to the student. After all jumps have been measured, have the class sit in a circle. Call two students at a time to bring their lengths of yarn to the middle of the circle and lay down their lengths of yarn side by side so that the class can

compare the lengths, using the terms *longer* and *shorter*. Repeat until every child has had a turn comparing his “broad jump” length.

Sample assessment

- Group the students into small groups, and have each group make a train, using three unifix cubes. Then, have them make a train of four cubes. Have the students identify the longer and shorter trains.
- Give each child a recording sheet with pictures of classroom objects to be measured. Let the student decide what nonstandard unit of measure he/she will use — e.g., popsicle stick, paper clip, pencil, etc. Have the students go around the room measuring and recording their measurements. Observe and ask the students questions as they work.

Specific options for differentiating this lesson

Technology

- Utilize alternative measuring tools that differ in size and texture; for example, fabric or felt of differing lengths used to measure and compare objects in the classroom.
- Select software programs that require students to compare sizes and lengths of visual stimuli.
- Provide a paint software program that lets the students freely draw different sizes and lengths.

Multisensory

- “Measure” using footsteps or any movement that creates an auditory sense of length. Use physical participation to model or imitate “long” by spreading arms and “short” by using fingers. For example, cue “Show me what long looks like” or “Show me how long an elephant’s trunk is.” “Show me what short looks like” or “Show me how short a worm is.”
- Use video segments from a science education or a preschool education television series.

Community Connections

- Invite speakers such as engineers, carpenters, painters, tailors and athletes to visit the classroom.
- Go on a field trip to a home construction site.

Small Group Learning

- Conduct either of the instructional activities with assigned jobs. One student or one team measures and another records the measurements. The students or teams then switch roles and review the work by measuring again.

Vocabulary

- Students need to know the following vocabulary: long, short, longer, shorter, shortest, longest, measure, length, How long is it? Which is longest/shortest?, unifix cube(s), paper clips, pencils (names of any non-standard item used); ruler, yardstick, tape measure (necessary to literature portion of lesson).
- Label a set of classroom or home objects with “long” and “short” to create a vocabulary basis. This provides a reference point for descriptive vocabulary in math.
- Provide all essential vocabulary for describing length as listed above on word cards and post during lessons. This vocabulary could then be placed on math word wall for reference.
-

Student organization of content

- Have the students draw the classroom objects measured and place their drawings on a class table/chart that provides categories defined by length.
- Complete a student-made mini-book with patterned sentences following instruction of the concepts. The patterned sentences could be placed one per page and read as follows: “The pencil is long. The eraser is short. The carpet is long. The bookshelf is short. The bus is long. The bike is short.” The student would illustrate the mini-book with teacher support.

Alternative assessment option

- Do an oral evaluation that requires students to select the best tool to measure a given item. The student would select the best non-standard or standard measurement tool and explain his/her rationale.

How Heavy Is It?

Reporting category

Measurement

Overview

Students use a balance scale to compare the weights of two different objects.

Related Standards of Learning K.8, K.10

Objective

- The student will recognize the balance scale as a tool to measure weight/mass.

Prerequisite Understandings/Knowledge/Skills

- Students must know that some objects are heavy and some are light.
- Students must know that things are weighed in grocery stores.
- Students must know that they are weighed at the doctor’s office.

Materials needed

- Balance scale
- Bathroom scale
- Other types of scales (or pictures of scales)
- Small objects that will fit in the pans/tubs of the balance scale, e.g., small blocks of wood, a tennis ball, an apple, a pack of gum

Instructional activity

1. Introduce students to different types of scales — the balance scale, platform scale, the bathroom scale, the scale used in grocery stores, and scales found in the doctor’s office.
2. Using a bathroom scale, demonstrate how the scale shows a measure of weight on the dial. Explain that the balance scale is like a seesaw and is used to compare the weight of two objects. Demonstrate with two of the objects. Ask which object they think is heavier and which is lighter. Help students develop the concept of weight by holding an object in each hand to determine which feels heavier before placing the objects on the balance scale. (Use objects that are roughly the same size but very different in weight, e.g., full and empty boxes, full and empty jars.) Have the students compare the weights of the objects when they are placed in the scale, using the terms *heavier* and *lighter*, e.g., “The pencil is lighter than the tennis ball. The tennis ball is heavier than the pencil.” Empty the scale and repeat the process. Repeat the activity until all the students have had an opportunity to weigh different objects and compare their weights.
3. Extend the lesson by having students use teddy bear counters to compare the weights of two different objects. Model for students how to weigh an object, using the number of teddy bear counters to equal its weight. Place students in groups of two with a balance scale between them and four small objects to weigh. Have students weigh each object by balancing the object with a sufficient number of teddy bear counters. Have students record the weights by drawing the object and indicating the number of counters required to balance the scale.

Sample assessment

- Distribute small pumpkins or gourds to each student. Have small groups of students measure the weight of each object on a scale, using teddy bear counters. When they are finished, have them record the results on their recording sheets.
- On the 100th day of school, have the children bring in a small Ziploc baggie of 100 items. Have small groups of students compare the weights of the various bags on a scale. When they are finished, have them record the results on their recording sheets.

Specific options for differentiating this lesson

Technology

- Use sorting trays to support clarity when presenting items that are compared based on weight.
- Provide digital scales to raise students' level of interest as they are representative of current technology.
- Provide talking scales for students with visual impairment.
- Use software programs that offer practice in the measurement of weight.

Multisensory

- Integrate physical education competitions or games involving the impact of weight on various athletic activities.
- Sing songs that teach opposites.
- Provide students with an opportunity to weigh themselves in the classroom.
- Use video segments from a science education or a preschool education television series.

Community Connections

- Invite speakers such as grocery store personnel, deli workers, candy shop workers, truckers/delivery workers, mail workers, auto mechanics, athletes, doctors, and scientists, who explain how they weigh items in their work or how weight impacts their professions.
- Go on a field trip to the school cafeteria, the grocery store, a post office, or a candy shop where the use of scales could be demonstrated in the real world.

Small Group Learning

- Duplicate balance scale extension activity as in #3 with a project focus. For example, students must prepare a trail mix that is heavier with cereal than M & Ms. If successful, the pairs of students may eat the trail mix.

Vocabulary

- Students need to know the following vocabulary: more, less, heavy, light, heavier, lighter, heaviest, lightest, weight, weigh, weighed, weighs, scale, balance scale, bathroom scale, How much does it weigh?; Which is heavier/heaviest/lighter/lightest?; Why do you think that the _____ is heavier/lighter?
- Present real (classroom or home) objects to students with instructor descriptors of weight. This will provide some reference for words used to describe weight.

Student Organization of Content

- Place together items found to be heavy in a specific location or container.
- Group together items found to be light in the same manner.

- Maintain and update the containers serving as a reference and as a developing visual based on current applications of the concept.

Hot or Cold?

Reporting category

Measurement

Overview

Different types of thermometers are introduced as tools used to measure temperature. Seasonal pictures are used to discuss hotter and colder temperatures.

Related Standards of Learning K.8, K.10

Objectives

- The student will determine the appropriate tool to measure temperature.
- The student will compare two events and determine which is hotter or colder.

Prerequisite Understandings/Knowledge/Skills

- Students must know that weather changes.
- Students must know that different clothes are used for different kinds of weather.
- Students must recognize the difference between cold and hot.

Materials needed

- Different types of thermometers, including a large demonstration thermometer
- Pictures depicting the various seasons of the year

Instructional activity

1. Display different kinds of thermometers, including a demonstration thermometer that can be manipulated. Talk about how they are used to measure temperature. Using the demonstration thermometer, show the students where the “red line,” would be if it were hot. Show students seasonal pictures from the summer (e.g., swimming at the beach, wearing summer clothes, playing in a pool), and explain that the thermometer would show a higher temperature when it is hot. Using winter pictures, go through the same process, explaining that the thermometer would show lower temperatures when it is cold.
2. Place a real thermometer on a window for the students to observe each day as part of the calendar activities.

Sample assessment

- Distribute pictures of hot and cold events to the students. In a small group, have the students sort the pictures. Have them place the “hot pictures” under a picture of a thermometer with the mercury at the top. Have them place the “cold pictures” under a picture of a thermometer with the mercury at the bottom.
- Divide the class into small groups of three or four. Give each group 3 cups — one with ice water, one with hot water, and one with room-temperature water. Label the cups A, B, C. Give each group a recording sheet. Allow the children to use the thermometer to determine which cup is hottest and which is coldest.

