The learner will recognize and use standard units of metric and customary measurement.

2

Notes and textbook references

2.01 Estimate and measure using appropriate units.

a. Length (meters, centimeters, feet, inches, yards).

Since students learn to measure with standard units during the second grade, they need to have a "ballpark" idea of the units they are using. Learning the length of an inch or a centimeter should include activities which relate the units to the child's body. Students should not convert units from one measurement system to the other.

Children will learn through their experiences that the polygons they are identifying are the faces of 3-D figures.

A. Read Jim and The Beanstalk by Raymond Briggs to students. This book is an example of using a story to introduce a math lesson. Jim measures the giant so that he can buy glasses, a wig, and false teeth for the giant. The children can brainstorm ways we use measurement in our world. Children can measure height, foot length, etc. of other children. Graphs can be created using this information. This would be a good book to use as an introduction to your measurement unit. Children can record their observations and conclusions in their learning logs.

How Big Is A Foot?
by Rolf Myller

This is a great book to read as an introduction to standard measurement. After reading, have children design their own bed for the queen using their feet. How close is it to a bed measured with standard feet? Students can write about their own beds.

Notes and textbook references

B. Give students a piece of tag-board one inch long. Ask students to find three objects at home that are about one inch long. Compare to see if estimates are reasonable. Repeat the activity with a centimeter long object (a centimeter cube is easy for students to hold).

C. Make a collection of ten-inch (and ten centimeter) items. Ask students to list three objects at home that are about ten inchs (centimeters) long. Have students check and report back to the class.

D. Show the student a collection of objects. Ask the student to identify which objects are about one inch long by sorting objects into groups; less than one inch, about one inch, and longer than one inch (for example, a paper clip, a short pencil, or crayon, Dentine gum, a hair clip, a pair of small scissors, a button, etc.). Compare with a one-inch model to verify the sorting.

E. Give a paper with different length lines drawn on it, ask student to measure the lines.

*Have students play **"The Inch Run"** from Week 14 and **"Centimeter Maze"** from Week 15 in the Week by Week Essentials.*

As standard units are introduced, students need to have sufficient experiences to understand why the need for standard units exists. They need to have a feel for the units themselves; they need to know how and when to use different forms of measurement; and they need to be able to choose the appropriate measurement devices. Activities with inches will lead to an introduction of feet and yards during the second grade just as centimeters should introduce decimeters and meters. Students should make their own measuring tapes and inch rulers as a measurement lesson. Use one-inch segments in two colors and have students tape the pieces together in an AB pattern to make a flexible measuring device 12 to 18 inches long. Taping pieces to a ribbon makes the measuring device sturdier. (An alternative is to tape 1-inch tiles together.) Ask students how they might number the tape to make measuring easier (number each segment). At an appropriate time repeat the activity making a rigid ruler by gluing or taping one-inch strips to a piece of tag-board. Talk with students about how to number this ruler. What happens if the first one-inch piece is not glued at the end of the background? (This is called a leading edge.)

F. Ask students to estimate the length of three objects and then measure the objects to the nearest inch/centimeter. *(Do not ask students to convert inches to centimeters or vice versa.)*

Notes and textbook references

G. Using the homemade measuring tape have students measure each other. Ask students to compare the different measurements: arm with a leg; foot with a hand; circumference of head with arm, etc. What do you notice about these measurements?

H. Given a workbook page with objects and rulers pictured, tell the length of the objects to the nearest inch/centimeter. Given a workbook page with pictures of objects, measure them to the nearest inch/centimeter.

I. Use Cuisenaire rods for measurement activities - the jumbo rods to measure in inches and the small ones to measure in centimeters. Have children put 3 red, 2 purple, and 1 orange in a train and measure the train. Repeat with different combinations. Then, have children find as many ways as they can, using the rods, to make 12 inches or 12 centimeters. Let the children invent their own way to record their findings.

J. Each student needs a pencil and list of all the students in the class who volunteer to throw a softball. Out on the field, mark off a starting line. Have students estimate the distances that students can throw a softball. Then have students throw and measure each distance. All students should record results on their sheets. In the classroom, tabulate data and decide how best to display it. What is the longest throw? The shortest? The difference between longest and shortest?

Julie needs to find out how much her puppy, Clancy, weighs. He will not stand still on the bathroom scale. Explain how Julie could weigh Clancy using the bathroom scale.

K. Developing **Measuring Savvy**. Introduce units of measure one at a time. For example, to introduce the meter, give each student a meter string. Have them find familiar things that they can relate to the length of a meter such as height of windows, circumference of a trash can, and the relationship to their own heights. Follow this example with other metric units. To learn about grams and kilograms, children need access to balance scales. For volume, students can use a variety of plastic containers and rice, beans or sand. At another time, develop an understanding of customary units with similar activities. Have children make displays.

L. Using their meter strings to verify adults' estimates, have students interview 5 adults to find whether they know about how long a meter is. Tell students to have adults indicate the length of one meter. When students report data, in groups tally the number of adults whose estimates were too short, just about right, and too long.

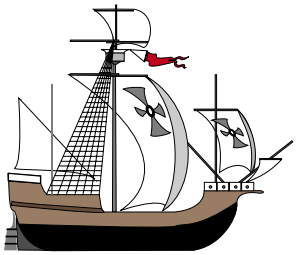
Notes and textbook references

M. Have a mock classroom tournament with javelin throws (straws), softball throws (cotton balls), and discus throws (bottom of a paper cup). Before beginning the tournament, divide the class into 3 groups. Each group is responsible for planning one event, making clear rules, and then gathering the data as the entire class participates. Also, on the day before the event have each group survey the class for estimates of how far students think they can throw the objects. On the day of the tournament, students should be involved in measuring, gathering and organizing data, creating interesting displays of data and writing about the tournament.

