

The learner will use non-standard units of measurement and tell time.

2

2.01 For given objects:

Notes and textbook references

a) Select an attribute (length, capacity, mass) to measure (use non-standard units.)

Before students use standard measurement units they should understand the process of comparing and of measuring. Mass (weight) and capacity frequently fool adults as well as children when visual clues alone are the basis for decisions. Students need to know why standard units are necessary. They must understand what happens to a balance when one side is heavier; how a ruler is made, and what type of measurements are appropriate (i.e. a piece of string is not a good tool for measuring capacity or weight, but is good for determining length). These mathematical explorations should come before the introduction of standard measurements.

A. Body Links

Materials: Connecting cubes, large paper clips or other non-standard units; large paper to trace children; pencils and crayons, Blackline Master II - 43.

Instructions: Help children trace around each other and let them color their life-size poster of themselves. Demonstrate how to measure different body parts with connecting cubes and how to record. Children work in pairs to help each other measure body parts with cubes. They should record results after measuring each part. Discuss results: How many cubes was your head? Who has the tallest outline? Whose foot was less than 15 cubes long?

B. Give Me a Hand

Materials: recording sheets (blank paper); crayon and pencil for each child; Unifix cubes; string and scissors

Instructions: Have each child trace around one hand on the recording sheet with a crayon. (Show them how to open their fingers to get a handspan.) Ask the children to estimate how many Unifix cubes it will take to make a line across the handprint and write the estimate on the back of the paper. Children then measure across their handprint using Unifix cubes and record the actual measurement on the handprint. Next, have them cut a piece of string the same length as their handspan and find objects in the room that equal the length of the string. Finally, graph the handprints by the number of Unifix cubes needed to measure each handspan. Discuss results.

Variation: Have students estimate and measure with different units. Compare the measurements and discuss why they are different.

C. Balance and Count

Materials: primary balance; one of each of the following: a large stone, a large shell, a large pine cone; collections of each of the following: Unifix or centimeter cubes; small rocks, nuts, keys, shells, stones, buttons, lima beans; recording sheet (see Blackline Master II - 44)

Instructions: Teacher demonstration is important. Show children how to balance one large (heavy) object with many small (lighter) objects. Have the children place a large object in a balance pan. Then they will select a set of small objects and place enough in the other side of the balance pan to equal the large object's mass. The amount is recorded on the recording sheet beside the large object which is already drawn onto the sheet. **Note:** Teachers will draw the large objects on the left side of each balance.

Variation: After the children know how to do this activity it should be left out as an independent task or activity center. Children need to do this many times to develop understanding.

D. Domino Measurement

Materials: dominoes for each child

Instructions: Ask children to estimate how many dominoes it takes to go from one side of the desk to the other side. Have children measure from side to side, then measure front to back, Children can also measure books, the length of the bookshelves or the perimeter of the rug

E. Massing Around

Materials: balance scale; baggie with 6-8 objects; teddy bear counters; paper for recording (see Blackline Master II - 45)

Instructions: Children can work independently or with partners after a demonstration of how to use the balance scale. Children select an object from the baggie and find out how many teddy bear counters it takes to balance it. On a recording sheet, draw a picture of the object, then write the number of bears beside each object.

F. Pasta Necklaces

Materials: a variety of pasta shapes; string with tape or “needle” on one end

Instructions: Let children make necklaces or bracelets from the pasta shapes. How many pieces of pasta will it take to fill the string? Have children compare their necklaces.

G. How Much Does It Hold?

Materials: sand and/or rice and/or water; containers of various sizes; funnels, sponges

Instructions: Use sand, rice, and/or water to fill containers. Encourage children to use smaller containers to fill larger containers. Help them to compare, modeling the estimating, the measuring, and the summarizing. (“I think this big jar will hold three small bottles full of rice. How much do you think it will hold? Let’s try it and see. Oh, it held a little more than a small bottle!”) The children should be given ample time to freely explore with these ideas and materials.