Specific options for differentiating this lesson

Technology

- Use white boards and markers to record temperature and utilize the symbol for degrees.
- Use digital thermometers to raise students' level of interest and promote a link to prior experience.
- Provide an enlarged thermometer(s), making it easier to read for preschool/kindergarten-aged students.
- Provide a thermometer with raised lines and numbers.

Multisensory

- Locate or prepare an adapted thermometer with raised lines and numbers to engage tactile learners.
- Sing songs that promote understanding of vocabulary and utilize dramatic representation of human reactions to temperature.
- Show video segments from science education and/or preschool education television series.

Community Connections

- Invite speakers to include weather reporters, park rangers, or maintenance/facilities managers who explain weather tracking and its impact on their work.
- The kindergarten students would be assigned the role of measuring temperature.
- Go on walks during different seasons to collect students' observations regarding temperature.
- Go on a field trip to a weather station or a military base and visit with aviation personnel to learn how temperature is measured and how it affects daily life and flight planning.

Small Group Learning

- Assign temperature reporters daily. One student checks the temperature on an indoor thermometer and one checks the temperature on an outdoor/window thermometer. Each student records the temperature on the white board or chalkboard and reports his/her findings to the class during Calendar Math.

Vocabulary

- Students need to know the following vocabulary: hot, hotter, hottest, cold, colder, coldest, temperature, thermometer, summer, winter, spring, fall, "red line"/mercury. They must demonstrate some knowledge of integers/numbers (10-100), degrees. Additional vocabulary would include essential vocabulary as outlined in the Science SOL.
- Color-code "hot" along with seasons associated with hot weather and color-code "cold" along with seasons associated with cold weather.
- Integrate these descriptive words into interactive writing during the teaching of the unit and during the year when seasons change.
- When "weather reports" are given by students during Calendar Math, require students to use essential vocabulary.
- Label thermometers.

Student Organization of Content

- Have students create a T-chart of illustrations and/or sentences that describe hot and cold weather or hot and cold items.
- Have students play "Concentration" or a matching game of concept cards; this may be student-made, teacher-made, or a purchased game.
- Ask students to create a temperature learning log within which temperatures are recorded for a specified length of time; it may include a temperature graph.

How Tall Are You?

Reporting category Measurement

Overview Students use nonstandard measurement to compare their heights.

Related Standards of Learning K.8, K.10

Objective

- The student will compare his/her height with that of a classmate, using the terms *taller* and *shorter*.

Prerequisite Understandings/Knowledge/Skills

- Students must know that people in their families, communities, and in public places are of differing heights.
- Students must be able to stand (see Technology section for adaptations).

Materials needed

- Butcher paper
- Rolls of adding machine tape
- String
- Scissors
- Appropriate story about height, e.g., “Jack and the Beanstalk”

Instructional activity

1. Share an appropriate story, like “Jack and the Beanstalk,” that relates the concept of height to students. Explain to students that we can measure a person’s height, using the same tools we used to measure the lengths of different objects. Ask students to estimate how tall they think they are.
2. Call two students to the front of the class. Introduce the word *height* and the comparison words *taller* and *shorter*. Have the class compare the heights of the two students. Repeat the activity until everyone has been given a turn.
3. Distribute rolls of adding machine tape. Have students work in groups of two. One partner takes the roll of adding machine tape and measures the height of the other student. The paper is cut as close to the measured height as possible. Then the students reverse roles. Once the students have put their names on the tape, gather then students together in a group. and order the tapes by height. This activity works smoothly if students line up from tallest to shortest and then place their tapes in order on the wall. Discuss with the students who is tallest and who is shortest, and make comparisons, using the terms *taller* and *shorter*.

Sample assessment

- Place students in groups of two, and have them trace each other on butcher paper. Once the tracing is done, have them use a hand as a nonstandard unit of measure to figure out how tall they are. Ask comparison questions to determine if the students understand the terms *taller* and *shorter*.
- Have the children measure the length of one of their arms, using string. Have them cut the string to that length. Give each child a piece of paper divided into fourths. Have them use their string to find four objects that are longer than their arm. Have them draw the objects and label their drawing. Then have them find four objects that are shorter than their arm, draw on other side of paper, and

label. If time permits, give them the challenge of finding one object that is the same length as their arm. This object can be drawn and labeled on another sheet.

Specific options for differentiating this lesson

Technology

- Prepare an oversized visual that compares the height of two animals to develop a reference point for tall and short. During the lesson, assist students with the task by having them stand against a wall or place measuring tape against wall or straight surface. Measurement may also be taken by having the student being measured lie on the floor. Students in adaptive chairs may be measured while seated.
- Use a software program that engages students in selecting visual stimuli of varying heights.
- Use adaptive scissors or teacher assistance for measuring with adding machine tape.

Multisensory

- Blindfold students and have them touch items such as yardsticks or books propped against a wall. Students are to describe or name the object that is tallest or shortest. The same activity may be conducted with items that are placed on a table and described using comparative words of height. Items should be selected carefully to avoid confusing the concept of height with the concept of length.
- Sing songs that teach opposites and require physical dramatization of height.

Community Connections

- Assign students the task of measuring a family member using the adding machine tape. The student should report back to the class observations made in an informal oral report. For example, “My sister is taller than me.” “My brother is shorter than me.”
- Invite speakers to include a city planner or an architect who speaks about the impact of tall buildings on city planning or the time it takes for construction.
- Invite an exceptionally tall individual to class and have students make comparisons between this person and class members or staff members.

Small Group Learning

- Assign students to play a sequencing game (student-made, teacher-made or purchased) in which they sequence pictures from tallest to shortest or shortest to tallest. The students are required to describe the comparisons of pictures using complete sentences; for example, “The elephant is taller than the bear.” “The giraffe is the tallest animal.” “The bear is the shortest animal.”

Vocabulary

- Students need to know the following vocabulary: short, shorter, shortest, tall, taller, tallest, height; additional vocabulary would include names of classroom objects and vocabulary for family members and people in the school whose heights may be compared.
- Label the oversized visuals prepared for developing a reference point for “tall” and “short.”
- Print other comparative words on flash cards or oversized cards with raised letters for labeling individual adding machine tapes once cut to represent the heights of the different students.
- Place words that describe height on a chart or a math bulletin board.
- If not already labeled or given pictorial labels (during opening school year procedures), label classroom objects.

Student Organization of Content

- Have students develop a comparison learning log as a guided activity. Each page is divided into two or three sections within which pictures or cut-outs from magazines are pasted/glued under the categories “tall” or “short” OR, if in three categories, “tall,” “taller,” “tallest” and “short,” “shorter,” “shorter.”
- Use a mini-book with simple, patterned sentences such as “ A _____ is tall.” “A _____ is short.”

Alternative assessment option

- Modify these assessments to be done one-on-one with adult support or decrease the number of objects that need to be measured (in the assessment section included above).

What Time Is It?

Reporting category

Measurement

Overview

Students determine time to the hour, using analog and digital clocks.

Related Standards of Learning

K.8, K.9

Objectives

- The student will identify different types of clocks (analog and digital) as instruments to measure time.
- The student will tell time to the hour on an analog clock.
- The student will tell time to the hour on a digital clock.

Prerequisite Understandings/Knowledge/Skills

- Students must know that clocks are used to “tell time.”
- Students must know that time is followed or measured throughout daily routines in their families or communities.

Materials needed

- Large demonstration clock with hands that move
- Small demonstration clocks for students to use
- Examples of analog and digital clocks

Instructional activity

1. Introduce the students to the concept of time by sharing an appropriate children’s book that contains clock faces. Using the large demonstration clock, explain the minute and the hour hand to students. Position the minute hand at twelve, and move the hour hand around the clock. Have students identify each time, using the word o’clock.
2. Display a digital clock to students. Point out the two dots, and explain that to the left of the two dots tells the hour and to the right tells the minutes. Write the time shown on the digital clock on a dry erase board. Using the large demonstration clock, show the same time. Distribute the smaller demonstration clocks to the students. Have the students practice showing different times to the hour on their clocks.
3. Write a time on the dry erase board, and have the students demonstrate the time on their small clocks.

Sample assessment

- Create time memory cards showing times as on both digital and analog clocks. Mix the cards and place them face down. Have a child turn over two cards. If the cards match, the student keeps them. If they do not match, the student turns the cards back over. Continue until all matches have been found.
- Have the students create a book reflecting five important hours in their day. Have them illustrate and label each event. Allow them to use a clock stamp to make clocks that reflect the times that are mentioned on the pages of their book. This activity is to be done over several days.