N. Give students a 10-centimeter strip. (Ten centimeters is one decimeter). Have them find and record 5 items that are about 10 centimeters in length or width. Let ten students tape their strips together to make a meter tape.

O. **What's Your Shape?** Divide the class into groups of three. Using metric tape measures have students measure and record the height of one student. Next, have students measure and record the width (reach) of the same student (arms outstretched). If height is greater than width, student is a tall rectangle. If height is less than width or reach, the student is a short rectangle. If height and width are about the same, then student is a square. Repeat with other members of the group. Have students cut a rectangle that represents their shape. Use shapes to make a graph to communicate total class results.

P. Draw off the dimensions of the Mayflower or draw off the dimensions of one of Columbus' ships on the playground using inches, feet, and yards. Draw off the dimensions of a school bus close to the ship. Compare the number of children who can stand inside each figure. Ask students to research the number of people who traveled in the ships. What would be some of the problems the passengers might have encountered?



Q. Have students write a measurement in inches that is between 8″ and 36″. Place all pieces of paper with the measurements in a bag. Have each student draw out a measurement and cut a string (or piece of adding machine tape that long). Find 5 things that length. For homework, take the strip or string home and find 5 more items. Discuss the homework.

R. Give students a collection of objects to measure. Have them estimate, measure, and record. Objects might include tables, books, fingers,

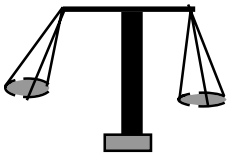
pencils, paper clips, shoes, and hallways. Use either metric or customary units.

Notes and textbook references

S. Let students work as partners to cut pieces of string the length of each other's smile. Each student measures his own string with a ruler. (Inches or centimeters can be used-whole class needs to use the same). Each student glues his "string smile" on construction paper in a smile shape. Students label pictures with their names and measurements. Create a bulletin board! All the smiles could be added together for a total class smile. A challenge could be given to another class to see how long their class smile is.

T. Have children make paper airplanes and work in pairs. Each child estimates the length of a flight for his/her plane. Mark the estimated landing points-fly and mark actual landing point and figure differences. Repeat this procedure 3 times. Compare the flights and add total distance in the air. Extension: Discuss which plane designs fly best (children's definition). Give students the opportunity to change their plane designs to better their flights. Discuss what changes were made and how the changes affected the plane.

U. Let each student estimate weights of classroom objects and record the estimates. Examples: lunches, envelopes, books, 1 jellybean, a bag of jellybeans. Weigh and record. (Note: Set up stations for measurement and let children rotate in small teams or with a partner).



V. Compare the weight of first graders with the weight of third graders. Have children estimate the weight of the typical first grader and the typical third grader. Use volunteers from each class to weigh. (Remember children are sensitive about weight, too).

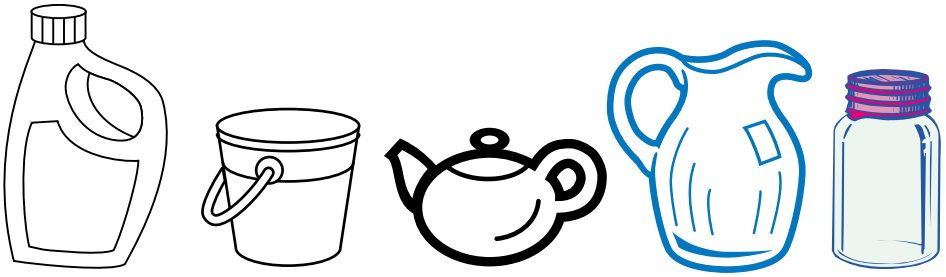
W. Choose 5 objects of varying weights for each group. Have students estimate the weight of each object and put the objects in order (in their estimates) from least to greatest weight. Students then weigh each item and reorder. Have students record their results on a chart.

X. Bring different types of fruit to school. Have students estimate the weight of each kind of fruit. Make several groups that you think weigh a kilogram. Weigh each and use a calculator to help estimate how many pieces of fruit you might get in a kilogram.

Y. Divide the class into groups. Give each team a container of bean mixture. Have students sort beans and estimate which kind of beans will weigh the most. Weigh and record data.

Notes and textbook references

Z. Have students estimate the capacity of three or more containers and order them from the container which will hold most to least. Students check estimates by filling containers with popcorn, rice, beans, or other materials and measuring the capacity with standard measures.



AA. Have students work in groups. Take a 9″ x 12″ inch sheet of construction paper and cut it in half. Make a round tube by rolling one piece the long way. Tape the edges where they just meet. Roll the other piece in the opposite direction and tape. Will one tube hold more than the other or will both tubes hold the same? Record all estimates. Using popcorn or some other filler , let students record the number of scoops each will hold.
Variation: Make larger tubes and use cups to determine whether volume is the same.

BB. Have children investigate different kinds of scales. Invite a guest from an agency or business to talk to the class about scales that are used in various occupations.

CC. See BlacklineMasters II - 29 to II -31 for recipes and recording sheets. Have students read their recipes and color in the amounts needed for each ingredient. Label the ingredient under each. Lastly, students should compute (or estimate) the quantity when the recipe is completed. Then have a group of students make the recipe. Newspapers and magazines are a good source for additional recipies.

DD. Have students create their own measurement tools. When students invest time and energy in creating a tool, they not only understand this tool better but also try harder to take care of it. The following procedure can be used by students to create measuring tools for inches, feet, yards, centimeters, and meters.

Working with a partner, complete the following steps:

1. Anchor a meter stick to a table top using masking tape.
2. Anchor a piece of inexpensive ribbon at least 1″wide (wrapping ribbon works) along the edge of the meter stick. Be sure the ribbon is lined

up along the edge of the meter stick with the demarcations.
3. Using a ball point pen, draw lines on the ribbon for each centimeter and leave enough room for writing the numbers 1 through 100.
4. Remove the ribbon, leaving the tape on the two ends as leaders.
5. Write your name on the back.