H. Practical Measuring (A homework activity)

Materials: recording sheet (see Blackline Master II - 46)

Instructions: After many measuring experiences in the classroom, send the recording sheet home with the children as an extended activity. Have children return the recording sheet to be used in partner or group comparison activities

*For some first graders,
recording sheets are
very appropriate.
Others may need
assistance with the
recording. The hands-
on exploration, however,
is most appropriate for
all children.*

Day 1	Day 2	Day 3	Day 4	Day 5
		Maria	Sam	Lee Kevin

I. Plant Growth

Materials: various types of seeds; soil; containers

Instructions: Students plant seeds. Charts are used to record when student's sprouts appear. Students choose Unifix cubes or other units to measure the growth of their plants. When the plant is ten cubes long (or another targeted length), it may be sent home.

Optional: A class garden is a wonderful way to observe growth and learn about time. Put a sweet potato in a jar of water to watch the roots and vine grow. Watch the water level change over a period of time. Sprout carrot tops on beds of small rocks with water. Or, better yet, grow a real garden outside your classroom.

J. Exploring Balance

Materials: balance scales; and assortment of items: nuts, buttons, chips, pasta, spools, lids, wooden blocks, pebbles, sponges

Instructions: Introduce the balance scale and ask questions. What happens when you put materials in only one pan? How can you make one side go down? Does it matter if the items are the same size? Give children free time to explore various materials and their effect on the scales.

K. My Shadow

Materials: chalk; adding machine tape

Instructions: Children work in teams of three on a sidewalk or asphalt play area. Student 1 in each team stands to have a "shadow measure" taken. Student 2 is in charge of placing and holding the tape at the heels (or students can use chalk to trace the shadow) and then student 3 unrolls and cuts the tape at the head. Students then rotate positions. Names are written on the tapes and displayed in class.

L. Count Your Beans

Materials: seasonal shapes to be traced; beans; stiff paper; pens; glue

Instructions: Children select a shape to trace on a piece of stiff paper. Have children estimate how many beans it will take, then have them glue beans inside the shapes. Children count and record how many beans are inside each shape. *Note:* You can adjust the number of beans the children will count by varying the size of the outline or the size of the beans.

M. Fill It Up!

Materials: Unifix cubes; cardboard

Instructions: Make tall and short cylinders from the cardboard. Have children fill the cylinders with Unifix cubes. Compare the number of cubes that are required to fill each of the cylinders.

Variation: Use shoe boxes and larger blocks or empty cereal boxes and Unifix cubes.

N. Twice Over

Materials: Unifix cubes; linking cubes; recording cards (index card with the name of the object written at the top); comparison chart

Instructions: This activity should be done on two different days. The children work in pairs. Give each pair of children the following materials: one object to measure, a recording card with the name of their object written on the top, and Unifix cubes. The recording cards will be used to make a chart for comparing the estimates and actual measurements.

Before they begin measuring, have the children estimate how many Unifix cubes long their object is and write this estimate on the back of their card. Next, have them measure and record on the front of the card. Compile this information on the chart. Discuss estimates and actual measurements. Discuss results on the chart. Repeat activity the next day using another non-standard unit of measurement. Compare the results.

O. Measuring Matters

Materials: rectangular construction paper strips; a supply of paper clips; toothpicks; counters; button; Unifix cubes; pennies; Blackline Master II - 47

Instructions: A child measures the length of the rectangle on blackline to determine the length using different units. The child counts the items used to measure the strip and records this number on the answer sheet.

Extension: Staple a longer construction paper rectangle to the blackline for the children to measure. The activity can be repeated many times using different size rectangles.

After children have completed a number of measurement activities a center could be designated for items from home they may wish to explore .

P. Eggs A-Weigh

Materials: 12 plastic Easter eggs, and egg carton for storage, 12 small objects of different weights (penny, pebble, washer, nut, bolt, clay, noodles, paper, buttons, beads, cotton, or erasers)

Instructions: Fill eggs with materials of varying weight and tape closed. Children select two eggs and decide whether each egg is heavy or light and sort accordingly. A balance scale can be used to encourage children's discussion.