Specific options for differentiating this lesson

Technology

- Use talking clocks and/or clocks with raised numbers or teacher-adapted raised numbers.
- Use oversized analog and digital clocks and transparency clocks for an enlarged visual.
- Use software programs that provide verbal cues or record times from student voices for computer-assisted guided practice.

Multisensory

- Create a class-made symbolic schedule that pairs a symbol representing an activity with a visual of a clock showing the time when the activity takes place.
- Sing songs that develop vocabulary for associations with different times of day and require physical modeling of the movement of the clock hands.
- Simulate the passing of time (to develop a concept of time) by requiring the students to jog, walk, clap hands or sit silently for a given period of time; for example, two minutes.

Community Connections

- Assign students to ask parents what time they get up, what time they eat dinner, and what time they go to bed in order to link unit to personal experience. This information could be requested on a simple interview sheet that parents complete or that students complete with parent help.
- Go on a field trip to a track event and observe the use of timing in athletics.
- Go on a field trip to a location that utilizes schedules such as a bus station, train station, metro station, or movie theater. Ask students to locate times they can read.

Small Group Learning

- Have students play a question/answer game using student clocks. One student puts a particular time on his/her clock and asks, “What time is it?” The partner is required to respond “It is _____ o’clock.”
- Play matching games with cards that provide digital and analog displays in pairs or groups of 3-4.

Vocabulary

- Students need to know the following vocabulary: time, hour, hand, long hand, short hand, numbers 1-12, morning, afternoon, night, day; What time is it; It is _____ o’clock.
- Label clocks as such; the minute hand and hour hand could be color-coded or a symbol could be placed on each hand to support concept acquisition.
- Post a chart that labels different sample hours and use a class-generated interactive bulletin board with Velcro for labeling different times.
- Prepare ahead of time cards with digital times or complete statements of time; for example, “It is 12 o’clock” or “It is 12:00.” Each card could be placed with Velcro under clocks of different times.

Student Organization of Content

- Have students practice writing times into complete statements to create memory of content specific structure and vocabulary. This can be done first through interactive writing and then in mini-books and time learning logs or math journals.

Alternative assessment options

- A book could be created that reflects three important times or events associated with certain times of day (focus on essential knowledge of morning, afternoon, and night).
- Students could be assessed orally on the ability to read time on analog and digital clocks.

Sample resources

<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” containing 6 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

- K.11 The student will identify, describe, and draw two-dimensional (plane) geometric figures (circle, triangle, square, and rectangle).
- K.12 The student will describe the location of one object relative to another (above, below, next to) and identify representations of plane geometric figures (circle, triangle, square, and rectangle) regardless of their position and orientation in space.
- K.13 The student will compare the size (larger, smaller) and shape of plane geometric figures (circle, triangle, square, and rectangle).

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 a circle, triangle, square, and rectangle.
- Describe the properties of triangles, squares, and rectangles, including number of sides and number of corners.
- Describe a circle.
- Draw a circle, triangle, square, and rectangle.
- Identify pictorial representations of a circle, triangle, square, and rectangle, regardless of their position and orientation in space.
- Describe the location of one object relative to another, using the terms *above*, *below*, and *next to*.
- Compare and group plane geometric figures (circle, triangle, square, and rectangle) according to their relative sizes (larger, smaller).
- Compare and group plane geometric figures (circle, triangle, square, and rectangle) according to their shapes.

Geometric Figures in Our Classroom

Reporting category

Geometry

Overview

Students are introduced to geometric figures in the classroom environment and identify figures by their characteristics. Students sort figures by shape, color, and size.

Related Standards of Learning

K.11, K.13

Objectives

- The student will identify, describe, and draw a circle, square, rectangle, and triangle.
- The student will find, identify, and describe circles, squares, rectangles, and triangles in the classroom and outdoors.

Prerequisite Understandings/Knowledge/Skills

- Students must be able to recognize that there are differences between geometric figures and other shapes (i.e., letters, numbers, etc.).
- Students must be able to sort according to the geometric figures as well as manipulate paper, pencil, chalk, and other writing/drawing instruments.

Materials needed

- A set of geometric figures (circle, square, triangle, rectangle) made from tagboard, which can be used on an overhead projector
- Chart paper
- “Shape Hunt” recording sheet

Instructional activity

1. Introduce students to the geometric figures, using one geometric figure at a time. For example, place the tagboard rectangle on the overhead projector. Let students take turns naming characteristics of the figure. (“It has four sides, two long and two short.” “It has four square corners.”)
2. Use this as an opportunity to introduce mathematics vocabulary and list these characteristics on chart paper. Take the rectangle off the overhead. Read the list of characteristics to the students and have them draw the shape from the list of characteristics. Ask the students if there is any other information they need to complete the figure.
3. Place the model of the square on the overhead. Tell the students that this is a square. Have them trace the figure with their fingers in the air. Have them describe the figure (four sides, four square corners, four sides that are all the same size). Explain to students that the square is a special rectangle. Ask them how this figure is like and how it is different from the other rectangle.
4. Use the same process to introduce and review the triangle and the circle. When presenting the triangle, use more than one example, and include equilateral, obtuse, and acute triangles.
5. Tell students they will be finding geometric figures in the classroom by playing a search game. Bring the students together in a circle. Tell them, “I see something in the room that has the same shape as a square.” Have the students ask “yes” and “no” questions until someone identifies the object. Once students understand the game, select a student to be the leader.

6. Place the students in small groups for the next activity. Explain to students that they will be looking for the following geometric figures in the classroom: circle, square, triangle, and rectangle. Review each geometric figure, and have students point to examples of each one in the classroom.
7. As students move around the room, one student can record the number of each geometric figure that is found. (See attached recording sheet)
8. At the end of the lesson, review the geometric figures and objects that the groups have found, and emphasize the basic features of each figure.
9. A final activity for this concept involves a “field trip” through the school and outside. Tell the students that the class is taking a field trip through the school and playground to search for certain geometric figures. Point out at least one example of each figure, and discuss the discoveries that students are making. The “Shape Hunt” recording sheet can be used for this activity as well.

Sample assessment

- During the activity, note whether students can describe the features of a circle, square, triangle, and rectangle.
- During the small group activity, observe which students are able to locate geometric figures in the classroom.
- Distribute a paper to each student with multiple examples of various geometric figures drawn on it in random arrangement. Have the students select a particular figure to color. Assign a color for students’ selected figure, and have the students color with the assigned color all the examples of that figure found on their paper. Then repeat the process several times, each time with a different figure and a different color.
- Provide students with toothpicks and yarn. Have students create the geometric figures with the art supplies. Or, spread shaving cream on the tabletop and have students draw geometric figures in the shaving cream.
- The “Van Hiele Levels of Geometric Thought” CD, available through the Virginia Department of Education, contains assessments to determine children’s level of geometric thinking. Information about the van Hiele Theory is located on the VDOE Web site at http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/geo_elem.html.

Specific options for differentiating this lesson

Technology

- Have the students use a chart posted in the classroom or displayed on their desk showing the geometric figures and names.
- Provide dry erase boards so the students can practice drawing the figures in this lesson
- Provide lengths of yarn to simulate the plane geometric figures.
- Locate a paint or drawing program on the computer to allow students to practice and print out their figures.

Multisensory

- Provide students with pattern blocks, attribute blocks, and/or objects from everyday life (for example, soup cans, a slice of bread) that illustrate each geometric figure.

Community Connections

- Go with students for a walk through the school and find different figures. Have students record their data on a template created by the teacher as a word processing program on the computer.
- Take a field trip through the town, city, even the playground, to find and record different figures students find.

Small Group Learning

- Have the students work in groups (or with a partner) to look for, sort, draw, and name figures. They could record their data on an overhead projector and share their results with other groups.

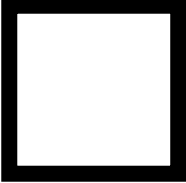

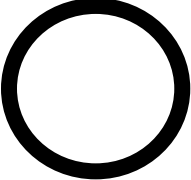
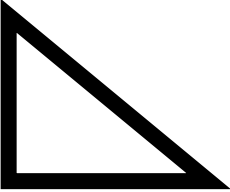
Vocabulary

- Students need to know the following vocabulary: sort, draw, sides, and corners.
- Have the students keep a math glossary or picture dictionary that would include the word, definition, and an example for access when needed.
- Model the words with picture cards and teacher demonstrations of the figures

Student Organization of Content

- Have students use “The Shape Hunt” sheet included with this lesson.