Repeat this process to create a yard marked off in inches.

EE. Send students on an awareness scavenger hunt. Have them find at least five things that measure about a meter, draw a picture of these things, and name them in a math journal. This could also become a homework assignment. This can be repeated for 1 centimeter, 10 centimeters, 2 meters, 1 inch, 1 foot, 1 yard, 2 feet, etc.

FF. Students will use the tools (meter ribbon and yard ribbon) while participating in a measurement Olympics competition where the goal is to estimate as close as possible. The AIMS (Activities to Integrate Math & Science) Project includes a MINI-METRIC OLYMPICS which is the basis for this task. Lead a brief discussion about the events in the summer Olympics. Hopefully, students will be familiar with events such as the shot put, javelin, and discus throw. Ask everyone to estimate how far they might be able to shot put a cotton ball and record the estimates on a chart. This might be an opportune time to discuss the appropriate unit of measurement for such a distance. Then, give everyone a cotton ball, have them shot put the cotton ball, and have their partner measure the distance. Record the actual distances beside the estimates on the chart. Each student's "score" for this event is the difference between the estimate and the actual distance of the shot put.

GG. The class can organize and implement their own mini Olympics. Lead a brainstorming session to create a list of possible events. Some of the events on the list might be held outside while others will be inside. Emphasize that the events must include estimates and actual distances, and the focus is on making the closest estimate - not the longest actual measurement. Divide students into pairs or small groups. Each group selects an event to plan. This planning should include a list of needed materials and clear rules for judging the event. Each group might also be responsible for designing a "medal" for the event. Students will be using their own handmade tools for measuring during this Olympic event. After holding the measurement Olympics for their own class, students might repeat this for other classes.

HH. Developing the objective: Begin by having students create their own tools. Using a balance scale, students can create a set of weights with non-toxic modeling clay. The following weights might be useful: 1g (make four of these), 5g, 10g, and 25g. Students might need to work in pairs when weighing heavier items since all of this will require a considerable amount of clay. They can also create about ten to twenty one-ounce pieces

Notes and textbook references

and combine ounces for pounds. If plenty of clay is available, students might want to create a one-pound weight. The weight and student's initials can be scratched into each weight piece.

II. Extend the mini Olympics idea with a focus on weight events. Use the same procedure by beginning with brainstorming a list of events. Then have small groups of students plan and implement the Olympics. Some ideas for events include:

- object snatch (estimating the weight of a handful of various kinds of objects like a handful of marbles or popcorn),
- barges (estimate the maximum weight that various floating objects will hold, or the "sinking weight" ... some of these might be commercial toy boats, and some might be boats created by students from clay, aluminum foil, etc.),
- dry sponge and wet sponge (estimate the weight of sponges before and after they are soaked in water)
- magnetic lift (estimate the weight of the paper clips that a small magnet will lift when "dunked" into a pile of paper clips), and
- your pick (pick an object to estimate), etc.

JJ. Again, students will "create" their own tools. Have students search at home for various capacity measurements and bring them to school to add to their personal "math kits". What might be a good measure for a cup? Larger plastic containers or milk cartons might also be calibrated using a permanent marker in order to show smaller amounts such as cups and pints.

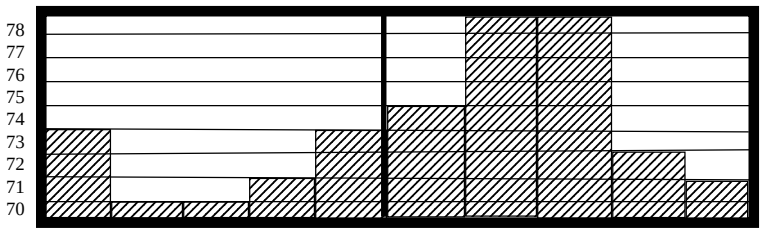
*Play **"The Heat is On"** in Week 7 of the Week by Week Essentials.*

b. Temperature (Fahrenheit).

A. Using a demonstration thermometer have the children act out the way they would feel at given temperatures. For example, at 30^0 F the children would shiver, but at 80^0 F they would pretend to be hot. Reverse the activity and have some children pantomime being hot, cold, cool, warm, etc. Another student would make the thermometer read an appropriate temperature.

Notes and textbook references

B. Have real thermometers inside and outside the classroom. Ask children to read the temperatures at the same time each day. Record the temperatures on a chart or graph. *This information can be used for a graphing activity in which students collect data and keep records over a long period of time.*



Fahrenheit readings at 9:30 am during the 1st two weeks of September

Read Lemonade Parade by Ben Brooks

C. Give students drawings of thermometers with increments of 1 , 2, and 5 degrees. Have children color given temperatures. Show pictures of thermometers. Ask children to read temperatures. Match scenes with appropriate temperatures. See Blackline Masters II - 26 through II - 28.

D. Have children predict the temperature and color in their predictions on a thermometer. Then check the outside temperature by having a child read an outside thermometer. Record the actual temperature on a thermometer beside the prediction. Compare the two thermometers. These recordings should show an increase in the ability to predict and correctly read over a period of two to three weeks. This may be added to the class calendar.

E. Have a student read an outside thermometer. Then ask the class members to estimate the temperature. Record results on a graph or chart. This is an excellent daily calendar activity.

2.02 Tell time at the five-minute intervals.

A. Have ten different times written in 3 ways (words, digital and analog clocks) on cards. Have a student shuffle the cards and deal five cards each to a group of 3 or 4 players. Turn the rest of the deck face down as a draw pile. When students can match all three cards, they place the cards face up in front of them. Play begins when the player to the right of the dealer draws a card from the discard pile. Play continues to the right. Winner is the person with most triplets. See Blackline Masters II - 22 through II - 24.