Note: The concept of weight is difficult because children tend to consider size when judging weight. Since the eggs are all the same size, children focus on weight alone in this activity.

Extension: Use a balance scale to find out how many lima beans it takes to balance one egg, or use a balance to order three eggs according to weight. Help children reason through the process rather than telling them how to proceed.

Q. Which Takes Longer?

Materials: activity cards (see Blackline Masters II - 48, and II - 49)

Instructions: Cut card apart (print on stiff paper, laminate, and use again). The children work in pairs. Each child takes an activity card. Children discuss which activity will take longer. Children do the activities at the same time to find out which one takes longer. Repeat to see if the result is the same or draw new cards to compare other actions.

Variation: How many times can this be done in three minutes?

R. Classroom Comparisons

Instructions: Use a stopwatch or watch with a second hand to time children in routine classroom tasks. Record the times and then discuss these familiar activities and how long they take. For example, which takes longer - cleaning up after center time or walking to the library?

How Can We Use Literature to Teach Mathematics. . . ?

Pose problems to students
Provide contexts where students can pose problems
Illustrate concepts

(adapted from Griffiths & Clyne, Books You Can Count On, 1988)

S. Sinking

Materials: metal lids (15 to 20) of different sizes with one hole in the center; container of water (Adding dish detergent will speed sinking.); recording sheet; labels for lids.

Instructions: Teacher demonstration is important. Children work as partners. Choose two lids from the box. Predict which one will sink faster. Have children discuss the reasons for their choice, then test by placing both lids in the water at the same time. Results can be recorded on chart paper then displayed in a center for further exploration.

T. Measurement Estimation (Length)

Materials: various classroom objects (table, door, book, easel, aquarium, etc.); collections of small uniform objects (connecting cubes, paper clips, links, snap beads)

Instructions: Draw the children's attention to the object (i.e. the aquarium) to be measured. Be sure to show them the unit of measurement (i.e. connecting cubes). Ask them how many cubes it will take to measure across the aquarium. Record estimates. Measure to check estimates. **Hint:** Measure the same object with different units. This helps the children see the relationship between the size of the unit and the total number of units required.

U. Measurement Estimation (Volume/Capacity)

Materials: containers of various sizes; small cups or measuring cups; sand, rice, or water

Instructions: Show the children a large container and a small cup. Ask the children to estimate how many small containers of sand/rice/water it will take to fill the large container. Record estimates, then fill and count to check estimates.

V. Using Cuisenaire rods or Unifix cubes or straws, measure the length of the teacher's desk, a tall book, and the bookcase. Use paper clips to measure shorter objects. If you use rods of a different color or larger paper clips, would the answer be the same?

W. Measurement Estimations (Mass)

Materials: various small classroom objects (pencil, book, block, roll of tape, bottle of glue, stapler, notepad, etc.); collections of small uniform objects for measuring (connecting cubes, bear counters, pennies, large lima beans, etc.); balance scale

Instructions: Show the children the object which will be measured. Show the objects such as pennies which will be used as the unit of measure. Have children touch both as they make an estimate of how many units of measurement it will take to equal the weight of the object. Check by using a balance and counting the units of measure.

Before students use standard measurement units they should understand the process of comparing and of measuring. Mass (weight) and capacity frequently fool adults as well as children when visual clues alone are the basis for decisions. Students need to know why standard units are necessary. They must understand what happens to a balance when one side is heavier, how a ruler is made, and what type of measurements are appropriate (i.e. a piece of string is not a good tool for measuring capacity or weight, but is good for determining length). These mathematical explorations should come before the introduction of standard measurements.

There are clock
templates in the
Blackline Masters
section of the Week by
Week Essentials.

X. Determine the weight of classroom objects using counters as non-standard units and a balance. Estimate and then check to see how many counters balance the object.

Y. Blindfold a student. Give the child two objects to estimate which is heavier. (These should be distinctly different.) Check with a balance.