Shape Hunt

	<h1>How Many?</h1>
	
	
	
	

Geometric Games

Reporting category

Geometry

Overview

Students locate, identify, and compare geometric figures in a game format.

Related Standards of Learning K.11, K.12, K.13

Objective

- The student will locate geometric figures in the classroom, identify the figures by their characteristics, and compare them by size, shape, and color.

Prerequisite Understandings/Knowledge/Skills

- Students must know the meaning of the words large, small, circle, square, triangle, rectangle, next to, on top of, and under.
- Students must be able to recognize colors.
- Students must be able to move around the classroom in an orderly manner.

Materials needed

- Cut-out shapes in different sizes and colors

Instructional activity

1. Before the lesson begins, review the geometric figures circle, square, triangle, and rectangle. Discuss the number of sides and square corners of each figure.
2. Review the rules for the game of “I Spy.”
3. Using a bag full of geometric figures (cut-out shapes), have each child pull a figure out of the bag and place it according to teacher direction in a specific place in the classroom (e.g., put circles next to the chair; put squares on the window sill). Then have the children put the figures back in the bag and repeat with different directions.
4. Prior to beginning this part of the lesson, place a different geometric figure in each corner of the room. Review the rules for playing “Four Corners.” Count to 10 while the students move into the four corners. Call out “small triangle”: the students in that particular corner are now out of the game and have to sit down, while the remaining students redistribute themselves into all four corners. Continue to play the game until one student is left.

Sample assessment

- Have students draw a picture of a tree in their math journals. Have them draw a sun above the tree, grass below the tree, and a person next to the tree. Check to see whether the elements in the drawing are in correct positions.
- The “Van Hiele Levels of Geometric Thought” CD, available through the Virginia Department of Education, contains assessments to determine children’s level of geometric thinking. Information about the van Hiele Theory is located on the VDOE Web site at http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/geo_elem.html.

Specific options for differentiating this lesson

Technology

- Use a chart with figure names written beside the figure and numbered along the sides.
- Develop a chart on a word processor with color names written in appropriate colors.
- Use a paint software program that provides the student with the opportunity to draw, color, name, and number shapes, and then print them out on a printer.
- Locate the free program at www.rereadplease.com so that the rules for “I Spy” and “4 Corners” may be spoken by the computer for children that need repeated readings of the directions in order to participate in the games.

Multisensory

- Provide students (if needed for extra practice and clarity) attribute blocks to match the figure that is called out during the color and shape bingo game.
- Print the directions for the “I Spy” game on a word chart with pictorial clues.

Community Connections

- Create a grid with a column for each geometric figure to record how many of each figure students can find in their room at home. The next day in class, a whole-class graph may be made to record totals for each figure for the whole class. Tally marks may be used to replace numerals at first and then numeral representation may be used after final counting.

Small Group Learning

- Pair students. Ask pairs of students to help each other find the proper geometric figure in the proper place during the “4 Corners Game.”
- Have the same or a different pair of students place the correct geometric figure in the correct spot or confer to find the answer during the “I Spy Game.”

Vocabulary

- Students need to know the following vocabulary: large, small, circle, square, triangle, rectangle, next to, on top of, and under. It is also helpful if the students know the basic colors.

Student Organization of Content

- Post the game rules in the classroom.
- Replicate the same game rules into smaller individual charts that contain figure names, numbered sides, and color names printed in color as needed by some students.

Geometric Snacks

Reporting category

Geometry

Overview

Students sort different shaped snacks by size and shape and make comparisons.

Related Standard of Learning

K.13

Objective

- The student will compare the size and shape of plane geometric figures (circle, triangle, square, and rectangle)

Prerequisite Understandings/Knowledge/Skills

- Students must understand the meaning of the words square, triangle, circle, rectangle, large, small, sort, larger than, and smaller than.
- Students must be able to demonstrate how to fold paper into fourths.
- Students must be able to demonstrate how to use a “hands-on” floor sorting grid (handmade or bought).

Materials needed

- Snacks in various shapes and sizes (e.g., circular, triangular, square, and rectangular crackers)
- Workmat

Instructional activity

1. Review characteristics of geometric figures with students. Draw a circle in the air, and have the students guess the shape you made. Review the other figures, using the same process. Note: Most kindergarten students are not at a developmental level where they can see that a square is a special kind of rectangle. However, they can begin to discover how a square and a rectangle are similar, i.e., they both have four sides, four corners, and all “square” corners.
2. Distribute drawing paper, and have students fold the paper into fourths. Ask students to draw one of the four geometric figures in each section.
3. Group students as partners. Distribute a small bag of the various crackers to each set of students. Have students pull one example of each figure out of the bag as you call out the shape. After students have correctly identified one example of each figure, let them eat the crackers. This should still leave enough in the bag for the sorting activity.
4. Explain to students that they will be sorting the crackers in different ways. Ask students how the crackers can be sorted. Have students work with their partners and explain the sorts to their partners. Once the sorts are completed, have the students share the different ways they have sorted their crackers.

Sample assessment

- Observe the students’ degree of participation, drawing of correct figures, and the discussion of the sorts.
- Distribute a page of small figures, medium-size figures, and large figures. Have students color the figures different colors and cut them out. Place the cut figures in an envelope. Have a student pull two figures out of the envelope, identify the figures by name, and compare their sizes.

- The “Van Hiele Levels of Geometric Thought” CD, available through the Virginia Department of Education, contains assessments to determine children’s level of geometric thinking. Information about the van Hiele Theory is located on the VDOE Web site at http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/geo_elem.html.

Specific options for differentiating this lesson

Technology

- Have students use a chart showing geometric figures with names. This chart may be created by a word processing program by the teacher or the student.
- Have students use a chart showing color names in appropriate color.
- Provide students with “hands-on” floor sorting grid with pictures of each figure as a heading.
- If necessary, provide students with a copied, standard-size sorting grid for their desk for referral.
- Have students practice the concepts in this lesson on a math computer program.

Multisensory

- Invite students to taste different crackers after properly identifying one cracker of each shape. They might trace around the cracker with finger to “feel” the figure.
- Compare the size and shape of the crackers both visually and tactically

Community Connections

- Take students on a field trip to local grocery store to find and purchase boxes of crackers with the correct figures.

Small Group Learning

- Allow students to work in pairs to identify the correct figure and corresponding sort.

Vocabulary

- Students will need to know the following vocabulary: compare – teacher will demonstrate comparing size by placing one cracker on top of another in a small-group activity while others are sorting by shape.
- Shape may be compared in a similar setting by visually determining the corners and sides.

Student Organization of Content

- Provide students with copies of individual sorting grids.
- Have students draw one shape in each column as a heading

Sample resources

<http://standards.nctm.org/document/chapter4/geom.htm#bp4> – NCTM Principles and Standards information related to geometry for prekindergarten through Grade 2.

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 poetry, songs, games, activities, and Internet site suggestions.

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.

“*Geometry for Elementary School Teachers*”

http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/geo_elem.html – a VDOE professional development training module containing 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 Probability

Standard of Learning

K.16 The student will investigate and describe the results of dropping a two-colored counter or using a multicolored spinner.

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

- Conduct investigations of probability through hands-on activities, such as dropping a two-colored counter or using a multicolored spinner.
- Describe verbally, pictorially, and/or with tally marks the outcome of dropping a two-colored counter or using a multicolored spinner (e.g., the number of times the red side of the counter landed up compared to the number of times the counter was dropped).

What Are the Chances?

Reporting category

Probability and Statistics

Overview

Students use cubes and two-color counters in investigations of probability.

Related Standard of Learning

K.16

Objectives

- The student will investigate probability with two-colored counters and cubes.
- The student will describe the results of the experiments with probability.

Prerequisite Understandings/Knowledge/Skills

- Students must have a working understanding of the terms: very likely, likely, unlikely, and impossible.
- Students must demonstrate the ability to recognize and differentiate between the different colors of manipulatives (cubes) used during this lesson.
- Students must demonstrate an understanding of the definition and function of “tally marks” and how to use them on a recording sheet.

Materials needed

- One two-color counter for each student
- Two red cubes and two white cubes
- Paper bag to hold cubes
- A “Two-Colored Counter Flip” sheet for each student to tally results of flips of two-colored counters
- Crayons matching the colors of the two-colored counters

Instructional activity

Note: Before the lesson, draw a tally sheet on a dry erase board to use during the cube experiment. This will be used to tally the number of times the red cube and the white cube are drawn out of the bag.