Notes and textbook references

B. Have students draw times on clocks for a variety of daily routines: time they get up, eat breakfast, leave for school, and so on. Have them write a log to explain each time pictured. See Blackline Master II - 25.

C. Have students make clocks showing the times of special classes or events for entire day. Let groups of children design a special poster for each day of the school week.

D. Using the cards from activity 2.02 A to play **Concentration**.

E. Duplicate pages from TV Guide or TV schedules from a newspaper. Have students draw times on clocks to show when favorite programs begin and end. Discuss how much time students spend watching TV. Record the length of time of your favorite TV show. How many commercials are there during your show? How much time was spent in commercials? How much time was spent on the actual show? Note: Consider turning these ideas into a study over a couple of weeks. Collect data and graph the amount of time spent watching TV. Have students decide what other data could be interestingly displayed.

F. Many people keep diaries and personal notes. Read a short selection from a famous diary like A Gathering of Days by Joan Blos, The Diary of Ann Frank or the captain's log from *Star Trek*. Have students keep personal timelines for a week. The special aspect of these diaries will be the inclusion of very specific times. Discuss times during the day upon which students might want to focus: time of rising, time of leaving the house for school, time of arrival at school, time of eating lunch, time of leaving school, etc. Students will design their own record-keeping method, but each record must state the activity or event recorded with a picture of the time on both traditional and digital clock.

G. Students might be encouraged to create a very detailed time line showing the classroom schedule on each day of the week. Keep this objective in mind during the school day and frequently ask students to focus on the time and how both traditional and digital clocks would record this time.

Notes and textbook references

How Can We Use Literature to Teach Mathematics?

- **to motivate investigations**
- **to pose problems to students**
- **to provide contexts where students can pose problems**
- **to illustrate concepts**
- **to foster use of mathematical language**
- **to stimulate independent, creative thinking**
- **to encourage choice and decision making**
- **to introduce or develop notation**
- **to assess students' abilities and inclinations**

(adapted from Griffiths& Clyne, *Books You Can Count On*, 1998)

Notes and textbook references

3

The learner will perform simple transformations.

3.01 Combine simple figures to create a given shape.

Spatial visulization activities carry over into real-life applications such as judging distances when riding a bike or skating, packing boxes or filling drawers or bottles, and using computer scoring sheets. Being able to bubble in the answer on a separate scoring sheet is a spatial problem for many children.

A. Have students solve jigsaw puzzles. Have students create puzzles by cutting up greeting cards into puzzle pieces and placing the homemade puzzles in sandwich bags.

B. Have students fill in pattern block designs in more than one way. Record by tracing the blocks used each time.

C. Show student a hidden shapes picture. Have child identify as many figures as possible. Pictures such as those in *Highlights* magazine are appropriate.

D. Arrange six to eight pattern blocks in a certain order (not a recognizable pattern). After the student examines the arrangement, scramble the blocks while the student's eyes are closed. Ask child to arrange the blocks in the original order.

E. Show students a drawing for a brief period. Ask the child to draw the figure from memory. For a group activity, place a design on the overhead for a few seconds. Ask students to draw what they remember. Show a second time and allow students to refine drawing. Several examples of this activity are in the *Week by Week Essentials:* **Seeing Math**.

F. Ask students to draw a picture of the front of the school from memory, givinging the picture as much detail as possible.

Notes and textbook references

G. Ask students to draw a floor plan of a room at home. Then take the drawing home and compare. How well did you remember?

H. Have students make a design on a geoboard. Ask students to record the geoboard design on dot paper. Reverse the process: give students a design drawn on dot paper and have children make it on the geoboard.

I. Given a picture of a block design (not actual size of the blocks), have students build the design.

*See **Oodles and Noodles** game in the Week by Week Essentials.*

J. Use the seven tangram pieces to make a square. Use tangrams to complete other puzzles.

K. Have child identify specific shapes in the classroom. For example, where do you see a circle? Where do you see a cube?

L. Give one student a design card. Ask the student to describe the design to another person. The second child tries to draw the design from the descriptions.

M. Make puzzle outlines with two pattern block pieces or shapes cut from stiff paper. Draw other puzzles which are similar but which cannot be completed with the two shapes. Ask student to identify which puzzles could be completed with the two blocks.

N. Ask students to identify three right angles (square corners) somewhere in the classroom. Have student model a right angle on a geoboard, with tinker toys, or with other materials. Ask child to make on a geoboard a figure that has a right angle.

O. Show students a picture from a magazine. Ask children to outline basic shapes. Create a graph of the basic shapes found in the picture.

P. Ask children to identify basic shapes in common objects. For example, "What shape are most students' desk tops? The tops on gallon milk jugs are what shape? What shape are the highway signs that say 'Yield'? What shape are most boxes?"

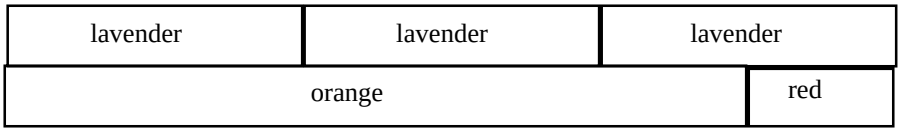
Q. Make a 3-dimensional design with blocks. Ask students to copy the design. Make a 3-dimensional design with Unifix cubes. Ask students to estimate how many cubes are needed to copy the design. (How many are hidden?) and then reproduce the design.

Notes and textbook references

R. Have one student make a design that is hidden from a partner. The first student describes the design and the second student tries to build the design from the description. Use cubes or pattern blocks.

S. Show students a picture of a 3-dimensional design (blocks, for example). Ask students to make the design.

T. Use Cuisenaire rods to replicate designs. Build a design on the table and have child replicate your design. Have children build designs in small groups for others to replicate. Record by drawing and coloring what they build.