Z. Estimate and then measure: how many scoops (sand, rice, beans, water) are needed to fill the coffee cup; how many scoops are needed to fill the glass; how many scoops are needed to fill the bowl? Which container holds the most? Which holds the least? *A measurement center, which is set up with materials for linear measurements for two weeks, then materials for weighing for a time, and then containers and materials for exploring capacity for a couple of weeks will afford students “hands on” experiences without burdening teachers with the need to gather materials for separate lessons. The same centers can accommodate students who are more advanced and ready for exploring standard units along with those who are still exploring non-standard measurement materials.*

AA. Have students cut 10 equal units (these need not be standard) out of stiff paper. After using the units loose, have students make a “tape measure” by taping the units together (a ribbon backing makes assembling the tape easier). Ask student, “Do you get the same answer when you measure your book with your units loose as you get when you use your measuring tape?” *Have students cut their units from two different colors of construction paper. Be certain to spend time discussing how two children measuring the same object could both have correct but different measurements because their units are different lengths. This discussion will arise as the tapes are being made because students will need different lengths of ribbon upon which to attach their units. The units might be “personalized,” that is, the length of Sam’s little finger, of Jana’s foot. Is there anything that we could do to make measuring with the tapes faster? Let students suggest numbering the units.*

BB. Given pictures of objects, student will measure with paper clips.

CC. Give students 3 objects to measure (for example, a book, their friend, length of room). Ask child to decide which non-standard units would be best to use.

DD. Save laundry scoops to use for non-standard capacity. Have children estimate how many scoops of pasta will fill a container. Then measure to see “How many scoops of water would it take? More, less, or the same? Why?”

b) Develop strategies to estimate size.

c) Compare, using appropriate language with respect to the attribute selected.

Students should have many opportunities to experience comparisons and to hear and use the appropriate vocabulary. A rod that is “taller” in one situation may be “shorter” in another. Vocabulary should include positive, comparative and superlative forms -tall, taller, tallest - or words such as short, long, small, large, big, little, old, young, new, thick, thin, heavy, and light. More and less should be explored as geometric terms as well as numerical ideas.

Many children appear to master fraction concepts during primary years only to demonstrate a very poor understanding when the ideas are applied in upper elementary and middle grades. More important than recognizing and writing the notation for one-half or one-fourth in early grades is the internalization of basic fraction concepts. Being able to recognize equal and unequal parts is a fundamental understanding that rarely receives much attention. While most first grade children recognize and can model “halves,” many fail to realize that “halves” are equal parts.

A. Ask two students to stand. Have another child tell who is taller (shorter). Direct one of the students to choose a friend and exchange places. Now who is taller (shorter)? Make other comparisons with people and familiar objects in the classroom.

B. Set up a table with six “compare” stations - two stations each of weight, length, and capacity. Have students compare objects at each station, explaining the comparisons. As students become confident in the measurement process, have children record the results of the comparisons.

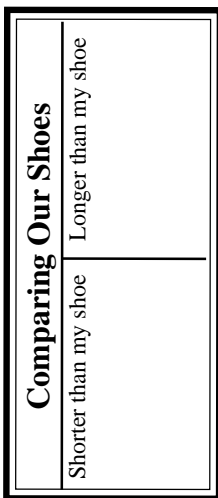
C. Give children stacks of one color of Unifix cubes (different lengths). The children must find other students with a stack the same size as theirs. (Use string, ribbons, or construction paper strips instead of cubes.) Children identify two more people--one with a shorter stack and one with a longer stack.

D. Use a balance to find the heavier object. (blocks, books, toys, etc.) Have children find other students with a stack the same size as theirs. (Use string, ribbons, or construction paper strips instead of cubes.) Children identify two more people -one with a shorter stack and one with a taller stack.

E. Have a teddy bear day and invite everyone to bring their favorite bear. Bring extras for those who don’t bring one. Have the children compare their bears by talking about the longest, shortest, heaviest, lightest, largest, smallest. Compare eyes and other features.