1. Begin the lesson with a discussion about the chances of certain events. For example, ask what the chances are that it will snow today or rain today, if it is a bright, sunny day with no clouds in the sky. Lead students to understand and use words such as *likely*, *unlikely*, and *impossible* when describing these events. For example, if the lesson is done during the month of May, help them to understand why it is *unlikely* that it will snow.
2. Explain to the students that in the activity that they will be doing, they will be looking at the chances of something happening. Explain that they are performing an “experiment” and will need to record what happens during the experiment. Tell them that good scientists keep track of the *data* or the things that happen during experiments. Scientists also record how many times things happen during their experiments.
3. Show the students two red cubes and two white cubes. Place the four cubes in a paper bag. Ask the students to predict what color cube they think will be pulled out of the bag. Pull out a cube, and mark the results on the tally sheet you created on the dry erase board prior to the lesson. Tell the students that marking on the tally sheet is how we record what is happening in this experiment. (See the next activity “Using Tally Marks.”) Explain that the tally marks are how we keep track of

how many times each “event” happens in our experiment. Place the cube back in the bag. Repeat the activity four more times.

4. Discuss the results with the students — i.e., the number of times that cubes were drawn from the bag, the number of times a red cube was drawn, and the number of times a white cube was drawn. Talk about the term *likely* when describing the probability of drawing a red or white cube out of the bag. Ask students if it was possible to draw a blue cube out of the bag, and relate the term *impossible* to describe this event.
5. Tell students they will now perform a similar experiment, using a two-colored counter. Show students how to flip a two-colored counter, and model how to record with tally marks on the recording sheet which color side lands face up. Distribute two-colored counters to each student and a recording sheet for them to use to keep track of the flips of the counter. Have them color the boxes in the table header to match the colors on their two-colored counters. Have them flip their counters 10 times and record the result of each flip.
6. Discuss the results of the flipping with the students. Have students describe the results in terms of the number of times each color occurred.
7. The same activity can be conducted using multi-colored spinners (with equal parts for each color) instead of the two-colored counters.

Sample assessment

- Have students record the results of a penny toss. Distribute a penny and a “Penny Toss” recording sheet to each student. Discuss the words *heads* and *tails* as they relate to a coin, making sure the students understand the meaning of the words and can identify the two sides of a penny. Have the children toss the penny 10 times. Each time they toss, have them record the results on their recording sheet. Then have them discuss the results in a small group with the teacher.

Specific options for differentiating this lesson

Technology

- Have students use a recording sheet with enlarged squares and lettering for recording purposes.
- Create taped or computer-generated directions and instructions for students who need multiple repetitions in order to complete the activity. Whenever needed, use a chart composed of picture symbols for words to clarify the sequence of directions and instructions. The picture symbols can be created on a software program on the computer and printed out.

Multisensory

- Provide color-coded cubes that are also textured differently to offer an additional modality for differentiation.
- Make tally marks with “wicky sticks” to provide a raised surface for applying and counting tallies on the recording sheet. The “wicky sticks” can be reused on other recording sheets.
- Provide checker chips and/or other differently textured, sized, colored, etc., objects in place of colored counters.

Community Connections

- Have students choose a shirt color of the day; then observe and tally how many people come through the door of the classroom that day wearing that shirt color and predict the likelihood that the next person will be wearing a shirt in that color.

- Ask two or more adult volunteers, preferably adults who are familiar with the students, to engage in an activity of probability; for instance, shooting baskets. Based on the adults' heights, perceived age differences, the students' perceptions of each person's ability and other variables (some nonsensical such as their hair or shirt color), etc., have the children predict who will be most successful at the chosen activity. Follow with discussion of choices.
- Hold a daily lottery. Allow the students to pick a number or a series of numbers from a pre-determined set, then pick a number in the afternoon before they leave. If the student picks the correct number, they win a small prize. Vary the number set from which they choose, and note relationships among the probability of a student picking a number – if they choose 1-25 or if they choose 1-50, 1-100, etc.

Cooperative Learning

- Working in pairs, have one student toss the cubes and/or colored counters and the other tally on the recording sheet. Let students present their findings and compare to the results of others pairs of students in the classroom who engaged in the same activity.
- For various activities in the classroom or around the school where choices need to be made, use the tossing of a coin. This can be done between student-student, student- teacher, etc. Encourage other school personnel to participate.

Vocabulary

- Students need to know the following vocabulary, using the described strategies:
- Probability – Picture charts, models of student-conducted experiments, graph.
- Experiments – Data collection charts, exhibits of student experiments, short presentations of experimental data.
- Data – Numerous displays of experiments designed and conducted by students, including picture charts, wall hangings, models, exhibits, etc.

Student Organization of Content

- Have students maintain a folder with a list of activities, represented in picture symbols, to be initialed by the teacher upon completion.
- Have students maintain wall charts denoting each of the activities, accompanied by a photograph or other picture symbol, with the student's name written or tagged on the chart upon completion of the task.
- Issue certificates of completion when all work from the unit is complete, and send a note home to the parent.

Sample resources

<http://shazam.econ.ubc.ca/flip/> – Ken's Coin Flipping Page allows students to have the computer generate the coin flips

<http://explorer.scrtec.org/explorer/explorer-db/html/820889837-81ED7D4C.html> – instructions for how to make a spinner that gives fair and random results

“Probability and Statistics for Elementary and Middle School Teachers”

http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/prob_stat.html – a VDOE professional development training module containing 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.

Two-Colored Counter Flip

Flip	Color A	Color B
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Penny Toss

Toss	Heads	Tails
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Organizing Topic Statistics

Standards of Learning

- K.14 The student will gather data relating to familiar experiences by counting and tallying.
- K.15 The student will display objects and information, using object graphs, pictorial graphs, and tables.

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

- Gather data on given categories by counting and tallying (e.g., favorites, number of days of various types of weather during a given month, types of pets, types of shoes).
- Display data by arranging concrete objects into organized groups to form a simple object graph.
- Display data, using pictorial representations of the data to form a simple pictorial graph (e.g., a picture graph of the types of shoes worn by students on a given day).
- Display information in tables, either in rows or columns (e.g., a table showing the number of bunnies in one column and the number of ears the bunnies have in another, or a table showing the time schedule for classroom activities).

Using Tally Marks

Reporting category

Probability and Statistics

Overview

Students gather data about the weather and record the data, using tally marks.

Related Standard of Learning

K.14

Objectives

- Students will collect information about the daily weather during the daily calendar activity.
- Students will use tally marks next to the types of weather on the graph.
- Students will count at the end of the month the number of days each type of weather occurred.

Prerequisite Understanding/Knowledge/Skills

- Students must possess basic knowledge regarding various weather conditions including, but not limited to, the terms: sunny, partly cloudy/sunny, cloudy, rainy, and snowy.
- Students must demonstrate an understanding of the purpose and function of tally marks.
- Students must count by ones and fives from 1-31.
- Students must understand the concept of recording information on a bar graph using both rows and columns.

Materials needed

- A chart that indicates the different types of weather: sunshine, clouds, rain, snow
- A “Pizza Toppings” recording sheet for each group of four students
- A “Pizza Toppings” spinner for each group of four students

Instructional activity

1. During the morning calendar activity, discuss the weather for the day. Model for students how to use tally marks by making a vertical line next to the appropriate symbol for the type of weather. After a type of weather has five tally marks, demonstrate how to use the diagonal mark to indicate the fifth day. As the weather is recorded with a tally mark each day, have students count the total number of tally marks for each type of weather. Students can practice counting by fives and double check by counting by ones.
2. For practice with tally marks, have students use the “Pizza Toppings” recording sheet and spinners. (Cut out the spinners, and use with a pencil and paper clip as a spinner, or attach an arrow with a brad.) Model for students how to use the spinner and how to record the result of each spin with a tally mark on the recording sheet. Distribute one spinner and one recording sheet to each group of four students. Have each student spin the spinner five times, and have one student act as the recorder. After all groups have completed their spinning and recording, have students count and share the tally information. Ask comparison questions of each group. Record the information for each group on the dry erase board, and calculate the total number for each topping. Talk about how the results were alike and different.
3. For additional experiences with tally marks, use other pictures on the recording sheet and spinners according to lessons in History and Social Science or Science.
4. Students may take the information and put it into a graph (pictorial graph).

Sample assessment

- During daily roll call, ask a question for all students to answer. Have a student record the responses, using tally marks on the dry erase board. Rotate student recorders so that each has a chance to demonstrate his/her ability to use tally marks.
- Give each child a clipboard with a piece of paper and pencil. At the top of the paper, have each student copy a question to ask the others in the classroom (e.g., “Do you eat apple pie?”). Below the question, have them set up a “yes” column and a “no” column. Then have the children go around the room, asking each other their questions and recording the responses with tally marks. After a set time, have them count the responses and give the class a report on their findings.