3.02 Describe the change in attributes as two- and three-dimensional figures are cut and rearranged.

A. Using any set of building blocks, make a "building". Have students make exact replicas of your building. Talk about congruent designs and how students know that the buildings match (i.e. same number of blocks, same size blocks, in the same positions). Use pictures of lego designs for students to make constructions.

While this objective speaks to designs with cubes, students need experiences with a variety of materials.

B. Pair students and pattern blocks, geoboards or Cuisenaire rods. One partner builds 1/2 of a figure or shape on the left side and the other partner completes the symmetrical half. Use a piece of yarn for students to mark line of symmetry.

C. Use 6-8 cubes to create a design. Have students copy the design. Pair students and have them repeat the activity. As students become proficient, make designs with 8 to 10 cubes.

D. Group students in pairs. Each student in the pair gets an identical set of building blocks (4-10 blocks). Students place file folders up as barriers so that neither student can see what the other is doing. One student

builds a structure with his or her blocks and describes how to build the structure to the partner. The partner tries to build the same structure (this person can ask as many questions as needed). Have students discuss what was helpful in the communicating process.

Notes and textbook references

E. Use the yearly index from the Arithmetic Teacher, the publication by the National Council of Teachers of Mathematics especially for elementary grades, to find good ideas. If your library does not subscribe, ask about joining. NCTM headquarters is located at 1906 Association Drive, Reston, VA 20191 or call 1-800-235-7566. Web site: www.nctm.org

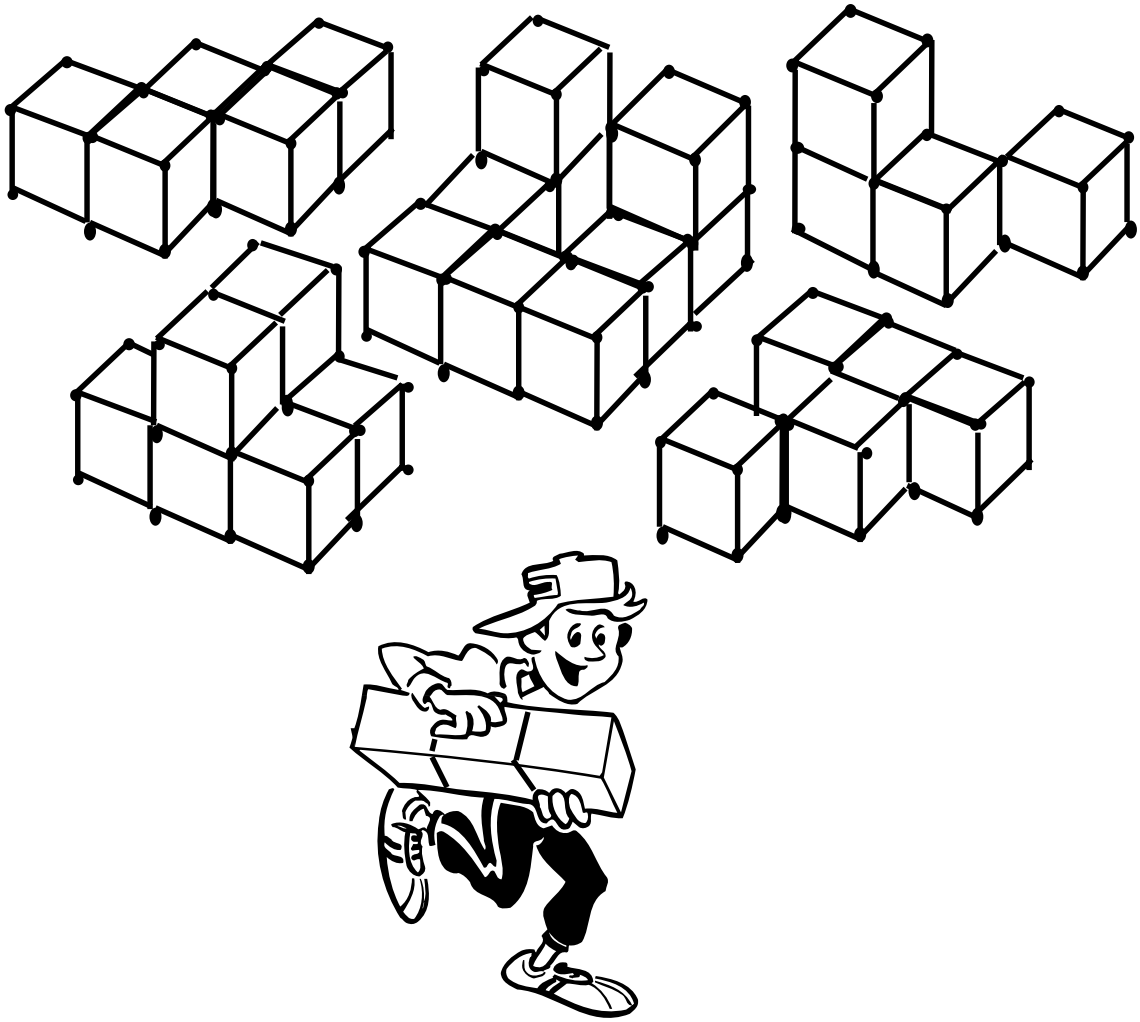
F. This presents a good opportunity to use the "Teaching Behind the Shield" strategy. Students work with a partner. Each student has the same number of cubes and a manila folder or some other object to put up a shield. One student builds a structure with cubes behind the shield while telling his/her partner how to build the same structure. The partner is also building behind a shield so that the two students must rely upon their communication skills to build congruent shapes. When the two students think that they have built the same structure, they lift their shields and compare. At this point, they discuss what occurred during the process that helped or hindered the building of congruent shapes. If the shapes are different, they work together to rebuild so that both shapes are congruent. Focus students' attention as much as possible upon use of specific vocabulary and communicating precisely.