F. Have students make a chart. Title the chart appropriately: “We compare our shoes.” As students measure and compare their shoes with others’, the children should record the names in the appropriate column. See Blackline Master II - 41.

G. Given pictures of two objects, ask students to make appropriate comparisons and explain the reasons. “Which person is older? Which tree is taller? Which is smaller?” Use pictures of three objects for more advanced

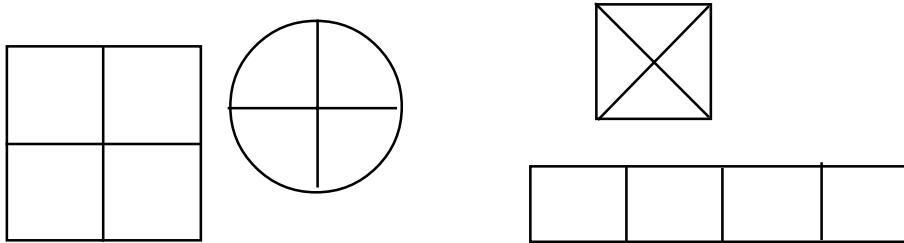


students. Workbook pages which picture comparisons are useful in testing if a child understands the vocabulary; however, teaching the child the meaning of the ideas needs to come through hands-on experiences.

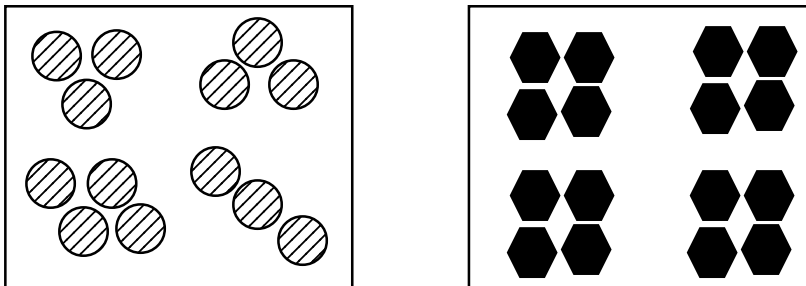
Notes and textbook references

H. Have children trace around their hands and cut them out. Then compare the hands in groups of four. Put them in order from smallest to largest. Then, compare in groups of eight. Put all hands together for a class comparison. For homework, trace the hands of everyone in your family and paste them in order from smallest to largest. How does this compare with their ages?

I. Divide shapes (paper, pop tarts or other edible models) into parts. Ask student if all parts are the same size. “Explain how you know.”



J. Use Unifix cubes (paper clips, counters, cereal, etc.) to make groups. Ask student whether the groups are equal. Ask student to explain how to tell



K. Show students regions which have been divided into parts. Ask child if the areas are equal. (Equality of area, not number of parts, is important.)

L. Ask student how many pieces there will be if something is divided into halves. Are there any special qualities that we could notice about halves? (They will be equal parts.)

M. Given pictures or a worksheet, student will identify regions or sets that have been divided into equal (or unequal) parts.

N. Give each child a whole graham cracker and have him/her try to break it into equal parts. Some will not break correctly so have them compare to see which are equal and which are not. Could there be two equal parts? four? eight?

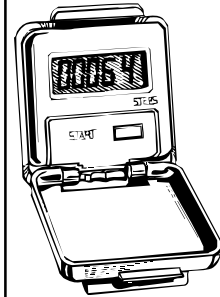
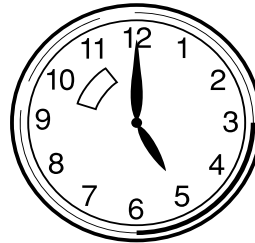
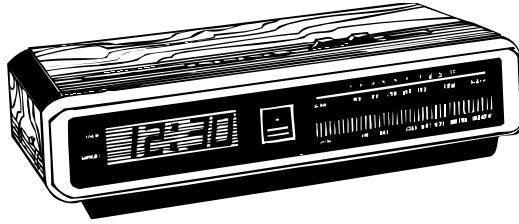
O. Each student should trace an outline of her/his right foot on a sheet of construction paper and cut it out. Next, students measure the length (or width) of the classroom using their personal “foot” measure. Record the measurements on a class chart and discuss. Why are the measurements different? Whose was the largest? the smallest? Look at the foot measures that were used. What does that tell us? Are any measures the same? Why is that? Check the “feet” that were used.