Specific options for differentiating this lesson

Technology

- Have students use pictorial displays of various weather conditions. Some of these may be generated and printed from software programs.
- Prepare wall charts in weekly segments depicting the days of each month.
- Using a word processing program, create a number line denoting information to assist students in counting by ones and five from 1-31
- Provide large-print number lines and enlarged-print graph paper for individual students. These may be created by the students or the teacher using a word processing program.
- Provide smaller versions of the wall graph attached to the students’ work station for near-point reference.
- Provide a software paint program for students who have difficulty using standard writing tools.

Multisensory

- Have students use color-coded designations for each weather condition to facilitate easy identification of weather categories; for example, yellow boxes for sunny, blue boxes for rainy, etc.
- Have students create pictorial weather representations of their own design using different art mediums that they associate with a particular weather condition.
- Provide number lines containing raised and/or color-coded bars depicting numbers to assist individual students in counting by ones and fives.
- Create manipulatives/props depicting different weather conditions and place them in a 3-D grid at work stations.
- Allow individual students the benefit of using pre-prepared color-coded or raised representation of graphing paper.

Community Connections

- Arrange for students to visit a local television weather station and speak to the local weather person about their record-keeping strategies.
- Invite a meteorologist from a nearby college to visit the class for the purpose of sharing his or her record-keeping strategies and assist the students in making a weather-related tool such as a sundial or a rain gauge.

Small Group Learning

- Have students work in pairs or teams to recreate weather patterns in pictorial graph form/tables of a previously covered month of the school year and construct a mural graph or timeline of the year's weather to be displayed somewhere in the school.
- Make students responsible, as small groups or in pairs, for determining the daily weather for one week, completing the wall graph daily by placing the correct pictorial weather representations in the correct grids, and recounting the results of their graph to that date for the other students.
- Have the students create, at the end of each month, a pictorial table representative of the outcomes noted in the pictorial wall bar graph.
- Working together, have students make the pictorial representations that go on the wall graph/table. For example, one group can make suns, another can depict rain, etc.

Vocabulary

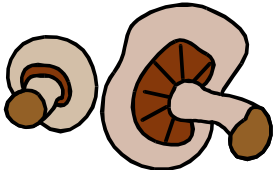
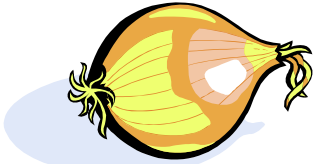
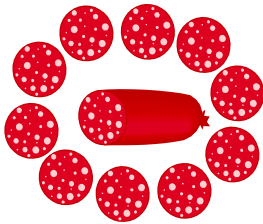
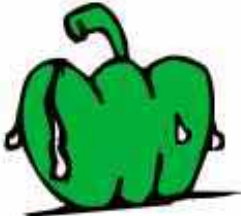
- Students need to know the following vocabulary using the specific strategies described below:
- Bar graphs – Pictorial representations on the wall, student-made pictorial representations on their desk, samples of bar graphs created from other data-collecting experiments – teacher-assigned or specific to individual student interests – manipulatives that can be placed in a 3-D bar graph grid.
- Table – Pictorial representations on the wall depicted side-by-side with the bar graphs or other data-collection techniques used to create that specific table, student-created tables based on data-collection specific to their own expressed interests (for example, how many Pokemon cards each student has in his or her collection).
- Tallying – Personal samples of data-collection activities where the student was required to use some form of tallying, through pictorial representation, marks, etc. Samples of data-collection activities assigned by the teacher where the student was required to use some form of tallying, either through pictorial representation, marks, etc.

Student Organization of Content

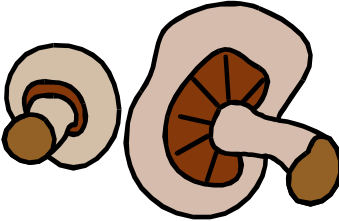
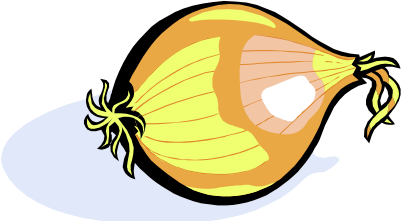
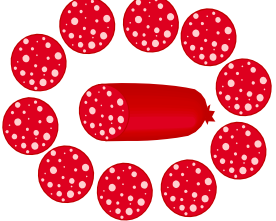

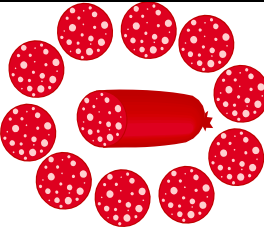

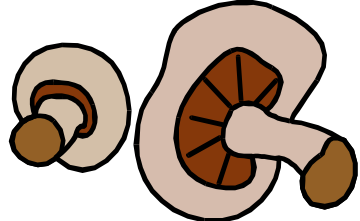
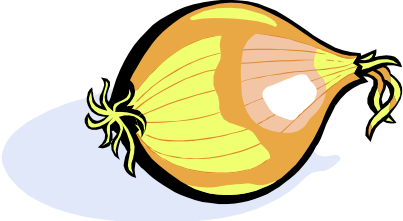
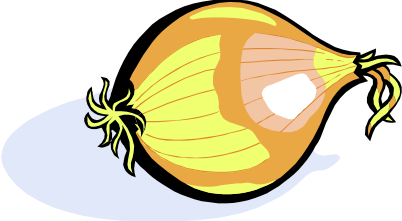
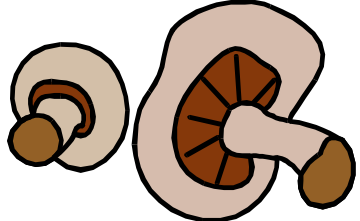
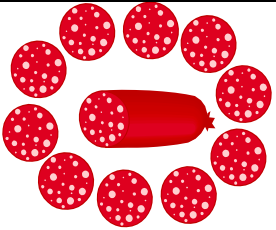

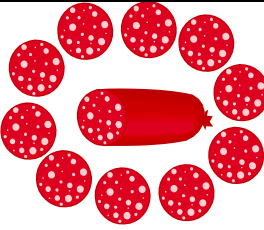

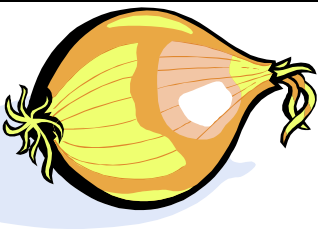
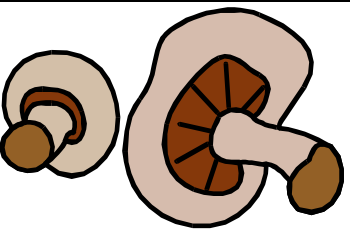
- Have the students maintain a folder with a list of activities, represented in picture symbols, to be initialed by the teacher upon completion.
- Generate wall charts denoting each of the activities, accompanied by a photograph or other picture symbol with the student's name written or tagged on the chart upon completion of the task.
- Issue certificates of completion when all work from the unit is complete, and send a note home to the parent.

Name _____

Pizza Toppings

Toppings	Tally Marks	Total
 <p>mushrooms</p>		
 <p>onion</p>		
 <p>pepperoni</p>		
 <p>green pepper</p>		

Pizza Toppings Spinners

 <p>mushrooms</p>	 <p>onion</p>	 <p>pepperoni</p>	 <p>green pepper</p>
 <p>pepperoni</p>	 <p>green pepper</p>	 <p>mushrooms</p>	 <p>onion</p>
 <p>onion</p>	 <p>mushrooms</p>	 <p>pepperoni</p>	 <p>green pepper</p>
 <p>pepperoni</p>	 <p>green pepper</p>	 <p>onion</p>	 <p>mushrooms</p>

My Favorite Things

Reporting category

Probability and Statistics

Overview

Students collect information about themselves and organize the information in a human graph, an object graph, and a pictorial graph.

Related Standards of Learning

K. 14, K.15

Objectives

- The student will gather data about his/her favorite things.
- The student will sort the data (objects) into categories.
- The student will answer questions about which categories have more and which have fewer.

Prerequisite Understandings/Knowledge/Skills

- Students must understand basic observational strategies for collecting data.
- Students must demonstrate a basic understanding of the function and construct of graphs.
- Students must have a workable knowledge of how to categorize objects.
- Students must demonstrate an understanding of the concepts of more than, less than, and equal.