Evaluating student progress: As students work to build behind the shield, circulate and observe. Make brief anecdotal notes about specific comments from individual students. Listen for use of precise language. If these notes are written on peel-off labels, they can be quickly attached to a plain piece of paper and filed in a student's portfolio. As anecdotal notes like these are added to each student's file, documentation of progress builds.

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

Notes and textbook references

G. Use picture cards for students to practice building models from drawings. See the Blackline Master III - 34 Cube Designs for examples. Students bring in boxes that are rectangular prisms. They trace around faces on a large piece of paper, labeling top, sides, and bottom. Place the papers the students made on a table with the boxes. Students try to match the boxes with their maps.



3.03 Identify and make:

a. Symmetric figures.

A. Introduce symmetry by discussing the symmetry of our bodies. Eyes, ears, arms, legs. Are the clothes you are wearing today symmetrical? How?

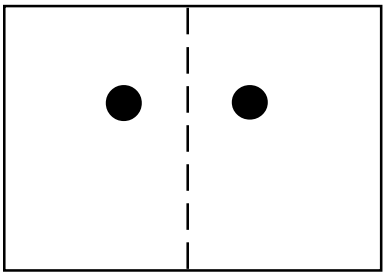
Notes and textbook references

B. Give students mirrors (or reflective metal or plastic) and test to see whether pictures are truly symmetric. Can you make symmetric figures with your mirror?

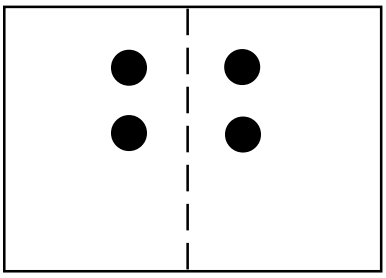
C. Give student pictures to cut out. Ask child to decide whether the figure is symmetrical and to locate lines of symmetry by folding the figure.

D. Give students paper which has alphabet letters printed as capitals. Ask student to find letters with lines of symmetry. *Children will discover both horizontal and vertical lines of symmetry.* Tell how you know the letters are symmetrical. Do some letters have more than one line of symmetry? **Extension:** Challenge student to write a word in which all letters are symmetrical.

E. Have students fold a 4 x 5 piece of paper in half and punch one hole, then open it up and glue on a colored piece of paper. Repeat with two holes, three holes, and so on. Have students write the doubles facts that match the hole punches.



1 + 1 = 2



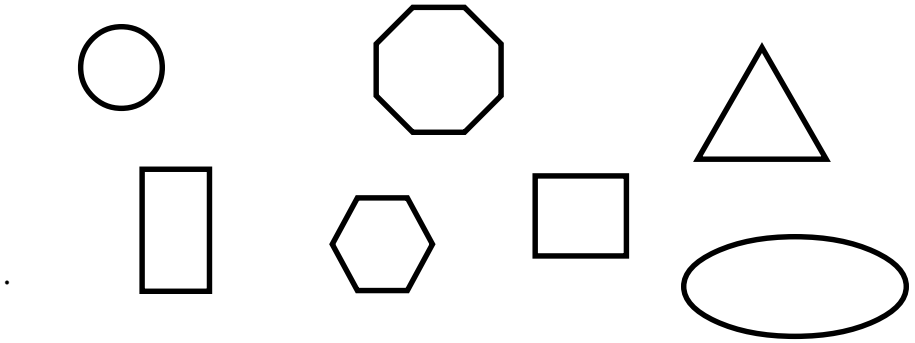
2 + 2 = 4

Ideas for teaching geometry, including computer activities, can be found in the Grade 2 Addenda book published by the National Council of Teachers of Mathematics.

F. Have students fold a sheet of orange construction paper and then follow the teacher's directions to cut out a jack o' lantern, white paper for a snowflake or fold red paper and cut out a valentine heart. Draw lines of symmetry.

Notes and textbook references

G. Collect pictures and drawings with symmetry as the theme. Some sections might have shapes with only one line of symmetry; other chapters would have shapes with two, three, four, or more lines of symmetry



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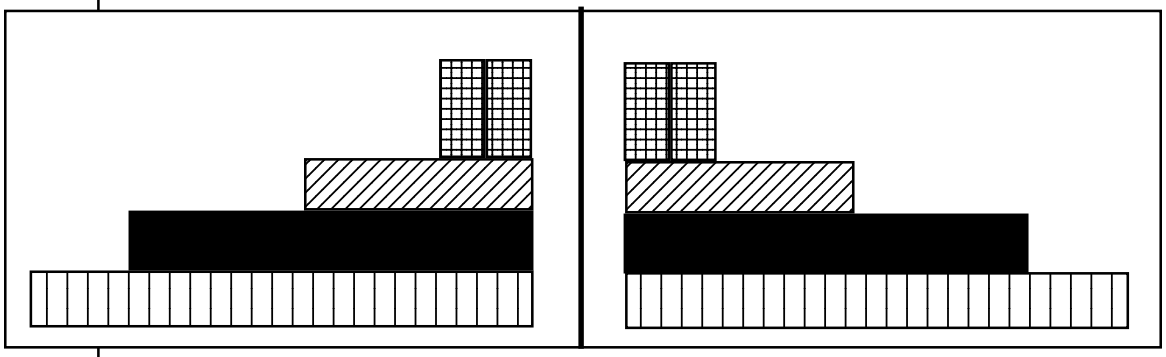
H. On a work mat that has a line drawn to indicate the line of symmetry, ask student to build with pattern blocks or Cuisenaire rods a symmetrical design. Work with a partner. The second student copies on the right side of the line of symmetry pieces that the first student has placed on the left of the line.



I. Show students how to cut paper dolls and other designs from folded paper. Illustrate for them that the fold line is a line of symmetry. Give students scrap paper to experiment folding and cutting.