P. Have students measure objects in a variety of ways such as their desktops using thumbs or the chalkboard using handspans and arms. Record the measures and compare results. Discuss which is the best tool for measuring a particular object. Why is it the best?

Q. Have students predict which of two (or three) objects is the heaviest. Check their predictions using a balance and teddy bear counters or cubes as the unit of measure. This same activity can be used for volume/ capacity investigations. Have students predict which of two (or three) containers holds the most water, sand, rice ,beans or ghost manure. How can we check the predictions? The discovery of a common standard or container by students is a significant step in their progress toward understanding measurement.

Variation: Have students order three or more objects according to height, weight or volume. Verify using the methods described above.

2.02 Develop an understanding of the concept of time



Notes and textbook references

a) Tell time at the hour and half-hour.

Telling time is difficult for most children. Like learning about money, learning about time should be lessons throughout the year, not one isolated unit. Having an idea of the duration of different units of time comes through multiple experiences and with age. Some activities focus on duration (In one minute how far can you walk around the playground?) and other activities focus on the mechanics of reading a clock. One useful idea is to make circular clocks with only one hand. Using the short hand only, students learn the direction in which the hand moves.. They can practice “before” and “after” numbers and learn the position of the short hand for o’clock. Activities which focus on reading the clock should include pictures of time on circular clocks which match those on digital clocks.

A. Ask student: “Which hand is the hour hand? Where does the long hand point when the time is ___ o’clock?”

B. When beginning to learn to tell time, have children look carefully at what happens to the hour hand. Discuss how it is exactly on the 2 at 2:00. Watch as the hand slowly moves to the next hour.

C. Play “The Hour Is” by setting the clock for a magic time, such as 11:30. When the time is 11:30, everyone who notices raises their hand, stands up, tells the teacher, or whatever you decide. This can be added to calendar activities each morning to review time.

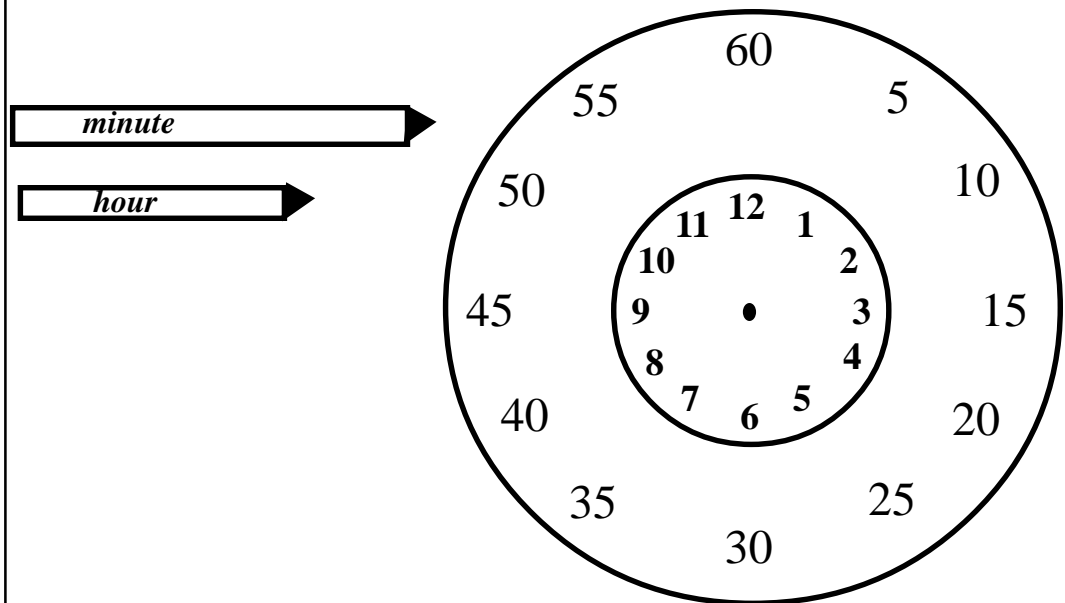
D. Ask student to name some things that are usually completed in one hour or less (for example, eat lunch). Name some things that take more than an hour (for example, going to movie). **Extension:** Ask student to tell something that could be done in about one minute.