Materials needed

- Letter to parent explaining the need to bring a favorite small item for the show-and-tell activity
- A small square of paper for each child to draw a picture of his/her favorite thing
- Butcher paper to use for graph with columns labeled at the bottom: Toys, Games, Food, Books, Other Items
- Labels for categories: Toys, Games, Food, Books, Other Items
- Floor graph
- Pictures of lace shoes, slip-on shoes, Velcro shoes, zipper shoes, buckle-up shoes, and labels for these types of shoes

Instructional activity

1. Have students bring and share with the class their favorite things. After the sharing, discuss how the items could be sorted. Suggest some categories like toys, games, food, books, and other items. Have students sort *themselves* into the appropriate categories as they hold their favorite item. (If the favorite items were displayed on the carpet instead of being held by the students, the concept of more or fewer would be less readily apparent because of the great diversity in the sizes of the objects.) Instruct students to stand in lines (columns), and place labels for each category at the front of each line. Have students count the number of students in each line. Ask if they can figure out which line is the longest (has the most students in it), and which line is the shortest (has the fewest students in it). Explain to students that we can use *graphs* to find out information about different topics. Tell students that they have constructed a “human graph.” Have students return to their seats.
2. Distribute the small squares of paper, and have the students draw a picture of their favorite thing on it. Explain to students that they will now construct a “pictorial graph” of the same information they organized in the human graph. Show students the graph you have prepared on the butcher paper. Have students bring up their squares, guide them in placing the squares in the correct

column. Once all students have placed their squares on the graphs, discuss the same questions that were used for the human graph. Emphasize that this pictorial graph displays the same information, but it *represents* their favorite things with a picture instead of the actual object. Talk about other comparisons that can be made, e.g., which category has the same number of items as another category.

3. Another variation of the object graph uses the types of shoes students are wearing. Ask the students, “What type of shoe do you have on today?” Place the word cards with the pictures on a floor graph. Have each student place his/her shoe on the floor graph in the appropriate space. Count, compare, and discuss results. Transfer the information to a paper pictorial graph to keep it up on the wall in the room.
4. On a daily basis, graph who is buying lunch and who is bringing lunch. Also graph other information, such as hair color, birthday month, type of home where they live. Use pictures of students to do daily graphing, along with clothespins with students names.

Sample assessment

- Give each child a collection of various colors of buttons. Have them sort and classify. Have them create a graph with a title, the number of items, and the categories. Have them record the information for each category in the correct column.
- Give each child a clipboard with a piece of paper and pencil. At the top of the paper, have each student copy a question to ask the others in the classroom (e.g., “What is your favorite type of pie?”). Below the question, have them set up their paper with a graph format where they will add in the question, numbers, and pictures/words of responses gathered, e.g., apple, cherry, pumpkin. Have them fill in the graph using crayons instead of tally marks. Have them report their findings to the class.

Specific options for differentiating this lesson

Technology

- Have students use enlargements of number lines placed on the students’ desks to assist in determining more than, less than, and equal. These number lines can be created by the student or the teacher using a word processing program on the computer and then printed out.
- Create picture cues by a software program indicating the directionality of “more than” and “less than” along a number line. The pictures are printed out and secured to individual students’ desks.
- For some students, use large-sized manipulatives/props (squares are specific to this lesson) for easier access representing either the objects being graphed or pictorial representations.

Multisensory

- Have students use color-coded designations for object categories. For example, once the student makes the pictorial representation of an item, color code the item by gluing it on a specific color of paper that matches the color of paper containing the broad category under which the object fits. This provides visual cues for individual children.
- Provide different mediums for students to use to make their pictorial representation. Encourage them to choose a medium that they associate with the broad category. For example, they may make shoes from leather cuttings or with a leather-smelling pen.
- Create number lines containing raised and/or color-coded bars with arrows in another medium that the students can slide their fingers up and down to assist them in learning “more than” and “less than” concepts.

- Provide manipulatives/props depicting chosen objects that may be placed in a 3-D grid at students' work station.
- Create pre-prepared color-coded or raised representation of graphing paper for individual students.

Community Connections

- Have students invite other members of the school faculty and staff, parents, security resource officers, etc., to class and ask them about their favorite things among the categories included in the graphing activities. The students can include them in their data as separate individuals, within the group, or can categorize the participants into their own groups.
- Collect categories of items such as canned food, old toys, clothes, etc., and donate them to different public service organizations. Students can keep graphs of items donated and compare what item was most frequently given.
- Visit the local SPCA and place cards with pictorial representations of animals into separate shoe boxes and transfer the data onto a graph when they return to school determining what category had the most. This could be done a second time at the same SPCA or at a different facility for comparison purposes.

Small Group Learning

- Have students conduct parent interviews individually regarding their preferences in television shows, favorite foods, favorite cars, etc. They can then return to school with the data and work in small groups to graph and analyze the data to determine which is the most popular item. All groups could put their data together to create a large graph of the “favorites” of the parents in the whole class. This may also be done with least favorite.
- Divide students into groups and ask them to observe and graph such things as hair color, type of shoes, color of their shirt, numbers of siblings, etc. This could also be done with another class in the school with the classes placing themselves into human graphs by class and transferring the information to a pictorial or object graph for comparing purposes.

Vocabulary

- Students need to know the following vocabulary using the specific strategies described below:
- Human graph – Take pictures of the students lined up as human graphs and exhibit them on the wall.
- Pictorial/object graphs – Exhibit human graph data transferred to pictorial/object graphs beside the human graph pictures.
- Categorization – List attributes of objects to be considered in determining category. For example, worn on feet, material, laces, etc., when considering shoes with pictorial representations of items that fit into the category. Make a game using items that do not fit into certain categories and ask the students to choose which does not belong and give one reason why it does not.

Student Organization of Content

- Have students maintain a folder with a list of activities, represented in picture symbols, to be initialed by the teacher upon completion.
- Have students create wall charts denoting each of the activities completed accompanied by a photograph or other picture symbol with the student's name written or tagged on the chart upon completion of the task.
- Issue certificates of completion for each student when all work from the unit is complete and send a note home to the parent.

- Have each student compile a biography of their likes and dislikes for an “All About Me” book about themselves, where they include all the graphs they did on themselves and on their families.

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 which revolves around the student’s favorite things. The items are graphed according to selected categories, and the students create “My Favorite Things” books about themselves.

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 for Elementary and Middle School Teachers”

http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/prob_stat.html – a VDOE professional development training module containing 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, Relationships

Standards of Learning

- K.17 The student will sort and classify objects according to similar attributes (size, shape, and color).
- K.18 The student will identify, describe, and extend a repeating relationship (pattern) found in common objects, sounds, and movements.

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 objects into appropriate groups (categories) based on one attribute, such as size, shape, or color.
- Classify sets of objects into three groups (categories) of one attribute (e.g., for size — small, medium, and large).
- Observe and identify the basic repeating pattern found in repeating patterns of common objects, sounds, and movements that occur in real-life situations, where there are four or fewer elements in the basic repeating pattern.
- Describe the basic repeating pattern found in a repeating pattern, where there are four or fewer elements in the basic repeating pattern.
- Extend a repeating pattern by adding at least two repetitions to the pattern.

The Button Box

Reporting category

Patterns, Functions, and Algebra

Overview

Students use an assortment of buttons to sort and organize by various attributes. Students describe patterns created with buttons and other objects.

Related Standard of Learning

K.17

Objective

- The student will sort and organize a collection of buttons by color, shape, and size.

Prerequisite Understandings/Knowledge/Skills

- Students must understand the words: color, shape, size, and sort.
- Students must demonstrate the ability to articulate how the materials are sorted.