J. Find letters of the alphabet that are symmetrical when written as capitals. Use folded paper to cut capital letters and discuss the lines of symmetry. What numerals are symmetrical? Classify letters

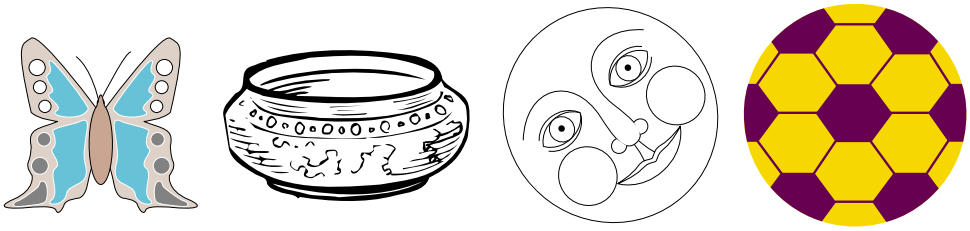
T H E D O G

and numerals as those with horizontal symmetry, those with vertical symmetry, and those with no symmetry. Can you write words in which all letters have line symmetry? Can you write a true number sentence in which all digits are symmetrical?

Notes and textbook references

K. Find pictures in magazines. Cut the pictures in half along a line of symmetry. Paste down the half and have students draw the other half to match.

L. Make symmetry blobs. Each student will make a blob picture by folding a sheet of paper in half and dabbing paint on one side of the paper, making sure some paint touches the center fold. Students then fold paper together and press gently. Open papers and allow to dry. Find and draw the line of symmetry.



M. Ask students to find symmetrical objects such as reading glasses, butterflies, leaves, flowers, faces, and so on. Make a display of real objects or pictures, showing the lines of symmetry.

N. Use a mirror to help children identify lines of symmetry with pattern blocks. Students trace around blocks and record lines of symmetry. Variation: Students make symmetrical designs on mats. Check for the line of symmetry with the mirror.

O. Decorate cookies or small pizzas symmetrically. Make an edible symmetrical design and figure the cost of each serving.

P. Using materials such as pattern blocks or Cuisenaire rods, have students make congruent shapes. Students could build shapes that are combinations of blocks and explain how they know the figures are congruent.

Q. Use computer programs for exploring this objective, for example, The Factory or Delta Draw. Have students create congruent figures with LOGO or LOGO Writer.

R. You and your partner need 2 sets of tangrams. Make 4 congruent squares; make larger congruent squares. How many can you make with your pieces? What other congruent shapes can you make? How will you know they are congruent?

Notes and textbook references

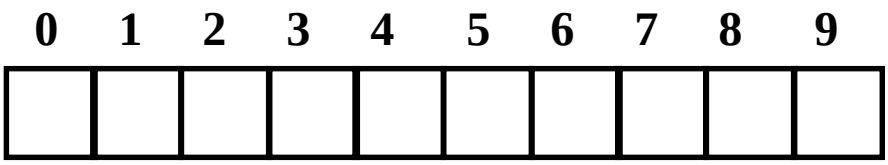
S. Give students squares of regular bond paper such as duplicating paper (4-inch squares are a good size). Have them fold the square side to side once. Then have them cut off one corner. Before opening the square, ask them to visualize what the square will look like when it is opened. Then they open the square to see what it does look like. Have them identify the line of symmetry. Then have them refold the square and draw the rectangle with the corner cut off (they might even trace this). At this point, using the fold as a line of symmetry, students draw what the square will look like when opened by drawing the reflection of the rectangle on the other side of the fold. Continue with this idea by having students make different kinds of cuts. Progress to folding the square on the diagonal and then folding more than once. Students could also punch holes in these squares. After working with squares for a while, try other shapes like circles, rectangles, hexagons, triangles, etc. This might make a good warm-up activity on a regular basis. Try putting some of the folded and cut shapes on the overhead and ask students to draw what the square will look like when opened. Be sure to identify where the folds are on the overhead shape so students know where the lines of symmetry are.

T. The activity described in developing objective 3.03 G will also help develop this objective. This activity could be expanded to include building materials other than cubes, such as Cuisenaire rods, pattern blocks, geoblocks, tangrams, etc.

U. Have students draw shapes behind the shield and tell a partner what to draw. If students draw on graph paper, their shapes might be easier to describe. Also, Logo Writer, a computer language complete with graphics capabilities, will offer students an infinite number of opportunities to use the computer to investigate congruent and symmetrical shapes.

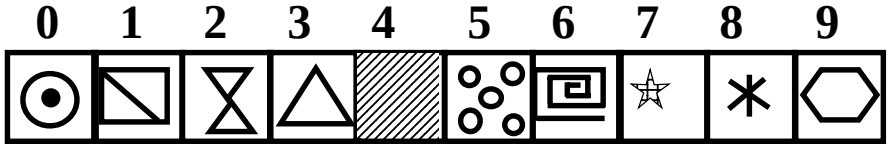
V. Create a abstract art picture while reviewing addition or subtraction facts. See Blackline Masters III - 32 and III - 33.

- Tell students that they will be working with either addition or subtraction and patterns and that they need to design a personalized code to use. Give them a number strip and have them use markers or crayons to create a unique design for each digit.



Notes and textbook references

These designs may be as simple as a different colored square for each digit or as involved as geometric figures and intricate pictures in each square.



- Give each student a blank multiplication or addition grid sheet on which you have written the numbers you feel are appropriate for the individual student. The grid may be any size (from 4 x 4 squares to 8 x 8). The student adds or multiples the numbers and writes the sum or product in the corresponding squares within the grid.

⊕	1	2	3	4
5				
6				
7				
8				

⊕	3	4	5	6
3				
4				
5				
6				

⊕	6	7	8	9
6				
7				
8				
9				

- Once the student has completed the grid and a number appears in every square, instruct students to underline the digit in the ones place in every section. Then, distribute blank grids that have the same number of squares.