One teacher reports that he collected old clocks at the flea market. Periodically, he and the students would wind them to go off at different times during the day. When an alarm rings, everyone stops and notices the position of the hands.

E. Have student identify clocks telling time to the hour and half-hour.. What times do they show? Which way do the hands move?

F. Have students place hands on clock to show specified times. What would the digital clocks say at these hours?

G. Telling time involves a variety of skills. Begin time by making a paper plate clock. Use a small plate to make the inside clock which has the numbers for the hours on it. Then put a brad through a larger paper plate and write the minutes on that plate. This helps the children to see the separate skills or two separate jobs of the two hands. Label the hands *hour* and *minute*.



H. Give student a paper clock with movable hands. Ask child to show the times that special activities take place during the day. Use hour and half hour designations such as "We begin school at 8:30" or "We go to the library at 10:30." "If its 1:00 now, what time will it be in two hours?"

I. Show student a digital clock. Ask child to position the hands on the circular clock to show the same time. Reverse the activity by showing student a circular clock and asking the child to make the same time on the digital clock.

J. Given pictures of clocks, have students tell the times. Relate circular (analog) clock times to digital clocks. Also, give child a clock to set a given time. Given pictures of clocks with no hands, have student draw hands to show designated times. Write corresponding digital times.

K. Write a “surprise” and seal it in an envelope (i.e., a book to read to the class or a special snack) and write a time on the outside of the envelope. When the time shows on the class clock, everyone stops for the surprise.

L. Play “Bingo Time” by having students draw hands for random hour and half hour settings on Blackline Master II - 50. The teacher calls out times and students place a marker on that clock, if they have it. Three in a row is the winner!

b) Solve problems involving applications of time (clock and calendar).

A. Show children cards with the months of the year in order. Turn some months over and ask “What’s missing? What month comes before June, after February, between August and October? How many months are in a year? What month will it be two months from now?”

B. Give cards with the names of the months to 12 children and ask them to put themselves in order.

C. Give one student cards with the months of the year to put in order or give students calendar pages to assemble in correct order.

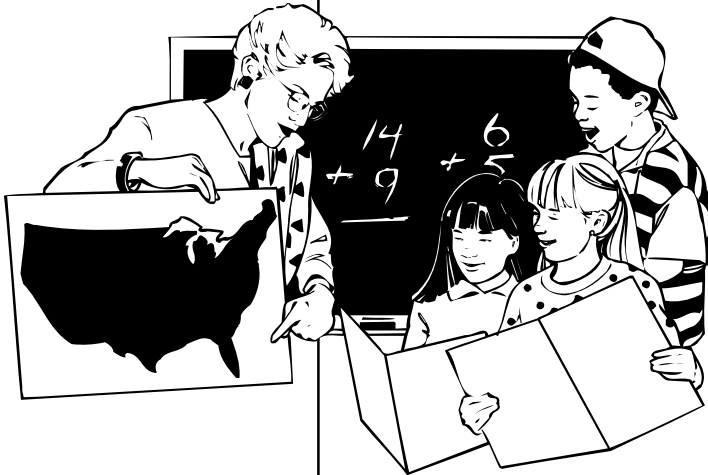
D. Divide the children into two teams. At a signal, children must put themselves in order by their birthdays beginning with January and ending with December. Extend the activity to make a birthday graph. Determine which month has the most birthdays or how long until a certain child’s birthday.