Materials needed

- Bags (or small boxes) containing an assortment of buttons for each group of students
- Appropriate literature relating to collections of objects (e.g., buttons, bugs)
- Letter to parents requesting donation of “junk” items (e.g., bread tags, bottle caps, plastic milk carton lids, keys, buttons, old nuts and bolts, rocks, shells) for junk boxes. (Draw a square on the parent letter, and indicate that the objects must fit inside the square.)
- Sample junk boxes to show students
- Boxes for collections (e.g., old check boxes or boxes that hold a gross of pencils)

Instructional activity

1. Use an appropriate children’s book to introduce students to the concept of collections. Tell students that they will be assisting the class in creating collections for students to use. Show students examples of “junk” that will be collected to create junk boxes. Tell students that the letter to their parents will explain what to bring and the size of the objects to bring. Show students the boxes so that they understand the need to bring small items.
2. Demonstrate for students the sorting activity with one of the junk box collections, e.g., milk carton lids. Take a small selection from the box, and place it on a mat so all the students can see. Ask the students to describe some of the attributes of the milk carton lids. Sort the lids by the suggested attributes, e.g., color. Mix the lids, and ask the students to describe a different attribute, e.g., lids with ridges and lids that are smooth. Sort the lids again. Continue asking for different attributes and sorting, as this also helps the children increase their vocabulary.
3. Explain to the students that each group will receive a box of buttons to sort. Distribute the boxes of buttons to each group, and have students sort into two or more categories. Sorts might include color, size, shape, and number of holes. When the sort is complete in each group, have a student explain the sort. Once the sort is explained, have the groups sort into two or more different categories. Have the groups repeat this procedure as many times as is possible in the time allotted.

Follow-up/extension

- Play “Read My Mind” to the students. Without telling the students how you are sorting them, sort a group of students by a certain attribute, e.g., those with tennis shoes and those with other types of

shoes. Ask the students to guess the rule by which you sorted. After the students have mastered this game, allow a student to be the sorter.

- Using all the items in the home living area, have the students sort, classify, label, and organize them to set up for general use in the classroom. The same can be done for establishing an art center, music center, and math center.

Sample assessment

- Observe the students during sorting activity, and record the vocabulary they use.
- Distribute a handful of one type of object (e.g., toy cars, buttons, earrings, seeds) to each child. Have each child sort by size, shape, color, type, etc., using bowls for sorting. Have each child label each bowl by the attribute they chose and then share the information with the class.

Specific options for differentiating this lesson

Technology

- Use a floor size “hands-on” sorting grid.
- Provide individual students the benefit of using a personal copied sorting grid that is available to them at all times throughout the activity. Due to the many different possibilities of shape and color in a variety of buttons, do not use pictures as headings.
- Create a duplicate of this activity using a computer software program for better access for students who have difficulty using standard writing tools.
- Tape record the directions so that they could be listened to multiple times by some students.
- Depict the directions and steps with pictures/words for some individual students who are visual learners.

Multisensory

- Have the students use various-sized grids, either hand-made, bought, or copied.
- Use larger objects if the student can not manipulate buttons.

Community Connections

- Suggest that the students put away silverware in divided drawer at home, sorting knives, forks, and spoons.
- Suggest that students help sort the laundry at home into darks, lights, and/or towels.
- Suggest that students sort toys at home according to various properties, such as wheels or no wheels, with or without batteries, whether the toy makes a sound or does not make a sound.

Small Group Learning

- Have students work with a partner to find different ways to sort the buttons.
- Have students work with a partner to discover various ways to articulate the sorting of the buttons, be it by size, shape, or color.

Vocabulary

- Provide a general word wall or a math word wall by adding appropriate key words contained in this activity.
- Have the student add key words to his/her own personal dictionary (at this level, a simple word list dictionary may be all that is needed).

Student Organization of Content

- Have the student use a copied Venn diagram for sorting.
- If beneficial, have the student check his/her partner's sort if using cooperative pairings.

Repeating Patterns

Reporting category

Patterns, Functions, and Algebra

Overview

Students use a variety of objects to identify, describe and extend patterns.

Related Standard of Learning

K.18

Objective

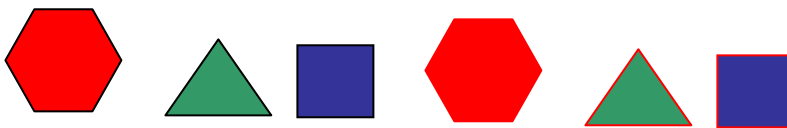
- The student will identify, describe, and extend a repeating pattern.

Prerequisite Understandings/Knowledge/Skills

- Students must demonstrate an understanding of the concept of simple AB patterns.
- Students must be able to describe orally and in written (drawn) form their pattern.
- Students must know the names of common objects such as attribute blocks, “people patterns,” etc.
- Students must be able to manipulate paper and pencil to create a reasonable facsimile of A-blocks or other manipulatives.

Materials needed

- Junk boxes from the previous activity
- Strips of drawing paper for students to complete patterns
- Pattern Task Cards (Using a half sheet of construction paper, trace objects (pattern blocks, keys, bread tags) in various repeating patterns, as shown in an example below. These cards can be laminated for repeated use.



Instructional activity

1. Introduce the students to pattern activities by arranging students in a pattern. Have 10 students line up in the front of the room in front of a row of 10 chairs. Point to every other student, and ask him or her sit in a chair. Ask the students to describe the “people pattern” that has occurred. Ask what position the next person in the line would be — sitting or standing. Add three additional students to the line, and have the students decide what their position would be. After all these students have returned to their usual places, call six new students to the front of the room, and arrange them in a different pattern — one standing, two sitting, one standing, and two sitting. Ask students to describe the pattern. Complete the pattern by adding four more students and asking the students in what position they should be — sitting or standing. Once students understand the process, have a student decide the pattern, and direct six new students to sit or stand. Have students figure out the pattern.
2. After all the students have participated in the “people patterns,” have them sit in a circle and demonstrate a “snap-clap pattern” with your hands. Have students repeat the pattern after you. Change the snap-clap pattern a few times. Again, once students understand the process, allow a student to lead this activity.
3. Explain to students that they will be creating patterns similar to the people patterns and snap-clap patterns but that they will be using objects from their junk boxes. Demonstrate with one of the

Pattern Task Cards and the pattern blocks. Discuss with the students how the pattern repeats — e.g., red hexagon, green triangle, blue square. Ask the students what would come next in the pattern, and place the correct pattern blocks on the task cards. Then show the students the strips of drawing paper, and demonstrate how to copy the pattern onto the drawing paper, using the pattern block shapes. Explain to students that they should have a total of ten objects drawn on their drawing paper after they have completed the pattern. Model for students, using pictures of the snap-clap pattern, what part represents the basic pattern. For example, in **snap, snap, clap, snap, snap, clap, snap, snap, clap**, the basic pattern is circled.

4. Distribute Pattern Task Cards, drawing paper, and junk boxes to each group, and have each group create a pattern strip. After students have completed the activity, have them describe their patterns to the group.

Follow-up/extension

- Give students a wide variety of materials, and ask them to create different patterns. They may use buttons, toy cars, socks, seeds, noodles, crayons, wooden blocks, etc. Encourage students to create patterns other than ABAB patterns.

Sample assessment

- Observe the snap-clap patterns of the students and the vocabulary they use to describe patterns
- Determine that the pattern strips completed in activity so show the appropriate repeated pattern
- Have students use a variety of shapes to create their patterns. Use a digital camera to take a picture of each child with his/her pattern. Print the pictures, and have the students write their patterns, using words, e.g., *triangle, square, triangle, square*. These can be posted on a bulletin board.

Specific options for differentiating this lesson

Technology

- Have students use a software program that requires opportunities to practice repeating patterns.
- Provide precut shapes to extend a teacher-made pattern.
- Replicate the “junk boxes” on the computer so some students can create patterns.

Multisensory

- Have students verbalize “sit, stand, sit, stand” when demonstrating the repeating pattern in a “people graph.”
- Make various “junk” manipulatives or A-blocks available for the students to create repeating patterns.

Community Connections

- At home, suggest that students organize pet food cans (many are color-coded according to flavor) so that the pet might eat one day of beef flavor and one day of chicken; or two days beef, two days chicken, etc.
- Direct student line-up in classroom before an out-of-the-room activity such as recess so that the line reflects 1 boy, 1 girl; then a line that reflects 2 boys, 2 girls; 3 boys, 3 girls.....as the size of the class population allows.

Small Group Learning

- Have students work in pairs or larger groups so that one student may check the patterns made when using junk boxes or line patterns for accuracy.

Vocabulary

- Have students add the key words such as pattern to a personal dictionary (at this level a personal word list dictionary may be adequate).
- Add key words to either the general word wall or to a specific math word wall.

Student Organization of Content

- Have students make strips of paper with repeating patterns (as indicated in instructional activity #3 in this lesson). Students may take the strips and, with adult supervision as needed, staple them together to make a student-made book of repeating patterns for personal reference as a reminder.

Sample resources

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

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

“Patterns, Functions and Algebra for Elementary School Teachers”

http://www.pen.k12.va.us/VDOE/Instruction/Elem_M/mathtrain.html – a VDOE professional development training module containing activities related 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.