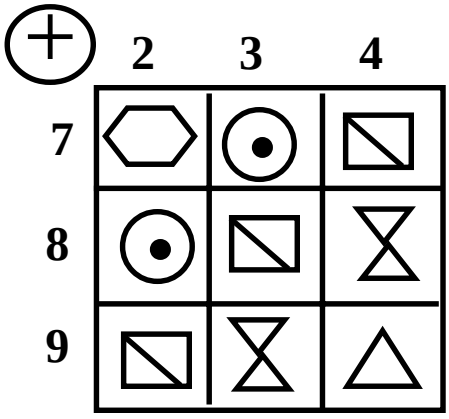
⊕	1	2	3	4
5	6	7	8	9
6	7	8	9	1<u>0</u>
7	8	9	1<u>0</u>	1<u>1</u>
8	9	1<u>0</u>	1<u>1</u>	1<u>2</u>

⊕	3	4	5	6
3	6	7	8	9
4	7	8	9	1<u>0</u>
5	8	9	1<u>0</u>	1<u>1</u>
6	9	1<u>0</u>	1<u>1</u>	1<u>2</u>

⊕	6	7	8	9
6	1<u>2</u>	1<u>3</u>	1<u>4</u>	1<u>5</u>
7	1<u>3</u>	1<u>4</u>	1<u>5</u>	1<u>6</u>
8	1<u>4</u>	1<u>5</u>	1<u>6</u>	1<u>7</u>
9	1<u>5</u>	1<u>6</u>	1<u>7</u>	1<u>8</u>

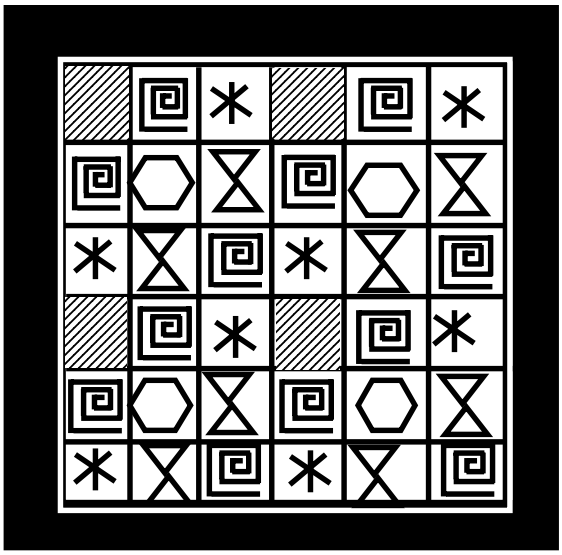
Notes and textbook references

- Using the personalized code the students made the previous day and the addition grid, tell students to color each square according to the code (using the number in the ones place).

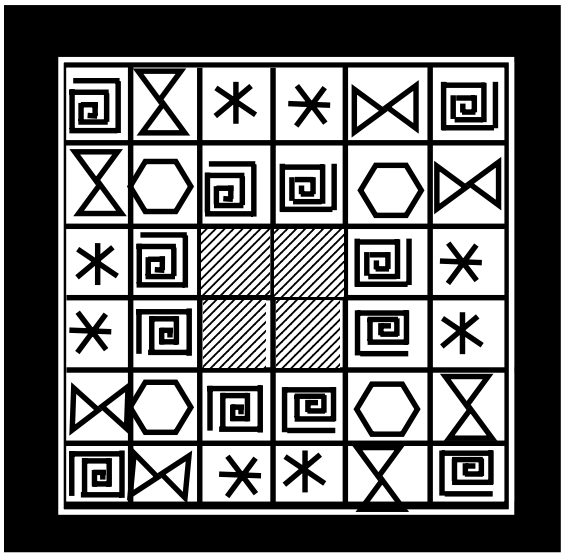


- As students complete their designs, have them identify patterns. Are they the same? Are they different? Why? Ask students to visualize what the designs would look like if they were rotated a quarter turn, a half turn. Try turning the designs to see. Cut out the entire grid and save for the next day.

- The next day talk about congruent figures (for example, cookies cut with the same cutter). Have students replicate their designs three times (i.e., create three more grids that are congruent in color and design). Experiment with putting the four designs together to make a large square. Have each child choose his or her favorite way to assemble the four congruent figures and glue them to large construction paper (leaving a border around the design).



Notes and textbook references



b. Congruent figures.

A. A fun way to introduce congruency is to show two figures on the overhead and say, “These are congruent.” Then show two more and say, “These are not congruent.” Continue this with several examples with you making the correct statement about congruent or not. As you proceed let students make the statements if they think they know what this new term means. Then have student s write what they think congruent means.

B. Make several designs with pattern blocks or other materials. Ask child to identify which ones are exactly alike (congruent). Ask child to make three more just like the one the child identifies as the favorite. Record these by tracing the blocks or stamping the designs.

C. Play **Copy Cat.** Seat two students side by side. One child makes a design and the other copies it. Repeat and take turns. Students should talk about their designs. Talk about how symmetrical designs are made of congruent parts but they have been flipped over.

D. Cut several different shapes from construction paper. Ask student to match those that are exactly alike. What does congruent mean?

E. Use Tangram pieces to make figures that are the same size and shape. How can we use the medium triangle and a square to make a figure congruent to a shape made with two small triangles and a medium triangle?

Notes and textbook references

F. Use cookie cutters to make congruent shapes out of play dough, clay, or real dough. Ask students to explain what congruent means.

Why Make a Connection Between Literature and Mathematics?

The use of literature in the classroom can:

- **provide a meaningful context for mathematics**
- **integrate mathematics into other curriculum areas**
- **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 aesthetic dimension to mathematical learning**

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