E. Group the months of the year by the season. Collect magazine pictures and decide which pictures go with winter? with spring? with summer? with fall?

F. Discuss the calendar with questions such as: “The first Tuesday in February will be what date?” “What day is February 8th?”

G. Discuss how we can know which day of the week a particular month begins and ends on. Look for patterns on the calendar. Have students look at the current month's calendar. Discuss the month before. What was its last day? its last date? next month? What is its first day? its last day? its last date?

Journal Starters to Support Writing in Mathematics



We can use mathematics journals as a way of extending each student's level of understanding. Mathematics journals can be used:

- daily
- at the end of a series of lessons
- for assessment
- at the end of a unit
- in combination with other subjects
- as a Friday summary.

Journals can be as formal as a composition book or just a few pages stapled together with a student- designed cover. Here are some prompts to get you started.

Today in math I learned . . .

I learn math best when . . .

When I find an answer, I feel . . .

The activity I liked best was . . . because . . .

What I don't understand is . . .

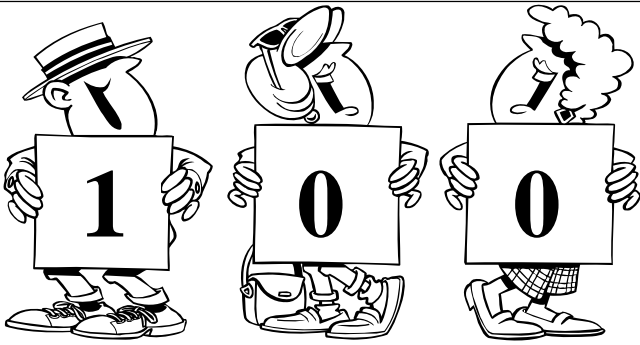
When I play this game, I know . . .

Something I want to remember is . . .

The most important thing I have learned is . . .

My favorite number is . . . because . . .

The hardest/easiest number fact is . . . because . . .



Days!!

- Identify the 100th day of the school year.
- If you had \$100 dollars, what could you buy?
- What collection of 100 things would fit in a shoe box?
- Roll a die 100 times. record the results and graph the data.
- Make a necklace of 100 objects.
- Estimate, with string, how long a train of 100 snap cubes would be. Snap them together and check.
- Who is the 100th person to enter (or leave) your classroom today?
- Draw a picture of what you will look like when you are 100 years old.
- Award a certificate for 100 days of perfect attendance.
- Bake a cake with 100 candles. How will you cut it so everyone has a fair share?
- Write or draw about the transportation people will use in 100 years.
- Make up a “100th Day Song”.
- Draw a picture of how you would have dressed 100 years ago.
- How long will it take for 100 ice cubes to melt?
- Make a display of a variety of materials to show that ten 10’s make 100.
- Collect 100 empty soda cans. how much do they weigh? How far will they stretch end-to-end?
- Give a prize to the 100th person served in the cafeteria on the 100th day.
- Make a display or poster with 100 pattern blocks, toothpicks, tinker toys or beans.
- Draw a picture of how people will dress in 100 years.
- Count out 100 gold fish or teddybear crackers. If everyone in the class shares equally, how many will each person get? will there be left overs? How many?
- In the school’s alphabetical listing, who is the 100th student?
- How long does it take for your heart to beat 100 times?
- What is your class doing on the 100th minute of the class day?
- Show 100 in a variety of ways using operations and symbols. make a poster to display.
- If $A = 1¢$, $B = 2¢$, $C = 3¢$, etc., find students whose names are closest to 100¢ in value.
- Create a 100 collage.

Why make a connection between literature and mathematics?

The use of literature in the classroom can . . .

- integrate mathematics into other curriculum areas
- provide a meaningful context for mathematics
- support the art of problem-posing
- demonstrate that mathematics develops out of human experience
- foster the development of number sense
- address humanistic, affective elements of mathematics
- celebrate mathematics as a language
- provide an esthetic dimension to mathematical learning

(adapted from Whitin & Wilde, Read Any Good Math Lately? 1992)

